

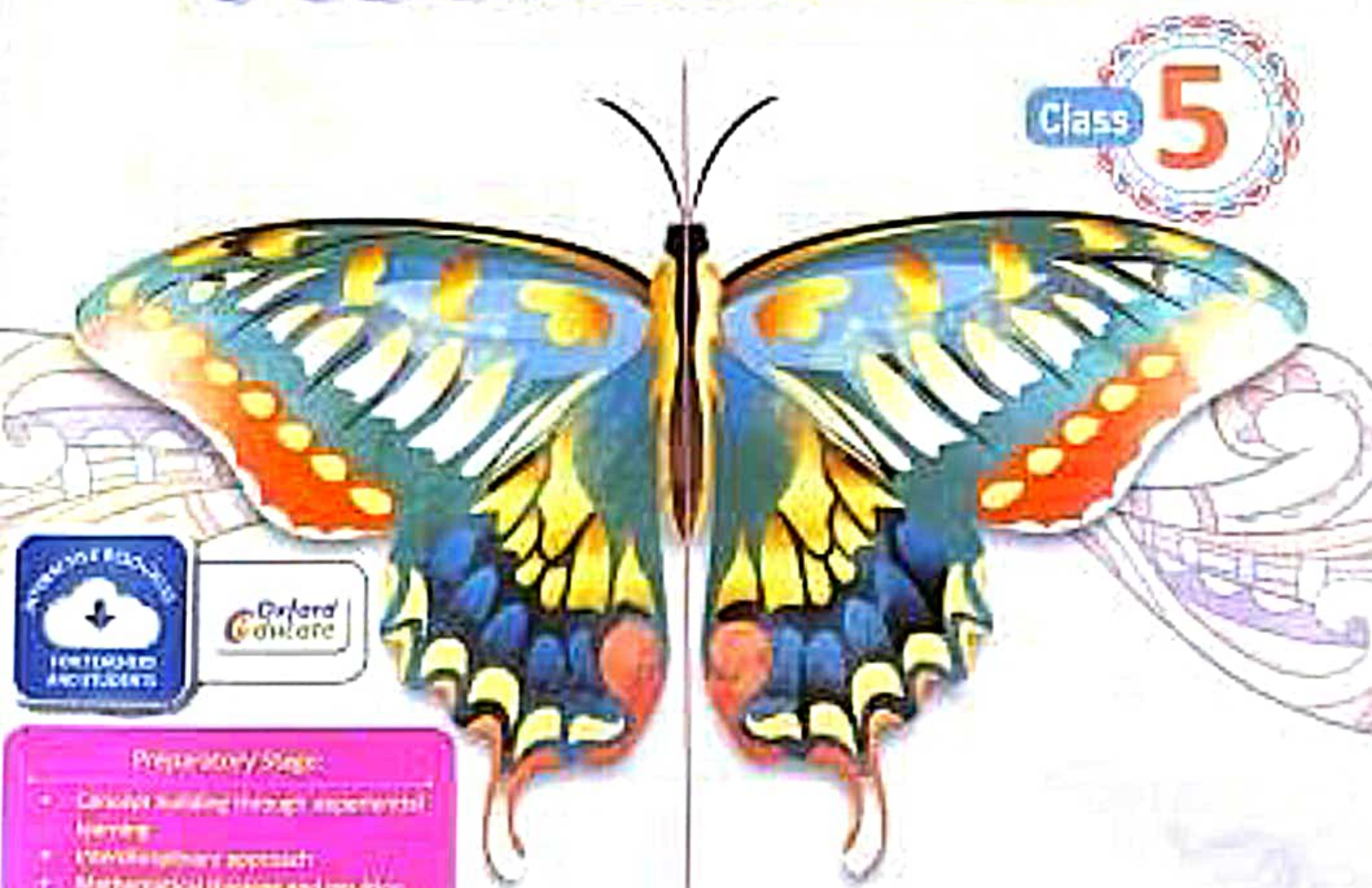
PREPARATORY
STAGE

As per
NCF
2023

New Enjoying Mathematics

Class

5



Oxford
Gadlure

Preparatory Stage:

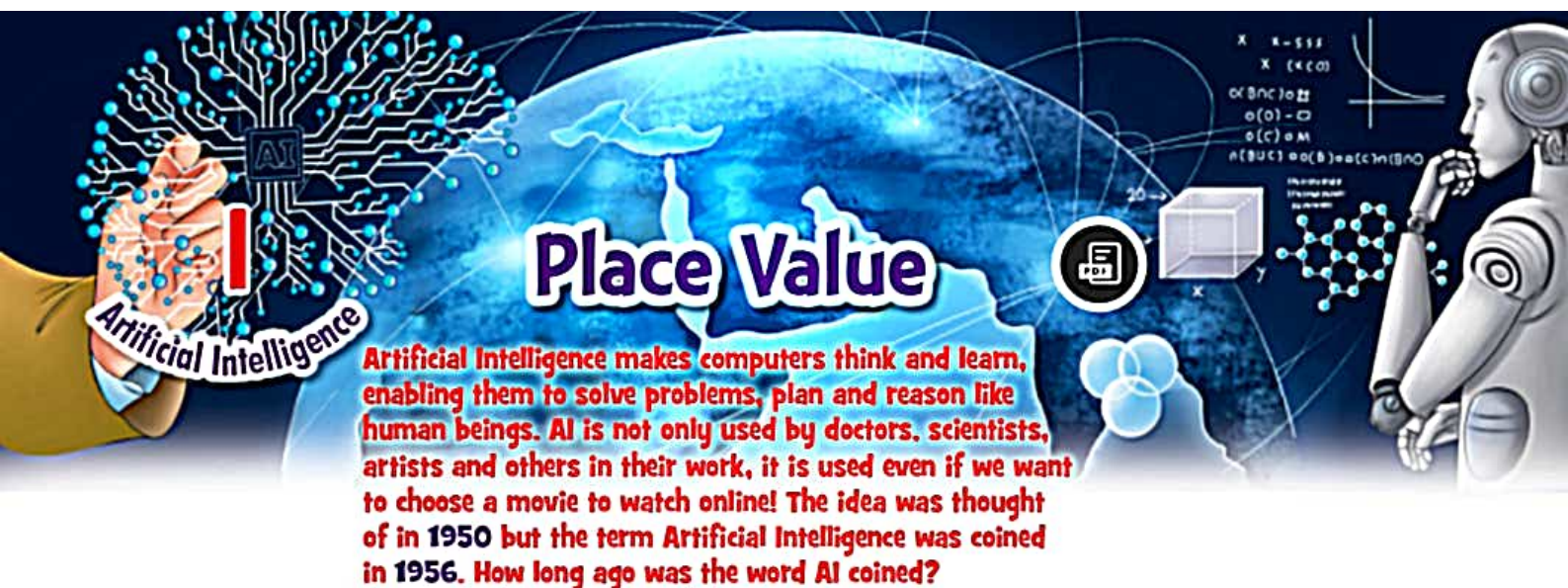
- Develops mathematical thinking and problem-solving skills
- Develops mathematical communication skills
- Mathematical thinking and problem-solving
- Building mathematical skills

In this book:

- HPS, Maths Lab Activities, and Projects
- Chapter themes, STEAM, Movement, Data Connect, and Maths Web
- Problem Solving Strategies, Challenges, Mental Maths, and Games
- Critical Thinking Skills, Journal, and Mathwork

Aashalata Badami

OXFORD



LOOKING BACK

Lakhs

1,72,404 – One lakh, seventy-two thousand, four hundred four

Lakhs	Thousands		Ones			← -- Period
Lakhs	Ten Thousands	Thousands	Hundreds	Tens	Ones	← -- Place
1	7	2	4	0	4	
1 Lakh	7 Ten Thousands	2 Thousands	4 Hundreds	0 Tens	4 Ones	
$1 \times 1,00,000$	$7 \times 10,000$	$2 \times 1,000$	4×100	0×10	4×1	

Expanded notation: $1,00,000 + 70,000 + 2,000 + 400 + 0 + 4$

The expanded form can be used to write the number in standard form.

- Give the place value of the coloured digit.
 - 34,987
 - 63,653
 - 4,10,987
 - 3,09,764
- Use the digits 5, 6, 3, 8, 9, and 1 to:
 - build the greatest number possible.
 - build the smallest number possible.
 - give the expanded notation and number name for both.
- Compare using $>$, $<$, or $=$.
 - $86,543$ $9,876$
 - $7,01,765$ $7,10,765$
- Spot the pattern and fill in the blanks.
 - 23567, 23667, 23767, _____, _____, _____
 - 15098, 25098, 35098, _____, _____, _____

Mathspeak

FA*

How is each column in the place value chart related to the column to the left of it?

NCF 2023

Competencies in this chapter
C-1.1: Applicable to the entire chapter
C-1.4: Labelled on specific pages

The Mathspeak feature will help you to express your understanding verbally to your teacher and your classmates.

LAKHS AND CRORES

7-Digit Numbers – Lakhs

In a smart city the authorities installed 13,92,684 AI sensors to collect data on traffic, air pollution, and security.

13,92,684 is a 7-digit number. Let us understand the number before we try to read it.

Do you remember the largest 6-digit number? $\rightarrow 9,99,999$

If you add 1 to it, you get the smallest 7-digit number. $\rightarrow + 1$



A 7-digit number begins at the ten lakhs place.

10,00,000

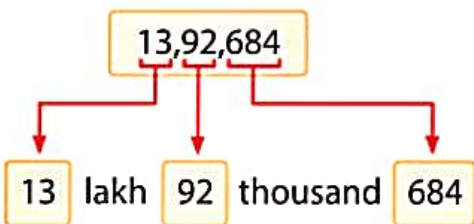
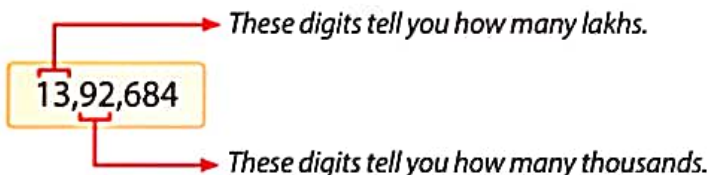
10,00,000 is ten lakhs.

These digits tell you how many lakhs.

Lakhs		Thousands		Ones		
Ten Lakhs (TL)	Lakhs (L)	Ten Thousands (TTh)	Thousands (Th)	Hundreds (H)	Tens (T)	Ones (O)
1	3	9	2	6	8	4
1 Ten Lakh	3 Lakhs	9 Ten Thousands	2 Thousands	6 Hundreds	8 Tens	4 Ones
$1 \times 10,00,000$	$3 \times 1,00,000$	$9 \times 10,000$	$2 \times 1,000$	6×100	8×10	4×1

Expanded notation: $10,00,000 + 3,00,000 + 90,000 + 2,000 + 600 + 80 + 4$

Read the number with the help of commas.



Try This!



Give the expanded notation and write in words.

- 14,00,651
- 23,45,000
- 87,23,986

In words: Thirteen lakh, ninety-two thousand, six hundred eighty-four

Common Mistake!

37,68,000

Thirty-seven lakhs sixty-eight thousand $\times$

Thirty-seven lakh, sixty-eight thousand $\checkmark$



8-Digit Numbers – Crores

A hospital of the future uses AI for diagnosis by studying 3,67,53,239 patients' records.

Let us understand this 8-digit number.

The largest 7-digit number is $99,99,999$

If you add 1 to it, $+1$

it becomes one hundred lakh. $100,00,000$

One hundred lakh is also called one crore.

$1,00,00,000$ is one crore.

$\rightarrow$ This digit tells you how many crores.

Take the 8-digit number 3,67,53,239.



Remember

- ★ An 8-digit number begins with the one crore (C) place. 1 crore has 7 zeros.
- ★ 10 ten lakhs (100 lakhs) = 1 crore.
- ★ We put a comma or leave space to separate the crores period from the lakhs period.

Crores	Lakhs		Thousands		Ones		
Crores (C)	Ten Lakhs (TL)	Lakhs (L)	Ten Thousands (TTh)	Thousands (Th)	Hundreds (H)	Tens (T)	Ones (O)
3	6	7	5	3	2	3	9
3 Crores	6 Ten Lakhs	7 Lakhs	5 Ten Thousands	3 Thousands	2 Hundreds	3 Tens	9 Ones
$3 \times$	$6 \times$	$7 \times$	$5 \times$	$3 \times$	$2 \times$	$3 \times$	$9 \times$
1,00,00,000	10,00,000	1,00,000	10,000	1,000	100	10	1
3,00,00,000	67,00,000		53,000			239	
3 crores	67 lakhs		53 thousands			239 ones	

Expanded notation: $3,00,00,000 + 60,00,000 + 7,00,000 + 50,000 + 3,000 + 200 + 30 + 9$

3,67,53,239

$\rightarrow$ These digits tell you how many thousands.
 $\rightarrow$ These digits tell you how many lakhs.
 $\rightarrow$ This digit tells you how many crores.

It is easy to read a number with three commas. The first comma says crore, the second says lakh, and the third, thousand.

In words: Three crore, sixty-seven lakh, fifty-three thousand, two hundred thirty-nine

Try This!



Write the number in standard form and give the number name.

- $4,00,00,000 + 70,00,000 + 0 + 40,000 + 800 + 20 + 9$
- $2,00,00,000 + 0 + 5,00,000 + 0 + 900 + 20 + 9$



Exercise I A



1. Read these statements out aloud.

- a. The diameter of the Sun is approximately 13,92,684 km.
- b. The Mangalyan was sent by the Indian Space Research Organisation from Earth to Mars. The distance between Earth and Mars keeps changing, but at its closest, it is about 5,46,00,000 km.



2. Give the place value of the coloured digit.

- a. 89,00,345 b. 30,34,112 c. 87,93,389 d. 2,67,23,592 e. 7,08,19,004

3. Give the word form and the expanded notation for these numbers.

- a. 67,09,654 b. 9,83,10,809 c. 2,10,23,008 d. 45,00,091

4. Give the standard numeral for:

- a. $4,00,00,000 + 60,00,000 + 5,00,000 + 40,000 + 200$
- b. $90,00,000 + 60,000 + 3,000 + 6$
- c. $6,00,00,000 + 5,00,000 + 20$
- d. $30,00,000 + 9,00,000 + 7,000 + 80$

Journal

We use numbers to **count** (there are 28 people in the room), to **identify** (my house number is 738), or to tell the **order of things** (Sabina picked the 9th book on the shelf). Find two more examples of each of the different ways in which we use numbers. In what other ways can numbers be used?

You may keep a separate notebook as your maths journal. You can use it to express thoughts, ideas, and experiences about the different things you have learnt in the maths class.

FA



Data Connect



Open the **Data Bank** on page 243 and study the data on 'If you Started Reading in Grade 1'. Then answer the questions below.

- 1. Read the statements out aloud.
- 2. Rewrite the numbers in word form.
- 3. Give the expanded notation for each number.
- 4. Arrange the numbers in increasing order.

In real life, we often come across facts and figures called data. **Data Connect** helps you to understand and use such data.

UNDERSTANDING NUMBERS BETTER

When we read the number 1500 as one thousand five hundred, we mean that there are 1500 ones in the number.

If we need to find how many tens are in 1500, we need to make the ones into towers of 10. We find we have 150 tens.

If we need to find how many hundreds are in 1500, we need to group the tens further into 100s, and we find we have 15 hundreds.

Can you see a pattern?

1500 = 1500 ones

1500 = 150 **tens**

1500 = 15 **hundreds**



Let us try it with the number 3,00,000.

3,00,000 has 3,00,000 ones, or,

3,00,000 = 30000 **tens** or

3,00,000 = 3000 **hundreds** or

3,00,000 = 300 **thousands** or

3,00,000 = 30 **ten thousands** or

3,00,000 = 3 **lakhs**

Similarly, the number 42,45,987 has 4,24,598 tens or 42,459 hundreds, and so on.

Try This!

1. 670 = _____ tens
2. 2700 = _____ hundreds
3. 18 hundreds = _____ thousand _____ hundreds
4. 3 thousands 2 hundreds = _____ hundreds
5. 25 thousands = _____ hundreds



Mathspeak

Explain how you can use towers of ten to model the number 1100.

Challenge!

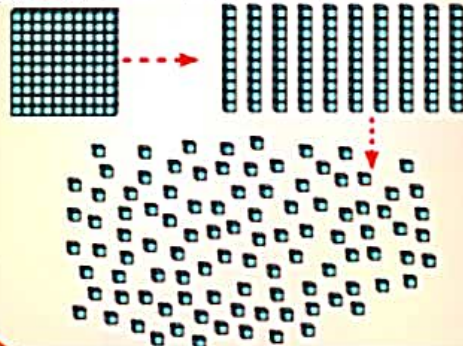
WHO AM I?

My number is made up of 6 ten thousands, 14 thousands, and 12 tens.

I am the number _____.

Remember

When we read the number one hundred or 100, we mean that there are 100 ones in the number.



Example 1: Write the number four crore, fifty-three thousand, one.

➡ Draw the place value chart and fill in the numbers according to the periods and places.

C	TL	L	TTh	Th	H	T	O
4			5	3			1

Then fill in all the vacant places with zeros.

C	TL	L	TTh	Th	H	T	O
4	0	0	5	3	0	0	1

Answer: 4,00,53,001

Example 2: Find the number before 6,78,800 and the number after 56,79,999.

➡ The number before 6,78,800 is 6,78,799.

The number after 56,79,999 is 56,80,000.

Example 3: What comes next? Look for the pattern.

a. 23,45,678, 23,46,678, 23,47,678, ?

b. 40,46,300, 41,46,300, 42,46,300, ?

Answer: a. 23,48,678 b. 43,46,300

Example 4: Make the smallest and greatest possible 7-digit numbers using 7, 6, 2, 8, and 0 by repeating the digits.

Answer: Smallest: 20,00,678; Greatest: 88,87,620

Example 5: How many numbers have 4 digits?

➡ Let us start by finding out how many numbers have 1, 2, and 3 digits. We may find a pattern!

a. The smallest one-digit number is 1.
The greatest one-digit number is 9.

$$9 - 1 = 8$$

$$8 + 1 = 9$$

There are 9 one-digit numbers.

b. Smallest 2-digit number is 10. Greatest 2-digit number is 99.

$$99 - 10 = 89$$

$$89 + 1 = 90$$

There are 90 two-digit numbers.

c. Smallest 3-digit number is 100. Greatest 3-digit number is 999.

$$999 - 100 = 899$$

$$899 + 1 = 900$$

There are 900 three-digit numbers.

Answer: The pattern shows us that there are 9,000 four-digit numbers.

You can also call the number after 'successor' and the number before 'predecessor'.

You can see that there are 9 one-digit numbers, so put back the extra number that was taken away. Do the same for the rest.



Exercise I B

1. How many ones, tens, hundreds, thousands, ten thousands, and lakhs are there in the number 8,00,000?

2. Write in figures (with commas).

- Eight lakh thirty-nine thousand twenty-three
- Twenty lakh nine hundred five
- Thirty-five thousand eight hundred fifty-seven
- Four crore thirty-seven lakh nineteen thousand

3. Compare using $<$, $>$, or $=$.

a. 5,87,90,456 5,78,23,567

b. 90,40,908 9,04,908

c. 8,20,45,899 8,20,54,899

d. 1,40,10,178 1,40,10,720

4. Make the smallest and the greatest possible 7-digit numbers.

- 5, 8, 2, 9, 1, 1, 8
- 4, 7, 1, 9, 0, 6, 7

5. Make the smallest and the greatest possible 8-digit numbers by repeating the digits.

- 3, 6, 1, 7, 8, 9, 2
- 4, 7, 1, 0, 3, 5

6. Give the number before:

a. 45,69,500

b. 87,16,000

c. 5,10,000

d. 20,00,000

7. Give the number after:

a. 9,29,499

b. 79,98,999

c. 99,99,999

d. 1,98,97,950

8. If you are 10 years old, you would have lived 52,56,000 minutes. Compare the numbers given below and match the age to the minutes lived. Do not calculate. Match by putting the numbers in ascending order.



11



12



13



14



15

68,32,800

73,58,400

57,81,600

63,07,200

78,84,000

NUMBER PATTERNS



C-1.4

Consecutive Numbers

Consecutive numbers are numbers that follow each other in order from the smallest number to the largest number and have a fixed difference between them. This pattern has been made by changing 2-digit numbers to 1-digit numbers. Complete the pattern.

									1+0	1+1					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	2	3	4	5	6	7	8	9	1	2	3	4	—	—	—
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
—	—	10	2	3	—	—	—	—	—	—	—	—	—	—	—
		1													

Consecutive Even Numbers

2	4	6	8	10	12	14	16	18	20	22	24
2	4	6	8	1	3	5	—	—	—	—	—
26	28	30	32	34	36	38	40	42	44	46	48
—	—	—	—	—	—	—	—	—	—	—	—

Add only till you see a pattern, then complete using the pattern.



Consecutive Odd Numbers

1	3	5	7	9	11	13	15	17	19	21	23	25	27	29
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

PASCAL'S TRIANGLE

Look for a pattern. Extend the triangle by another two rows.

				1		
			1	1		
		1	2	1		
	1	3	3	1		
1	4	6	4	1		
1	5	10	10	5	1	
—	—	—	—	—	—	—
—	—	—	—	—	—	—

There are many patterns in this triangle. Can you spot at least three?

Project

Explore consecutive numbers.

- Take 3 consecutive numbers. 5, 6, 7
 Multiply the middle number by itself. $6 \times 6 = 36$
 Multiply the remaining two numbers. $5 \times 7 = 35$
 The difference is 1! $(36 - 35 = 1)$
 Do the same with these consecutive numbers.
a. 3, 4, 5 **b.** 2, 3, 4 **c.** 6, 7, 8 **d.** 7, 8, 9
- Do the same with three consecutive odd numbers and three consecutive even numbers. What do you notice?

ROUNDING

In an AI research laboratory system there are about 4,000 folders each containing approximately 28,000 images.

The figures 4,000 and 28,000 are not exact figures but they are close to the exact figures. They give an idea of **about** how many pictures of balloons the laboratory uses. These are called **rounded** figures.



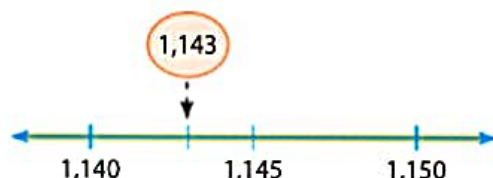
Rules of Rounding

- When we round a number to the nearest 10, we use the nearest multiple of 10.
- When we round a number to the nearest 100, we use the nearest multiple of 100.
- When we round a number to the nearest 1,000, we use the nearest multiple of 1,000.
- A number which is halfway is rounded to the higher multiple.

Round using a Number line

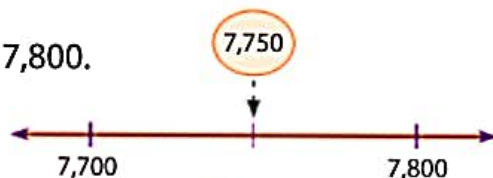
a. Round 1,143 to the nearest 10.

- Find which two tens the number lies between, and mark the halfway point
 - Place the number to be rounded in the correct place on the number line.
- 1,143 is closer to 1,140 on the number line. So 1,143 rounds to 1,140.



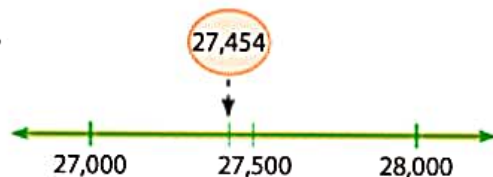
b. Round 7,750 to the nearest 100.

- 7,750 lies half way between the hundreds 7,700 and 7,800.
- As per the rule, 7,750 is rounded to 7,800.

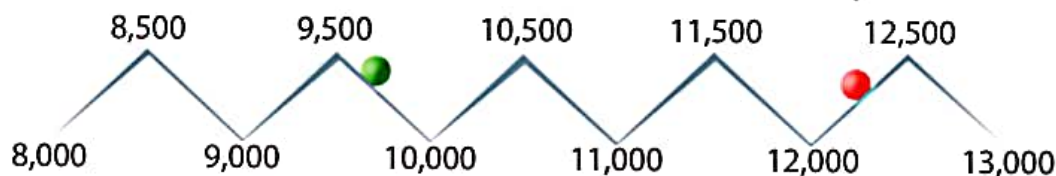


c. Round 27,454 to the nearest 1,000.

- 27,454 is between the thousands 27,000 and 28,000.
 - 27,454 is closer to 27,000.
- 27,454 is rounded to 27,000.



d. You can also think of the number line as a series of hills and valleys.



- A ball at 9,625 would roll down to 10,000.
9,625 rounded to the nearest 1,000 is 10,000.
- A ball at 12,324 would roll back to 12,000.
12,324 rounded to the nearest 1,000 is 12,000.

In this example, a 4-digit number has got rounded to a 5-digit number.



Mathspeak

FA

Explain why 25,500 is closer to 30,000 than 20,000.

Round using a shortcut

Round 17,698 to the nearest 1,000.

- Place the number in the place value chart.
- Find the digit in the place you are rounding to. 7 is in the thousands place.
- Look at the digit to its right. 6 is the digit to its right.
- Since $6 > 5$, increase the digit in the thousands place by one. So 17,698 rounds to 18,000.

TTh	Th	H	T	O
1	7	6	9	8

Exercise 1 C

Solve. Use any method you like.

1. Round to the nearest 10.

- a. 46 b. 388 c. 1,014 d. 92,407 e. 11,003

2. Round to the nearest 100.

- a. 649 b. 875 c. 6,850 d. 14,910 e. 58,009

3. Round to the nearest 1000.

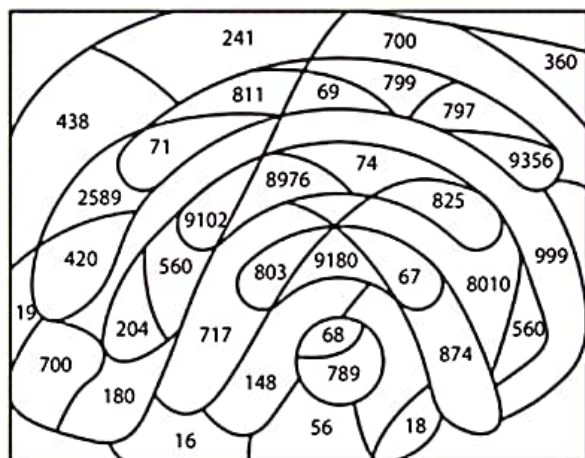
- a. 567 b. 9,846 c. 4,096 d. 35,502 e. 97,764

4. Shade the following using a pencil.

- a. 2-digit numbers that round to 70
b. 3-digit numbers that round to 800
c. 4-digit numbers that round to 9,000



Do you recognise this icon?
What is it called? What do you
understand when you see this on
a smartphone or a laptop?



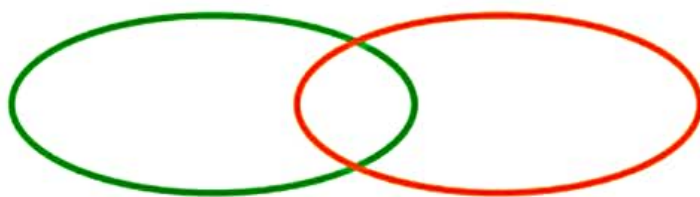
Challenge!

The green oval has numbers which when rounded to the nearest 100 is 4500. The orange oval has numbers which when round to the nearest 1000 is 4000. The overlapping part will have numbers that fit into both categories. Look at the list given below and write the numbers in their correct place on the shapes.

4143, 4489, 4517, 4475, 3549, 4541

Nearest 100

Nearest 1000



INTERNATIONAL SYSTEM

AI software that was being trained to recognise the different accents that people spoke in, used 3,40,000 voice recordings to do that.

Using the International system, we would write it as 340,000 and read it as '*three hundred forty thousand*' accents.

5-digit numbers are read the same way in both the Indian and International systems.

6-digit and greater numbers are read differently in the Indian and International systems.



Indian		International
10,000 Ten thousand	←--- 5 digits ---→ 10000	10,000 Ten thousand
1,00,000 One lakh	←--- 6 digits ---→ 100000	100,000 One hundred thousand
10,00,000 Ten lakh	←--- 7 digits ---→ 1000000	1,000,000 One million

International system

Million			Thousands			Ones			←--- Period
Hundred Millions	Ten Millions	Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones	←--- Place

The International system has 3 places in each period.

The periods are separated by commas. The commas help us read the number by taking the name of the period it follows.

M	HTh	TTh	Th	H	T	O	
	1	0	0	,	0	0	←--- One hundred thousand (100,000)
1	,	0	0	,	0	0	←--- One million (1,000,000)

Let us try to read the six-digit number 415348 using the International system place value chart.

Thousands				Ones		
M	HTh	TTh	Th	H	T	O
	4	1	5	3	4	8
415 thousand				348		

Four hundred fifteen thousand, three hundred forty-eight

Comparing the Indian and International Systems



Indian System	(10 lakh) TL	(1 lakh) L	TTh	Th	H	T	O
International System	(1 million) M	(100 thousand) HTh	TTh	Th	H	T	O
	Different		Same				

Let us read the number 5237819 in both International and Indian systems.

International System

M	HTh	TTh	Th	H	T	O
5	2	3	7	8	1	9
5 million		237 thousand		819		

Five million, two hundred thirty-seven thousand, eight hundred nineteen

Indian System

TL	L	TTh	Th	H	T	O
5	2	3	7	8	1	9
52 lakh		37 thousand		819		

Fifty-two lakh, thirty-seven thousand, eight hundred nineteen

M	I	L	L	I	O	N
1	0	0	0	0	0	0

I remember that a million has 6 zeros with the help of this grid.



Read these figures in the International system.

- 439,168—Four hundred thirty-nine thousand, one hundred sixty-eight
- 705,001—Seven hundred five thousand, one
- 1,201,590—One million, two hundred one thousand, five hundred ninety
- 5,500,109—Five million, five hundred thousand, one hundred nine

Try This!

Read these aloud.

- There are more than 400,000 species of plants in the plant kingdom.
- There are about 250,000 flowering plants.
- Mr Acharya's new house costs ₹5,703,800.



Mathspeak

FA

Explain what is same, what is different between the Indian and the International number systems.

Exercise I D

1. Rewrite using figures.

- One million, three hundred thousand Earths could fit inside the Sun.
- The Moon is about three hundred fifty-six thousand, four hundred kilometres from the Earth.
- There are about one million, thirteen thousand, nine hundred thirteen words in the English language.

2. Insert commas and rewrite in words according to the International system.

- 712801 = 712,801, _____
- 602590 = _____, _____
- 1016800 = _____, _____
- 5397284 = _____, _____

3. Give the place value of the coloured digit using the International system.

- 234,198 b. 6,042,381 c. 191,291 d. 7,184,089

4. Write the following numbers in the Indian and International systems, using both figures and words.

- 850009 b. 1670112 c. 4290281 d. 530563



Maths and Art



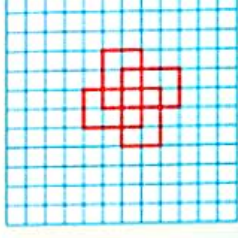
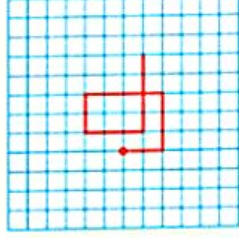
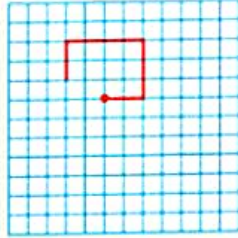
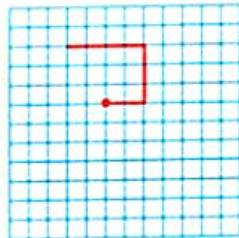
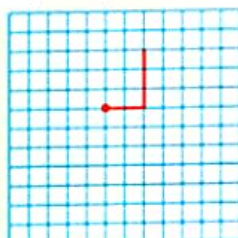
Making a spiral design with number patterns.

You need a ruler, square-lined paper, and colour pencils.

Choose a repeating number pattern like 2-3-4, 2-3-4, ...

Mark a point on the square-lined paper. It will be your starting and finishing point.

Go right 2 squares. Go up 3 squares. Go left 4 squares. Go down 2 squares. Then right again 3 squares and so on. Keep repeating in a loop till you reach your starting point. You have made a spiral pattern. You can colour your design.



- Experiment with other spiral loops.
- Try 3-2-5. Will 5-2-3 look any different?
- Try loops with 4 and 5 numbers. Are there some loops that don't end?

ROMAN NUMBERS

You are familiar with Roman numbers up to 39. Let us look back at the rules of forming Roman numerals and apply it to numbers up to 100. Remember that the Romans did not have '0', so they did not use place value.

They had seven basic symbols represented by these letters.



Roman number	I	V	X	L	C	D	M
Hindu-Arabic	1	5	10	50	100	500	1,000

They formed other numbers by combining these letters and following certain rules.

- Putting a letter **after** one of bigger value means you **add** it.
 - a. $75 = \text{LXXV}$ ($50 + 10 + 10 + 5$)
 - b. $60 = \text{LX}$ ($50 + 10$)
- Putting a letter **before** one of bigger value means you **subtract** it.
 - a. $40 = \text{XL}$ ($50 - 10$)
 - b. $94 = \text{XCIV}$ ($100 - 10$) + $(5 - 1) = 90 + 4$
- A letter can be **repeated** up to a maximum of **three times** only.
 $80 = \text{LXXX}$ ($50 + 10 + 10 + 10$)
- When a smaller number that has been made of two letters using the addition/subtraction rule is combined with a larger number, the whole of the smaller number is written to the right of the larger one.
 - a. $59 = \text{LIX}$
 - b. $74 = 70 + 4 = \text{LXX} + \text{IV} = \text{LXXIV}$

Remember

- ★ V and L are never subtracted.
- ★ I can be subtracted from V and X only.
- ★ X can be subtracted from L and C only.
- ★ V and L are never repeated.

Try This!

Write the ages of your family members in Roman numerals.

Challenge!

Correct this Roman number sentence in three different ways.

- a. By moving one stick
- b. By removing one stick
- c. By not touching any stick

$$\text{XI} + \text{I} = \text{X}$$



Exercise I E

1. Fill in the boxes with Hindu-Arabic numerals.

C	L	XL	X	LXX	XXX	XC	XX	LX	LXXX
		40							

2. Write the Hindu-Arabic numerals.

- a. XXIV b. XC c. LVII d. XLIV
e. LXXV f. LXXXII

3. Write the numbers from 41 to 100 in your notebook using Roman numerals.

4. Compare using $<$, $>$, or $=$.

- a. XC XL b. XLIV LXX c. XXVII LX d. LVII C

5. Give the answer in Roman numerals.

- a. XXV + XL b. LXII + XII c. LXX - XXX d. L - XXXIX

Project

The ancient Egyptians did not have a place value system, and neither did they have a symbol for zero. This is how they wrote their numbers.

Stick		1
Heel bone	∩	10
Coiled rope	☉	100
Lotus flower	🪷	1000
Pointing finger	☞	10,000
Tadpole	🐸	1,00,000
Astonished man	🧑	10,00,000

Since they did not have a place value system, the Egyptians simply combined the symbols and added their values. So they could write the symbols from right to left or left to right. Sometimes they even wrote it vertically.

18 ∩ | | | | | | |
350 ∩ ∩ ∩ ∩ ∩ ☉ ☉ ☉
4186 🪷 🪷 🪷 🪷 ☉ ∩ ∩ ∩ ∩ ∩ ∩ ∩ ∩ | | | | |

- Write your age in standard numerals and Egyptian numbers.
- Write the year of your birth in standard numerals and Egyptian numbers.
- Write the year of India's independence in standard numerals and Egyptian numerals.



Chapter Check-Up



Colour the circle that describes best how you feel.

I got this!

I'm getting there!

I need help!

1. Write the following numerals in word form and expanded notation.

a. 11,00,948 b. 78,98,001 c. 5,67,03,670

2. Write the figures.

a. Thirty lakh, seventy thousand, three hundred six
b. Four crore, seventeen lakh, one hundred ninety-five

3. Give the place value of the coloured digit:

a. 4,56,78,923 b. 54,69,345 c. 9,76,13,984

4. What are the greatest and the smallest 7-digit numbers you can make using the digits 3, 5, 7, 1, and 2? (Digits may be repeated.)

5. Write the number before and after:

a. 79,98,999 b. 13,80,970

6. Compare using $>$, $<$, or $=$.

a. 5,67,98,345 5,76,98,435

b. 67,83,009 67,08,900

7. Put commas using the International system and rewrite these statements using the word form of the number.

a. A 15-year-old boy would have lived for 131400 hours.
b. 2401596 people travelled by planes this year.

8. Pretend that you are a newspaper reporter. Rewrite these news headlines by rounding.

a. The municipal corporation spent ₹5,94,830 on repairing the roads. (nearest 1,000)
b. 389 people attended the meeting of coin collectors in the city. (nearest 100)
c. The Rajdhani Express was delayed by 5 hours and 15 minutes. (nearest hour)

9. Tick (✓) the correct answer.

What is the Roman numeral for 95?

a. LXCLV

b. IXV

c. CXV

d. XCV

- Colour the green circle if you understand and are ready to move ahead.
➤ Colour the yellow circle if you understand but still need a little practice.
➤ Colour the red circle if you don't understand and need help.

Vocabulary Review

- Ascending order
- Descending order
- Digit
- Period
- Face value
- Place value
- Consecutive
- Lakh
- Crore
- Multiple
- International system
- Indian system
- Million
- Hundred thousand
- Halfway point





EXACT OR ROUNDED?



There are some cases where it is okay if numbers are rounded and some others where the exact figure is important.

Read the situations below and decide which can use rounded figures and which require exact figures and explain why in your notebooks.



1. Man at railway station: 'What time does the Shatabdi express leave?'
'It leaves in about half an hour.'

Exact needed

2. One man asking another on the road: 'What is the time?'
'It is 20 seconds after 9:23 in the morning.'

Rounded can be used

3. Customer to shopkeeper: 'How much do I have to pay you for this book?'
'About ₹300.'



4. Tailor to customer: 'How long should I make the sofa cover?'
'About $1\frac{1}{2}$ m please.'

5. Announcer in a quiz competition:
'Team A wins with about 150 points.'

6. Child to mother: 'When are my grandparents arriving?'
'They are coming after 2 months 3 days and 6 hours.'



7. Visitor to librarian: 'How many books are there in the library?'
'There 13,865 books for reference and 50,198 books for borrowing of which 32,145 are out now.'



Background: The binary system, which is the language of computers, uses base two just like we use base ten in what is called the decimal system. There are 10 digits - 0 to 9 in the decimal system and only 2 digits, 0 and 1 in the binary system.

Find out more about these related career choices.

- A software developer
- A computer systems analyst
- A web developer

In the decimal system every time a digit moves one place to the left its value increases ten times. In the binary system every time a digit moves one column to the left its value increases 2 times.

Materials: Paper and pen or pencil.

Preparation: Students may work in pairs or on their own after understanding the chart below. Each column is named after its value. Study the chart below. Begin reading from the far right. Note how the value keeps increasing by 2 times for every move to the left.

32	16	8	4	2	1
16×2	8×2	4×2	2×2	1×2	1
1 here has the value of 32	1 here has the value of 16	1 here has the value of 8	1 here has the value of 4	1 here has the value of 2	1 has the value 1

Procedure: Study the table below to understand how binary numbers are built. The number 1 takes the value of the column it is placed in. Those values are then added. For example, 5 is 101 in computer language as it gives the value $4 + 0 + 1$.

Binary Conversion	32	16	8	4	2	1
5 ($4 + 0 + 1$)				1	0	1
10 ($8 + 0 + 2 + 0$)			1	0	1	0
19 ($16 + 2 + 1$)		1	0	0	1	1
26						
30						
35						
48						
53						

In all the columns, 0 has the value of 0.

Extension

Build all the binary numbers from 1 to 20. Spot the pattern in the last two digits of the binary numbers you have built.



Addition, Subtraction, and Their Applications



Objects that are made by hand are special as no two pieces can be exactly the same. A potter can take many hours to create a symmetrical pot. Cross-stitch embroidery needs careful counting of squares in the design. A tablecloth with mirror work has 235 small pieces of mirrors equally distributed in 10 sections. How many pieces are there in each section?



LOOKING BACK

Addition

Addition of large numbers is the same as addition of smaller numbers. You start from the ones place and regroup if necessary.

a.

L	TTh	Th	H	T	O
	1	1		1	
	6	1	3	2	7
+		3	9	8	5
	1	0	1	1	8
					2

b.

L	TTh	Th	H	T	O
		2	1		
		2	7	5	3
+	1	2	6	9	3
	1	4	7	8	4
	1	7	7	5	2
					6

The numbers you add are called **addends**.



Check your addition by adding up.

	2	7	4	4	2	9
+	2	3	4	5	7	4
		3	9	8	5	5
	2	7	4	4	2	9

Remember

- ★ You can add numbers in any order and the sum will be the same.
- ★ Zero added to any number gives the same number as the sum.

1. Rewrite in columns using place value and add. Check your addition by adding up.

a. $5087 + 26542$

b. $45735 + 69046$

c. $93485 + 48294$

d. $51487 + 456 + 239601$

e. $111321 + 56789 + 45987$

f. $108162 + 59346 + 18992$

NCF 2023

Competencies in this chapter

C-1.3: Applicable to the entire chapter

C-4.1, C-4.3: Labelled on specific pages

Subtraction

Subtraction of large numbers is the same as subtraction of smaller numbers. You start from the ones place and regroup if necessary. You can check your subtraction with addition.

The number you subtract from is called the **minuend**.
The number you subtract is called the **subtrahend**.



L	TTh	Th	H	T	O
		10			
3	5	7	8	5	3
- 1	5	3	8	5	2
2	0	3	2	9	1

Check:

2	0	3	2	9	1
+ 1	5	3	8	5	2
3	5	7	1	4	3

Watch out for the zeros.

a.

Th	H	T	O
	9	9	
5	0	0	6
- 2	7	5	8
3	2	4	8

b.

TTh	Th	H	T	O
	14			
1	2	0	8	0
-	8	2	3	4
1	6	8	5	6

Use a shortcut: Subtract: $4000 - 2847$

Reduce both numbers by 1 and then subtract.

$$(4000 - 1) \quad 3 \ 9 \ 9 \ 9$$

$$(2847 - 1) \quad -2 \ 8 \ 4 \ 6$$

This helps avoid regrouping.

$$1 \ 1 \ 5 \ 3$$

You can try this method for large numbers also.

Remember

- Any number subtracted from itself will give zero as the difference.
- Zero subtracted from any number will give the number itself as the difference.

1. Rewrite in columns using place value and subtract.

a. $8765 - 2984$

b. $938743 - 78243$

c. $439235 - 145987$

d. $30000 - 18603$

e. $50001 - 39846$

f. $81065 - 21952$

2. Fill in the boxes.

a.

	2		4	5	6
+		8			
82013					

b.

	7		7		
-	1	5		4	6
2280					

3. Subtract. Check your answer with addition.

a. $93542 - 78645$

b. $21976 - 8756$

c. $20106 - 15302$

USING COMPENSATION FOR ADDITION AND SUBTRACTION

We can change numbers into multiples of 10 or 100 to make it easier to add and subtract.

Addition

a. 38 gives you the same answer as $38 (+ 2) = 40$
 $+ 26$
 64

$+ 26 (- 2) = 24$
 64

b. In this example it is easier to make the second number into a multiple of 10.

45
 $+ 87$
 $?$

45
 $+ 87 (+ 3)$
 132

$45 (- 3) = 42$
 $+ 87 (+ 3) = 90$

In addition, increase one number and decrease the other by the same amount.



Subtraction

While subtracting we always change the subtrahend into a multiple of 10 or 100.

a. 43 gives you the same answer as $43 (+ 2) = 45$
 $- 28$
 15

$- 28 (+ 2) = 30$
 15

In subtraction, either increase both numbers or decrease both numbers by the same amount.

b. 77
 $- 33$
 $?$

77
 $- 33 (- 3) = 74$
 44

$77 (- 3) = 74$
 $- 33 (- 3) = 30$

Exercise 2 A

Solve using compensation.

- $28 + 86$
- $39 + 63$
- $72 + 46$
- $63 + 94$
- $47 + 86$
- $51 + 39$
- $93 + 47$
- $56 - 38$
- $80 - 27$
- $97 - 29$
- $63 - 31$
- $84 - 39$
- $96 - 63$
- $70 - 58$
- $64 - 42$

Challenge!

This is a magic square. All the rows, columns, and diagonals should add up to 150. While writing it out, two of the numbers were written in the other's place. Find the error and correct the magic square.

30	31	32	42
34	40	39	37
38	36	35	41
33	43	44	45

Hint: First find which are the rows or columns that do not add up to 150. Then work on those.

C-4.1



PROFIT AND LOSS

Profit

Chikankari is delicate embroidery work on fine cloth done in Uttar Pradesh. It costs Preeti ₹363 to make this *chikankari* cushion cover. She will sell it for ₹450.

₹363 is the **cost price (C.P.)** of the cushion cover.

₹450 is the **selling price (S.P.)** of the cushion cover.

When the selling price is more than the cost price, the difference is the **profit**.



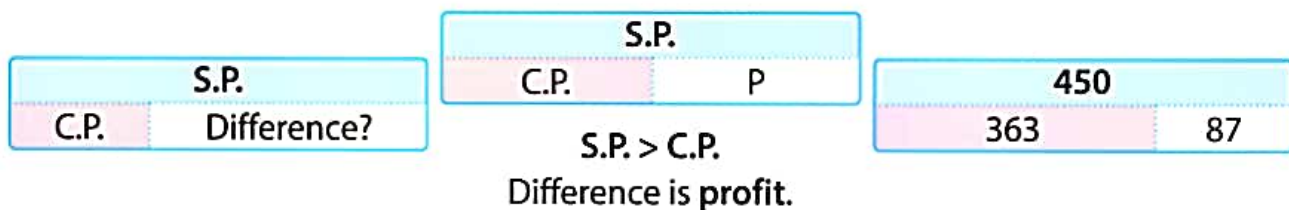
I will earn ₹87 on each cushion cover I sell.

Selling price = ₹ 4 5 0

Cost price = - ₹ 3 6 3

₹ 8 7 ← Profit (P)

These models will help you remember the relationship between these three terms.



Loss

One cushion cover was slightly damaged so Preeti sold it for ₹300. When the cost price is more than the selling price, the difference is the **loss**.

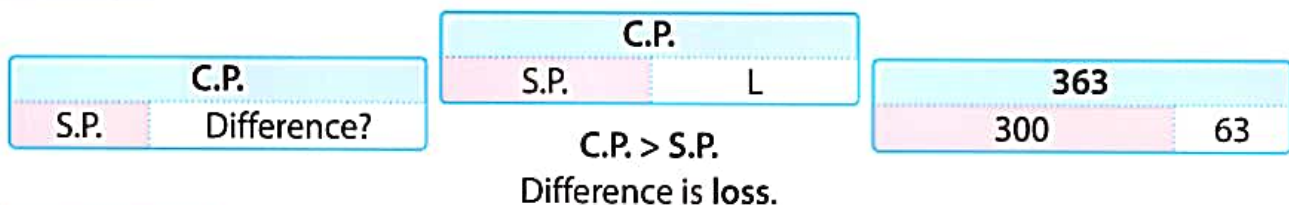


I lost ₹63 on this cushion cover.

Cost price = ₹ 3 6 3

Selling price = - ₹ 3 0 0

₹ 6 3 ← Loss (L)



Mathspeak

Describe any one bar model on this page and explain the relationship between the longer bar above to the shorter bars below it.

FA

Sometimes the price of an object increases due to other expenses like transportation, shop rent, salaries, and so on. These are called **overheads** and are added to the cost price.

When somebody outside her city buys a cushion cover, Preeti spends ₹75 on packing and postal charges.

$$\begin{array}{r} \text{C.P.} = \quad \text{₹ } 3 \ 6 \ 3 \\ + \quad \text{₹ } 7 \ 5 \\ \hline \text{₹ } 4 \ 3 \ 8 \end{array} \leftarrow \text{Final cost price}$$

I will now sell it at ₹500.



S.P.	
C.P.	Profit

S.P. > C.P.

So, the difference is profit.

₹500	
₹438	?
C.P.	Profit

$$\begin{array}{r} \text{₹ } 5 \ 0 \ 0 \\ - \text{₹ } 4 \ 3 \ 8 \\ \hline \text{₹ } 6 \ 2 \end{array}$$

₹500	
₹438	₹62
C.P.	Profit

Exercise 2 B

1. Decide whether there is profit or loss in each of these products with the help of a model.

a. Kondapalli toys from Andhra Pradesh



S.P.	
C.P.	Profit?
3 4 0	
- 3 0 5	

Cost price = ₹305

Selling price = ₹340

Profit = ₹ _____

b. Mask from Kerala



Cost price = ₹275

Selling price = ₹255

c. Kolhapuri chappals from Maharashtra



Cost price = ₹428

Selling price = ₹410

d. Metal craft of Madhya Pradesh



Cost price = ₹1,680

Selling price = ₹2,390

2. Find out the profit or loss in each of these. You may use models if you wish.

	Cost price	Selling price	Profit/Loss	Amount
a.	₹2,090	₹2,100	C.P. < S.P. = Profit	₹2,100 – ₹2,090 = ₹10
b.	₹8,395	₹8,935		
c.	₹14,060	₹14,600		
d.	₹9,319	₹9,139		
e.	₹11,190	₹11,865		

3. First find the final cost of each item. Then calculate profit or loss using models if you wish.

	Cost price	Overheads	Final cost (C.P. + Overheads)	S.P.	Profit/Loss amount
a.	₹645	₹80	₹725	₹800	₹800 – ₹725 = ₹75 profit
b.	₹909	₹162		₹1,235	
c.	₹2,100	₹395		₹2,300	
d.	₹7,213	₹520		₹9,818	
e.	₹9,127	₹2,061		₹10,050	

4. Solve.

- During the Diwali sale, a shopkeeper sells a watch that costs ₹3,500 for ₹2,750. What was his gain or loss?
- A mobile phone that costs ₹8,900 is sold at ₹9,800. What was the profit made?
- A shopkeeper buys fabric for ₹1,740 and has it tailored into a coat for ₹760. He then sells it for ₹2,999. What was his profit or loss?
- At a used book sale, Karan sells books worth ₹5,000 at ₹3,150. What was the loss he incurred?
- A dining table costing ₹9,500 was sold at ₹9,900 after polishing it at a cost of ₹1,500. What was the profit or loss?

Another word for profit is 'gain'.

Project

- Choose a 3-digit number with the first digit greater than the third digit.
- Reverse the digits and subtract.
- Reverse the digits you get as the difference and add.

Now try with these numbers. What do you notice?

1. 321 2. 782 3. 844 4. 775

$$\begin{array}{r}
 6 \ 7 \ 2 \\
 - 2 \ 7 \ 6 \\
 \hline
 3 \ 9 \ 6 \\
 + 6 \ 9 \ 3 \\
 \hline
 1 \ 0 \ 8 \ 9
 \end{array}$$

FINDING COST PRICE OR SELLING PRICE

The same bar models you used in the previous pages can help you find the cost price or selling price when you know the profit or loss.

Model A (for profit)	If you know any two values you can find the third.	Model B (for loss)							
<table><tr><td colspan="2">S.P.</td></tr><tr><td>C.P.</td><td>P</td></tr></table>		S.P.		C.P.	P	<table><tr><td colspan="2">C.P.</td></tr><tr><td>S.P.</td><td>L</td></tr></table>	C.P.		S.P.
S.P.									
C.P.	P								
C.P.									
S.P.	L								

To Find the Cost Price

Example 1: Rakul from Rajasthan sold a puppet for ₹315 at a loss of ₹23. What was the cost of the puppet?

➡ Selling price = ₹315

Loss = ₹23

Cost price = ?

This is for loss, so use Model B.

Add to find C.P. ₹ 315

S.P. + L = C.P. + ₹ 23

₹ 338

← C.P.

C.P.	
?	
₹315	₹23
S.P.	L

Check your answer:

C.P. - S.P. = L

338 - 315 = 23 ✓



Answer: The cost of the puppet was ₹338.

Example 2: A shop sells sandalwood carvings from Karnataka. A particular piece was sold at ₹5,389 for a profit of ₹281. What was the cost of the carving?



Selling price = ₹5,389

Profit = ₹281

Cost price = ?

This is for profit, so use Model A.

Subtract to find C.P. ₹ 5389

S.P. - P = C.P. - ₹ 281

₹ 5108

← C.P.

S.P.	
₹5,389	
?	₹281
C.P.	P

Check your answer:

S.P. - C.P. = P

5,389 - 5,108 = 281 ✓

Answer: The cost price of the carving was ₹5,108.

Try This!

a.

C.P.	
?	
₹713	₹142
S.P.	L

b.

S.P.	
₹4,538	
?	₹968
C.P.	P

c. S.P. = ₹1,205; P = ₹213; C.P. = ?

d. S.P. = ₹1,900; L = ₹190; C.P. = ?

3. Find the selling price or cost price of each of these products with the help of a model.

a. Terracotta from West Bengal



C.P.	
S.P. ?	L

Cost price – Loss = ?

Cost price = ₹315

Loss = ₹38

Selling price = ?

$$\begin{array}{r} \text{₹ } 315 \\ - \text{ ₹ } 38 \\ \hline \end{array}$$

b. Juttis from Punjab



Selling price = ₹690

Profit = ₹57

Cost price = ?

c. Shawl from Nagaland

Selling price = ₹1,560

Loss = ₹350

Cost price = ?



d. Dokra metal from Telangana

Cost price = ₹2,880

Profit = ₹990

Selling price = ?



4. Solve.

- Simran incurred a loss of ₹750 on a painting she sold for ₹4,500. What was the cost of the painting?
- Shashank sold a carpet at a profit of ₹3,200. If he had originally paid ₹15,290 for the carpet, what price did he sell it for?
- Salim sold an encyclopaedia set at a loss of ₹300. If he sold it for ₹1,790, what price had he paid for it?
- Ricky bought a keyboard at ₹12,980. He sold it a year later at a profit of ₹1,900. What price did he sell it for?
- A laptop costing ₹20,350 was repaired at a cost of ₹2,300 and sold later at a loss of ₹2,500. What price was it sold for?

Data Connect

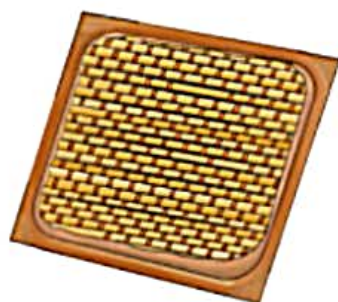
Open the Data Bank on page 242 and study the data on 'The Water Footprint of Food'. Then answer the questions below.

- Rewrite the table starting from the highest to the lowest water footprint.
- What is the water footprint of 2 kg almond chocolate made with equal quantities of both ingredients?
- What is the difference between the highest and the lowest water footprint given in the table? Name the items.
- What is the water footprint of half a dozen eggs?
- What is the water footprint of a litre of milk made into a milk shake with $\frac{1}{2}$ kg banana?

STEPS OF PROBLEM SOLVING

The steps of problem solving help you think in an organised way and decide how to solve a word problem.

Supriyo needs 16 equal strips of bamboo to make a coaster. He has a 198 cm strip of bamboo of which 3 cm at both ends are damaged, so he needs to cut those off. How long will each of the bamboo pieces be?



Step 1: Read the problem and understand the question.

We need to find out how long each of the 16 bamboo pieces will be.

Step 2: Find the important information in the problem.

- Supriyo needs 16 equal pieces of bamboo.
- The length of the bamboo strip is 198 cm.
- 3 cm at each end of the strip is damaged.

Step 3: Decide what to do?

To make equal pieces of bamboo strips we have to divide. But there is some part of the bamboo that is unusable, so we must subtract that figure before we divide. This is a multi-step problem.

Step 4: Solve the problem and answer the question:

- $3\text{ cm} + 3\text{ cm} = 6\text{ cm}$ of the bamboo cannot be used.
- So, $198 - 6 = 192\text{ cm}$ can be used.
- $192 \div 16 = 12\text{ cm}$

Answer: Each piece of bamboo that Supriyo gets will be 12 cm long.

Step 5: Check your answer:

a: Is the calculation correct?

Yes. Working back, $12 \times 16 = 192\text{ cm}$ and $192 + 3 + 3 = 198\text{ cm}$.

b: Have you answered the question correctly using the correct units?

Yes. The answer gives the length of each equal piece of bamboo. The unit cm is correct.

c: Does your answer make sense?

Yes, the answer of 12 cm makes sense as each piece will be much smaller than the entire length of bamboo.

Read	R	
Find	F	
Decide	D	
Solve	S	
Check	C	

Can you think of a sentence to remember the steps **R - F - D - S - C**? My sentence is Rita Finds Dogs So Cute. What is yours?



Exercise 2 D

Solve using addition, subtraction, multiplication, or division. There are single-step, two-step, and multi-step problems.

1. Mr Shenoy had ₹3,25,765. He borrowed ₹1,12,700 to buy a new car. How much did the car cost?
2. A chef has to bake 5 cakes for dessert at a party. She uses seven 250 g packets of flour for these. If she empties all the flour packets into one large bowl and then divides it equally into 5 smaller bowls, how much flour will go into each cake?
3. The odometer on a van showed 53,811 km in the beginning of October. After being used for three months it showed 84,209 km at the end of December. If it had travelled 21,614 km in October and November, what distance did it cover in the month of December?
4. Suraksha's website had 23,450 visitors in one month. That was 2,300 visitors less than what Varun's website had. How many visitors did Varun's website have?
5. A school's audio-visual room has 12 rows of chairs. Each row has 12 chairs. If two more chairs are added to each row, how many chairs will be in the AV room?



SKILLS OF PROBLEM SOLVING – Less Information

The following problems have either enough or less information than you need to solve them. Say what information is missing on the ones with less information and solve the others.

1. The drawing teacher bought 30 boxes of pencils. Was that enough for 450 students?
Answer: Not enough information. We do not know how many pencils are in each box.
2. Half the students in the music class are learning to play the sitar. Of the rest, 12 are learning the tabla and 4 are learning the violin. How many students are in the music class?
3. A group of 35 children formed quiz teams with an equal number of students in each group. 3 students were the judges. How many students were on each team?
4. 600 people went to see a musical show. Tickets for adults cost ₹115 each and tickets for children cost ₹75 each. How much money was collected by the organisers of the show?
5. Monica sold tickets for the school fair to her friends. She did this for 3 days. Each day she started with a book of 50 tickets and on each day she had 5 tickets left. How many tickets did she sell in all?



USING MODELS TO FIND MISSING NUMBERS

Missing Addends

Example 1: A pen drive can hold 530 songs. So far 391 songs have been copied on to it. How many more songs can be copied on to the pen drive?

In other words, what must you add to 391 to make it 530?

➡ $391 + ? = 530$

Total songs	
530	
391	?
Songs already copied	Songs yet to be copied (difference)

Subtract to find the difference:

$$\begin{array}{r} 530 \\ - 391 \\ \hline 139 \end{array}$$



Answer: 139 more songs can be copied on to the pen drive.

Missing Minuends

Example 1: Devyani was playing a maths game on her computer. She made some points in the beginning but lost 128 points after a while. She now has 318 points left with her. How many points had Devyani made in the beginning?

In other words, from what can you take away 128 and leave 318?



➡ $? - 128 = 318$

Add to find the total points:

Total points	
?	
128	318
Points lost	Points left

$$\begin{array}{r} 128 \\ + 318 \\ \hline 446 \end{array}$$

Try This!

- What must you add to 7,328 to make it 14,095?
- Find the number from which 8,913 must be subtracted to leave 11,238.

Answer: Devyani had made 446 points in the beginning.

Challenge!

Three consecutive numbers have a sum of 9,000. What are the numbers?

Missing Subtrahends

Example 1: Dheeraj's laptop had 738 files. He deleted some of them, but still had 239 left. How many files had he deleted?

In other words, what do you take away from 738 to leave 239?

738 - ? = 239

Total files	
738	
239	?
Files left	Files deleted (difference)

Subtract to find the difference:

$$\begin{array}{r} 738 \\ - 239 \\ \hline 499 \end{array}$$

Answer: Dheeraj had deleted 499 files from his laptop.



Exercise 2 E

Solve. Use models to help you.

1. Find the missing numbers.

a. $612 + \underline{\quad} = 948$

b. $7394 + \underline{\quad} = 12642$

c. $\underline{\quad} - 847 = 1238$

d. $\underline{\quad} - 9162 = 1811$

e. $9408 - \underline{\quad} = 1138$

f. $49584 - \underline{\quad} = 23175$

2. Solve.

a. What must you add to 18,345 to make it 19,624?

b. If you subtract 23,146 from a number, you are left with 35,906. Find the number.

c. Find the number which must be subtracted from 83,196 to leave 11,422.

d. The sum of two numbers is 40,132. If one number is 29,184, find the other number.

3. Application in real life.

a. Khalid wants to buy a board game that costs ₹501. He has ₹479. How much more money does he need?

b.  Harshita had space for 1,500 stickers in her book. So far she has put 785 stickers in it. How many more stickers can Harshita put in the book?

c. A large library has lent out 1,785 books. It has 7,816 books left. How many books does the library have in all?

d. An art exhibition had 915 pieces of art on show. Some of them got sold but there were 211 unsold pieces. How many pieces were sold?



Mathspeak

Look at this bar model. Would you say that the parts shown are drawn correctly? Explain why and how would you change it to a better representation if you don't agree.

FA





Chapter Check-Up



Colour the circle that describes best how you feel.



Vocabulary Review

- Addend
- Multiple
- Loss
- Bar Models
- Cost price
- Subtrahend
- Minuend
- Selling price
- Overheads
- Adding up
- Column
- Profit
- Compensation

1. Solve. Check your answers.

- a. $45673 + 3452 + 456$ b. $434476 + 365432$
 c. $36542 - 27543$ d. $849007 - 256324$

2. Solve using compensation.

- a. $41 + 34$ b. $73 - 58$ c. $24 + 48$ d. $92 - 39$

3. Solve.

- a. A painting was bought for ₹45,895. The frame was changed for ₹2,060. It was finally sold for ₹51,080. What was the loss or gain?
 b. A factory makes car wheels. If it sells each wheel for ₹5,925 at a profit of ₹398, what is the cost price of the wheel?
 c. A chair costs ₹1,046. If it is sold at a loss of ₹191, what is its selling price?

4. Solve with the help of models.

- a. What number should be added to 78,543 to get 87,653?
 b. If you subtract 456 from a number, you are left with 1,290. What is the number?
 c.  A truck was carrying a load of mangoes. It deposited 302 kg at the first market. It is still carrying 942 kg. How many kilograms of mangoes did it have in the beginning?

5. Tick (✓) the correct answer.

A building is 48 m high. The topmost floor is 4 m high. If the ground level is parking, what is the height of the rest of the floors excluding the parking?

- a. 44 m b. 52 m
 c. 40 m d. Not enough information



Keeping in Touch

1. Round to the nearest 100.

- a. 483 b. 7650

2. Round to the nearest 1,000.

- a. 1863 b. 15085

3. Write these numbers in Roman numerals.

- a. $99 =$ b. $56 =$ c. $84 =$



What question can you never honestly answer 'yes' to?

To find the answer, first find each sum or difference. Use the decoder to find the letter that matches the answer and write the letter in the space below.

$$\begin{array}{r} 141286 \\ + 183192 \\ \hline \end{array}$$

$$\begin{array}{r} 201020 \\ - 98562 \\ \hline \end{array}$$

$$\begin{array}{r} 181263 \\ - 24026 \\ \hline \end{array}$$

Watch out for the signs.



$$\begin{array}{r} 25879 \\ - 9856 \\ \hline \end{array}$$

$$\begin{array}{r} 131051 \\ - 86152 \\ \hline \end{array}$$

$$\begin{array}{r} 958628 \\ + 15782 \\ \hline \end{array}$$

$$\begin{array}{r} 137027 \\ + 187451 \\ \hline \end{array}$$

$$\begin{array}{r} 362000 \\ - 120050 \\ \hline \end{array}$$

$$\begin{array}{r} 93582 \\ + 67158 \\ \hline \end{array}$$

$$\begin{array}{r} 87385 \\ + 69852 \\ \hline \end{array}$$

$$\begin{array}{r} 35895 \\ + 121342 \\ \hline \end{array}$$

$$\begin{array}{r} 70000 \\ - 8316 \\ \hline \end{array}$$

?

DECODER

A	324478
E	157237
L	160740
O	44899
P	61684
R	102458
S	241950
U	974410
Y	16023



The decoded question is:

Learn

$$\begin{array}{r}
 37 + 44 \\
 \swarrow \quad \searrow \\
 40 + 4 \\
 37 + 40 = 77 \\
 77 + 4 = 81 \\
 37 + 44 = 81
 \end{array}$$

$$\begin{array}{r}
 45 + 28 \\
 \swarrow \quad \searrow \quad \swarrow \quad \searrow \\
 40 + 5 \quad 20 + 8 \\
 40 + 20 = 60 \\
 5 + 8 = 13 \\
 60 + 13 = 73
 \end{array}$$

Solve.

- a. $32 + 65 =$
- b. $55 + 33 =$
- c. $44 + 18 =$

Learn

$$\begin{array}{r}
 34 + 59 = ? \\
 34 + 60 = 94 \\
 94 - 1 = 93 \\
 34 + 59 = 93
 \end{array}$$

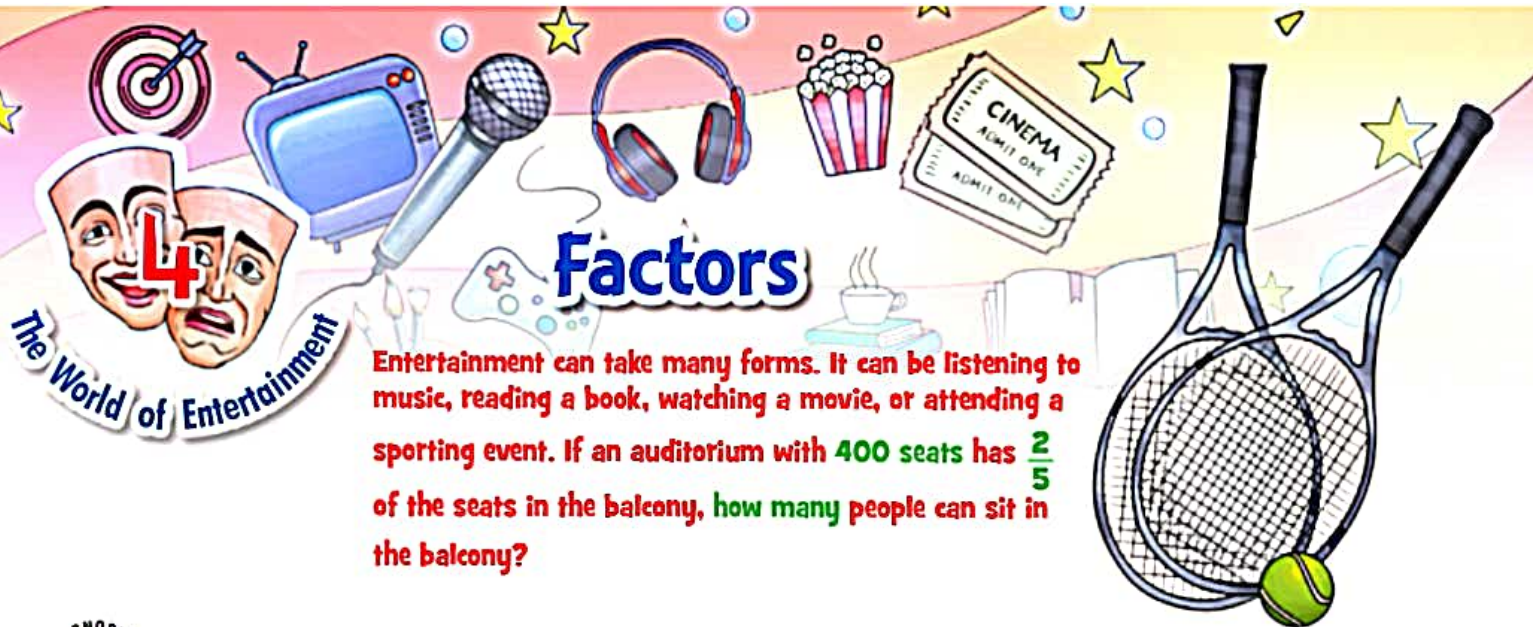
$$\begin{array}{r}
 43 + 28 = ? \\
 43 + 30 = 73 \\
 73 - 2 = 71 \\
 43 + 28 = 71
 \end{array}$$

Solve.

- a. $75 + 29 =$
- b. $52 + 88 =$
- c. $63 + 99 =$

Use

- | | |
|--------------------------------------|---|
| a. $799 + 51 =$ _____ | l. $50,000 - 100 =$ _____ |
| b. $583 + 17 =$ _____ | m. $29,356 - 8,000 =$ _____ |
| c. 21395, 31395, 41395, _____ | n. $296 - 42 =$ _____ |
| d. $105 + 37 =$ _____ | o. Sum of place values of 8 in 8,39,508 is _____. |
| e. 50,00,000 is 1 less than _____ | p. $57 + 43 =$ _____ |
| f. 7,00,000 is 1 more than _____ | q. $99 + 67 =$ _____ |
| g. $25,550 + 450 =$ _____ | r. $250 - 49 =$ _____ |
| h. $80,000 + 5,000 - 4,000 =$ _____ | s. $1,789 + 11 =$ _____ |
| i. 60, 51, 42, 33, _____ | t. 12,890 rounded to the nearest 1,000 is _____. |
| j. Take away 599 from 6000: _____ | |
| k. $16,76,500 =$ _____ $+ 16,70,000$ | |



Entertainment can take many forms. It can be listening to music, reading a book, watching a movie, or attending a sporting event. If an auditorium with 400 seats has $\frac{2}{5}$ of the seats in the balcony, how many people can sit in the balcony?

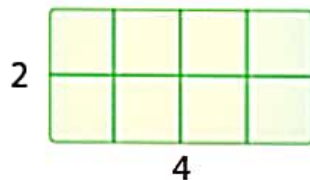


LOOKING BACK

An arrangement in rows and columns is called an array. Arrays help us find the factors of a number. The number 8 has been shown in arrays.

$$1 \times 8 = 8$$

$$2 \times 4 = 8$$



1, 2, 4, and 8 are factors of 8.

The numbers that are multiplied to get a product are called its factors.

1 and 8, 2 and 4 are factor pairs for 8.

Factors pairs when multiplied together give the original number.

You can find factors with the help of multiplication or division.

Factors of 20:

$$1 \times 20 = 20$$

$$2 \times 10 = 20$$

$$3 \times \underline{\quad} = \underline{\quad}$$

$$4 \times 5 = 20$$

$$20 \div 1 = 20$$

$$20 \div 2 = 10$$

$$20 \div 3 = \underline{\quad}$$

$$20 \div 4 = 5$$

The factor pairs of 20 are _____, _____, _____.

The common factors of 8 and 20 are _____.

Remember

- ★ 1 is a factor of every number. It is also the smallest factor of a number.
- ★ Every number is a factor of itself. It is also the greatest factor of that number.
- ★ The factor of a number is less than or equal to the number.
- ★ Every number (other than 1) has at least 2 factors—1 and the number itself.



THE RULES OF DIVISIBILITY

A number is **divisible** by another number when the quotient is a counting number and the remainder is 0. The rules of divisibility help you find such numbers. They also help you find the factors of a number.

Number	Divisibility Rule	Examples
2	The number is even.	32, 90, 116
3	The sum of digits is divisible by 3.	84 ($8 + 4 = 12$)
4	The number formed by the last two digits is divisible by 4 or ends with 00.	32, 216, 900
5	The last digit is 0 or 5.	40, 75, 920
6	The number is even and divisible by 3.	24, 72, 384
9	The sum of digits is divisible by 9.	117 ($1 + 1 + 7 = 9$)
10	The last digit is 0.	20, 130, 500

Journal

FA



All numbers that are divisible by 10 are also divisible by 5. But all numbers that are divisible by 5 are not divisible by 10. Explain why in your own words.



Mathspeak

How is divisibility and factors related?

Exercise 4 A

1. Complete the table.

Number	Divisible by						
	2	3	4	5	6	9	10
12	✓	✓	✓	✗	✓	✗	✗
79							
98							
65							
60							
120							
313							
504							
600							

2. Answer with yes or no. Then give reasons for your answer.

- Shamim is collecting old cards from friends for a craft project. She collects 10 cards a day for 10 days. Can she put them into 4 boxes with the same number of cards in each box?
- A balloon seller has 56 unblown balloons. He wants to put them into packets with the same number of balloons in each packet. Can he put them into packets of 6 and not have any left over?

USING FACTORS IN REAL LIFE

A group of 10 Bharatanatyam dancers have to perform on the stage in equal groups.



If we find the factors of 10, we can find how many different kinds of equal groups they can make. The factors of 10 are 1, 2, 5, and 10.

So, they can appear as groups of 10 dancers, or 5 dancers, or 2 dancers or just 1 dancer at a time.

Try This!

Mrs Paul has 24 sarees. She likes to arrange them in equal-sized piles in her cupboard. How many kinds of equal-sized piles can she make?

How do we use common factors in real life?

At a music concert, tabla players and sitar players are to be seated in equal groups on a stage. If there are 12 sitar players and 9 tabla players, what are the different kinds of equal groups that can be made with each group playing only one kind of instrument?

Factors of 12 – 1, 2, 3, 4, 6, 12

Factors of 9 – 1, 3, 9

Common factors are 1, 3.

They can be in groups of 1 player each or in groups of 3 each and each group will be playing the same instrument.



Try This!

Ashutosh has 24 bottles of Indian spices and 16 bottles of foreign spices in his restaurant kitchen. He wants to store them in racks so that all the racks have the same number of bottles.

In how many different ways can he do that so that each rack has only Indian spices or only foreign spices?

He can arrange the bottles in rows of _____, or _____, or _____ each and still have each row with only one kind of spice.

Challenge!

There are two numbers less than 100. One common factor of the two numbers is 40. The other common factor is 10. What are the two numbers?

Exploring Factors

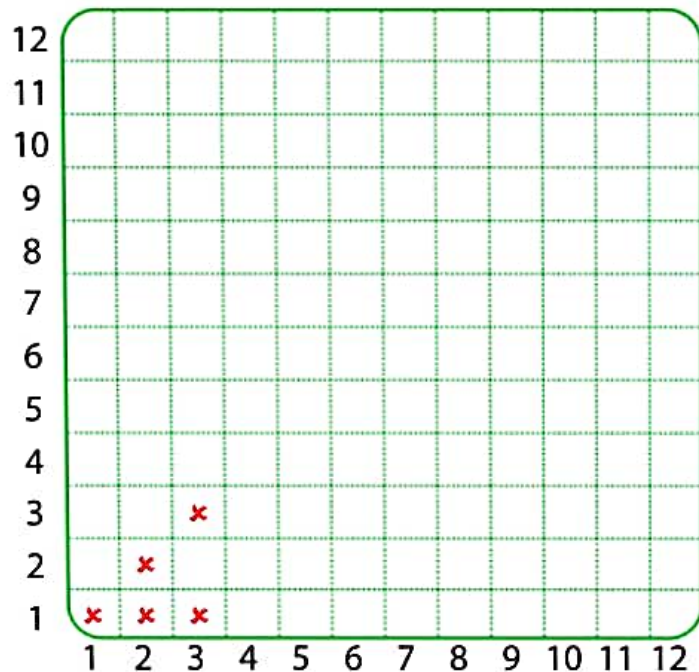
- A. Put a cross mark (x) in the box to show the factors of the numbers.

The number 1 has only 1 as a factor.

The number 2 has 1 and 2 as factors.

The factors of 3 are 1 and 3.

Complete the rest.

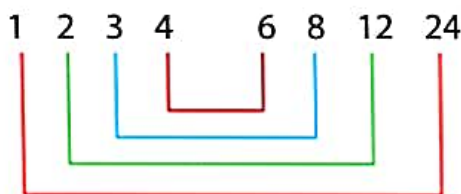


- B. Use the completed grid to answer the following questions:

- Complete the blue table on the right.
- Which number is the factor of every number?
- Which factors are common between 5 and 10?
- Which factors are common between 6 and 12? Which is the highest of these?
- Which are the numbers that have only two factors? Shade those numbers on the table.

- C. The factors of the number 24 can be listed like this.

The connected numbers are factor pairs.



The factor pairs for 24 are 1×24 , 2×12 , 3×8 , and 4×6 .

We can also list them as 1 and 24, 2 and 12, 3 and 8, and 4 and 6.

- D. Find the factor pairs for the number 27.

How many factors does it have?

Number	Factors
1	1
2	1, 2
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	

Project

FA



Work with a friend. Find how many factors are there for the numbers 4, 9, 16, and 25?

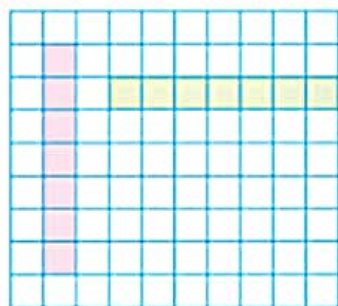
- Is there anything you notice in common about the number of factors in these numbers?
- What do you notice about the numbers themselves?
- Can you predict the next number with an odd number of factors? Explain your reasoning.

PRIME AND COMPOSITE NUMBERS



Jessica and Joseph are colouring arrays using numbers. Jessica makes these arrays with the number 7. She can make only two arrays using the number 7. That is because the number 7 has only 2 factors 1 and 7. Numbers more than 1 that have only two factors are called **prime numbers**.

Use the table on page 62 to list all the prime numbers up to 12.

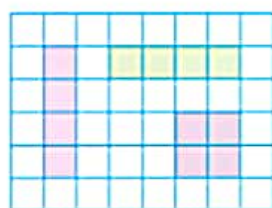


Joseph is trying to make arrays using the number 4. He can make three arrays showing the factors 1, 2, and 4.

Numbers more than 1 that have more than two factors are called **composite numbers**.

Use the table on page 62 to list all the composite numbers up to 12.

The number 1 has only one factor. It is neither prime nor composite.



Try This!

Use square-lined paper and find the arrays for all the numbers up to 12.

Primes Between 1 and 100

Long ago, a Greek mathematician, named Eratosthenes found a simple method of locating prime numbers from 1 to 100. This is called the Sieve of Eratosthenes.

- ★ Cross 1 as it is neither prime nor composite.
- ★ Leave 2 as it is a prime number, but cross out all the multiples of 2.
- ★ Leave 3 as it is prime, but cross out all its multiples.
- ★ Leave 5, but cross out all its multiples.
- ★ Leave 7, but cross out all its multiples.

All the numbers that are not crossed out are prime numbers.

Use the grid to answer these questions.

- List all the prime numbers from 1 to 100.
- Which is the only even prime number?
- Which is the only prime number that ends with 5?
- Write the greatest prime number less than 50?
- Write the greatest prime number less than 100?

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

More About Prime Numbers

A. Many prime numbers are multiples of 6, plus or minus 1. Complete the following:

$$5 = (6 \times 1) - 1$$

$$13 = (6 \times 2) + 1$$

$$23 = \boxed{}$$

$$7 = (6 \times 1) + 1$$

$$17 = \boxed{}$$

$$29 = \boxed{}$$

$$11 = (6 \times 2) - 1$$

$$19 = \boxed{}$$

$$31 = \boxed{}$$

B. Every even number except 2 is the sum of two primes.

For example: $8 = 5 + 3$ and $14 = 7 + 7$

Prove this for 12, 18, 24, 32, and 40.

C. Every odd number greater than 7, is the sum of three primes.

For example: $9 = 3 + 3 + 3$ and $21 = 11 + 3 + 7$

Prove this for 11, 15, 19, 23, and 33.

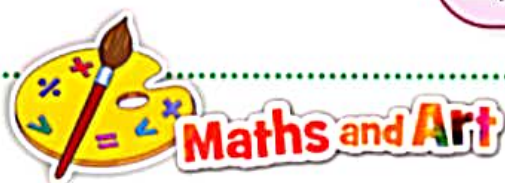
Challenge!

If the first Sunday of the month has the smallest prime number as its date, what will be the date on the last Friday of the month?



Journal

The number 1 is neither prime nor composite. Explain why this is so.



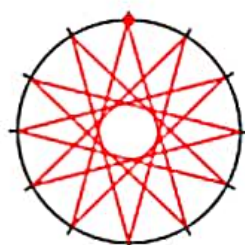
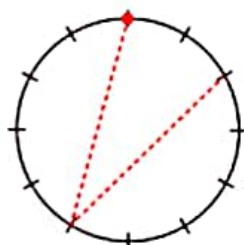
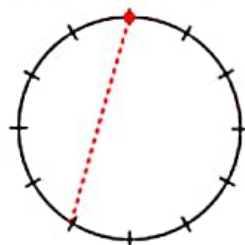
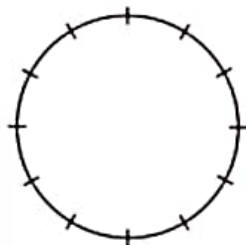
Creating Patterns

Choose a composite number, say 12. Draw a circle and mark out 12 equal parts on it.

List the factors of 12 – 1, 2, 3, 4, 6, and 12.

Which are the prime factors here? 2 and 3.

- Now choose a prime number that is **not** a factor of 12, say 7.
- Choose any one point and mark it with a dot. That is your starting and finishing dot.
- Now count 7 points from the starting dot and join the dot to the 7th point with a straight line.
- Next, count another 7 places from the 7th point and join those.
- Continue like this till you reach the starting dot again.



Have you created a pattern? Will the pattern look different if you had chosen 5?

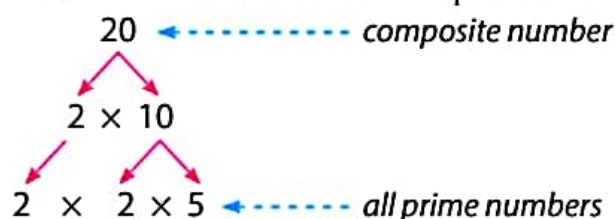
Can you use a prime number that is greater than the composite number you are working with?

Experiment with 13, 17, and 19. What do you notice?

Create patterns with other numbers.

Prime Factorisation

All composite numbers can be broken up into their factors.



Mathspeak

FA

If you were factorising a prime number, how many prime factors would it have. How do you know?

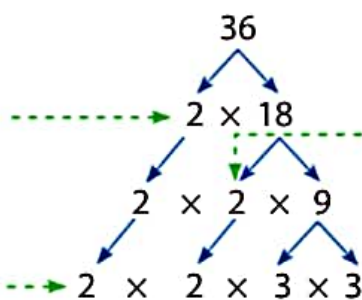
When the factors are all prime, it is called **prime factorisation** of the number.

Find the prime factors of 36.

Method 1: Beginning with the smallest prime factors

Step 1: Start with the smallest prime factor of 36.

Step 3: Continue to find the smallest prime factor at every step.



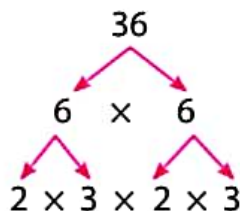
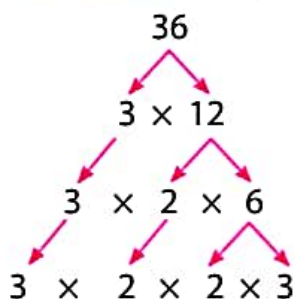
Step 2: Next find the smallest prime factor of 18.

Remember

1 is not a prime number so you do not have to use it for prime factorisation.

Stop: When the last row has only prime numbers.

Method 2: Using any two factors as a starting point



It does not matter which two factors you start with, you will always end up with the same prime factorisation.

Answer: Prime factorisation of $36 = 2 \times 2 \times 3 \times 3$

We put the factors in increasing order only to organise the information better. You can check that your factorisation is correct by multiplying all the factors to see if you arrive at the number you started with.

Play a Game

C-4.1

Play with a friend. Prepare two sets of digit cards from 0 to 9. Shuffle them. Each player should pick two cards and build a number of his or her choice. Then he/she finds all the factors of that number *except the number itself*. The factors are added to give the points for the round. The game can be played in five rounds.

Example: Number

1

6

Factors (except the number itself) = 1, 2, 4, 8

Points: $1 + 2 + 4 + 8 = 15$

Exercise 4 B

1. Say true or false. Explain the reason for your answer with examples.
 - a. The product of two prime numbers is also a prime number.
 - b. There is only one composite number in the eighties.
 - c. All numbers with 2 in the ones place are composite.
 - d. All odd numbers are prime numbers.
 - e. A composite number cannot have three factors.
2. Use any method you prefer to prime factorise these composite numbers.
 - a. 51
 - b. 60
 - c. 90
 - d. 32
 - e. 24
 - f. 63
 - g. 81
 - h. 72
3. Write the prime factorisation. If the number is already prime, write 'prime number'.
 - a. 61
 - b. 75
 - c. 21
 - d. 43
 - e. 37
 - f. 54

Using Prime Factors

We can use the prime factors of a number to help us see other relationships.

Look at the prime factors of 30.

$$30 = 2 \times 3 \times 5$$

2, 3, and 5 are prime factors of 30. We can use these to find the other factors of 30.

$$30 = 2 \times 3 \times 5$$

$$= 6 \times 5$$

So, 6 is also a factor of 30.

$$30 = 2 \times 3 \times 5$$

$$= 2 \times 15$$

So, 15 is also a factor of 30.

$$30 = 2 \times 5 \times 3$$

$$= 10 \times 3$$

So, 10 is also a factor of 30.

Try This!

First do the prime factorisation of the number. Then list the other factors with the help of the prime factors. a. 42 b. 70

Project

FA

I am a perfect number!

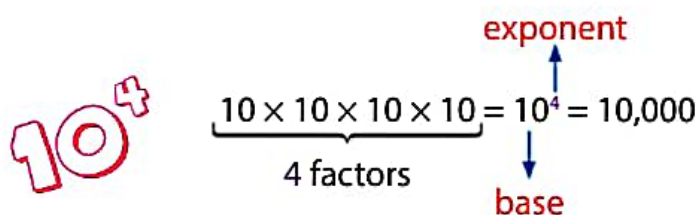
6

- Did you know that 6 is called a **perfect number**? That is because the factors of 6 (excluding 6 itself) are 1, 2, and 3 and $1 + 2 + 3 = 6$.
The sum of the factors is also 6.
Find the next perfect number.
(Hint: It is less than 30. Remember, do not include the number itself as a factor while adding.)
- The factors of 12 (excluding 12 itself) are 1, 2, 3, 4, and 6. These add up to 16 which is more than 12. So, 12 is called an **abundant number**. Find the numbers between 2 and 20 that are abundant.
- The factors of 10 (excluding 10 itself) are 1, 2, and 5. These add up to 8 which is less than 10. So, 10 is called a **deficient number**. Find the numbers between 90 and 100 that are deficient.

POWERS OF 10 AND 2

C-1.4

Sometimes scientists, mathematicians, and others need to write very large numbers that have been got by multiplying a factor repeatedly by itself. To make the number simpler to write, we use a scientific notation called **exponents**.


$$\underbrace{10 \times 10 \times 10 \times 10}_{4 \text{ factors}} = 10^4 = 10,000$$

The base is the number that is used as the repeated factor.

The exponent shows the number of times the base has been multiplied by itself.

So using exponents, $10 \times 10 \times 10 \times 10 \times 10 \times 10$ can be written as 10^6 . The *value* is 10,00,000 and it is read as '10 to the power of 6'. This is also called the *word form* of the exponent.

Some songbirds sing more than 2×10^3 times a day. How many times is that in a day? We can also work this out by using a pattern.



$$2 \times 10^1 = 2 \times 10 = \underline{\hspace{2cm}}$$

$$2 \times 10^2 = 2 \times 10 \times 10 = \underline{\hspace{2cm}}$$

$$2 \times 10^3 = 2 \times 10 \times 10 \times 10 = \underline{\hspace{2cm}}$$

Try This!

Write in exponent form, word form, and find the value of $10 \times 10 \times 10 \times 10 \times 10$.

Some songbirds sing $\underline{\hspace{2cm}}$ times a day.

Exponents can be used for all numbers. Let us explore the powers of 2.

- $2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 2^9 = 512$
Word form is 2 to the power of 9
Value is 512

Try This!

Write in factor form and find the value of 2^5 .

Project

FA

In computer science, the binary system which is based on powers of 2 is widely used. Storage on hard drives and pen drives are commonly available in powers of 2. Work out the exponential form of these storage values:

16 GB, 32 GB, 64 GB, 128 GB, 256 GB, 512 GB

Find out how powers of ten are used to measure earthquakes on the Richter scale.

HIGHEST COMMON FACTOR

During a magic show the magician invites 12 girls and 18 boys to come up on stage for his next trick. He needs to put them into equal groups in such a way that there are only girls or only boys in each group. What is the largest number he can have in each group?



- First let us find the factors of 12 and 18 to find the different groups that are possible for each.

Factors of 12: 1, 2, 3, 4, 6, 12

Factors of 18: 1, 2, 3, 6, 9, 18

This means that the girls can be put in groups of 1, 2, 3, 4, 6, and 12 and the boys can be put in groups of 1, 2, 3, 6, 9, and 18.

- The magician needs the boys and girls to be in equal groups of the same number, so we need to find the common factors of 12 and 18.

The common factors of 12 and 18 are 1, 2, 3, and 6.

So, the boys can be put into groups of 1, 2, 3, and 6 and the girls can also be put into groups of 1, 2, 3, and 6.

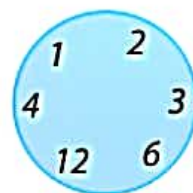
- Next, the magician requires the largest possible group. When we look at the list of common factors we find that 6 is the greatest or the highest factor.

So, the magician will put the volunteers into groups of 6 and each group will have only boys or only girls.

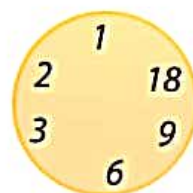
We can also say that 6 is the greatest number that can divide both 12 and 18 without a remainder.

The **Highest Common Factor** or **HCF** of two numbers is the greatest number that divides both the numbers without leaving any remainder.

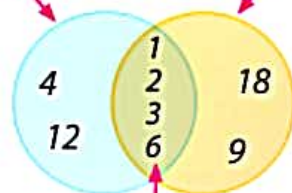
Factors of 12



Factors of 18



Factors of 12



Factors of 18

Common factors of 12 and 18.

Try This!

Aparna is organising her books on the shelf. She has 18 books of adventure stories and 24 books of mystery stories. She wants to organise the books in equal piles but she wants each pile to have only adventure books or only mystery books. What is the largest number she can have in each pile?

Refer to **Maths Lab Activity** on pg 70.

To Find HCF Using Prime Factorisation

Example 1: Let us find the HCF of 24 and 32 using prime factorisation.

➡ **Step 1:** Do the prime factorisation of the numbers.

$$24 = 2 \times 2 \times 2 \times 3$$

Step 2: Find the common factors. Common factors are 2, 2, 2.

$$32 = 2 \times 2 \times 2 \times 2 \times 2$$

Step 3: Multiply the common factors, i.e., $2 \times 2 \times 2 = 8$

Answer: HCF of 24 and 32 is 8.

Example 2: Find the HCF of 10, 12, and 15.

$$10 = 2 \times 5 \quad 12 = 2 \times 2 \times 3 \quad 15 = 3 \times 5$$

There are no common prime factors for all three numbers, so the HCF is 1.

Answer: HCF of 10, 12, and 15 is 1.

Example 3: Find the HCF of 11 and 13.

➡ 11 and 13 are both prime numbers so the HCF has to be 1.

Answer: HCF of 11 and 13 is 1.

Common Mistake!

HCF of 10, 12, and 15 = ?

$$10 = 2 \times 5$$

$$12 = 2 \times 2 \times 3$$

$$15 = 3 \times 5$$

$$\text{HCF} = 2 \times 3 \times 5 = 30 \quad \times$$

$$\text{HCF} = 1 \quad \checkmark$$

Exercise 4 C

1. First find the common factors of these numbers. Then mark their HCF.

a. 9, 15

b. 8, 16

c. 4, 18

d. 28, 32

e. 40, 24

2. Complete the HCF chart.

HCF	12	15	18	30	36
3					
6					
9			9		
12					
24				6	

Remember

The HCF of given numbers cannot be bigger than any one of the numbers.

3. These numbers have already been factorised for you. Find the HCF of the given pairs.

20— $2 \times 2 \times 5$

16— $2 \times 2 \times 2 \times 2$

14— 2×7

36— $2 \times 2 \times 3 \times 3$

27— $3 \times 3 \times 3$

40— $2 \times 2 \times 2 \times 5$

a. 20, 40

b. 20, 36

c. 27, 40

d. 14, 36

e. 14, 16

f. 16, 36

4. Find the HCF of these using the prime factorisation method.

a. 6, 10

b. 16, 8

c. 15, 25

d. 16, 48

e. 28, 36

f. 36, 45

g. 27, 36

h. 28, 33



Colour the circle that describes best how you feel.



Vocabulary Review

- Factor
- Factorisation
- Divisible
- Factor tree
- Common factors
- Prime Factorisation
- Highest common factor
- Prime number
- Composite number
- Divisibility
- Factor pair
- Array

1. Complete the table.

Number	Divisible by						
	2	3	4	5	6	9	10
93							
84							
35							
450							
700							

2. Give the factor pairs for the number 36.

3. List the composite numbers from 21–30.

4. Factorise these composite numbers into prime factors.

a. 48 b. 39 c. 27

5. First do the prime factorisation of the number. Then list the other factors with the help of the prime factors.

a. 28 b. 63 c. 45

6. The factors of these numbers are given. Find the HCF of the pairs.

8 — 1, 2, 4, 8

16 — 1, 2, 4, 8, 16

15 — 1, 3, 5, 15

20 — 1, 2, 4, 5, 10, 20

a. 8, 20: _____

b. 15, 20: _____

c. 16, 15: _____

7. Find the HCF using prime factorisation.

a. 16, 24

b. 14, 56

c. 72, 48

8. Solve.

a. Janani has 12 red balloons and 16 blue balloons. How many different ways can she make them into equal bunches, such that each group has the same colour, and none is left over?

b. If she had 20 red balloons and 24 blue balloons, then what is the biggest bunch she could have made, such that all the bunches are equal, and each bunch has the same colour?

9. Tick (✓) the correct answer.

The prime numbers up to 20 are _____.

a. 2, 3, 5, 7, 13, 17

b. 2, 3, 5, 7, 11, 13, 17, 19

c. 2, 3, 5, 7, 13, 15, 17, 19

d. 1, 2, 3, 5, 7, 13, 17, 19

Keeping in Touch

a. $735 \times 202 =$ _____

b. $1864 \times 39 =$ _____

c. $16423 \div 28 =$ _____



Objective: To find the HCF of two numbers 18 and 24.

Materials Required: Square-lined paper, colour pencils, and scissors.

Preparation: Students work in pairs with their own set of materials and one different colour pencil each.

Step 1: The first student uses the square-lined paper and a blue pencil to explore all the arrays that can be made with the number 18. Care should be taken not to repeat arrays. For example, the array of 3×6 is the same as 6×3 and does not have to be shown twice. The factor pairs for each array is written showing the factors for the number.

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Step 2: The second student does the same for the number 24 using a green pencil.

A = 1×24
 B = 2×12
 C = 3×8
 D = 4×6

Factors of 24 = 1, 2, 3, 4, 6, 8, 12, 24

Step 3: Each student then cuts out his or her array with a scissor.

Step 4: Then they try to match the sides of each blue array with each green array by placing one on top of the other to find the sides that match.

- They find that blue A matches one side of green A showing the common factor 1.
- Next, blue B matches green B showing the common factor 2.
- Blue C matches green C showing the common factor 3.

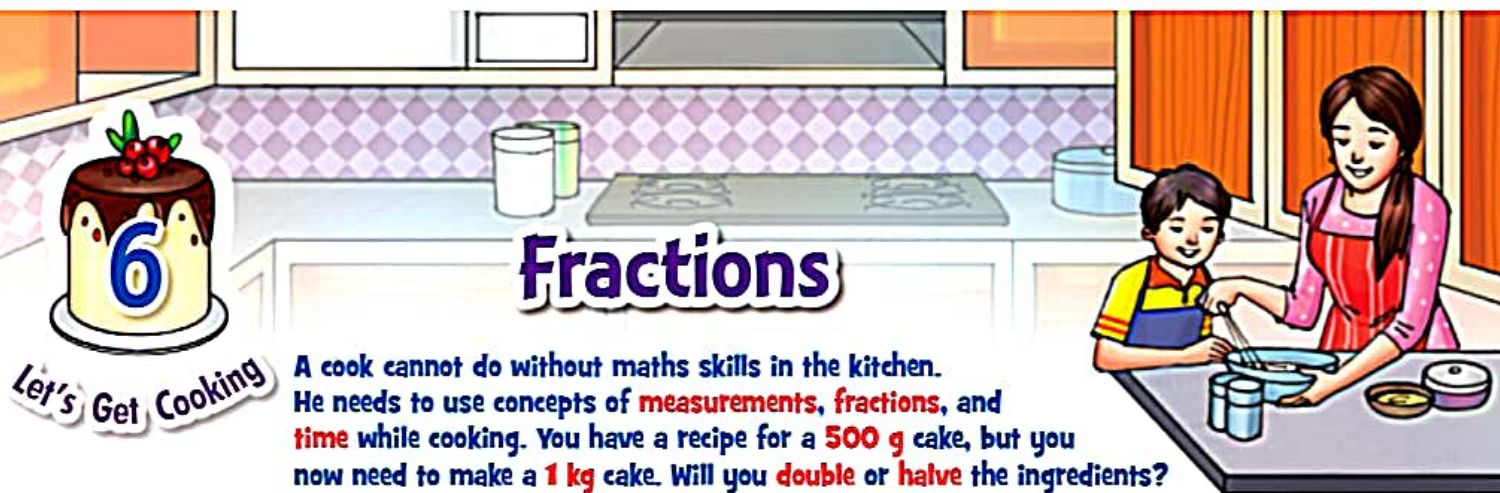
Step 5: The greatest matching side comes from blue C and green C showing the common factor 3.

Therefore, the HCF of 18 and 24 is 3.

Try This!

Repeat the activity using square-lined paper to find the HCF of:

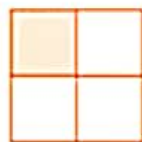
- a.** 8 and 12 **b.** 15 and 21



LOOKING BACK



A fraction shows part of a whole. A whole can be a region or a group.



$$\frac{1}{4}$$

$\frac{\text{Numerator}}{\text{Denominator}}$

$$\frac{3}{5}$$



Types of Fractions



Unit fractions are fractions that have 1 as the numerator: $\frac{1}{2}, \frac{1}{5}, \frac{1}{9}$

Like fractions have the same denominator: $\frac{3}{7}, \frac{5}{7}, \frac{1}{7}$

Unlike fractions have different denominators: $\frac{4}{7}, \frac{5}{10}, \frac{5}{9}$

Proper fractions have a value of less than one and have the numerator smaller than the denominator: $\frac{1}{8}, \frac{4}{9}, \frac{6}{11}$

Improper fractions have a value of one, or more than one, and have the numerator equal to or greater than the denominator: $\frac{5}{2}, \frac{12}{7}, \frac{8}{8}$

A mixed number combines a whole number and a fraction:

$$\underbrace{\frac{1}{2} + \frac{1}{2} + \frac{1}{2}}_2 + \frac{1}{2} = 2\frac{1}{2}$$



1. Compare the following like fractions using $<$ or $>$.

a. $\frac{7}{12} \square \frac{9}{12}$

b. $\frac{8}{11} \square \frac{3}{11}$

c. $\frac{6}{8} \square \frac{3}{8}$

2. Change into mixed or improper fractions. i. $\frac{17}{8}$: _____ ii. $2\frac{3}{7}$: _____

3. Of the ₹2,400 Mr Krishnan earned, he spent $\frac{3}{8}$ on food, $\frac{1}{3}$ on taxes, and $\frac{1}{6}$ on other expenses. Find out how much all this is in rupees. Then find out how much he saved.

NCF 2023

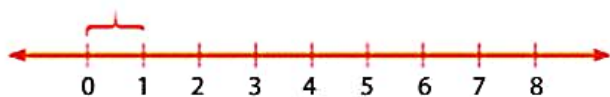
Competencies in this chapter

C-1.2: Applicable to the entire chapter

C-1.4, C-4.1, C-4.3: Labelled on specific pages

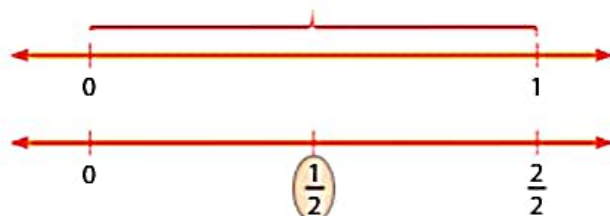
FRACTIONS ON THE NUMBER LINE

You recognise number lines like these which show whole numbers.

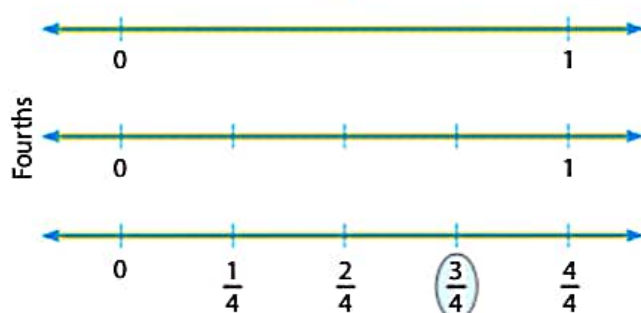


To show proper fractions (numbers less than one) on a number line, we need to only to work on the space between 0 and 1.

To mark $\frac{1}{2}$ on the number line: Divide the space between 0 and 1 into the number of parts shown by the denominator. Mark $\frac{1}{2}$ as shown. Rename 1 as $\frac{2}{2}$.



To mark $\frac{3}{4}$ on the number line: Divide the space between 0 and 1 into 4 equal parts as indicated by the denominator.



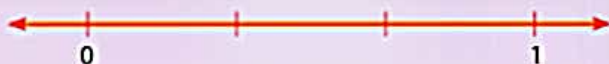
Name each fourth as shown.

Ring $\frac{3}{4}$.



Try This!

a. Name and ring $\frac{2}{3}$ on the number line.



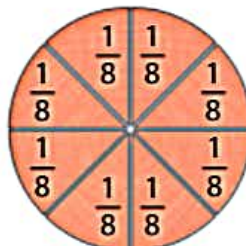
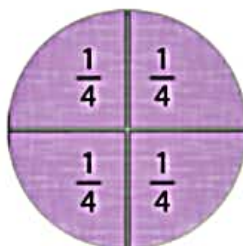
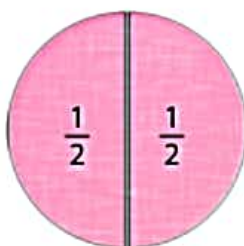
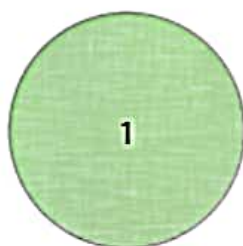
b. Mark, name, and ring $\frac{5}{6}$ on the number line.



Keep this material ready and use whenever you see the 'Hands-On' symbol.



Take 4 paper plates of the same size. Flatten them out. The first is 1 whole. Fold and cut the remaining into halves, quarters, and eighths. Colour as shown.



FINDING EQUIVALENT FRACTIONS



These are two trays of burfi.

Both show the amount of burfi remaining in each tray.

$$\frac{2}{4} = \frac{4}{8}$$



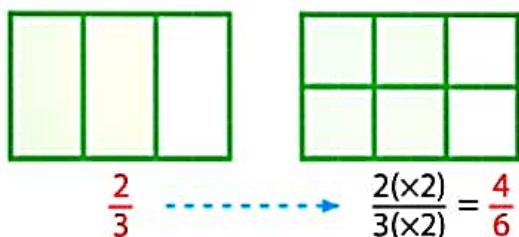
$$\frac{2}{4}$$



$$\frac{4}{8}$$

Fractions that name parts of the same value are called **equivalent fractions**.

We can find equivalent fractions by multiplying the numerator and denominator by the same number.

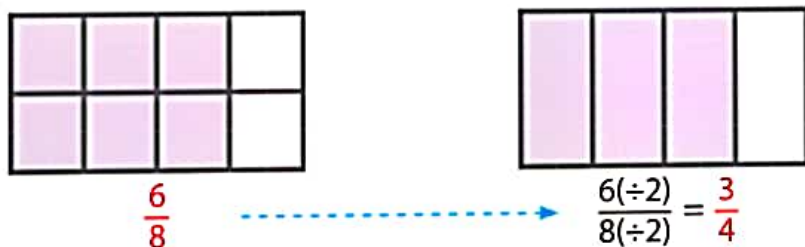


Example 1: $\frac{3}{7} = \frac{15}{?}$

$$\frac{3(\times 5)}{7(\times 5)} = \frac{15}{35}$$

Answer: $\frac{15}{35}$

We can also find equivalent fractions by dividing the numerator and denominator by the same number.



$$\frac{6}{8} = \frac{3}{4}$$



Mathspeak

FA

Look at the two models alongside. What is the relationship between the number of parts and the size of the part in each model?

Divide the numerator and denominator by a common factor to find equivalent fractions.

Example 2: Are $\frac{6}{9}$ and $\frac{14}{21}$ equivalent fractions?

$$\frac{6(\div 3)}{9(\div 3)} = \frac{2}{3}$$

3 is a common factor of 6 and 9.

$$\frac{14(\div 7)}{21(\div 7)} = \frac{2}{3}$$

7 is a common factor of 14 and 21.

$$\frac{2}{3} = \frac{6}{9} = \frac{14}{21}$$

Answer: $\frac{6}{9}$ and $\frac{14}{21}$ are equivalent fractions.

Example 3: $\frac{18}{45} = \frac{?}{5}$

$$\frac{18(\div 9)}{45(\div 9)} = \frac{2}{5}$$

Answer: $\frac{18}{45} = \frac{2}{5}$

Think $45 \div ? = 5$
 $45 \div 9 = 5$
 $18 \div 9 = ?$



Try This!

Divide by a common factor to get an equivalent fraction.

a. $\frac{15}{27}$

b. $\frac{21}{49}$

c. $\frac{4}{10} = \frac{2}{?}$



1. $\frac{3}{4} = ?$

Use your fourths. Show $\frac{3}{4}$. Find out how many eighths fit in $\frac{3}{4}$.

2. $\frac{4}{8} = ?$

Use your eighths. Show $\frac{4}{8}$. Find out how many halves fit in $\frac{4}{8}$.

Checking Equivalent Fractions

Example 1: Rahul made strawberry ice-cream and mango ice-cream. The strawberry ice-cream froze in $\frac{2}{5}$ of an hour and the mango ice-cream froze in $\frac{6}{15}$ of an hour.

Which ice-cream took longer to freeze? Or did they both take the same amount of time?

➡ If we want to check whether two fractions are equivalent, we must **cross-multiply**.

$$\begin{array}{ccc} \frac{2}{5} & \begin{array}{c} \nearrow \quad \nwarrow \\ \searrow \quad \nearrow \end{array} & \frac{6}{15} \end{array} \quad \begin{array}{l} \text{---} \rightarrow 5 \times 6 = 30 \\ \text{---} \rightarrow 2 \times 15 = 30 \end{array}$$

Since the cross-products are equal, the fractions are equivalent.

Answer: Both ice-creams took the same amount of time to freeze.

Example 2: Are $\frac{2}{5}$ and $\frac{4}{7}$ equivalent?

$$\begin{array}{ccc} \frac{2}{5} & \begin{array}{c} \nearrow \quad \nwarrow \\ \searrow \quad \nearrow \end{array} & \frac{4}{7} \end{array} \quad \begin{array}{l} \text{---} \rightarrow 5 \times 4 = 20 \\ \text{---} \rightarrow 2 \times 7 = 14 \end{array}$$

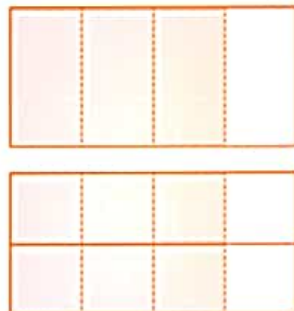
Since the cross-products are not equal, the fractions are not equivalent.

Answer: $\frac{2}{5}$ and $\frac{4}{7}$ are not equivalent.

Exercise 6 A

1. Action Exercise

- Take a sheet of plain paper. Fold it into 4 equal parts, that is into fourths.
- Colour 3 parts out of 4. What fraction of the sheet is coloured?
- Fold the sheet back into fourths. Then fold into half. Open it. What fraction of the sheet is coloured?
- Fold the sheet back into eighths. Fold into half again. Open it. What fraction of the sheet is coloured?
- $\frac{3}{4} = \boxed{?} = \boxed{?}$



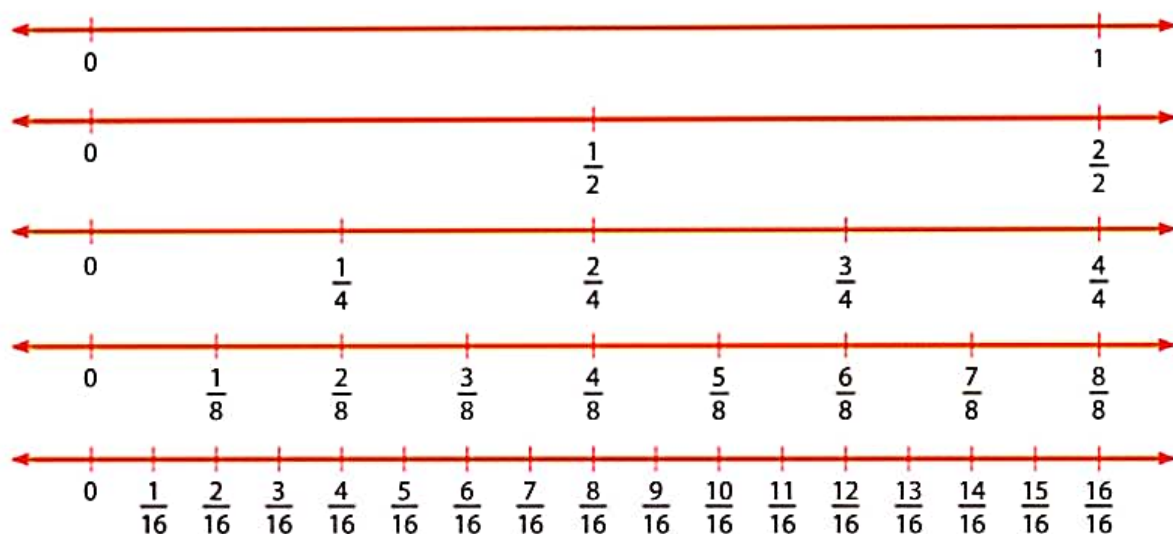
Mathspeak

'All fractions equivalent to $\frac{1}{3}$ have odd number denominators.' Do you agree with this statement? Give reasons for your answer.

FA



2. Ring all the fractions equivalent to $\frac{1}{2}$ on the number line in green. Ring all the fractions equivalent to $\frac{1}{4}$ on the number line in blue.



3. Multiply the numerator and the denominator by 3 in each of these to get an equivalent fraction.
- a. $\frac{1}{4}$ b. $\frac{3}{5}$ c. $\frac{1}{6}$ d. $\frac{1}{5}$ e. $\frac{2}{5}$ f. $\frac{4}{5}$
4. Multiply the numerator and the denominator by 2, 3, and 4 in each of these to get a set of equivalent fractions.

a. $\frac{1}{5} = \frac{2}{10} = \frac{3}{15} = \frac{4}{20}$ b. $\frac{1}{4}$ c. $\frac{2}{3}$ d. $\frac{2}{5}$ e. $\frac{3}{4}$

5. Divide by a common factor to get an equivalent fraction.

a. $\frac{6}{24}$ b. $\frac{14}{49}$ c. $\frac{28}{32}$ d. $\frac{10}{30}$ e. $\frac{17}{34}$ f. $\frac{88}{120}$

6. Fill in the empty boxes.



a. $\frac{2}{5} = \frac{\boxed{}}{15}$ b. $\frac{5}{7} = \frac{10}{\boxed{}}$ c. $\frac{\boxed{}}{5} = \frac{20}{25}$ d. $\frac{5}{\boxed{}} = \frac{15}{21}$ e. $\frac{8}{15} = \frac{40}{\boxed{}}$ f. $\frac{6}{7} = \frac{42}{\boxed{}}$

7. Are these pairs of fractions equivalent? Divide each to decide.

a. $\frac{4}{8}$ and $\frac{9}{18}$ b. $\frac{7}{21}$ and $\frac{5}{15}$ c. $\frac{3}{12}$ and $\frac{4}{20}$

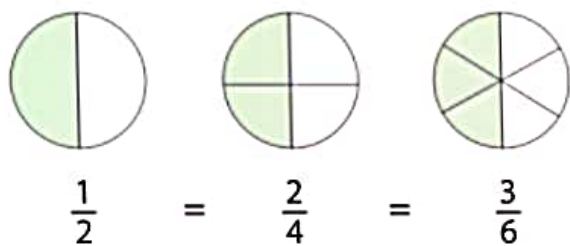
8. Cross-multiply to find whether the fractions are equivalent. Write **E** if they are and **NE** if they are not.

a. $\frac{4}{5}$ and $\frac{8}{10}$ b. $\frac{6}{9}$ and $\frac{3}{2}$ c. $\frac{1}{6}$ and $\frac{2}{3}$

d. $\frac{4}{5}$ and $\frac{6}{8}$ e. $\frac{2}{6}$ and $\frac{4}{12}$ f. $\frac{2}{4}$ and $\frac{3}{6}$



A FRACTION IN ITS LOWEST TERM



$\frac{1}{2}, \frac{2}{4}, \frac{3}{6}$ are all equivalent fractions, but $\frac{1}{2}$ is the fraction in its **lowest term**.

A fraction is in the lowest term when the only common factor between the numerator and the denominator is 1.

A fraction can be reduced to its lowest term in the following ways.

Abu and Amina were trying to reduce the fraction $\frac{18}{30}$ to its lowest term.

Amina's way



Keep dividing the numerator and the denominator by their common factors till you cannot divide further.

$$\frac{18 (\div 2)}{30 (\div 2)} = \frac{9 (\div 3)}{15 (\div 3)} = \frac{3}{5}$$

$\frac{3}{5}$ is the lowest term of the fraction $\frac{18}{30}$.

Abu's way

The HCF of 18 and 30 is 6.

Divide both the terms by 6.

$$\frac{18 (\div 6)}{30 (\div 6)} = \frac{3}{5}$$

$\frac{3}{5}$ is the lowest term of the fraction $\frac{18}{30}$.

You can use the HCF method to find out whether a fraction is in its lowest term.

Example 1: Is $\frac{7}{12}$ in the lowest term?

➡ The HCF of 7 and 12 is 1.

So, $\frac{7}{12}$ is the lowest term of the fraction.

Example 2: Is $\frac{9}{27}$ in the lowest term?

➡ The HCF of 9 and 27 is 9. Since the numerator and denominator do not have 1 as their HCF, $\frac{9}{27}$ is not in its lowest term.

You can also reduce a given fraction to its lowest term by finding the HCF of both the terms and then dividing by it.



Try This!

- Reduce $\frac{24}{40}$ to its lowest term by dividing the terms by common factors.
- Reduce $\frac{16}{24}$ to its lowest term by finding the HCF.



Mathspeak

If two fractions do not have the same lowest form, they cannot be equivalent fractions. Do you agree? Justify your answer.

FA



Try This!

Shade the fractions that are in their lowest term.

$\frac{2}{3}$	$\frac{12}{16}$	$\frac{3}{9}$	$\frac{2}{5}$	$\frac{4}{7}$	$\frac{7}{14}$
$\frac{2}{12}$	$\frac{1}{2}$	$\frac{8}{16}$	$\frac{4}{9}$	$\frac{6}{12}$	$\frac{6}{7}$
$\frac{5}{10}$	$\frac{3}{4}$	$\frac{3}{7}$	$\frac{18}{21}$	$\frac{16}{24}$	$\frac{3}{5}$

Journal

FA



When a fraction is in its lowest term you can only use multiplication to find its equivalent fractions. When it is not in its lowest term you can use both multiplication and division. Do you agree with this statement? Why?



Exercise 6 B

1. Reduce the fraction to its lowest term in each of the following.

a. $\frac{14 (\div 7)}{21 (\div 7)}$ b. $\frac{9 (\div 3)}{12 (\div 3)}$ c. $\frac{10 (\div 5)}{15 (\div 5)}$ d. $\frac{12 (\div 4)}{16 (\div 4)}$ e. $\frac{18 (\div 9)}{27 (\div 9)}$ f. $\frac{6 (\div 2)}{10 (\div 2)}$

2. Reduce each of the following fractions to their lowest term.

a. $\frac{2}{6}$ b. $\frac{4}{8}$ c. $\frac{6}{8}$ d. $\frac{6}{9}$ e. $\frac{5}{10}$ f. $\frac{4}{6}$ g. $\frac{12}{15}$ h. $\frac{12}{18}$ i. $\frac{16}{20}$ j. $\frac{7}{35}$

3. Circle the fractions in their lowest term.

a. $\frac{3}{15}$ b. $\frac{4}{12}$ c. $\frac{1}{5}$ d. $\frac{11}{13}$ e. $\frac{12}{14}$ f. $\frac{2}{11}$ g. $\frac{3}{5}$ h. $\frac{5}{7}$ i. $\frac{6}{8}$ j. $\frac{9}{18}$

Project



FA

Take any fraction that is not in its lowest term and represent it on a square-lined paper. Figure 1 shows the fraction $\frac{6}{8}$ with pink lines.

- Use a ruler to draw a line from 0 to the opposite corner of the rectangle.
- Use a pencil to mark the other corner through which the line passes.
- Draw green lines as shown in figure 2.

What fraction does the green rectangle in figure 2 represent?

How is this fraction related to $\frac{6}{8}$?

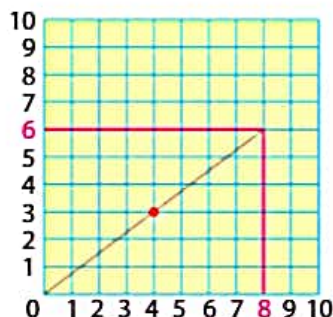


Figure 1

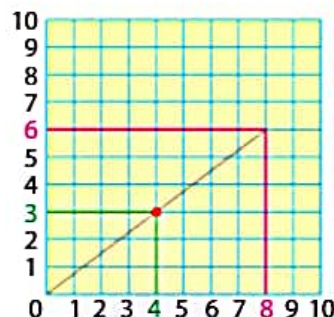


Figure 2

Try this with a. $\frac{2}{6}$, b. $\frac{6}{9}$, and c. $\frac{8}{10}$ in your notebook.

Challenge!

Rearrange these fractions cards according to the instructions given below.

$$\frac{1}{3} \quad \frac{5}{10} \quad \frac{2}{7} \quad \frac{9}{5} \quad \frac{3}{7}$$

- ★ First place the two like fractions one after the other in ascending order.
- ★ Next place the fraction that is equivalent to $\frac{1}{2}$, followed by the improper fraction.
- ★ Finally place the fraction equivalent to $\frac{4}{12}$.



COMPARING UNLIKE FRACTIONS



Half of the first pizza is not equal to half of the second pizza. This is because the first pizza is not the same size as the second one.

Remember you can only compare fractions from the same whole or same-sized wholes.

Fractions with the Same Numerator

Example 1: Shantanu and Anita both baked cakes of the same size. Shantanu has finished icing $\frac{1}{3}$ of his cake and Anita has finished icing $\frac{1}{4}$ of her cake. Who has finished more icing?

When the denominators are different it means the whole is divided into parts of unequal sizes. We cannot compare 1 piece of one size $\frac{1}{3}$ with 1 piece of a different size $\frac{1}{4}$. So, we need to make them into parts of the same size—in other words, we need to make them into like fractions where the denominators are the same.

Step 1: Find equivalent fractions of $\frac{1}{3}$ and $\frac{1}{4}$ such that they are like fractions.

$$\frac{1}{3} = \frac{2}{6} = \frac{3}{9} = \frac{4}{12} \quad \frac{1}{4} = \frac{2}{8} = \frac{3}{12}$$

Step 2: Compare. $\frac{4}{12} > \frac{3}{12}$

Answer: $\frac{1}{3} > \frac{1}{4}$ so, Shantanu has finished icing more of his cake.

In unlike fractions with the same numerator, the fraction with the greater denominator is the smaller fraction.

Example 2: Rearrange these fractions in descending order.

$$\frac{5}{6}, \frac{5}{12}, \frac{5}{7}, \frac{5}{16}, \frac{5}{13} \longrightarrow \frac{5}{6} > \frac{5}{7} > \frac{5}{12} > \frac{5}{13} > \frac{5}{16}$$

Shantanu



$$\frac{1}{3}$$

Anita



$$\frac{1}{4}$$



$$\frac{4}{12}$$



$$\frac{3}{12}$$

A greater denominator means that the number of parts are more. The more the number of parts the smaller the size of each part.

Fractions with Different Denominators

Example 1: After a while Shantanu finished icing $\frac{2}{3}$ of his cake and Anita finished icing $\frac{4}{5}$ of her cake.

Who finished more icing?

⇒ $\frac{2}{3} \boxed{?} \frac{4}{5}$

When the denominators are different it means that the parts are not of the same size. We cannot compare 2 pieces of one size $\frac{2}{3}$ with 4 pieces of a different size $\frac{4}{5}$. So, we need to make them into parts of the same size—in other words, we need to make them into like fractions where the denominators are the same.

You can also use the LCM to convert to like fractions.

Step 1: Find the LCM of the two denominators.

LCM of 3 and 5 is 15.

Step 2: Convert the fractions into like fractions with denominator 15.

$$\frac{2}{3} \left(\frac{\times 5}{\times 5} \right) = \frac{10}{15} \quad \frac{4}{5} \left(\frac{\times 3}{\times 3} \right) = \frac{12}{15}$$

Step 3: Compare the like fractions. $\frac{10}{15} < \frac{12}{15}$
 $\frac{2}{3} < \frac{4}{5}$

Answer: Anita finished icing more of her cake.

Example 2: Rearrange the following fractions into both ascending and descending orders.

$$\frac{1}{2}, \frac{2}{3}, \frac{5}{6}, \frac{3}{8}$$

⇒ Use the LCM to convert to like fractions.

Step 1: LCM of denominators 2, 3, 6, and 8 = 24

Step 2: Convert them into like fractions.

$$\frac{1}{2} = \frac{1 \times 12}{2 \times 12} = \frac{12}{24} \quad \frac{2}{3} = \frac{2 \times 8}{3 \times 8} = \frac{16}{24} \quad \frac{5}{6} = \frac{5 \times 4}{6 \times 4} = \frac{20}{24} \quad \frac{3}{8} = \frac{3 \times 3}{8 \times 3} = \frac{9}{24}$$

Step 3: Compare the like fractions: $\frac{12}{24}, \frac{16}{24}, \frac{20}{24}, \frac{9}{24}$

Step 4: i. In ascending order

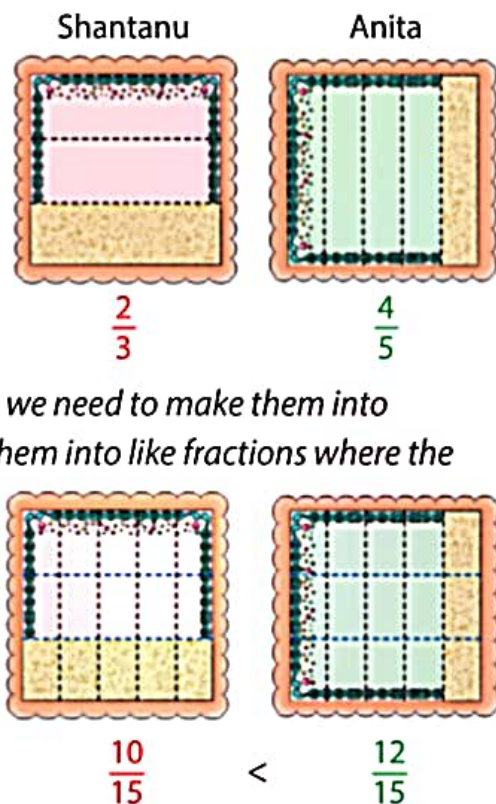
$$\frac{9}{24}, \frac{12}{24}, \frac{16}{24}, \frac{20}{24} \longrightarrow \frac{3}{8} < \frac{1}{2} < \frac{2}{3} < \frac{5}{6}$$

ii. In descending order

$$\frac{20}{24}, \frac{16}{24}, \frac{12}{24}, \frac{9}{24} \longrightarrow \frac{5}{6} > \frac{2}{3} > \frac{1}{2} > \frac{3}{8}$$

Answer: Ascending order: $\frac{3}{8} < \frac{1}{2} < \frac{2}{3} < \frac{5}{6}$

Descending order: $\frac{5}{6} > \frac{2}{3} > \frac{1}{2} > \frac{3}{8}$



Try This!

Put < or > signs without changing into equivalent fractions. Use the rule.

a. $\frac{4}{7} \boxed{?} \frac{4}{9}$ b. $\frac{7}{13} \boxed{?} \frac{7}{11}$

Exercise 6 C

1. Put $>$ or $<$ sign without changing into equivalent fractions. Apply the rules you have learnt so far.

a. $\frac{2}{5} \square \frac{2}{7}$

b. $\frac{1}{7} \square \frac{1}{9}$

c. $\frac{5}{12} \square \frac{5}{11}$

d. $\frac{3}{13} \square \frac{3}{7}$

2. Compare using $>$ or $<$.

a. $\frac{3}{4} \square \frac{1}{5}$

b. $\frac{7}{8} \square \frac{2}{3}$

c. $\frac{3}{4} \square \frac{2}{3}$

d. $\frac{1}{12} \square \frac{5}{7}$

e. $\frac{7}{10} \square \frac{3}{4}$

f. $\frac{9}{10} \square \frac{7}{8}$

g. $\frac{2}{8} \square \frac{3}{5}$

h. $\frac{4}{5} \square \frac{3}{4}$

3. Rearrange in ascending order.

a. $\frac{9}{10}, \frac{9}{15}, \frac{9}{21}, \frac{9}{16}, \frac{9}{19}$

b. $\frac{2}{4}, \frac{2}{8}, \frac{2}{3}, \frac{2}{6}$

c. $\frac{3}{15}, \frac{14}{15}, \frac{12}{15}, \frac{1}{15}, \frac{6}{15}$

d. $\frac{3}{12}, \frac{7}{8}, \frac{2}{4}, \frac{2}{6}$

e. $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{1}{3}$

f. $\frac{4}{5}, \frac{2}{3}, \frac{1}{2}, \frac{5}{6}, \frac{6}{10}$

4. Rearrange in descending order.

a. $\frac{10}{14}, \frac{10}{20}, \frac{10}{15}, \frac{10}{35}, \frac{10}{22}$

b. $\frac{11}{19}, \frac{9}{19}, \frac{10}{19}, \frac{8}{19}, \frac{15}{19}$

c. $\frac{1}{3}, \frac{1}{5}, \frac{1}{2}, \frac{1}{6}$

d. $\frac{1}{8}, \frac{5}{12}, \frac{2}{6}, \frac{3}{4}$

e. $\frac{2}{3}, \frac{3}{5}, \frac{5}{6}, \frac{3}{4}$

f. $\frac{3}{4}, \frac{2}{3}, \frac{5}{8}, \frac{7}{9}, \frac{11}{12}$

Mathspeak

FA

Explain how you know that $\frac{7}{8} < 1\frac{2}{3}$ without working it out.



Maths and Art

FA



1. Make your own tile designs with fraction cut-outs.

- Use several circles of the same size in different colours. Cut the circles into halves, quarters, and eighths.
- Combine shapes and colours to create new shapes. Stick your shapes on a sheet of white or coloured paper.



- Write what fraction of each colour and each shape you used.
- Then give the same information using mixed numbers if applicable.

2. Create a larger design by combining shapes.



ADDING UNLIKE FRACTIONS

Example 1: Alam and Akshay are chopping vegetables for salad. So far Alam has chopped $\frac{1}{2}$ of the vegetables required for the salad and Akshay has chopped $\frac{1}{4}$. What fraction of all the vegetables for the salad have been chopped so far?

When we try to add fractions with different denominators we are trying to add fractions of different sizes. When you look at the first picture, how do you decide what the denominator of the sum should be? Therefore, in order to add the fractions it is important to make them into fractions of the same denominator or the same size. In other words, we must make them into like fractions.

Step 1: Make into like fractions by finding the equivalent fraction

of $\frac{1}{2}$ with denominator 4. $\rightarrow \frac{1 \times 2}{2 \times 2} = \frac{2}{4}$

Step 2: Add the like fractions. $\rightarrow \frac{2}{4} + \frac{1}{4} = \frac{3}{4}$

Answer: $\frac{3}{4}$ of the vegetables for salad have been chopped so far.

Example 2: $\frac{2}{5} + \frac{1}{4} = ?$

$\frac{2}{5} = \frac{4}{10} = \frac{6}{15} = \frac{8}{20}$; $\frac{1}{4} = \frac{2}{8} = \frac{3}{12} = \frac{4}{16} = \frac{5}{20}$

$\frac{8}{20}$ and $\frac{5}{20}$ are like fractions.

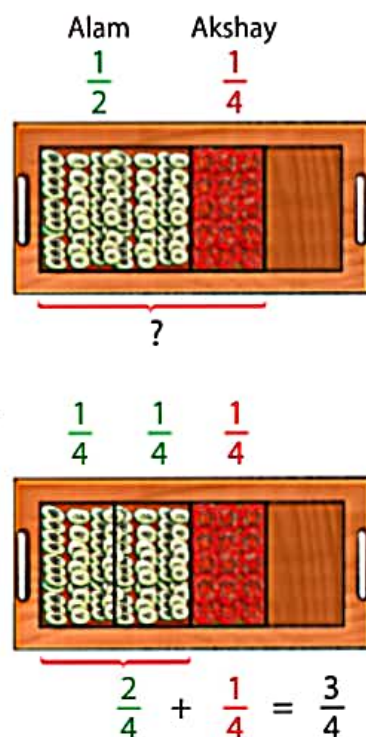
$$\frac{8}{20} + \frac{5}{20} = \frac{13}{20}$$

Answer: $\frac{13}{20}$

Learn these well:

$$\frac{1}{2} + \frac{1}{2} = 1 \quad \frac{1}{3} + \frac{2}{3} = 1$$

$$\frac{1}{4} + \frac{3}{4} = 1$$



$$\frac{3}{4} + \frac{1}{8} = ?$$

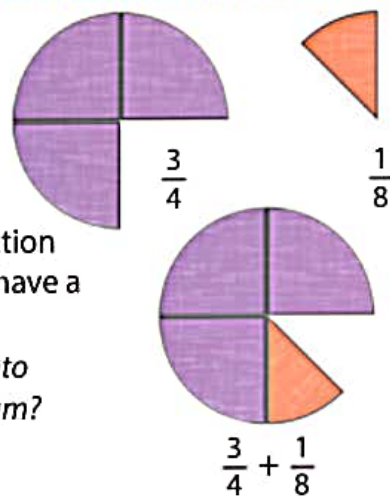
Use your fourths. Make $\frac{3}{4}$. Use your eighths. Make $\frac{1}{8}$.

Add $\frac{1}{8}$ to $\frac{3}{4}$.

After putting the pieces together, you will find that you have a fraction you cannot name, since the parts are of different sizes and do not have a common denominator.

How will you make all the parts the same? How will you make them into like fractions with a common denominator so that you can find the sum?

Draw out the solution after you have found it with your material and give the answer. Then show the same as a written calculation.



You can also use the LCM method to add fractions.

Example 3: $\frac{1}{6} + \frac{3}{4} = ?$

Step 1: Find the LCM of both denominators. LCM of 6 and 4 is 12.

Step 2: Find the equivalent fractions with denominator 12.

$$\frac{1(\times 2)}{6(\times 2)} = \frac{2}{12}, \quad \frac{3(\times 3)}{4(\times 3)} = \frac{9}{12}$$

Step 3: Add the fractions. Reduce to the lowest term if required.

$$\frac{2}{12} + \frac{9}{12} = \frac{11}{12}$$

Answer: $\frac{11}{12}$

Example 4: $\frac{2}{5} + \frac{1}{10} = ?$

Step 1: LCM of 5 and 10 is 10.

Step 2: $\frac{2(\times 2)}{5(\times 2)} = \frac{4}{10}$

Step 3: $\frac{4}{10} + \frac{1}{10} = \frac{5}{10}$
 $\frac{5}{10} = \frac{1}{2}$ (lowest term)

Answer: $\frac{1}{2}$

Example 5: $\frac{3}{4} + \frac{2}{3} = ?$

Step 1: LCM of 4 and 3 = 12

$$\frac{9}{12} + \frac{8}{12} = \frac{17}{12} = 1\frac{5}{12}$$

Answer: $1\frac{5}{12}$

Common Mistake!

$$\frac{2}{5} + \frac{1}{2} = \frac{3}{7} \quad \times$$

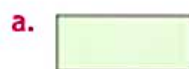
$$\frac{2}{5} + \frac{1}{2} = \frac{4}{10} + \frac{5}{10} = \frac{9}{10} \quad \checkmark$$

Remember

- ★ If the sum of two or more fractions is not in its lowest term, reduce it to its lowest term.
- ★ If the sum of two or more fractions is an improper fraction, change the improper fraction to a mixed number.

Challenge!

If each of these is $\frac{2}{3}$ of a shape, make it into the whole shape.



Exercise 6 D

1. Solve.

a. $\frac{1}{8} + \frac{1}{4}$

b. $\frac{1}{9} + \frac{2}{3}$

c. $\frac{1}{2} + \frac{3}{8}$

d. $\frac{1}{2} + \frac{1}{6}$

e. $\frac{3}{5} + \frac{1}{10}$

f. $\frac{1}{2} + \frac{1}{4}$

g. $\frac{3}{8} + \frac{1}{4}$

h. $\frac{3}{10} + \frac{2}{5}$

2. Solve. Give your answer in the lowest term or as a mixed number.

a. $\frac{1}{6} + \frac{1}{3}$

b. $\frac{1}{8} + \frac{6}{16}$

c. $\frac{1}{2} + \frac{5}{8}$

d. $\frac{2}{5} + \frac{9}{10}$

e. $\frac{8}{9} + \frac{5}{12}$

f. $\frac{1}{2} + \frac{7}{8}$

g. $\frac{9}{10} + \frac{13}{15}$

h. $\frac{2}{12} + \frac{3}{4}$

ADDING MIXED NUMBERS

Adding Mixed Numbers with Like Fractions

Example 1: Amar used $1\frac{3}{6}$ cups of almonds and $2\frac{5}{6}$ cups of walnuts to make nutty chocolate fudge. How many cups of nuts did he use in all?



Step 1: Add the whole numbers $1 + 2 = 3$

Step 2: Add the fractions $\frac{3}{6} + \frac{5}{6} = \frac{8}{6}$

Step 3: Convert $\frac{8}{6}$ to a mixed number $= 1\frac{2}{6}$

Step 4: Add both $3 + 1\frac{2}{6} = 4\frac{2}{6}$

Step 5: Reduce the fraction to its lowest term $4\frac{1}{3}$

Answer: Amar used $4\frac{1}{3}$ cups of nuts in all.

You can add fractions in any order and the sum will be the same.



Adding Mixed Numbers with Unlike Fractions

Example 2: $3\frac{1}{2} + 2\frac{1}{4}$

Method 1:

Step 1: Add the whole numbers $3 + 2 = 5$

Step 2: Add the fractions $\frac{1}{2} + \frac{1}{4} = \frac{2+1}{4} = \frac{3}{4}$

Step 3: Add the fraction and whole number $5 + \frac{3}{4} = 5\frac{3}{4}$

Method 2:

Step 1: Convert the mixed numbers into improper fractions

$$3\frac{1}{2} = \frac{7}{2} \quad 2\frac{1}{4} = \frac{9}{4}$$

Step 2: Add the fractions $\frac{7}{2} + \frac{9}{4} = \frac{14+9}{4} = \frac{23}{4}$

Step 3: Convert into a mixed number $\frac{23}{4} = 5\frac{3}{4}$

Answer: $5\frac{3}{4}$

Data Connect

Open the Data Bank page 243 and study the data on 'Share of Water of Different Oceans on Earth'. Then answer the questions below.

1. Express the share of water in the Indian Ocean in its lowest term.
2. Which ocean has the greatest share of the world's ocean water? Express the fraction in its lowest term.
3. The Arctic Ocean and the Southern Ocean together constitute what fraction of the total volume of oceans?
4. How much more water is in the Atlantic Ocean than in the Indian Ocean?

Exercise 6 E

Solve using any method you like. Give the answer in the lowest term.

1. $5 + 3\frac{1}{2}$

2. $3\frac{3}{7} + 2\frac{2}{7}$

3. $1\frac{1}{4} + 2\frac{1}{4}$

4. $1\frac{3}{4} + 2\frac{2}{3}$

5. $1\frac{3}{8} + \frac{2}{7}$

6. $1\frac{3}{10} + 4\frac{1}{2}$

7. $2\frac{3}{4} + 2\frac{2}{3}$

8. $3\frac{2}{5} + 2\frac{1}{2}$

9. $1\frac{7}{9} + 4\frac{5}{6}$

10. $4\frac{1}{2} + 2\frac{3}{4}$



SUBTRACTING UNLIKE FRACTIONS

Example 1: An ice-cream sundae recipe needs $\frac{1}{2}$ cup vanilla ice-cream and $\frac{1}{3}$ cup mango jelly. How much more ice-cream is there than jelly in the sundae?



➡ $\frac{1}{2} - \frac{1}{3} = ?$

To subtract unlike fractions, change them to equivalent like fractions first.

$$\frac{1}{2} = \frac{2}{4} = \frac{3}{6}$$

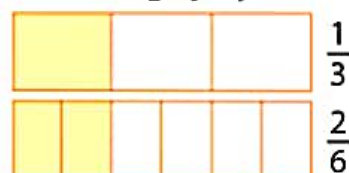
$$\frac{1}{3} = \frac{2}{6}$$

$$\frac{3}{6} - \frac{2}{6} = \frac{1}{6}$$

vanilla ice cream



mango jelly



Answer: There was $\frac{1}{6}$ cup more vanilla ice-cream than mango jelly in the sundae.

You can also use the LCM method to subtract fractions.

Example 2: $\frac{5}{6} - \frac{3}{5} = ?$

➡ **Step 1:** Find the LCM of the two denominators. LCM of 6 and 5 is 30.

Step 2: Find the equivalent fractions with denominator 30.

$$\frac{5 \times 5}{6 \times 5} = \frac{25}{30} \text{ and } \frac{3 \times 6}{5 \times 6} = \frac{18}{30}$$

Step 3: Subtract. Reduce to the lowest term if needed.

$$\frac{25}{30} - \frac{18}{30} = \frac{7}{30}$$

Answer: $\frac{7}{30}$



$$\frac{3}{4} - \frac{5}{8} = ?$$

Use your fourths. Make $\frac{3}{4}$. Use your eighths. Make $\frac{5}{8}$.

Place $\frac{5}{8}$ on $\frac{3}{4}$.

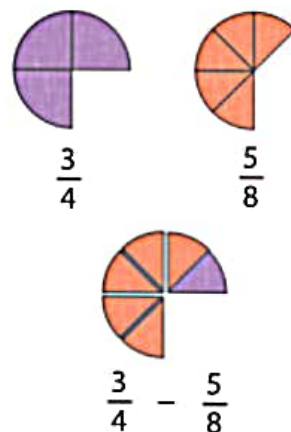
Subtract $\frac{5}{8}$ from $\frac{3}{4}$ by removing the exactly overlapping pieces. It is not possible to remove the last piece as $\frac{1}{4}$ is bigger than the $\frac{1}{8}$ that needs to be removed.

To be able to subtract you must have all pieces of the same size, that is, you must have common denominators.

How will you make all the pieces the same size to be able to subtract?

Solve with the help of your material.

Then show the same as a written calculation.



Exercise 6 F

Solve.

1. $\frac{1}{3} - \frac{1}{4}$

2. $\frac{3}{4} - \frac{1}{2}$

3. $\frac{3}{4} - \frac{2}{3}$

4. $\frac{5}{6} - \frac{3}{4}$

5. $\frac{4}{7} - \frac{1}{4}$

6. $\frac{3}{8} - \frac{1}{3}$

7. $\frac{7}{10} - \frac{2}{5}$

8. $\frac{2}{3} - \frac{1}{2}$

9. $\frac{5}{8} - \frac{1}{2}$

10. $\frac{8}{11} - \frac{3}{10}$

SUBTRACTING MIXED NUMBERS

Example 1: Aruna had $2\frac{2}{3}$ bowls of dosa batter. After preparing dosas for the family breakfast, she found she still had $1\frac{1}{4}$ bowls of batter left. How many bowls of batter did she use for breakfast?



⇒ $2\frac{2}{3} - 1\frac{1}{4} = ?$

To subtract mixed numbers, change them to improper fractions first.

Step 1: Change to improper

fractions. → $\frac{8}{3} - \frac{5}{4}$

$2\frac{2}{3} = \frac{8}{3}$ and $1\frac{1}{4} = \frac{5}{4}$

Step 2: Change to equivalent fractions and

subtract. → $\frac{32}{12} - \frac{15}{12} = \frac{17}{12}$

$\frac{8}{3} = \frac{8(\times 4)}{3(\times 4)} = \frac{32}{12}$ and $\frac{5}{4} = \frac{5(\times 3)}{4(\times 3)} = \frac{15}{12}$

Step 3: Change the difference to a mixed number. → $\frac{17}{12} = 1\frac{5}{12}$

Answer: Aruna used $1\frac{5}{12}$ bowls of dosa batter for breakfast.

Example 2: $7 - 1\frac{3}{6} = ?$

⇒ $7 - 1\frac{3}{6} = \frac{7}{1} - \frac{9}{6}$
 $= \frac{42}{6} - \frac{9}{6} = \frac{33}{6}$
 $= \frac{33 \div 3}{6 \div 3} = \frac{11}{2} = 5\frac{1}{2}$

Before giving the answer, simplify it by changing an improper fraction to its lowest term first, and then to a mixed number.

Example 3: $2\frac{1}{4} - 1\frac{3}{4} = ?$

⇒ $= \frac{9}{4} - \frac{7}{4}$
 $= \frac{2}{4}$
 $= \frac{1}{2}$

Answer: $5\frac{1}{2}$

Answer: $\frac{1}{2}$



Mathspeak

In Example 3, we are subtracting mixed numbers with like fractions. Yet we need to change them to improper fractions. Explain why.

Exercise 6 G

1. Solve. Give the answer in the lowest term.

a. $3\frac{5}{6} - 1\frac{1}{3}$

b. $7\frac{4}{5} - 2\frac{3}{5}$

c. $9\frac{3}{7} - \frac{2}{7}$

d. $4\frac{1}{2} - 2\frac{3}{5}$

e. $6\frac{3}{4} - 2\frac{1}{2}$

f. $5 - 4\frac{1}{3}$

g. $8 - \frac{2}{3}$

h. $5\frac{2}{5} - 2\frac{3}{5}$

i. $4\frac{3}{4} - \frac{1}{2}$

j. $7\frac{1}{5} - 2$

2. Decide whether to add or subtract. Then solve.

a. Vedika spent $\frac{1}{2}$ of her pocket money on a movie and $\frac{1}{4}$ on a new pen. What fraction of her total pocket money did she spend?

b. Ankana did $\frac{3}{8}$ of her homework on Saturday and $\frac{1}{3}$ of her homework on Sunday. How much of the homework did she do over the weekend?

c. Mrs Kumar bought 3 litres of milk in the morning. There was $\frac{5}{8}$ litres left in the evening. How much milk was used during the day?

d. If $3\frac{2}{3}$ metres is cut from a ribbon which is $5\frac{1}{2}$ metres long, how much ribbon is left?

e. A recipe needs $\frac{2}{5}$ cup of milk and $\frac{1}{3}$ cup of cream. How much more milk than cream is required?



Mathspeak

$$3\frac{6}{7} - 2\frac{3}{7}$$

This question for subtraction of mixed numbers with like fractions does not need us to change it to improper fractions. Can you explain why?

Mental Maths



PA

It is easy to find like fractions when the denominators are multiples of each other.

To solve: $\frac{1}{8} + \frac{3}{4}$

Think

$$\frac{3}{4} = \frac{6}{8}$$

So, $\frac{1}{8} + \frac{6}{8} = \frac{7}{8}$

To solve: $\frac{1}{3} - \frac{3}{12}$

Think

$$\frac{1}{3} = \frac{4}{12}$$

So, $\frac{4}{12} - \frac{3}{12} = \frac{1}{12}$

Do these mentally a. $\frac{3}{10} + \frac{1}{5} = ?$

b. $\frac{3}{4} - \frac{1}{2} = ?$

c. $\frac{5}{8} + \frac{1}{4} = ?$

d. $\frac{1}{3} - \frac{1}{6} = ?$



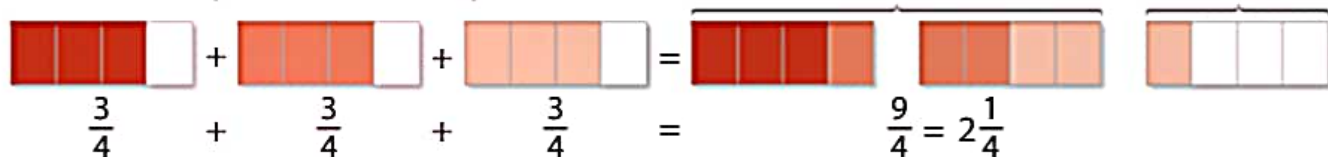
MULTIPLICATION OF FRACTION BY WHOLE NUMBER

Multiplication of fractions by whole number can be understood in two ways.

- A. Repeated addition** (where the whole number gives you the number of groups and the fraction gives you the number in each group)

Example 1: 3 cooks were rolling out puris for a party. Each had $\frac{3}{4}$ kg of dough to roll out. How much dough did they have in all?

$\Rightarrow 3 \times \frac{3}{4} = ?$ (3 groups of $\frac{3}{4} = ?$)



Answer: The cooks had $2\frac{1}{4}$ kg of dough in all.

- B. Finding the fraction of a number**

Example 2: Shantu was steaming idlis. Her idli tray can make 8 idlis at a time. She poured batter into $\frac{3}{4}$ of them. How many idlis did she make?

$\Rightarrow \frac{3}{4}$ of 8 is the same as $\frac{3}{4} \times 8$.

You can multiply in any order and get the same product. So, $8 \times \frac{3}{4} = ?$

Step 1: Write the whole number as a fraction $\rightarrow \frac{8}{1} \times \frac{3}{4}$

Step 2: a. Multiply the numerators $\rightarrow \frac{8 \times 3}{1 \times 4} = \frac{24}{4}$
b. Multiply the denominators $\rightarrow \frac{24}{4}$

Step 3: Simplify $\rightarrow \frac{24}{4} = \frac{6}{1} = 6$

Answer: Shantu made 6 idlis.

Example 3: $\frac{5}{7} \times 0 = ?$

$\Rightarrow \frac{5}{7} \times 0 = \frac{5}{7} \times \frac{0}{1} = \frac{5 \times 0}{7 \times 1} = \frac{0}{7} = 0$

Answer: 0

Example 4: $\frac{6}{7} \times 1 = ?$

$\Rightarrow \frac{6}{7} \times 1 = \frac{6}{7} \times \frac{1}{1} = \frac{6 \times 1}{7 \times 1} = \frac{6}{7}$

Answer: $\frac{6}{7}$



Try This!

- a. $9 \times \frac{5}{6}$ b. $\frac{3}{6}$ of 36

Remember

- ★ When we multiply a fraction by zero, we get zero as the answer.
- ★ When we multiply a fraction by 1, we get the same fraction.



$2 \times \frac{3}{4} = ?$

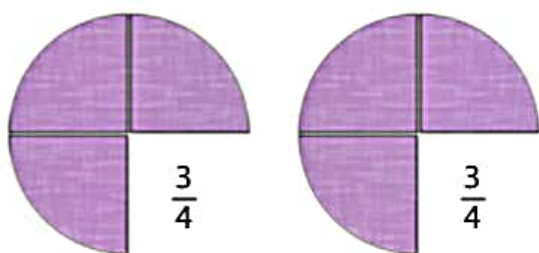
Work with a friend. Share your material.

Use your fourths. Make two sets of $\frac{3}{4}$.

Join the pieces together to show repeated addition. What do you get?

$2 \times \frac{3}{4} = \boxed{}$

Draw out your answer then show the written calculation. Give the answer in the lowest form.



MULTIPLYING FRACTIONS BY FRACTIONS

When we multiply proper fractions by proper fractions we take the 'x' sign to mean 'of'.

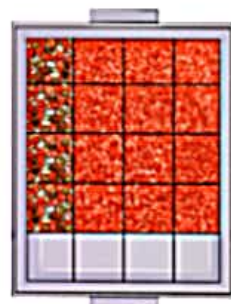
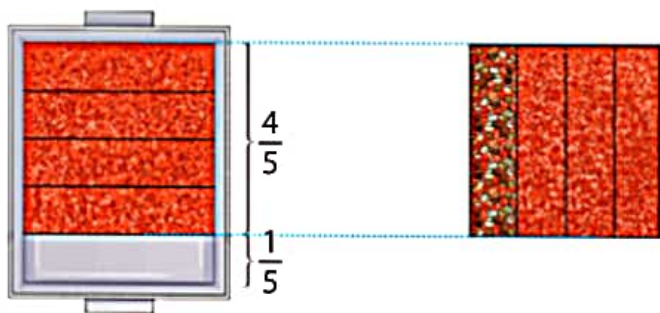
Example 1: Anita made *halwa* and put it into a tray. Only $\frac{4}{5}$ of the whole tray was used. She then sprinkled chopped nuts on $\frac{1}{4}$ of the *halwa*. What fraction of the whole tray has *halwa* with nuts?

➡ To find what fraction of the whole tray has *halwa* with nuts, we have to find $\frac{1}{4}$ of $\frac{4}{5}$.

$\frac{4}{5}$ of the whole tray
has *halwa*.

$\frac{1}{4}$ of the *halwa* portion
has nuts.

$\frac{4}{20}$ of the whole tray
has *halwa* with nuts.



The third diagram combines the first and second diagrams to show that 4 out of 20 parts have *halwa* with nuts.

That shows that $\frac{1}{4}$ of $\frac{4}{5} = \frac{4}{20}$

Since 'of' means we have to multiply, we can read

this as $\frac{1}{4} \times \frac{4}{5} = \frac{4}{20}$

Answer: $\frac{4}{20}$ of the tray has *halwa* with nuts.

Solve without pictures: $\frac{1}{4} \times \frac{4}{5}$

Step 1: Multiply the numerators $\rightarrow \frac{1 \times 4}{4 \times 5} = \frac{4}{20}$
Multiply the denominators $\rightarrow$

Step 2: Simplify the fraction $\rightarrow \frac{4}{20} = \frac{1}{5}$

So, $\frac{1}{4} \times \frac{4}{5} = \frac{1}{5}$.

Answer: $\frac{1}{5}$ of the tray has *halwa* with nuts.

Use a shortcut!

Sometimes it is possible to use a shortcut and simplify before the last step.

$$\frac{5}{4} \times \frac{12}{9} = ? \quad \frac{5}{\cancel{4}_1} \times \frac{\cancel{12}^3}{9} = \frac{5}{\cancel{4}_1} \times \frac{\cancel{12}^2}{\cancel{9}_3} = \frac{5}{3}$$

Answer: $\frac{5}{3} = 1\frac{2}{3}$

Look for common factors between the numerator and denominator and then divide.

Common Mistake!

$$\frac{2}{3} \times \frac{3}{5} = ?$$

$$\frac{2}{3} \times \frac{3}{5} = \frac{6}{15} \text{ answer is incomplete}$$

$$\frac{2}{3} \times \frac{3}{5} = \frac{6}{15} = \frac{2}{5} \checkmark$$

Common Mistake!

$$\frac{7}{10} \times \frac{14}{3} = \frac{7}{10} \times \frac{14^2}{3} = \frac{2}{30} \times$$

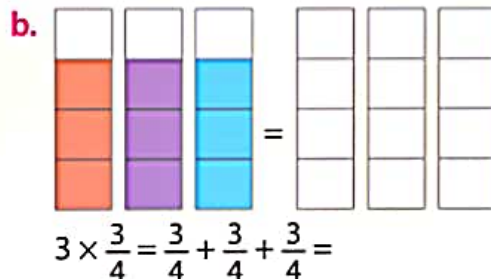
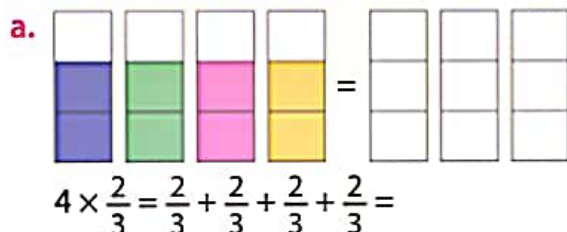
$$\frac{7}{10_5} \times \frac{14^7}{3} = \frac{49}{15} = 3\frac{4}{15} \checkmark$$

Refer to **Maths Lab Activity** on pg 103.

Exercise 6 H

1. Action Exercise

Colour to find the answer.



2. Multiply. Give the answer in the lowest term.

- a. $7 \times \frac{1}{2}$ b. $8 \times \frac{4}{5}$ c. $\frac{2}{7}$ of 14 d. $5 \times \frac{2}{3}$ e. $\frac{1}{20} \times 20$
 f. $\frac{3}{7} \times 0$ g. 18 of $\frac{2}{3}$ h. $\frac{3}{4}$ of 32 i. $\frac{5}{12} \times 5$ j. $\frac{8}{17} \times 1$

3. Multiply.

- a. $\frac{1}{2} \times \frac{3}{4}$ b. $\frac{2}{3} \times \frac{4}{5}$ c. $\frac{3}{2} \times \frac{1}{4}$ d. $\frac{5}{3} \times \frac{7}{4}$
 e. $\frac{4}{3} \times \frac{4}{5}$ f. $\frac{2}{5} \times \frac{2}{7}$ g. $\frac{1}{2} \times \frac{1}{2}$ h. $\frac{2}{5} \times \frac{1}{3}$

4. Multiply. Simplify before the last step.

- a. $\frac{5}{12} \times \frac{7}{10}$ b. $\frac{1}{6} \times \frac{9}{4}$ c. $\frac{5}{33} \times \frac{11}{2}$ d. $\frac{5}{8} \times \frac{8}{15}$
 e. $\frac{6}{11} \times \frac{55}{42}$ f. $\frac{7}{6} \times \frac{6}{21}$ g. $\frac{3}{4} \times \frac{4}{3}$ h. $\frac{2}{3} \times \frac{9}{14}$

RECIPROCAL

Two numbers whose product is 1 are called **reciprocals**.

Another word for reciprocal is **multiplicative inverse**.

Example 1: $\frac{3}{4}$ and $\frac{4}{3}$ are reciprocals.

$$\Rightarrow \frac{3}{4} \times \frac{4}{3} = \frac{12}{12} = 1$$

Example 2: 5 and $\frac{1}{5}$ are reciprocals.

$$\Rightarrow 5 \times \frac{1}{5} = \frac{5}{5} = 1$$

Did you notice?
The reciprocal of a proper fraction is an improper fraction and is more than 1.

Try This!

Match the fractions with their reciprocals.

- a. $\frac{9}{3}$ b. $\frac{1}{8}$ c. $\frac{11}{7}$ d. 3 e. $\frac{4}{8}$
 i. 8 ii. $\frac{7}{11}$ iii. $\frac{3}{9}$ iv. $\frac{8}{4}$ v. $\frac{1}{3}$



DIVISION OF FRACTIONS

To understand division of fractions let us look at division once more. Given below are 6 slices of bread.



If you had to solve $6 \div 2$, you could think of it as 'how many 2s are there in 6?'



There are three 2s in 6.

Dividing a Whole Number by a Unit Fraction

To understand $3 \div \frac{1}{2}$, ask the question 'how many halves are there in 3?'



There are 6 halves in 3 slices of bread or $3 \div \frac{1}{2} = 6$.

The same picture can be described as $3 \times 2 = 6$.

Dividing by $\frac{1}{2}$ is just like multiplying by 2.

Solve without the picture: $3 \div \frac{1}{2}$

Step 1: Write the whole number as fraction. $\rightarrow \frac{3}{1} \div \frac{1}{2}$

Step 2: Find the reciprocal of the divisor.

Reciprocal of $\frac{1}{2}$ is $\frac{2}{1}$.

Step 3: Multiply the dividend and the reciprocal of the divisor. $\rightarrow \frac{3}{1} \times \frac{2}{1} = \frac{6}{1}$

Step 4: Write in the lowest term. $\rightarrow 6$ is in its lowest term.

Answer: 6

Remember

While dividing with fractions always find the reciprocal only of the divisor.

Try This!

- a. How many $\frac{1}{2}$ s in 2 apples?
 $2 \div \frac{1}{2} = \underline{\hspace{2cm}}$
- b. How many $\frac{1}{3}$ s in 2 bananas?
 $2 \div \frac{1}{3} = \underline{\hspace{2cm}}$
- c. $3 \div \frac{1}{4} = ?$ d. $4 \div \frac{1}{3} = ?$ e. $2 \div \frac{1}{4} = ?$

Common Mistake!

$$3 \div \frac{1}{2} = ?$$

$$\frac{1}{2} \div 3 = \frac{1}{2} \div \frac{3}{1}$$

$$\frac{1}{2} \times \frac{1}{3} = \frac{1}{6} \quad \times$$

You cannot interchange the divisor and dividend while dividing. The quotient will change.

$$3 \div \frac{1}{2} = 6 \quad \checkmark$$

Dividing a Whole Number by a Fraction

Example 1: How many $\frac{3}{4}$ pieces in 3 pizzas?

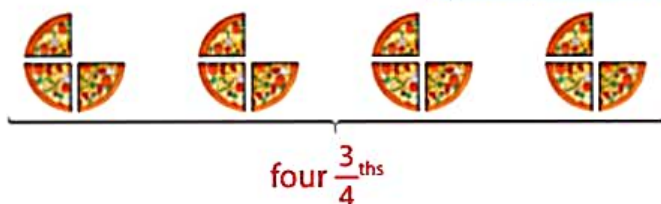
$$3 \div \frac{3}{4} = \boxed{?}$$

Here are 3 pizzas.



How many $\frac{3}{4}$ ths in 3 pizzas?

First cut each pizza into $\frac{1}{4}$ ths.



Then separate them into $\frac{3}{4}$ ths.

Answer: There are four $\frac{3}{4}$ th pieces in 3 pizzas.

Solve without pictures:

$$3 \div \frac{3}{4} = \boxed{?}$$

Step 1: Write the whole number as a fraction.

$$3 \rightarrow \frac{3}{1}$$

Answer: 4

Step 2: Find the reciprocal of the divisor.

$$\frac{3}{4} \rightarrow \frac{4}{3}$$

Step 3: Multiply the dividend and the reciprocal of the divisor.

$$\frac{3}{1} \times \frac{4}{3} = \frac{12}{3}$$

Step 4: Write in the lowest term.

$$\frac{12}{3} = 4$$

Example 2: $6 \div \frac{2}{3} = ?$

$$6 \div \frac{2}{3} = \frac{6}{1} \times \frac{3}{2} = \frac{18}{2} = 9$$

Answer: 9



$$2 \div \frac{1}{2} = ?$$

Work with a friend. Share your material.

Place two wholes. Then find how many $\frac{1}{2}$ s can be fitted on the wholes by placing enough halves on them.

There are halves in 2.

$$2 \div \frac{1}{2} = \underline{\hspace{2cm}}$$

Common Mistake!

$$4 \div \frac{1}{8} = ?$$

$$\frac{4}{1} \div \frac{1}{8} = \frac{4}{1} \times \frac{1}{8} = \frac{1}{32} \quad \times$$

$$\frac{4}{1} \div \frac{1}{8} = \frac{4}{1} \times \frac{8}{1} = 32 \quad \checkmark$$

Try This!



a. $2 \div \frac{2}{3} = ?$

How many $\frac{2}{3}$ ths in 2? Solve with the help of pictures first. Then solve with steps.



b. $5 \div \frac{2}{5} = ?$

c. $3 \div \frac{1}{4} = ?$

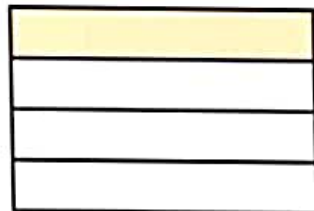
Dividing Fractions by a Whole Number



Example 1: Virat used a $\frac{1}{4}$ kg block of butter to cook three different dishes. Each dish needed the same amount of butter. How much butter did Virat use in each dish?

⇒ $\frac{1}{4} \div 3 = ?$

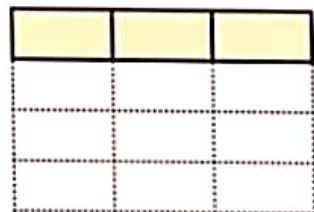
Let a rectangle represent 1 kg of butter.
Put it into 4 equal parts and mark out $\frac{1}{4}$ th.



Divide $\frac{1}{4}$ th into 3 equal parts.

Each part represents $\frac{1}{12}$ of the full block of butter.

$\frac{1}{4} \div 3 = \frac{1}{12}$



Solve without pictures: $\frac{1}{4} \div 3$

Step 1: Write the whole number as a fraction.

$\frac{1}{4} \div \frac{3}{1}$

Step 2: Find the reciprocal of the divisor: reciprocal of $\frac{3}{1}$ is $\frac{1}{3}$.

Dividend Divisor

Step 3: Multiply the dividend and the reciprocal of the divisor.

$\frac{1}{4} \times \frac{1}{3} = \frac{1}{12}$

Step 4: Simplify if needed. $\frac{1}{12}$ is in its lowest term.

Answer: Virat used $\frac{1}{12}$ kg butter in each dish.

Example 2: $\frac{2}{3} \div 4$

⇒ $\frac{2}{3} \div \frac{4}{1} = \frac{2}{3} \times \frac{1}{4} = \frac{2}{12} = \frac{1}{6}$

Answer: $\frac{1}{6}$

Exercise 6 I

1. Divide.

a. $\frac{6}{7} \div 3$

b. $\frac{4}{5} \div 12$

c. $\frac{6}{7} \div 5$

d. $\frac{1}{2} \div 7$

e. $\frac{1}{3} \div 12$

f. $\frac{3}{8} \div 8$

g. $\frac{2}{5} \div 2$

h. $\frac{3}{7} \div 21$

i. $\frac{4}{5} \div 10$

j. $\frac{1}{6} \div 3$

2. Solve.

a. $3 \div \frac{1}{5}$

b. $7 \div \frac{1}{3}$

c. $8 \div \frac{1}{6}$

d. $6 \div \frac{1}{2}$

e. $4 \div \frac{1}{3}$

f. $6 \div \frac{3}{4}$

g. $5 \div \frac{2}{5}$

h. $4 \div \frac{2}{3}$

i. $6 \div \frac{2}{3}$

j. $1 \div \frac{1}{10}$

3. Study the quotients you have got in the questions above and then fill in the blanks in the statements below using the words 'more than' or 'less than'.

a. When you divide a proper fraction by a whole number, the quotient is _____ the dividend.

b. When you divide a whole number by a proper fraction, the quotient is _____ the dividend.

Dividing Fractions by Fractions

Example 1: A chef has $\frac{8}{9}$ kg of cheese. If she keeps it in the fridge in equal packets of $\frac{1}{9}$ kg each, how many packets of cheese does she keep?

Think: How many $\frac{1}{9}$ ths in $\frac{8}{9}$? $\frac{8}{9} \div \frac{1}{9} = ?$

To divide a fraction by a fraction:

Step 1: Find the reciprocal of the divisor.

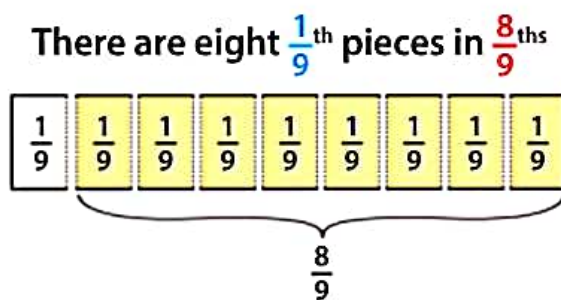
Reciprocal of $\frac{1}{9}$ is $\frac{9}{1}$.

Step 2: Multiply the dividend and reciprocal of the divisor.

$$\frac{8}{9} \times \frac{9}{1} = \frac{72}{9}$$

Step 3: Simplify.

$$\frac{72}{9} = \frac{8}{1} = 8$$



Answer: The chef keeps 8 packets of cheese in the fridge.

Example 2: $\frac{3}{7} \div \frac{2}{5} = ?$

$$\frac{3}{7} \div \frac{2}{5} = \frac{3}{7} \times \frac{5}{2} = \frac{15}{14}$$

Answer: $\frac{15}{14} = 1\frac{1}{14}$

Common Mistake!

$$\frac{3}{4} \div \frac{1}{3} = \frac{4}{3} \times \frac{3}{1} = \frac{12}{3} = 4 \quad \times$$

$$\frac{3}{4} \div \frac{1}{3} = \frac{3}{4} \times \frac{3}{1} = \frac{9}{4} = 2\frac{1}{4} \quad \checkmark$$

Exercise 6 J

1. Divide.

a. $\frac{1}{2} \div \frac{7}{12}$

b. $\frac{5}{9} \div \frac{2}{3}$

c. $\frac{1}{3} \div \frac{5}{9}$

d. $\frac{1}{4} \div \frac{3}{8}$

e. $\frac{3}{8} \div \frac{3}{5}$

f. $\frac{6}{7} \div \frac{2}{3}$

g. $\frac{1}{3} \div \frac{1}{3}$

h. $\frac{3}{5} \div \frac{1}{5}$

i. $\frac{2}{3} \div \frac{1}{4}$

j. $\frac{3}{5} \div \frac{1}{2}$

2. Solve using multiplication or division.

a. A painter uses $\frac{3}{5}$ of a can of paint to cover one wall of a house. How many cans of paint will he need to cover 7 such walls?

b. Three children are sharing $\frac{2}{3}$ of a pizza. What fraction of the pizza will each child get?

c. Kiran is giving away $\frac{1}{4}$ of his bookmark collection to 5 of his friends. If each friend gets the same number of bookmarks, what fraction of the collection has each child received?

d. A packet of soup makes 9 bowls of servings. How many $\frac{3}{4}$ bowls of servings are possible?

Project

Find a recipe for fruit salad that serves 4 people. Use cup and spoon measurements. Make the fruit salad. Rewrite the recipe for 8 people. Rewrite the recipe for 2 people.

FA





Chapter Check-Up



Colour the circle that describes best how you feel.

I got this!

I'm getting there!

I need help!

Vocabulary Review

- | | | | |
|---------------------|------------------------|-------------------|--------------------------|
| • Numerator | • Mixed number | • Unit fraction | • Like fraction |
| • Denominator | • Lowest term | • Whole | • Unlike fraction |
| • Region | • Equivalent fractions | • Whole number | • Reciprocal |
| • Improper fraction | • Simplify | • Proper fraction | • Multiplicative inverse |

1. Find two equivalent fractions for each of the following.

a. $\frac{4}{5}$

b. $\frac{7}{9}$



2. Reduce to the lowest terms.

a. $\frac{32}{48}$

b. $\frac{81}{90}$

3. Compare using $<$ or $>$.

a. $\frac{1}{7}$ $\frac{1}{3}$

b. $\frac{2}{9}$ $\frac{5}{9}$

c. $\frac{3}{5}$ $\frac{2}{7}$

d. $\frac{6}{9}$ $\frac{2}{5}$

4. Solve.

a. $\frac{3}{13} + \frac{7}{13}$

b. $\frac{2}{4} + \frac{5}{5}$

c. $\frac{8}{9} + \frac{2}{9} + \frac{3}{9}$

d. $4\frac{2}{7} + 1\frac{3}{5}$

e. $\frac{4}{5} - \frac{2}{3}$

f. $\frac{7}{17} - \frac{4}{17}$

g. $\frac{7}{9} - \frac{7}{12}$

h. $3\frac{2}{5} - 2\frac{1}{10}$

5. Solve.

a. $\frac{5}{7} \times 2$

b. $\frac{7}{3} \times \frac{4}{11}$

c. $0 \times \frac{7}{13}$

d. $\frac{3}{6} \times \frac{4}{12}$

e. $\frac{2}{7} \div \frac{3}{4}$

f. $\frac{4}{7} \div 5$

g. $\frac{5}{11} \div \frac{3}{7}$

h. $16 \div \frac{3}{4}$

6. a. Zeenat bought 5 kg of wax to make some decorative candles. If she needs $\frac{1}{10}$ kg of wax per candle, how many candles can she make?
- b. Divya spends $2\frac{1}{2}$ hours watching birds on Saturday, and $1\frac{3}{4}$ hours watching birds on Sunday. How many hours did Divya spend bird watching?
- c. Prateek studied for $6\frac{1}{3}$ hours in one week, and $4\frac{3}{4}$ hours the next week. How much longer did he study in the first week?

7. Tick (✓) the correct answer(s).

Name two equivalent fractions represented by the diagram.



a. $\frac{1}{2}$

b. $\frac{8}{4}$

c. $\frac{2}{4}$

d. $\frac{4}{2}$

Keeping in Touch

Find the LCM of 32 and 24 using prime factorisation.

Maths Lab Activity



Objective: To build an understanding of multiplication of fraction by fraction.

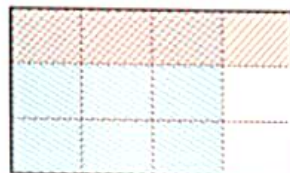
Materials Required: Blank sheet of paper and crayons.

Preparation: Students work independently or in pairs.

Steps: To solve $\frac{1}{3} \times \frac{3}{4}$. This is the same as finding $\frac{1}{3}$ of $\frac{3}{4}$.

1. Fold the blank sheet of paper vertically into four equal parts. Take care not to have any other creases or lines on the sheet.
2. Colour 3 of the four parts in blue to represent $\frac{3}{4}$.
3. Now fold the same sheet horizontally into 3 equal parts. Shade 1 part in red to represent $\frac{1}{3}$.
4. How many rectangles do you see on the sheet now? _____
How many are shaded twice – both with red and blue? _____
5. What fraction of the sheet is shaded twice? _____

This shows that $\frac{1}{3}$ of $\frac{3}{4} = \frac{3}{12}$ or $\frac{1}{3} \times \frac{3}{4} = \frac{3}{12} = \frac{1}{4}$ in lowest term.

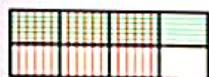


Try This!



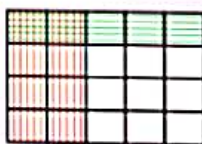
Multiply the fractions.

a.



$$\frac{1}{2} \times \frac{3}{4} = \square$$

b.



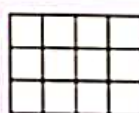
$$\frac{1}{4} \times \frac{2}{5} = \square$$

c.



$$\frac{1}{3} \times \frac{4}{6} = \square$$

d.



$$\frac{2}{3} \times \frac{3}{4} = \square$$

Project

Play musical fractions.

Fill identical glasses with $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, and $\frac{4}{4}$ (1 full glass) water.

Place the glasses in a row. Now use a small metal spoon and lightly tap the edge of each glass.

Do you get a different sound in each?

Now try tapping in the order of this pattern: $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, 1.

You have made music!

Try it with other patterns of your own.





Learn

Since 1 is the same as $\frac{1}{1}, \frac{2}{2}, \frac{3}{3}, \frac{4}{4}$, and so on, 5 is the same as $4\frac{2}{2}, 4\frac{3}{3}, 4\frac{4}{4}$, and so on.

To solve: $5 - \frac{3}{4}$



Think: $5 = 4\frac{4}{4}$
 $4\frac{4}{4} - \frac{3}{4} = 4\frac{1}{4}$

To solve: $6 - 1\frac{2}{7}$

Think: $6 = 5\frac{7}{7}$
 $5\frac{7}{7} - 1\frac{2}{7} = 4\frac{5}{7}$



Practice

a. $3 - \frac{1}{6}$

b. $4 - \frac{2}{3}$

c. $2 - \frac{3}{4}$

d. $5 - \frac{2}{5}$

e. $6 - \frac{3}{8}$

Use

a. Write in descending order:

$\frac{5}{12}, \frac{5}{11}, \frac{5}{17}, \frac{5}{13}$ _____

b. $\frac{8}{64}$ in its lowest term is _____

c. $\frac{15}{30}$ $\frac{4}{8}$ (Use <, >, or =)

d. $\frac{16}{28} = \frac{\text{ } \text{ }}{7}$

e. $3\frac{1}{2} + 3\frac{1}{2} = \text{_____}$

f. How many halves in 5? _____

g. Reciprocal of 1 is _____.

h. $\frac{6}{18}$ $\frac{6}{8}$ (Use >, <, or =)

i. $6 - \frac{3}{5} = \text{_____}$

j. If $\frac{1}{4}$ th of a number is 100, what is the number? _____

k. $\frac{2}{3}$ of 21 = _____

l. $\frac{2}{5} \times \frac{8}{9} \times 0 = \text{_____}$

m. $6\frac{2}{7} - 5\frac{2}{7} = \text{_____}$

n. $\frac{1}{4}$ of _____ = ₹2

o. $\frac{4}{5}$ $\frac{16}{25}$ (Use >, <, or =)

p. $\frac{7}{\text{ } \text{ }} = \frac{42}{66}$

q. $7 - \frac{3}{4} = \text{_____}$

r. $\frac{3}{17} + \frac{14}{17} = \text{_____}$

s. $\frac{4}{3} \times \frac{3}{4} \times 1 = \text{_____}$

t. $8 - 1\frac{1}{2} = \text{_____}$



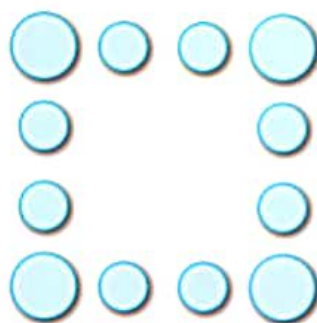
Critical Thinking Skills



C-1.4, C-4.1

Visual Thinking

12 counters are placed in a square with 4 counters on each side. How will you rearrange the same 12 counters into another square such that there are 5 counters on each side?



Number Sense

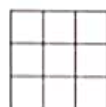
How many squares are there on an 8×8 chess board? Complete the pattern to find out.



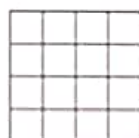
1×1



2×2



3×3



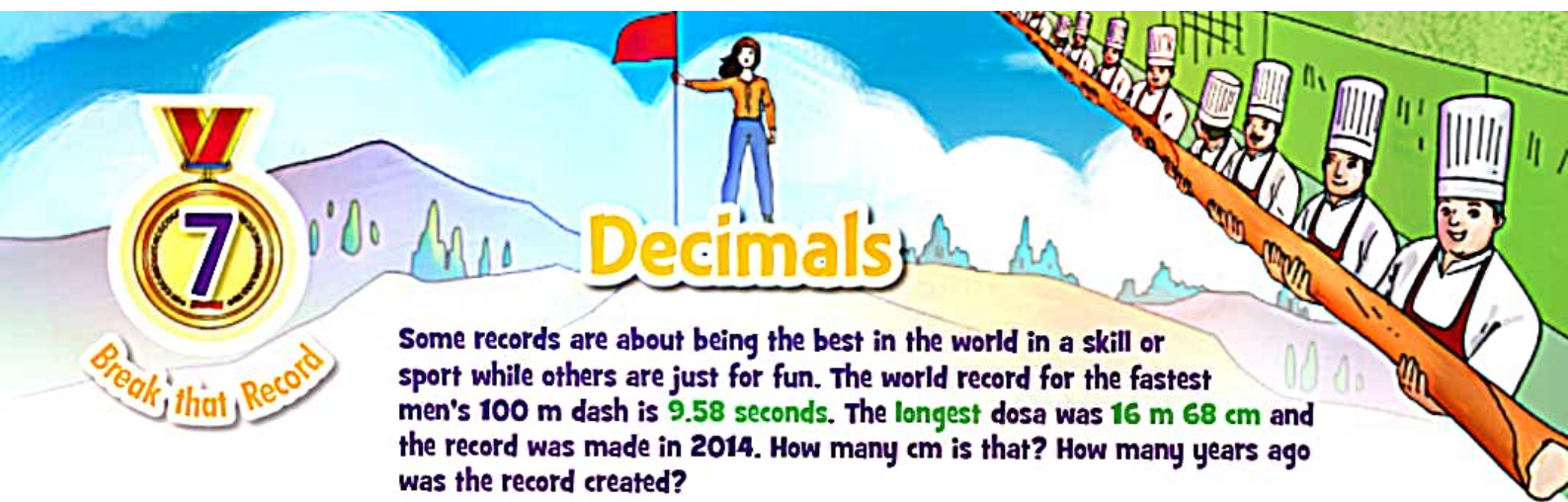
4×4

Board	1×1	2×2	3×3	4×4	5×5	6×6	7×7	8×8
Squares	1	4	9	16				

Logical Thinking

Five friends Amber, Anita, Ayesha, Annika, and Antara have taken a selfie. Amber is between Anita and Ayesha. Anita has no one to her left. Annika is right in the front holding out the phone camera. Can you name who is who in the picture?





Some records are about being the best in the world in a skill or sport while others are just for fun. The world record for the fastest men's 100 m dash is **9.58 seconds**. The **longest** dosa was **16 m 68 cm** and the record was made in **2014**. How many cm is that? How many years ago was the record created?



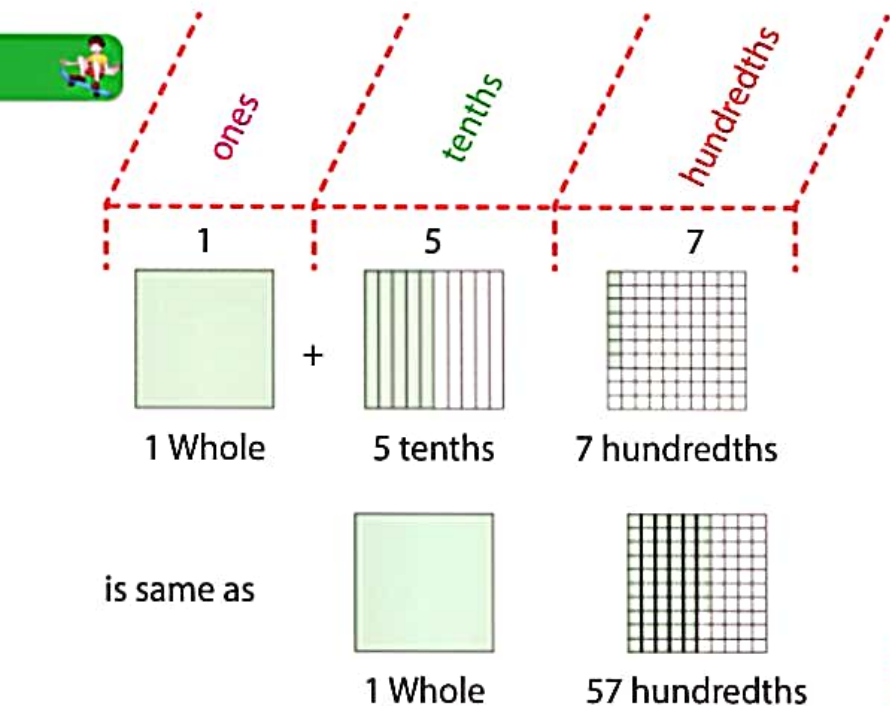
LOOKING BACK

When a digit moves to the right of the ones place it gets ten times smaller.

When 'one' is further divided into 10 equal parts, each part is called a tenth.

The decimal point separates the ones place and the tenths place.

When one tenth is further divided into 10 equal parts, each part is called a hundredth.



$$1 + \frac{5}{10} + \frac{7}{100} = 1\frac{57}{100}$$

$$1 + 0.5 + 0.07 = 1.57$$

1.57 is read as one and fifty-seven hundredths.

Word form	Standard form
One tenth	$\frac{1}{10}$ 0.1
Three hundredths	$\frac{3}{100}$ 0.03
One and twenty-seven hundredths	$1\frac{27}{100}$ 1.27

The darkened lines in the hundredths square show you the tenths within them.



Exercise 7 A

1. Match.

a.



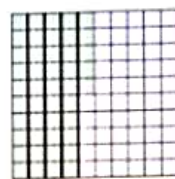
1.02

1.2

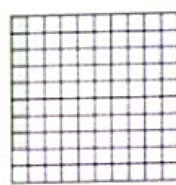
1.38

1.45

c.



d.



2. For the number 186.45, write the digit in the:

a. tens place

b. tenths place

c. hundreds place

d. hundredths place

e. ones place

3. Build a decimal with:

a. 7 in the tenths place and 4 in the ones place.

b. 9 in the tenths place, 6 in the hundredths place, 8 in the ones place, 5 in the tens place.

c. 5 in the ones place, 7 in the tenths place, 8 in the hundredths place.

4. Express as a decimal.

a. $\frac{13}{10}$

b. $\frac{27}{100}$

c. $\frac{142}{10}$

d. $\frac{843}{100}$

e. $\frac{5}{100}$

5. Express as a fraction.

a. 0.11

b. 0.8

c. 1.1

d. 3.07

e. 5.84

6. Given the next three numbers.

a. 1.5, 1.6, 1.7, _____

b. 5.92, 5.93, 5.94, _____

c. 11.8, 11.9, 12.0, _____

d. 7.97, 7.98, 7.99, _____

e. 6.02, 6.03, 6.04, _____

f. 4.23, 4.24, 4.25, _____

Project

FA

Go through a newspaper and find different places where decimals are used. Copy these into your notebook and write them out in words.



Journal

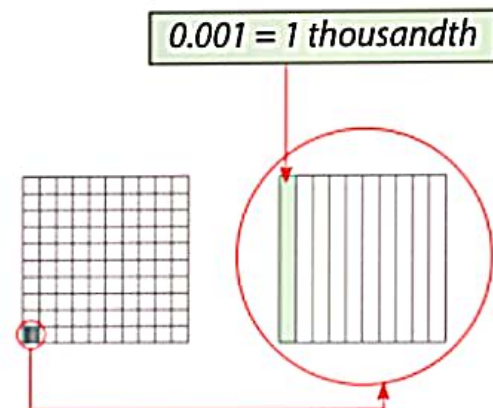
FA



Explain in your own words the difference it makes when '0' is placed before a decimal point or after it—for example 0.5 and .05.

THOUSANDTHS

- 1 hundredth is further divided into 10 equal parts. Each part is called 1 **thousandth**.
- The fractional form of one thousandth is $\frac{1}{1000}$.
The corner box has been shown bigger here. All other boxes, if enlarged, would look like this.
- The decimal form of one thousandth is 0.001.
1 hundredth = 10 thousandths



Manav is attempting to beat the school record for the 1000-step walking backward race.

- When he has walked 8 steps backward, we can say $\frac{8}{1000}$ or 0.008 of the race has been covered. We read this as **eight thousandths** or zero point zero zero eight.
- When he has walked 75 steps backward, we can say $\frac{75}{1000}$ or 0.075 of the race has been covered. We read this as **seventy-five thousandths** or zero point zero seven five.
- When he has walked 598 steps backward, we can say $\frac{598}{1000}$ or 0.598 race has been covered. We read this as **five hundred ninety-eight thousandths** or zero point five nine eight.



Try This!

- Give as a decimal: $\frac{5}{1000}$, $\frac{123}{1000}$
- Give as a fraction: 0.076, 1.529

Eight thousandths
Seventy-five thousandths
Five hundred ninety-eight thousandths

Ones	.	tenths	hundredths	thousandths
0	.	0	0	8
0	.	0	7	5
0	.	5	9	8

Exercise 7 B

1. Write in fractions and decimals.

- four thousandths
- sixty-eight thousandths
- three hundred forty-eight thousandths

2. Rewrite in decimal form.

- $\frac{950}{1000}$
- $\frac{30}{1000}$
- $\frac{6}{1000}$
- $1\frac{450}{1000}$

3. Rewrite as fractions.

- 4.008
- 3.980
- 0.562
- 0.015
- 0.005
- 3.065



Mathspeak

FA

Do 0.7 and 0.70 represent the same value? Justify your answer. You may use a diagram.

CONNECTING DECIMALS AND MEASUREMENT

The Indian record for women's long jump is held by Anju Bobby George at 6.83 m. Let us understand that figure better.

Measurement of Length

You know that $1 \text{ m} = 100 \text{ cm}$.

When we say 6 m 83 cm, we mean 6 m and $\frac{83}{100}$ of one more metre. In decimals we can express this as 6.83 m.

When we say 5 m 2 cm, we mean 5 m and $\frac{2}{100}$ of one more metre. In decimals we express this as 5.02 m.

$1 \text{ km} = 1000 \text{ m}$

When we say 2 km and 350 m, we mean 2 km and $\frac{350}{1000}$ of one more kilometre. In decimals we can express this as 2.350 km.

When we say 8 km and 75 m, we mean 8 km and $\frac{75}{1000}$ of one more kilometre. In decimals we express it as 8.075 km.

Measurement of Mass

$1 \text{ kg} = 1000 \text{ g}$

4 kg 980 g means 4 kg and $\frac{980}{1000}$ of one more kilogram. In decimals this is expressed as 4.980 kg.

Measurement of Capacity

$1 \text{ l} = 1000 \text{ ml}$

2 l 400 ml means 2 l and $\frac{400}{1000}$ of one more litre. In decimals this is expressed as 2.400 l.



Common Mistake!

$$6 \text{ m } 9 \text{ cm} = 6.9 \text{ m} \quad \times$$

$$6 \text{ m } 9 \text{ cm} = 6.09 \text{ m} \quad \checkmark$$

$$1 \text{ km } 89 \text{ m} = 1.089 \text{ m} \quad \times$$

$$1 \text{ km } 89 \text{ m} = 1.089 \text{ km} \quad \checkmark$$

$$3 \text{ m } 15 \text{ cm} = 3.15 \text{ cm} \quad \times$$

$$3 \text{ m } 15 \text{ cm} = 3.15 \text{ m} \quad \checkmark$$

$$9 \text{ km } 655 \text{ m} = 9.655 \text{ m} \quad \times$$

$$9 \text{ km } 655 \text{ m} = 9.655 \text{ km} \quad \checkmark$$

$$5 \text{ kg } 345 \text{ g} = 5.345 \text{ g} \quad \times$$

$$5 \text{ kg } 345 \text{ g} = 5.345 \text{ kg} \quad \checkmark$$

$$3 \text{ l } 250 \text{ ml} = 3.250 \text{ ml} \quad \times$$

$$3 \text{ l } 250 \text{ ml} = 3.250 \text{ l} \quad \checkmark$$

Exercise 7 C

1. Express these measurements as decimals.

a. 3 m 45 cm

b. 4 m 7 cm

c. 1 m 12 cm

d. 2 km 340 m

e. 1 km 45 m

f. 5 km 90 m

2. Express these measurements as decimals.

a. 6 kg 300 g

b. 9 kg 125 g

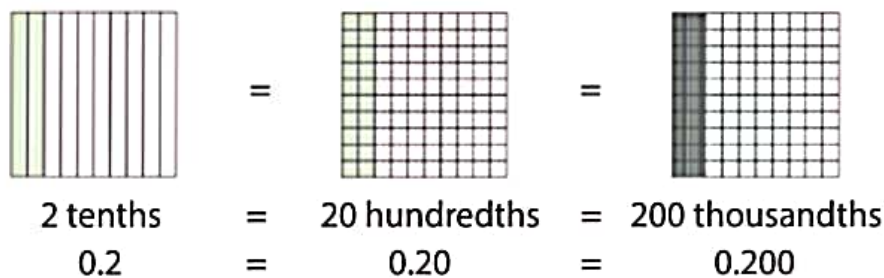
c. 3 kg 550 g

d. 4 l 700 ml

e. 3 l 250 ml

f. 2 l 985 ml

EQUIVALENT DECIMALS



Each of the 100 boxes in the last grid are further divided into 10 boxes.

All three decimal numbers shown above have the same value and they are called **equivalent decimals**.

This can also be checked by comparing the decimals with equivalent fractions:

$$\begin{array}{rcccl} \frac{2}{10} & = & \frac{20}{100} & = & \frac{200}{1000} \\ \downarrow & & \downarrow & & \downarrow \\ 0.2 & = & 0.20 & = & 0.200 \\ \downarrow & & \downarrow & & \downarrow \\ 0.2 & = & 0.2 & = & 0.2 \end{array}$$

Try This!

- $0.6 = 0.60 = \underline{\hspace{2cm}}$
- $1.7 = 1.70 = \underline{\hspace{2cm}}$
- $2.40 = \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$

Writing or removing zeros at the end of a decimal number does not change its value.

LIKE AND UNLIKE DECIMALS

Decimals with the same number of decimal places are called **like decimals**.

- 0.3 4.5 8.7 (one decimal place each)
- 12.07 1.04 236.11 (two decimal places each)
- 1.093 0.847 11.970 (three decimal places each)

Decimals having different number of decimal places are called **unlike decimals**.

- 0.7 2.81 b. 18.24 13.8 c. 0.724 8.74

Unlike decimals can also be equivalent decimals.

0.7, 0.70, 0.700 are *unlike but equivalent decimals*.

Converting Unlike Decimals into Like Decimals

Unlike decimals can be converted into like decimals by finding their equivalent decimals.

Unlike decimals	1.7	8.36	9.755
	↓	↓	↓
Like decimals	1.700	8.360	9.755

To convert unlike decimals into like decimals find their equivalent decimals up to the same number of places.

Challenge!

Place the decimal points in these numbers so that they make sense.

- I weigh 2345 kg.
- I am 115 years old.
- My height is 1315 cm.

Try This!

Change to like decimals.

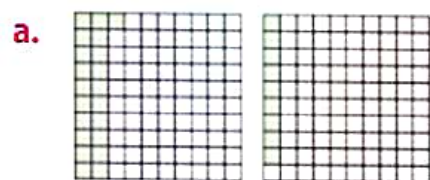
- 9.5, 9.15
- 13.6, 1.72, 0.845
- 5.73, 0.919
- 1.03, 1.8, 3

COMPARING AND ORDERING DECIMALS

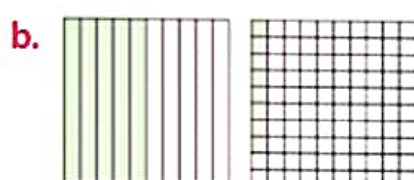
Comparing Decimals

Using mathematical models

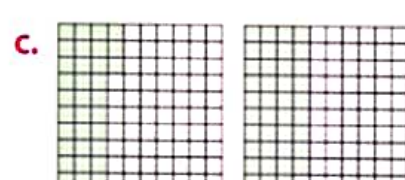
Example 1: Compare the following.



$0.21 > 0.09$



$0.5 > 0.08$



$0.33 < 0.39$

Using a place value chart

Example 2: Compare 1.35 and 1.5.

Step 1: Start by comparing from the left.

Step 2: The digit in the ones place is the same.

Step 3: 3 tenths < 5 tenths

So, $1.35 < 1.5$.

Answer: $1.35 < 1.5$

Ones	.	tenths	hundredths
1	.	3	5
1	.	5	

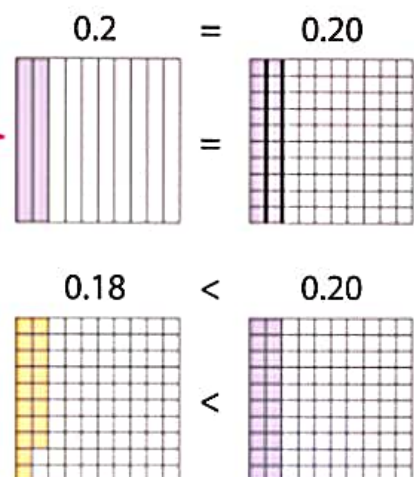
Using equal size parts

Example 3: Compare 0.18 and 0.2

Make both into like decimals. 0.2 or 2 tenths is the same as 0.20 or 20 hundredths.

0.18 0.2
 0.18 0.20

Convert into like decimals



Now compare like you do for whole numbers.

$018 < 020$

Answer: $0.18 < 0.2$

Journal

FA



Equivalent decimals also have to be like decimals. Do you agree or disagree? Explain why in your words.

Common Mistake!

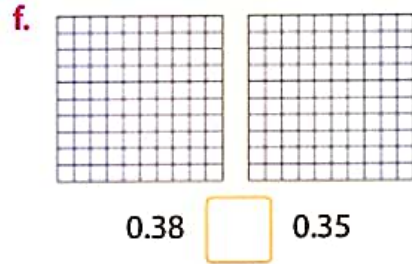
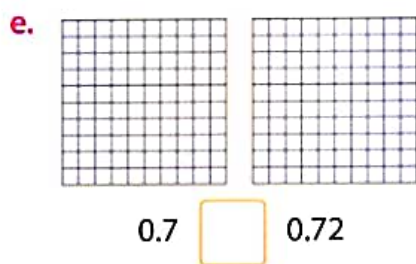
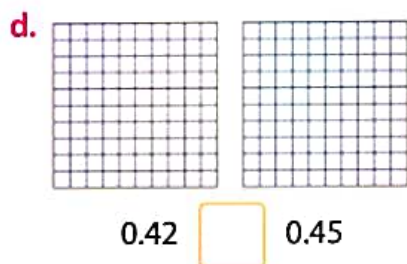
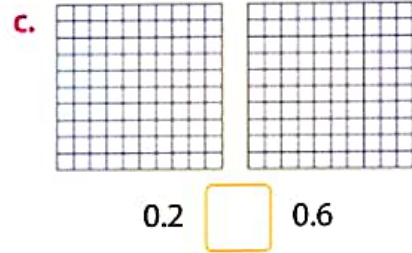
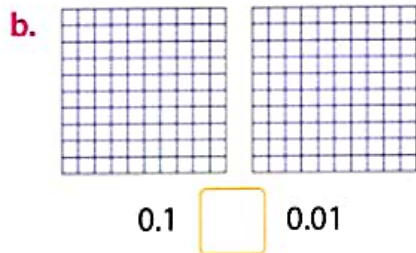
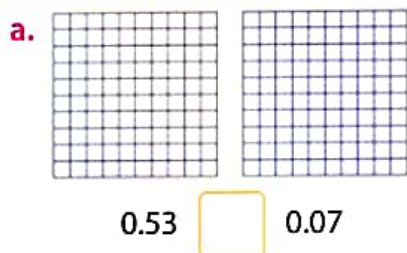
$3.486 > 3.52$ ✗

Do not compare decimals by counting the number of digits!

$3.486 < 3.52$ ✓

Exercise 7 D

1. Colour to compare.



2. Compare using $<$, $>$, or $=$.

a. 9.099 9.99

b. 70.08 70.7

c. 96.550 96.55

d. 0.5 0.15

e. 0.3 2.895

f. 0.76 0.8

Ordering Decimals

Example 1: Rewrite these weights in descending order.

43.17 kg 43.7 kg 42.09 kg 41.8 kg

► To put them in descending order, convert into like decimals of two places each.

43.17	43.7	42.09	41.8
↓	↓	↓	↓
43.17	43.70	42.09	41.80

Now rearrange as you would do for whole numbers.

(4370 4317 4209 4180)

Answer: 43.7 kg, 43.17 kg, 42.09 kg, 41.8 kg

Example 2: Rewrite in ascending order.

0.88 0.8 0.808

► **Step 1:** Convert into like decimals → 0.880 0.800 0.808

Step 2: Write in ascending order → $0.800 < 0.808 < 0.880$

Answer: 0.8, 0.808, 0.88

Mathspeak

FA

Explain why you do not have to compare the hundredths place while comparing 0.62 and 0.57.

Journal

FA

0.2 can be expressed using a hundredths model. Can 0.25 be expressed only using a tenths model? Why or why not? Use a model to explain.

Exercise 7 E

1. Rewrite in descending order.

a. 8.06 8.059 8.013 8.3

c. 19.4 1.945 19.46 1.95

e. 8.63 80.002 8.6 80.2

b. 3.48 4.2 3.8 4.02

d. 6.8 8.66 8.06 6.08

f. 3.9 3.09 3.91 3.019

2. Rewrite in ascending order.

a. 0.04 1.04 0.14 1.14

b. 20 19.09 20.01 19.9

c. 14.19 19.14 14.9 19.4

d. 6.23 6.32 6.4 6

e. 9.09 0.99 1.1 6

f. 7.162 7.23 7.02 7.2

Challenge!

Use these digits with a decimal point.

7

8

2

- Build the biggest number less than one.
- Build the smallest number less than one.
- The biggest number between 7 and 8.

3. Application in real life.

- In a quiz competition Team A, secured 84.5 points and Team B secured 85 points. Which team won the quiz?
- Shanay can swim the 100 m race in 68.1 seconds. Swapneel can swim the same distance in 68.02 seconds. Who is faster?
- Smriti, Saroj, and Shamin were comparing their test marks. They got 15.05, 15.25, and 15.5 marks, respectively. Who did the best?
- The table below gives the names of the top runners of a 100 metres race. Who came first? Who came last? List the names in order, beginning with the person who came first.

Names	100 m race timing
Rohan	20.52 seconds
Ananth	20.5 seconds
Suraj	20.25 seconds
Prashant	20.05 seconds

Remember, the person who has the lowest timing is the winner!



Data Connect

Open the **Data Bank** on page 243 and study the data on 'Share of Water of Different Oceans on Earth'. Then answer the questions below.

- Rewrite the information given as decimals.
- Arrange in decreasing order from the largest to the smallest water body.

Journal

In what way is ordering decimals same as ordering whole numbers? In what way is it different?

FA



ADDITION OF DECIMALS

Adding Tenths



$$0.3 + 0.5 = 0.8$$



$$0.6 + 0.4 = 1.0$$



$$0.8 + 0.5 = 1.3$$

Adding decimal numbers is just like adding whole numbers but remember to place the decimal points one below the other and regroup if required.

Ones	.	tenths
0	.	3
0	.	5
0	.	8

Ones	.	tenths
¹ 0	.	6
0	.	4
1	.	0

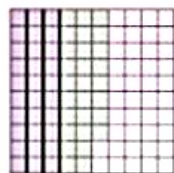
Ones	.	tenths
¹ 0	.	8
0	.	5
1	.	3

The addition properties of whole numbers apply to addition of decimals too.

$$3.2 + 0 = 3.2$$

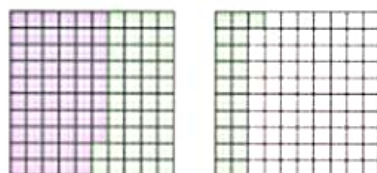
$$4.5 + 3.7 = 3.7 + 4.5$$

Adding Hundredths



$$0.3 + 0.28 = 0.58$$

O	.	t	h
0	.	3	0
0	.	2	8
0	.	5	8



$$0.58 + 0.63 = 1.21$$

O	.	t	h
¹ 0	.	5	8
0	.	6	3
1	.	2	1

Adding Unlike Decimals

Example 1: If the world's heaviest onion weighing 8.15 kg and the world's heaviest tomato at 3.9 kg are both put into one bag, how heavy will the bag be?



Step 1: List decimal points one below the other.

$$\begin{array}{r} 8.15 \\ + 3.9 \end{array}$$

Step 2: Make both into like decimals.

$$\begin{array}{r} 8.15 \\ + 3.90 \end{array}$$

Step 3: Add as usual.

$$\begin{array}{r} \overset{1}{8}.15 \\ + 3.90 \\ \hline 12.05 \end{array}$$

Answer: The bag would weigh 12.05 kg.

Example 2: $7 + 0.95$

$$\begin{array}{r} 7.00 \\ + 0.95 \\ \hline 7.95 \end{array}$$

Common Mistake!

$$\begin{array}{r} 5.4 \\ + 6.7 \\ \hline 121 \end{array} \quad \times$$

$$\begin{array}{r} 5.4 \\ + 6.7 \\ \hline 12.1 \end{array} \quad \checkmark$$

$$\begin{array}{r} 14 \\ + 0.59 \\ \hline \end{array} \quad \times$$

$$\begin{array}{r} 14.00 \\ + 0.59 \\ \hline \end{array} \quad \checkmark$$

Answer: 7.95



Mathspeak

What would happen if you did not line up the decimal points while adding?

FA

Exercise 7 F

1. Action Exercise

Colour to show how much juice in all.

a.  +  = 

$0.3 \ell + 0.7 \ell = 1 \ell$

b.  +  = 

$0.4 \ell + 1.6 \ell =$

c.  +  = 

$1.2 \ell + 1.8 \ell =$

2. Add.

a. $23.11 + 3.8$ b. $13.01 + 1.1 + 1.98$

c. $9 + 1.8$ d. $562.9 + 49.3$

e. $0.1 + 1 + 11.40$ f. $162.1 + 16.21$

g. $9.85 + 0.61$ h. $17.01 + 18.1$

3. Compare using $>$, $<$, or $=$.

a. $2.5 + 3.09$ 5.95

b. $3 + 0.05$ 0.35

c. $10 + 0.01$ 10.01

d. $21.93 + 1.16$ $1.8 + 20.16$

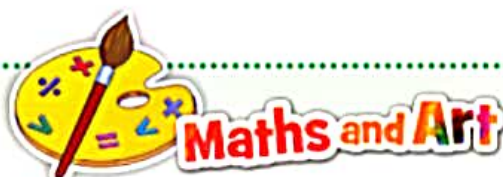
Play a Game

0.1 0.5 0.9 0.35 0.55 0.2

0.6 0.45 0.65 0.4 0.8 0.50

Play with a friend.

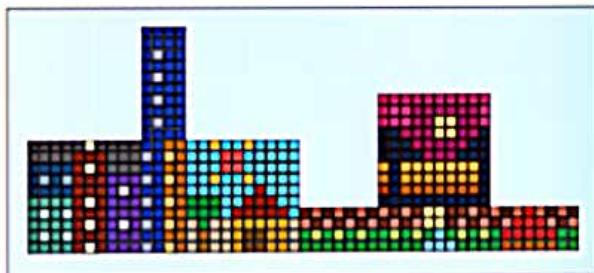
Make separate decimal cards using the numbers shown. Mix them up. Place them face down. Take turns to pick any two at a time. If they add up to 1 keep them. If they do not, put them back. Continue till you have found all the pairs. The person who has more cards wins the game.



Make a decimal mosaic of a cityscape.

Mosaic art was originally done using different coloured stones to create images or patterns on walls. You can create a mosaic design on square-lined paper to create an outline of a city.

- Cut out different rectangular shapes of 100 squares. You can use arrays of 10×10 , 5×20 or 4×25 for your rectangles.
- Colour your array to look like a building.
- Stick your completed building on card paper.
- List the colours you have used for each building as a decimal in your notebooks.
- The entire class can paste their buildings along the edge of a wall or a bulletin board on a blue background to create your decimal cityscape.



SUBTRACTION OF DECIMALS

Subtracting Tenths



$$0.9 - 0.4 = 0.5$$



$$1.3 - 0.6 = 0.7$$

Subtracting decimals is just like subtracting whole numbers. Line up the decimal points one below the other and regroup if necessary. Remember to place the greater number on top.

a.

Ones	.	tenths
0	.	9
- 0	.	4
0	.	5

b.

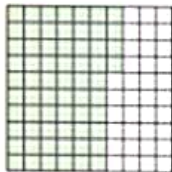
Ones	.	tenths
1	.	3
- 0	.	6
	.	

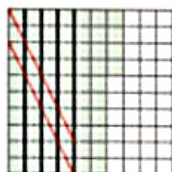
→

Ones	.	tenths
⁰ 1	.	¹³ 3
- 0	.	6
0	.	7

Subtracting Hundredths

a.



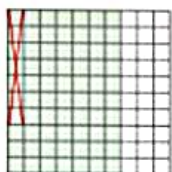
$$0.64 - 0.4 = ?$$


$$0.64 - 0.40 = 0.24$$

O	.	t	h
0	.	6	4
- 0	.	4	0
0	.	2	4

b.



$$0.7 - 0.07 = ?$$


$$0.70 - 0.07 = 0.63$$

O	.	t	h
0	.	⁶ 7	¹⁰ 0
+ 0	.	0	7
0	.	6	3

Example 3: $4.1 - 3.97$

Step 1: List the decimal points one below the other.

$$\begin{array}{r} 4.1 \\ - 3.97 \end{array}$$

Step 2: Make both into like decimals.

$$\begin{array}{r} 4.10 \\ - 3.97 \end{array}$$

Step 3: Subtract as usual.

$$\begin{array}{r} ^{10} \\ 3 ^0 ^{10} \\ 4.10 \\ - 3.97 \\ \hline 0.13 \end{array}$$

Answer: 0.13

Try This!

Subtract.

a. $0.32 - 0.18$

b. $0.5 - 0.14$

c. $3.3 - 2.4$

d. $1.46 - 0.9$

Example 4: $6 - 4.5 = ?$

$$\begin{array}{r} 6 \\ - 4.5 \\ \hline \end{array} \quad \begin{array}{r} 6.0 \\ - 4.5 \\ \hline \end{array} \quad \begin{array}{r} \overset{5}{\cancel{6}} \overset{10}{0} \\ - 4.5 \\ \hline 1.5 \end{array}$$

Common Mistake!

$\begin{array}{r} 18.2 \\ - 7.25 \\ \hline 11.05 \end{array}$	$\times$	$\begin{array}{r} 18.20 \\ - 7.25 \\ \hline 10.95 \end{array}$	$\checkmark$
---	----------	--	--------------

Mental Maths

PA

$5 - 1.9 = ?$

$$\begin{array}{r} 2 - 0.1 \\ 5 - 2 = 3 \\ 3 + 0.1 = 3.1 \\ 5 - 1.9 = 3.1 \end{array}$$

Because 2 has been subtracted instead of 1.9, give back 0.1 to 3.

$8 - 3.9 = ?$

$$\begin{array}{r} 4 - 0.1 \\ 8 - 4 = 4 \\ 4 + 0.1 = 4.1 \\ 8 - 3.9 = 4.1 \end{array}$$

Solve:

- $6 - 1.9$
- $8 - 2.9$
- $5 - 3.9$
- $9 - 4.9$
- $12 - 1.8$

Exercise 7 G

1. Subtract.

a. $9.32 - 4.16$

b. $18.43 - 9.26$

c. $7 - 4.32$

d. $9.4 - 3.13$

e. $11.01 - 10.11$

f. $24.1 - 18.39$

g. $0.62 - 0.23$

h. $8 - 6.04$

2. Subtract. Add to check your subtraction.

a. $14.1 - 9.25$

b. $4.37 - 0.65$

c. $12.35 - 4$

d. $15.1 - 12.05$

3. What should be added to 2.1 to get 10?

4. What should be taken away from 15 to get 3.96?

5. Play a game.



- Draw a large circle like this in your notebook.
- Drop two paper clips or *rajma* seeds on the circle.
- Subtract the smaller number from the greater one.
- Ask a friend to do the same.
- Whose difference is smaller?
- Record all your work.



Mathspeak

FA

Why is it important to show a whole number with decimal places while subtracting from it?

6. Application in real life. Use addition or subtraction to solve.

- Akshit's father drove 158.3 km on Monday and 79.8 km on Tuesday. How many kilometres less did he drive on Tuesday?
- A bean plant measured 8.5 cm on Friday. It grew another 0.75 cm on Saturday. What was its height on Saturday?
- The thickness of one book is 3.8 cm. The thickness of another book is 2.03 cm. What is the thickness of the two books together when placed one on top of the other?

Data Connect

Open the **Data Bank** on page 242 and study the data on '**Rapid Transport-Metro Lines in India**'. Then answer the questions below.

1. Rewrite the table showing one more column with the total length once the under-construction work is completed.
2. Name the cities in descending order according to the length of the completed lines.
3. Give the difference in the lengths of the longest and the shortest completed lines.
4. How much more has been completed than under construction in Delhi?
5. How much less has been completed than under construction in Mumbai?

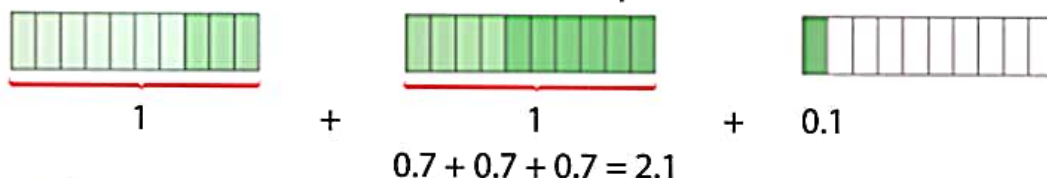
MULTIPLICATION OF DECIMALS

These models will help you understand how to multiply decimal numbers.

Example 1: $3 \times 0.7 = ?$

► We can solve this using repeated addition as $0.7 + 0.7 + 0.7$.

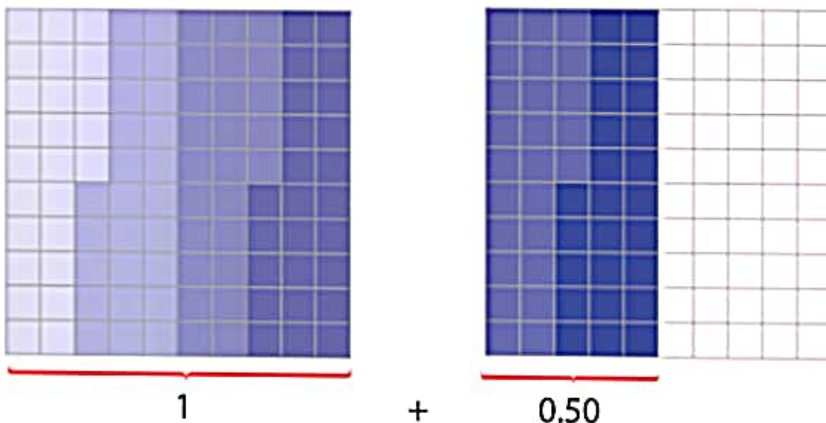
Each of the three colours on the model represent 0.7.



Answer: 2.1

Example 2: $6 \times 0.25 = ?$

► 6×0.25 is the same as 6 groups of 0.25.



Answer: 1.50

The number of decimal places in the **product** equals the sum of the number of decimal places in the **factors**.



The properties of multiplication of whole numbers apply to the multiplication of decimals also.

- $3.4 \times 0 = 0$
- $5.3 \times 1 = 5.3$
- $7 \times 1.3 = 1.3 \times 7$

Multiplying Without Models

Example 1: The school high jump record was 1.23 m. If that same jump was made on the moon it would be 6 times higher. What would the school record be on the moon?

➡ $1.23 \times 6 = ?$

Step 1: Multiply as in whole numbers ignoring the decimal.

Step 2: Count the total number of decimal places in both numbers.

Step 3: Starting from the right, count the same number of decimal places in the product and place the decimal point there.

$$\begin{array}{r} 1.23 \\ \times \quad 6 \\ \hline 7.38 \end{array}$$

$$\begin{array}{r} 1.23 \quad (2 \text{ decimal places}) \\ \times \quad 6 \quad (0 \text{ decimal places}) \\ \hline 7.38 \quad (2 + 0 = 2 \text{ decimal places}) \end{array}$$

Answer: The school high jump record on the moon would be 7.38 m.

Zeros in the product

Example 1: $0.02 \times 3 = ?$

➡ **Step 1:** Multiply as you would with whole numbers.

$$\begin{array}{r} 0.02 \\ \times 3 \\ \hline 6 \end{array}$$

Answer: 0.06

Step 2: Write the decimal point.

$$\begin{array}{r} 0.02 \\ \times 3 \\ \hline 0.06 \end{array}$$

This zero shows that the product is less than 1. Write this zero to show the correct number of decimal places.

Example 2: $0.05 \times 6 = ?$

$$\begin{array}{r} 0.05 \\ \times 6 \\ \hline 30 \end{array} \longrightarrow \begin{array}{r} 0.05 \\ \times 6 \\ \hline 0.30 \end{array} \text{ or } 0.3 \text{ as zero at the end of a decimal has no value.}$$

Answer: 0.30

Try This!

Multiply.

- a. 6.45×3 b. 0.1×9
c. 0.08×5 d. 2.02×5

Common Mistake!

$$\begin{array}{r} 0.02 \\ \times 4 \\ \hline 0.80 \end{array} \times \quad \begin{array}{r} 0.02 \\ \times 4 \\ \hline 0.08 \end{array} \checkmark$$



30 hundredths is the same as 3 tenths.



Exercise 7 H

1. Action Exercise

Colour to find the product.

a. 4×0.6

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

b. 3×0.75

2. Multiply only the first in the series. Then use the rules of decimals to fill in the rest.

a. 127×8 12.7×8 1.27×8

--

--

--

b. 312×5 31.2×5 3.12×5

--

--

--

3. Multiply.

a. 5.3×9

b. 8.4×11

c. 24×0.9

d. 1.9×68

e. 2×3.45

f. 7×8.39

g. 0.04×5

h. 0.03×2

4. Solve.

a. A day on planet Mercury is equal to about 58.6 Earth days. How many Earth days are there in 7 days on Mercury?

b. A day on Jupiter is equal to about 9.8 Earth hours. How many Earth hours are there in 15 days on Jupiter?

c. A day on Earth is actually 23.93 hours long. How many hours are there in a month of 30 days?

Multiplication by 10, 100, 1000

Look at these examples.

$$10 \times 5.623 = 56.23$$

$$100 \times 5.623 = 562.3$$

$$1000 \times 5.623 = 5623$$

What do you observe?

Multiplying by 10 moves the decimal point **one** place to the right:

$$10 \times 0.389 = 3.89$$

$$10 \times 3.89 = 38.9$$

$$10 \times 38.9 = 389$$

$$0.389$$

$$3.89$$

$$38.9$$

389. is written as 389 because we do not show the decimal point at the end of a number.

Look for a pattern. Watch the decimal points.

Multiplying by **100** moves the decimal point **two** places to the right:

$$\begin{array}{ll}
 100 \times 0.795 = 79.5 & 0.795 \\
 100 \times 7.95 = 795 & 7.95 \\
 100 \times 79.5 = 7950 & 79.50 \leftarrow \text{extra zero}
 \end{array}$$

Multiplying by **1000** moves the decimal point **three** places to the right:

$$\begin{array}{ll}
 1000 \times 1.987 = 1987 & 1.987 \\
 1000 \times 19.87 = 19870 & 19.870 \leftarrow \text{extra zero} \\
 1000 \times 1.9 = 1900 & 1.900 \leftarrow \text{two extra zeros}
 \end{array}$$

Mental Maths

To find 5.2×3

Think

$$\begin{array}{l}
 5 \times 3 = 15 \\
 0.2 \times 3 = 0.6
 \end{array}$$

$$\begin{array}{l}
 15 + 0.6 = 15.6 \\
 5.2 \times 3 = 15.6
 \end{array}$$

Solve:

a. $4.3 \times 2 =$	b. $9.2 \times 2 =$	c. $5.2 \times 4 =$
d. $3.3 \times 3 =$	e. $4.2 \times 3 =$	f. $8.1 \times 3 =$

PA

Exercise 7 I

1. Multiply.

a. 28.25×10	b. 0.81×10	c. 1.23×10	d. 1.1×100
e. 16.73×100	f. 3.19×100	g. 0.14×1000	h. 0.8×1000

2. Fill in the missing numbers.

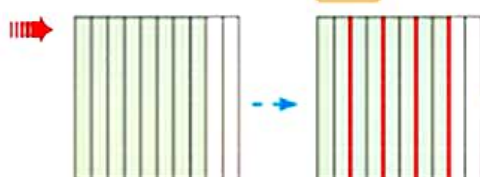
a. $32.1 \times \underline{\quad} = 321$	b. $15.26 \times \underline{\quad} = 152.6$	c. $0.03 \times \underline{\quad} = 3$
d. $2.834 \times \underline{\quad} = 2834$	e. $1.86 \times \underline{\quad} = 18.6$	f. $1.75 \times \underline{\quad} = 175$
g. $0.18 \times \underline{\quad} = 18$	h. $15.26 \times \underline{\quad} = 15260$	i. $1.1 \times \underline{\quad} = 11$

DIVIDING DECIMALS BY WHOLE NUMBERS

Divisor Greater than Dividend

This model will help you understand division of a decimal by a whole number.

Example 1: $0.8 \div 4 = ?$



$$0.8 \div 4 = ?$$

8 tenths put into 4 equal parts gives 2 tenths in each part.

$$0.8 \div 4 = 0.2$$

Answer: 0.2

Example 2: The tallest paper cup pyramid in a school fun-records competition was 1.12 m high. If there are 7 levels of identical paper cups used, what is the height of each cup?



Dividing by decimals is just like dividing whole numbers, except for placing the decimal point in the quotient.

Step 1: Place the decimal point in the quotient directly above the decimal point in the dividend.

Step 2: Then divide as if you were dividing whole numbers.

• Place the decimal point $7 \overline{) 1.12}$

• Divide the ones $7 \overline{) 1.12}$

• Divide the tenths $7 \overline{) 1.12}$

• Divide the hundredths $7 \overline{) 1.12}$

Check: 0.16
 $\times 7$
 $\hline 1.12$
 (Divisor $\times$ Quotient = Dividend)

Try This!

a. $4 \overline{) 2.36}$ b. $3 \overline{) 0.36}$

c. $6 \overline{) 2.40}$

Answer: Each cup is 0.16 m high.

Divisor Smaller Than Dividend

Example 1: $4.35 \div 3 = ?$

$3 \overline{) 4.35}$

$3 \overline{) 4.35}$

$3 \overline{) 4.35}$

Do not show the decimal in the working. It should appear only in the dividend and the quotient.

Try This!

a. $2 \overline{) 4.18}$ b. $4 \overline{) 5.32}$

c. $3 \overline{) 5.7}$ d. $5 \overline{) 7.90}$

Answer: 1.45

Remainders While Dividing Decimals

$3.5 \div 2 = ?$

When you divide decimals, you do not show remainders. You have to write extra zeros to complete the division.

Answer: 1.75

$2 \overline{) 3.5}$

$2 \overline{) 3.5}$

$2 \overline{) 3.50}$

Remainder $\rightarrow 1$

Writing an extra zero in the dividend does not change the value of the dividend.

Exercise 7 J

1. Action Exercise

Colour and divide to find the quotient.

a. $0.9 \div 3$

--	--	--	--	--	--	--	--	--	--

b. $1.2 \div 4$

--	--	--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--	--	--

2. Place the decimal points correctly in these quotients.

a. $\begin{array}{r} 0.06 \\ 8 \overline{)0.48} \end{array}$

b. $\begin{array}{r} 12.4 \\ 4 \overline{)49.6} \end{array}$

c. $\begin{array}{r} 0.05 \\ 7 \overline{)0.35} \end{array}$

d. $\begin{array}{r} 03.4 \\ 8 \overline{)27.2} \end{array}$

3. Divide. Check your answer with multiplication.

a. $82.17 \div 9$

b. $0.65 \div 5$

c. $272.22 \div 6$

d. $168.6 \div 3$

e. $17.73 \div 3$

f. $1.80 \div 5$

g. $27.54 \div 9$

h. $4.8 \div 12$

4. Divide until the remainder is zero.

a. $90.3 \div 6$

b. $17.2 \div 8$

c. $3.1 \div 4$

d. $9.15 \div 2$

e. $7.4 \div 4$

f. $5.2 \div 8$

g. $2.67 \div 5$

h. $18.9 \div 2$

Division by 10, 100, 1000

$321.5 \div 10 = 32.15$

$\begin{array}{r} 321.5 \\ \downarrow \end{array}$

$321.5 \div 100 = 3.215$

$\begin{array}{r} 321.5 \\ \downarrow \downarrow \end{array}$

$321.5 \div 1000 = 0.3215$

$\begin{array}{r} 321.5 \\ \downarrow \downarrow \downarrow \end{array}$

What do you observe?

The decimal point moves to the left as many places as there are zeros.

When dividing by	The decimal point moves to the left by
10	1 decimal place
100	2 decimal places
1000	3 decimal places

Example 1: $4 \div 10$ is the same as $4.0 \div 10$.

So $4 \div 10 = 0.4$

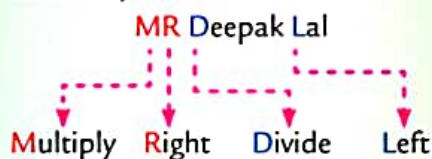
Example 2: $2.35 \div 100 = 0.0235$

extra zero

Example 3: $8 \div 1000 = 0.008$

two extra zeros

Use this idea to remember in which direction to move the decimal point.



Try This!

Fill in the missing numbers.

a. $243 \div \underline{\quad} = 2.43$

b. $6.3 \div \underline{\quad} = 0.63$



Mathspeak

Explain what happens to the value of a decimal number when you multiply it by 10, 100, 1000 and when you divide it by 10, 100, 1000.

FA

Exercise 7 K

1. Divide.

a. $42.8 \div 10$

$42.8 \div 100$

b. $725 \div 10$

$725 \div 100$

c. $0.9 \div 10$

$9 \div 100$

d. $256 \div 1000$

$25 \div 1000$

2. Fill in the blanks.

a. $0.6 \div \underline{\hspace{1cm}} = 0.06$

b. $68.14 \div \underline{\hspace{1cm}} = 0.6814$

c. $31.6 \div \underline{\hspace{1cm}} = 3.16$

d. $0.91 \div \underline{\hspace{1cm}} = 0.091$

3. Application in real life. Solve using multiplication or division.

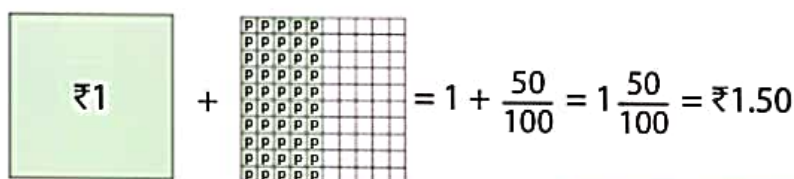
- On a hiking trip, the hikers needed 1.75 litres of water each day. If the trip lasted 10 days how many litres of water did they carry?
- The Koshy family was visiting Delhi. They rode 11.5 km a day for 3 days in the city. How many kilometres did they travel?
- Mr Shah bought 1.76 m of wire and cut it into 8 equal pieces. What was the length of each piece of wire?
- The total weight of 9 identical gold rings is 40.5 g. What is the weight of each ring?

DECIMALS AND MONEY

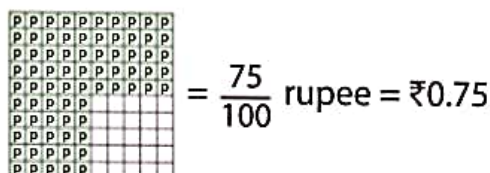
1 rupee = 100 paise



So, 1 rupee 50 paise can be shown as

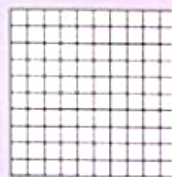


75 paise



Try This!

Colour to show ₹0.25.



Mathspeak

FA

Explain why you can consider ₹0.50 to be the same as $\frac{1}{2}$ a rupee.

MULTIPLYING AND DIVIDING WITH MONEY

Unitary Method

Example 1: For the school fun-records events, limes were needed for the spoon and lime race. The teacher wanted to compare the prices before buying them.



₹20 for 8
Good Buy Shop



₹13.50 for 6
True Value Shop



➡ To find out which is the better buy, compare the price of one lime from Good Buy shop with one lime from True Value shop.

Price of one lime from Good Buy Shop is $₹20 \div 8$.

$$8 \overline{) 20} \quad \longrightarrow \quad 8 \overline{) 20.00} \quad \longrightarrow \quad \begin{array}{r} 2.50 \\ 8 \overline{) 20.00} \\ -16 \\ \hline 40 \\ -40 \\ \hline 00 \\ -00 \\ \hline 0 \end{array}$$

The price of one lime from
Good Buy shop is ₹ 2.50.

Price of one lime from True Value Shop is $₹13.50 \div 6$.

$$\begin{array}{r} 2.25 \\ 6 \overline{) 13.50} \\ -12 \\ \hline 15 \\ -12 \\ \hline 30 \\ -30 \\ \hline 0 \end{array}$$

Price of one lime from the True Value
shop is ₹2.25.

$$₹2.50 > ₹2.25$$

Answer: The limes from True Value shop are the better buy because they are cheaper than the limes at Good Buy shop.

Finding the 'price of one' is called finding the unit price for which we use the **unitary method**.

Common Mistake!

$$\begin{array}{r} 2.5 \\ 8 \overline{) 20.00} \\ -16 \\ \hline 40 \\ -40 \\ \hline 0 \end{array} \quad \times \quad \begin{array}{r} 2.50 \\ 8 \overline{) 20.00} \\ -16 \\ \hline 40 \\ -40 \\ \hline 00 \\ -00 \\ \hline 0 \end{array} \quad \checkmark$$

The zero at the end is important
while dividing money.

Try This!

Find the better buy.



₹12 for 6

Or



₹15.75 for 9

Example 2: Juggling balls were needed for the school fun-records event. If a box of three juggling balls cost ₹22.50, how much will 10 balls cost?

➡ To find the price of 10 juggling balls, you need to first find the price of one.

$$₹22.50 \div 3 = ?$$

$$\begin{array}{r} 7.50 \\ 3 \overline{) 22.50} \\ \underline{- 21} \\ 15 \\ \underline{- 15} \\ 0 \\ -0 \\ 0 \end{array}$$

₹7.50 is the price of one juggling ball.

To find the price of 10, multiply.

$$₹7.50 \times 10 = ₹75$$

Answer: 10 juggling balls cost ₹75.

Try This!



₹21 for 4. How much for 9?

Project

Students from the class who live in different areas should find the price of a kilo of potatoes, onions, and tomatoes in their area. They should also find out whether it is cheaper to buy a larger quantity. How much would it cost then? Pairs of students compare the prices per kilo. What is the difference in price per kilo?

Journal

$$8.13 \div 3 = 2.4$$

Explain in your own words how you know that the quotient is wrong. How will you find the correct quotient?

FA



Exercise 7 L

1. Here are some things needed to make a toy battery operated model train set. Fill in the table according to the number of parts needed.



₹150



₹25 for 2



₹105 for 5



₹13 for 2



₹16.50 for 3

Part	Price for one	Number needed	Total cost for each part
Engine		1	
Batteries		4	
Coaches		9	
Wheels		18	
Tracks		10	

2. These are Mrs Viswanathan's grocery bills. First find the cost of one of each item, then use the information to fill up the other two bills.

Date: 12/07/2024		The Grocery Mart		Bill Number: 157
Item	Quantity	Cost of each item	Price in rupees	
Toothpaste	3		85.50	
Soap	4		60.00	
Rice	8 kg		202.00	
Wheat flour	10 kg		185.00	
Washing powder	2 kg		86.00	
Biscuits	6 packets		70.50	
Buns	10 pieces		42.00	
	Total		731.00	

Date: 15/10/2024		The Grocery Mart		Bill Number: 248
Item	Quantity	Price in rupees		
Toothpaste	2			
Rice	5 kg			
Wheat flour	5 kg			
Biscuits	3 packets			
	Total			

Date: 15/11/2024		The Grocery Mart		Bill Number: 279
Item	Quantity	Price in rupees		
Soap	2			
Rice	10 kg			
Washing powder	1 kg			
Biscuits	5 packets			
Buns	6 pieces			
	Total			





Chapter Check-Up



Colour the circle that describes best how you feel.

I got this!

I'm getting there!

I need help!

Vocabulary Review

- Tenths
- Decimal point
- Whole numbers
- Unitary method
- Hundredths
- Thousandths
- Unit price

1. Express as a decimal.



a. $\frac{73}{1000} =$ _____

b. $\frac{9}{1000} =$ _____

c. $\frac{462}{1000} =$ _____

d. Three thousandths: _____

e. One and fourteen hundredths: _____

f. Two hundred thirty-eight thousandths: _____

2. Express in words.

a. 0.095

b. 0.101

c. 1.43

3. a. Rearrange in ascending order: 99.52, 80.2, 80.5, 99.25

b. Rearrange in descending order: 9.4, 9.89, 8.09, 8.5

4. Solve.

a. $5.2 + 3.67$

b. $16.95 + 12$

c. $3 - 1.1$

d. $28.1 - 16.25$

e. 7.92×8

f. 0.05×4

g. $4.25 \div 5$

h. $39.96 \div 6$

5. Multiply or divide.

a. 5.76×10

b. $8.3 \div 10$

c. 0.9×10

d. $3.6 \div 1000$

e. 53.1×100

f. $62 \div 100$

g. 2.8×100

h. $114 \div 1000$

6. Solve.

a. Your body needs 35 g of protein every day. If your breakfast had 10.73 g of protein, how much more do you need for the day?

b. Ananth and Ankur participated in a quiz. Ananth scored 32.5 points. Ankur scored 9.7 points more than that. How much did Ankur score?

c. Justin spends a week hiking 26.25 km in the forest. If he walks the same distance every day, how much did he walk daily?

d. Shireen's favourite song is 2.39 minutes long. She listens to it continuously 12 times over. How long did she listen to the song?

7. Tick (✓) the correct answer.

6 kg of grapes cost ₹195. How much will 17 kg cost?

a. ₹1170

b. ₹32.50

c. ₹102

d. ₹552.50

Keeping in Touch



a. $3\frac{1}{2} + 1\frac{3}{4}$

b. $2\frac{3}{5} - 1\frac{3}{4}$

c. $\frac{4}{5} \times \frac{2}{3}$

d. $\frac{4}{11} \div \frac{8}{9}$



Why was the equal sign so humble?

Multiply or divide. Then write the letter on the matching answer below to find the answer to the riddle.

$\begin{array}{r} \text{T} \quad 3.25 \\ \times 10 \\ \hline 32.5 \end{array}$	$\begin{array}{r} \text{U} \quad 3.6 \\ \div 10 \\ \hline \end{array}$	$\begin{array}{r} \text{E} \quad 0.8 \\ \times 100 \\ \hline \end{array}$
$\begin{array}{r} \text{A} \quad 1.6 \\ \div 100 \\ \hline \end{array}$	$\begin{array}{r} \text{G} \quad 1.2 \\ \times 100 \\ \hline \end{array}$	$\begin{array}{r} \text{S} \quad 2.8 \\ \div 10 \\ \hline \end{array}$
$\begin{array}{r} \text{L} \quad 2.36 \\ \div 10 \\ \hline \end{array}$	$\begin{array}{r} \text{O} \quad 5.24 \\ \times 100 \\ \hline \end{array}$	$\begin{array}{r} \text{B} \quad 21.2 \\ \div 100 \\ \hline \end{array}$
$\begin{array}{r} \text{R} \quad 4.1 \\ \div 100 \\ \hline \end{array}$	$\begin{array}{r} \text{C} \quad 9.03 \\ \times 10 \\ \hline \end{array}$	$\begin{array}{r} \text{H} \quad 8.61 \\ \div 10 \\ \hline \end{array}$
$\begin{array}{r} \text{N} \quad 2.1 \\ \times 10 \\ \hline \end{array}$	$\begin{array}{r} \text{Y} \quad 17.3 \\ \div 10 \\ \hline \end{array}$	$\begin{array}{r} \text{W} \quad 9.01 \\ \times 100 \\ \hline \end{array}$



0.212	80	90.3	0.016	0.36	0.28	80
-------	----	------	-------	------	------	----

0.861	80

901	0.016	0.28	21	32.5
-----	-------	------	----	------

				T		
120	0.041	80	0.016	32.5	80	0.041

32.5	0.861	0.016	21

524	0.041

0.236	80	0.28	0.28
-------	----	------	------

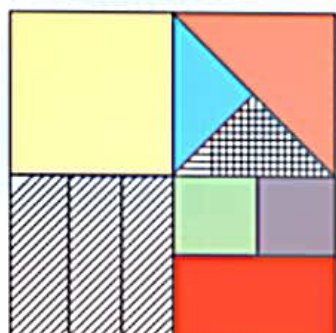
32.5	0.861	0.016	21

0.016	21	1.73	524	21	80
-------	----	------	-----	----	----

80	0.236	0.28	80



1. What fraction of the square are these?



$\frac{1}{4}$



$\frac{3}{12}$ or $\frac{1}{4}$



2. Check these answers. Tick (✓) those that are right and correct those that have a mistake.

a. $70.3 \times 5 = 35.15$

b. $8.6 + 3.9 = 12.5$

c. $24.24 \div 6 = 4.4$

d. $9 - 2.23 = 7.23$

e. $\frac{8}{11} - \frac{3}{10} = \frac{5}{1} = 5$

f. $\frac{2}{13} \times \frac{5}{6} = \frac{10}{19}$

g. $1\frac{5}{8} + 1\frac{3}{8} = 3$

h. $\frac{15}{20} \div 5 = \frac{3}{4}$

3. State whether these statements are true or false.



a. The number 1 is not prime, therefore it is composite.

b. All prime numbers are odd.

c. All numbers that are divisible by 3 are not divisible by 6.

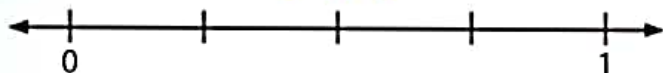
d. The HCF of two prime numbers will always be 1.

e. The LCM of two numbers cannot be bigger than both the numbers.

f. The greater the number, the more the number of factors it has.

g. Every number is a multiple of itself.

4. Write the fractions $\frac{1}{2}$, $\frac{1}{4}$, $\frac{3}{4}$ in the correct place on the number line given below.



5. Write the words—'does not make sense' against the statements where the underlined sentences do not make sense and 'makes sense' against the statements that do.

a. Ananth walked halfway to school and jogged $\frac{2}{3}$ of the way.

b. Half the children in the tennis class are girls. There are 7 boys in the tennis class. So, there are 14 children in the tennis class.

c. Arnab, Rehan, and Binod were watching a television programme. Arnab watched half of it, Rehan watched half of it, and Binod watched half of it.



Shapes, Patterns, and Nets

Threads are woven together in vertical and horizontal lines called warps and wefts to become fabrics. The world over, artisans use threads of wool, silk, or cotton to create patterns for different products using mathematical calculations. If 7 m of gold thread has been used to weave a saree border, how much is that in centimetres?



LOOKING BACK



1. Ring the shapes that do not have symmetry. Draw the lines of symmetry on those that do.

a.



b.



c.



d.



e.



f.



2. Tessellations are the shapes that do not overlap and do not have gaps. Mark the shapes that tessellate.

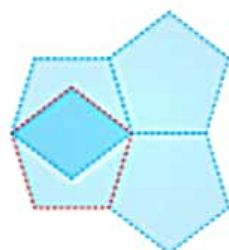
a.



b.



c.



3. Draw the next two in the sequence for these patterns.

a.



b.



UNDERSTANDING SYMMETRY BETTER



C-2.3

Shape alone does not give symmetry. The details within a shape also decide whether it is symmetrical or not.

Persian carpets are made in Iran and are famous for their designs and high quality.

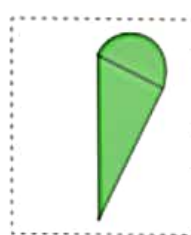


*This is a symmetrical carpet because the design in the carpet is also symmetrical. One half is a reflection of the other. This kind of symmetry is also called **reflectional symmetry**.*



This is not a symmetrical carpet because the design in the carpet does not have reflectional symmetry.

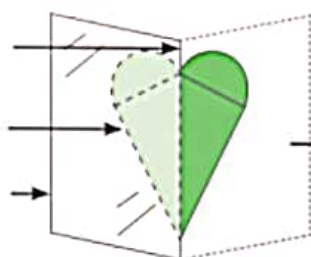
The line of symmetry shows where the shape has been reflected. You can take any shape drawn on a piece of paper and make it a symmetrical shape with the help of a mirror.



Line of symmetry

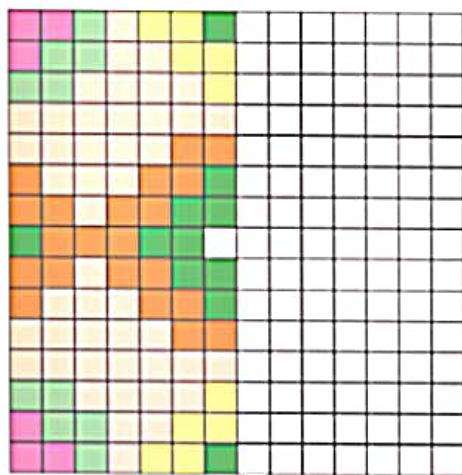
Reflection

Mirror



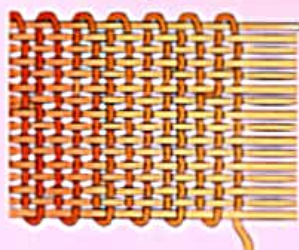
paper

Kullu Valley in Himachal Pradesh is famous for its woollen shawls with traditional border designs. Colour the other half of this square by reflecting the design to make a basic Kullu shawl border pattern.



Journal

This is a close-up of warps and wefts. Describe it in detail using mathematical language.



Try This!



Tick (✓) the images that have symmetry and draw their line of symmetry.

a.



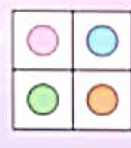
b.



c.



d.



Project

FA

There are many different kinds of fonts available on the computer. Look at the letter A in them.

A – Comic Sans MS – not symmetrical

A – Arial – symmetrical

Find 3 more fonts where A is symmetrical and three where the A is not symmetrical.



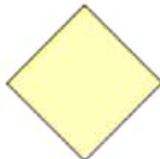
Exercise 8 A

1. Draw the lines of symmetry for these shapes.

a.



b.



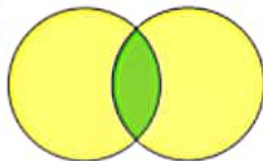
c.



d.



e.



2. These flags belong to some South Asian countries. Say how many lines of symmetry they have, if any, and draw them on the flags.



Bangladesh



Bhutan



India



Maldives



Nepal



Pakistan



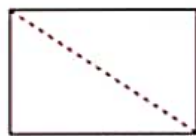
Sri Lanka



Mathspeak

FA

Is the dotted line on the rectangle a line of symmetry? Explain your answer.



FA



- Face a friend and copy his or her movements like you are a reflection in the mirror. Practice it slowly first.
When your friend raises his/her left hand, are you raising your right?
What happens when he/she stretches out his/her right leg sideways?
Can you create a series of movements together?
- Next, draw a line on the floor. Stand on one side of the line and let your friend stand on the other. You may face each other or stand next to each other. Create reflectional symmetry movements but this time by moving away, toward, or along the line – but stay on your side of the line.
For example, if you move two steps back from the line with the left leg stepping back first, your friend will do the same with the right leg moving back first. If you swing towards your right, your friend will swing towards his/her left.
- Head, body, arm, and leg movements can be used. Be creative. You can even create a sequence of movements and set it to music.



ROTATIONAL SYMMETRY

C-2.3

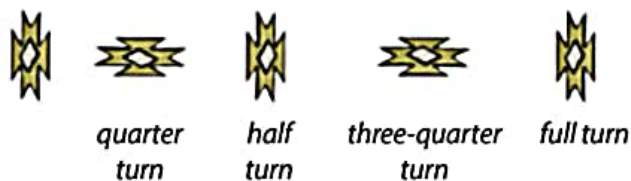
Quarter Turns and Half Turns

Some figures look the same before you make them take a full turn, while some don't.

This is a Navajo weaving design made by native Americans.

Let us turn one part of the design around a fixed point to see when it comes back to its original shape.

The design looks the same after a **half turn**. So we can say the shape has **rotational symmetry**.

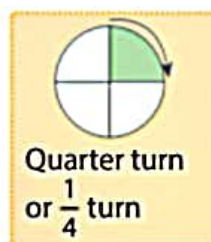


quarter
turn

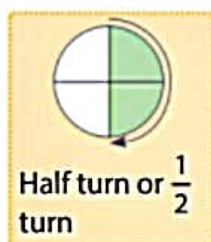
half
turn

three-quarter
turn

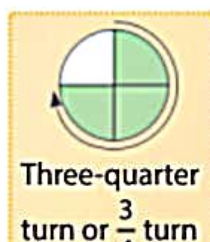
full turn



Quarter turn
or $\frac{1}{4}$ turn

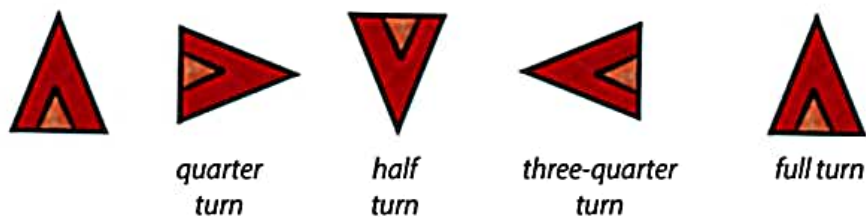


Half turn or $\frac{1}{2}$
turn



Three-quarter
turn or $\frac{3}{4}$ turn

The second part of the design does not look the same till it takes a **full turn**. This shape does not have rotational symmetry.



quarter
turn

half
turn

three-quarter
turn

full turn

A figure has rotational symmetry if you can rotate it to less than a full turn around a point and it looks the same as it did before the rotation.

Project



- Research the logos of three well-known organisations or companies to understand what the design is meant to convey. If they have symmetry describe the kind of symmetry they have.
- Design a logo with rotational symmetry for your class. The logo should have meaning. At which turn does your logo come back to its original shape?

FA

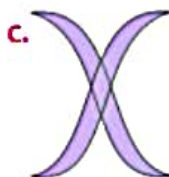
Try This!

Trace each figure. Which ones have rotational symmetry? Turn each one around a quarter, half, and three-fourth turn. Decide at which turn the shapes show their rotational symmetry.

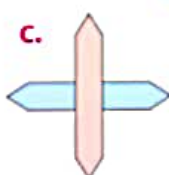
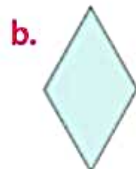
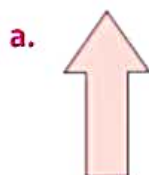


Exercise 8 B

1. Which of these shapes will look the same after $\frac{1}{4}$ turn? Put a tick (✓) next to them.

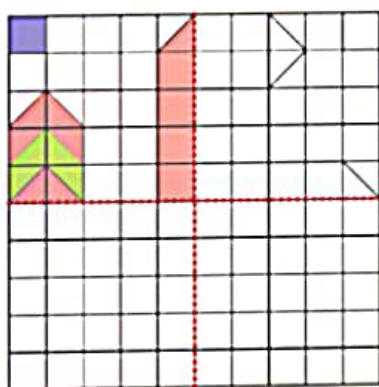


2. Which of these shapes will look the same after $\frac{1}{2}$ turn? Put a tick (✓) next to them.

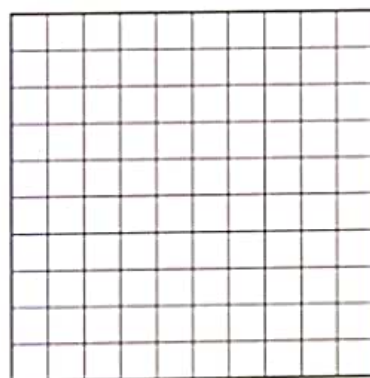


3. Which 6 letters of the English alphabet look the same after half a turn?

4. a. Complete this pattern using quarter turns. The first quarter turn has been outlined for you.



- b. Create a simple pattern of your own using the same idea.



Challenge!

Which is the largest 4-digit number you can make that will look the same on a $\frac{1}{2}$ turn? Which is the smallest?



Mathspeak

FA

Can a shape have reflectional symmetry but yet not have rotational symmetry? Decide on your answer after studying these shapes.

Y A

Try This!



Look at these traffic signals. Find out what each one means. Then mark the ones that will look the same on a half turn.



CREATING PATTERNS

C-2.4

France is well known for its delicate lace patterns made from fine thread.

This pattern has been made by repeating the basic design over and over without any change.



This pattern has been made by rotating the basic design by half turn every time.



This pattern has been created by repeating the basic design with a quarter turn every time.



Try This!



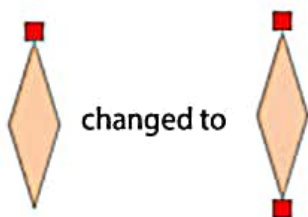
Say what kind of turn this saree border has. Then extend the pattern.



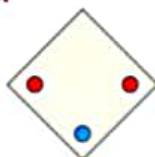
Challenge!

Change the shape so that the new shape looks the same on a $\frac{1}{2}$ turn.

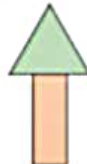
a.



b.



c.



d.





Exercise 8 C



1. Spot the pattern and continue.

a.



Pattern made with ____ turns.

c.



Pattern made with ____ turns.

b.



Pattern made with ____ turns.

d.



Pattern made with ____ turns.

2. Use the shapes shown below and create three sets of patterns for each as mentioned with the help of tracing paper in your notebooks.

a.



b.



c.



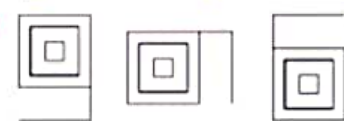
i. Repeat the shape with no change.

ii. Repeat by giving a $\frac{1}{2}$ turn every time.

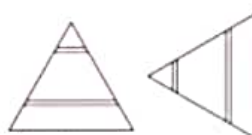
iii. Repeat by giving a $\frac{1}{4}$ turn every time.

3. These patterns have been made by moving the designs anti-clockwise. Draw the next three designs for each pattern in your notebook.

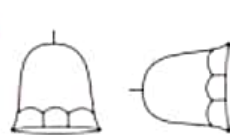
a.



b.



c.



4. Circle the design that breaks the pattern and then set it right.

a.



b.



c.



Challenge!

The outlines of these Indian states have been rotated. Identify the states.

a.



b.



c.



d.



e.



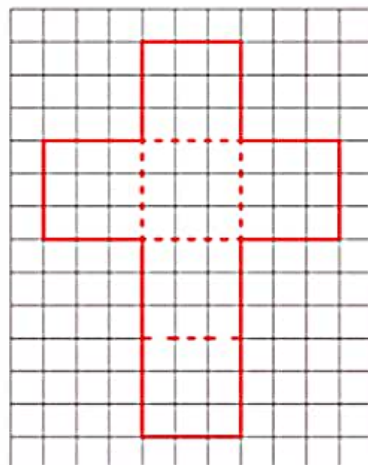
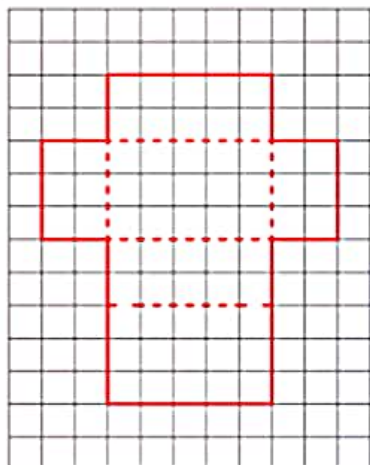
NETS

C-2.1

A net is a flat pattern that can be folded to make a solid shape.

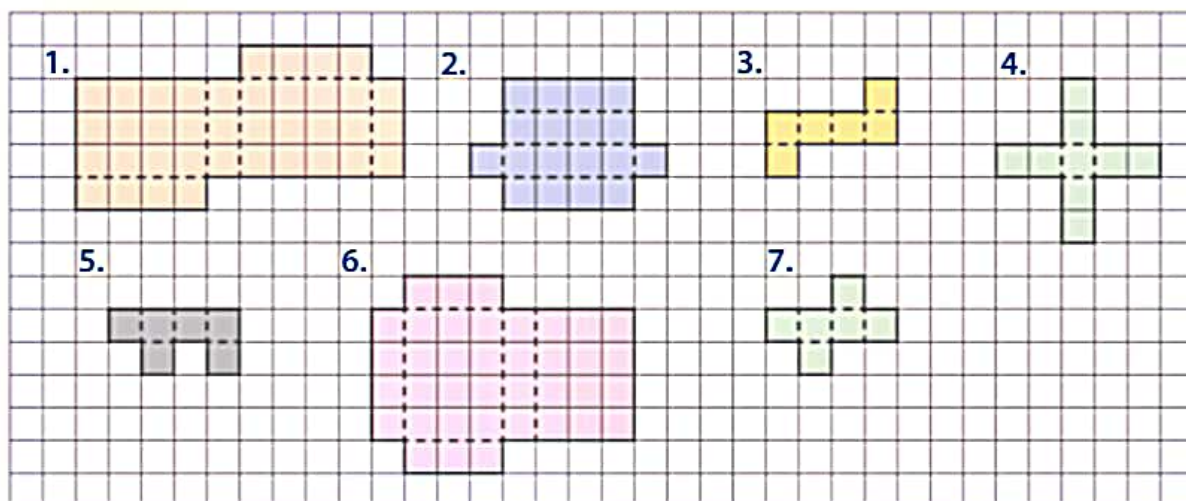
Cardboard boxes are made from nets.

Draw these shapes onto square-lined paper. Fold on the dotted lines. Can you predict which one will be a cube and which one will be a cuboid?



Exercise 8 D

Say which of these nets will form a cube, cuboid, or neither. Then copy onto square-lined paper, fold and check if you are right.



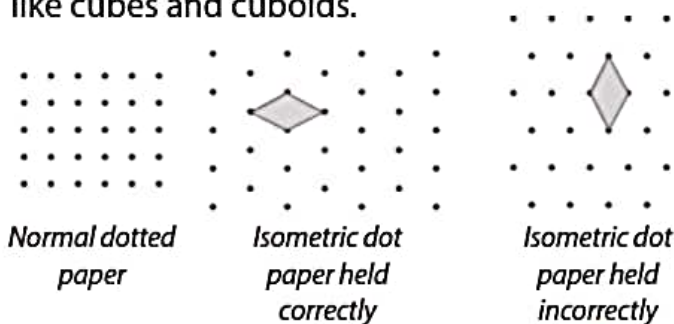
Project

FA

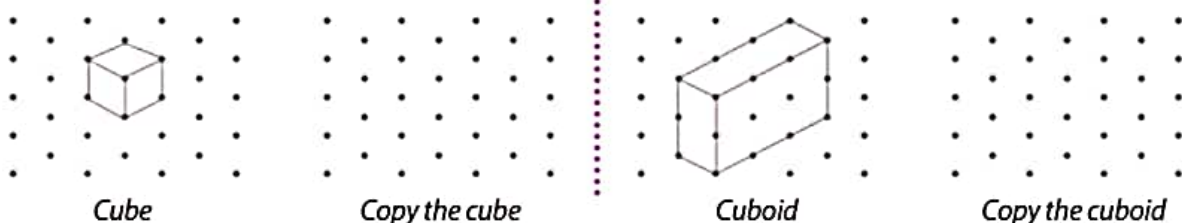
Find three different cubes or cuboids – toothpaste boxes, soap, boxes, etc. Open them up and outline their nets. Cut out the nets and fold them to re-create the solid shapes.

Drawing Cubes and Cuboids

You can use special dotted paper called isometric dot paper to help you draw solid shapes like cubes and cuboids.

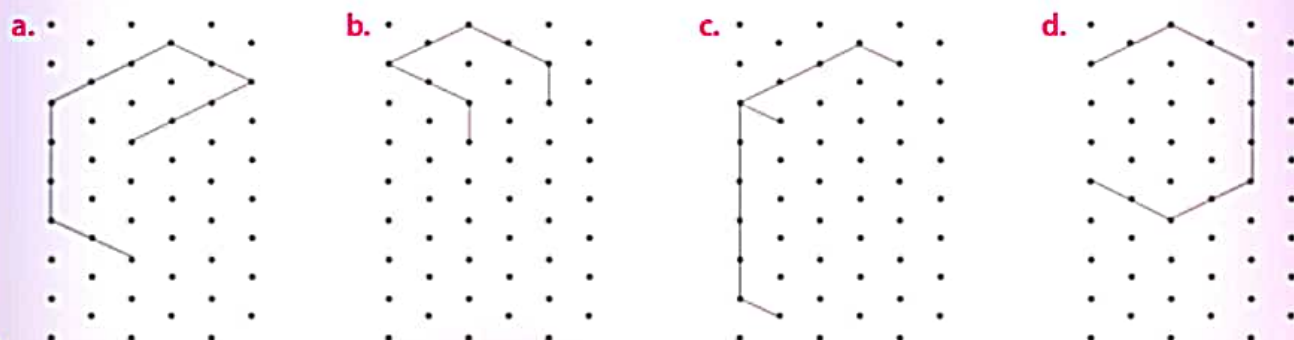


The shaded shape on the isometric dots tells you which way the paper should be held.

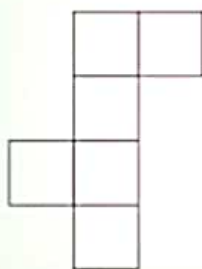


Try This!

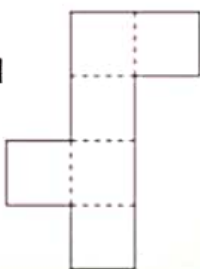
Complete the following figures to make cuboids.



Cut out a square piece of card paper with sides of 10 cm. Copy the net below by outlining the square six times as shown. The sides should touch. Cut out the whole shape.



Fold along the dotted lines. Seal the cube with the help of adhesive tape.



Stick pictures of your family and friends on each side. You can also put some marbles into the cube before sealing it. Then draw interesting pictures on each face of the cube and use it as a paper weight.

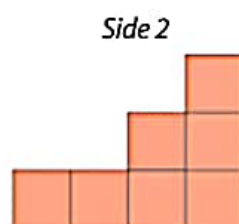
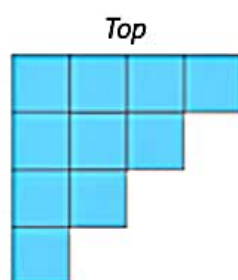
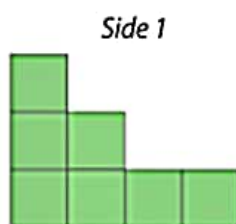
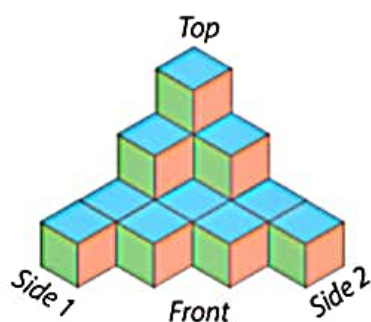


PERSPECTIVE



C-2.1

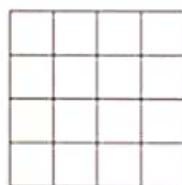
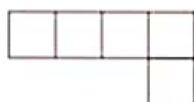
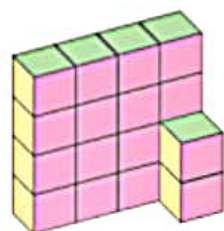
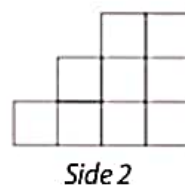
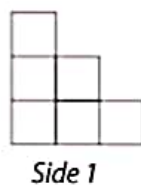
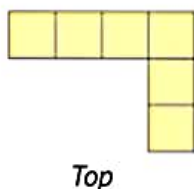
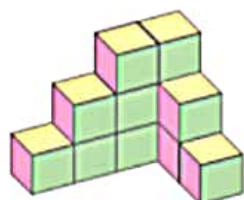
Shapes often look different when you view them from different directions.



The first picture on the left gives the front view of the shape.

The adjacent pictures show the other views.

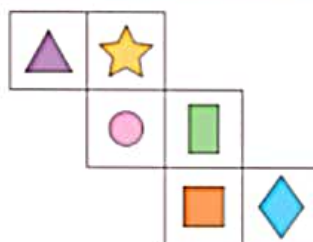
Colour to match the view of each shape.



Challenge!

If this net is folded into a cube, say what will be opposite to the following shapes?

- a. b. c.



Project

FA

Many crosswords have the same shape when turned. Go through newspapers to find such crosswords and paste them in your notebook in columns. Show how many turns they need to come back to their original position. Ignore those that need a full turn.



Chapter Check-Up



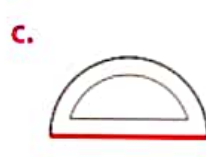
Colour the circle that describes best how you feel.



Vocabulary Review

- Rotational Symmetry
- Rotate
- Three-quarter turn
- Perspective
- Reflectional Symmetry
- Quarter turn
- Cube
- Net
- Reflection
- Half turn
- Patterns
- Isometric dots
- Line Symmetry
- Full turn
- Cuboid

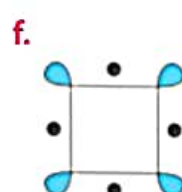
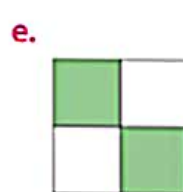
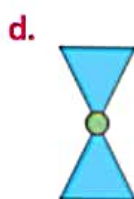
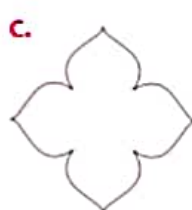
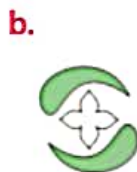
1. Use the red line as the line of symmetry and draw the reflection of the shapes given below.



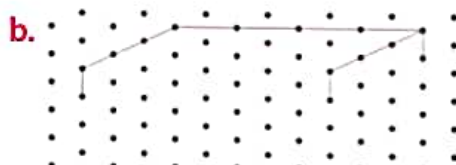
2. Circle the numbers that look the same on half a turn.

11, 88, 18, 808, 118, 818, 1001, 1100, 1881

3. Decide which need $\frac{1}{2}$ turn and $\frac{1}{4}$ turn to come back to their original shape.

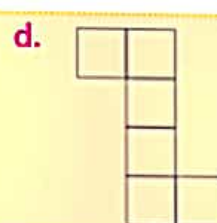
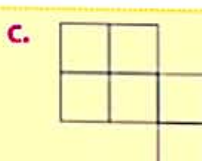
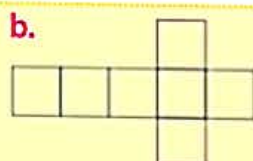
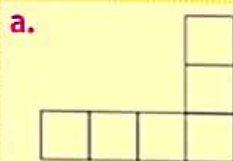


4. Complete the cuboids.



5. Tick (✓) the correct answer.

Which of these nets can be made into a cube?



Keeping in Touch



- a. 2.8×10 b. 7.61×100 c. 5.3×3 d. $5.2 \div 10$ e. $93 \div 100$ f. $3.15 \div 5$



Symmetry and Turns

Here are some commonly used international symbols for the 12 Zodiac signs. Complete the table.

	Symbol	Zodiac sign it represents	Lines of Symmetry if any	$\frac{1}{4}$ turn		$\frac{1}{2}$ turn	
				Looks the same		Looks the same	
					Yes/No		Yes/No
1		Aries			No		No
2		Taurus					
3		Gemini					
4		Cancer					
5		Leo					
6		Virgo					
7		Libra					
8		Scorpio					
9		Sagittarius					
10		Capricorn					
11		Aquarius					
12		Pisces					

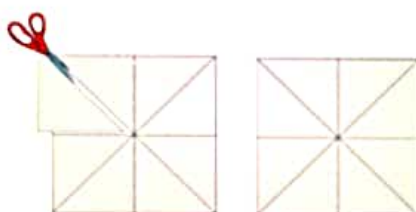
Background: Kaleidoscopes use mirrors to create reflections of continuous symmetrical images. Let's make a kaleidoscopic design using the same idea on paper.

Materials: 2 square sheets of white paper of the same size, black marker, colour pencils or crayons, and scissors.

Preparation: Fold each sheet into eighths in triangular parts. Cut out one-eighth piece from one of the sheets.

Procedure:

1. Use the triangle that you have cut to write any three- or four-letter word. Make sure the letters are big and flow out of the triangle.
2. Use the black marker and outline the letters on both sides of the triangle (figure a.).
3. Then take second sheet which has not been cut. Treat the creased lines as the lines of symmetry and trace the word onto one triangle on the square sheet by first placing it on top and then sliding it under the sheet to trace it.

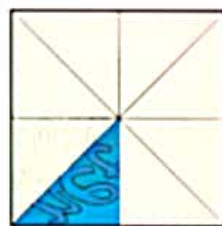


b.



c.

4. Place the small triangle back on top like it was in figure b. and flip it across the line of symmetry. Slide underneath and trace (figures d. and e.). Keep repeating this action till the entire sheet is covered with your kaleidoscopic design. Remember to always flip over the line of symmetry to create a reflection. And slide beneath to trace in exactly the same way it was on top of the sheet.



d.



e.

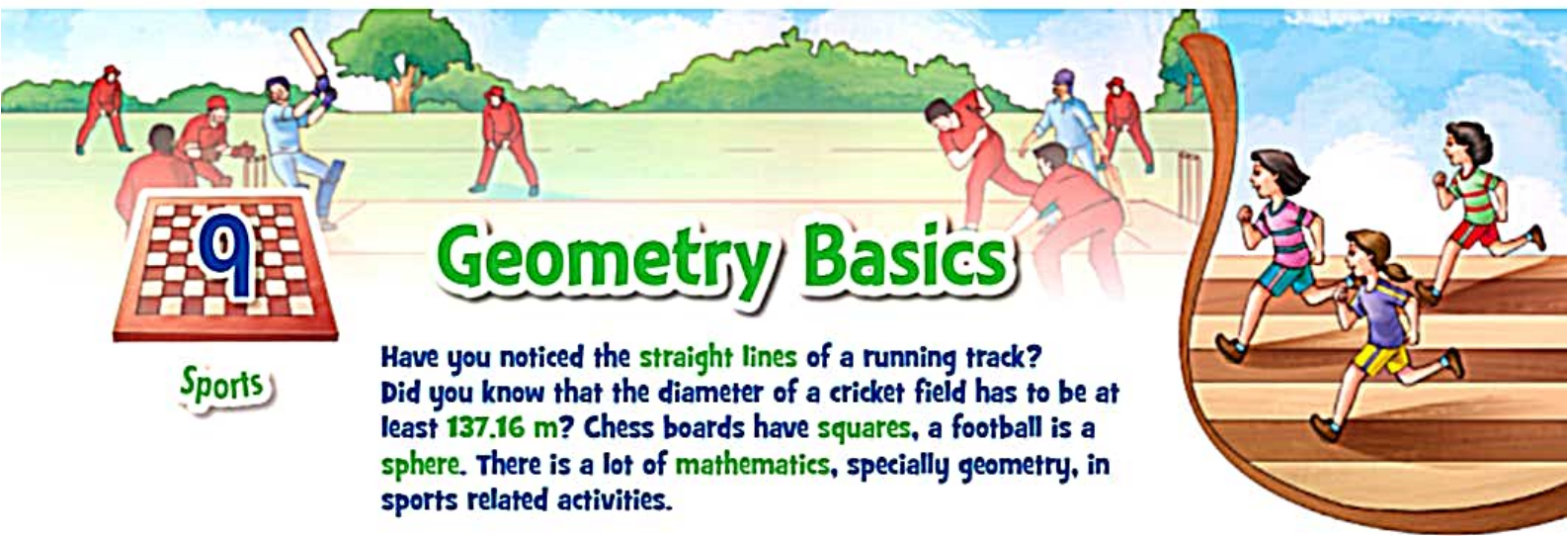


f.



g.

Colour. Try more patterns with other words.



Sports

Have you noticed the **straight lines** of a running track? Did you know that the diameter of a cricket field has to be at least **137.16 m**? Chess boards have **squares**, a football is a **sphere**. There is a lot of **mathematics**, specially geometry, in sports related activities.

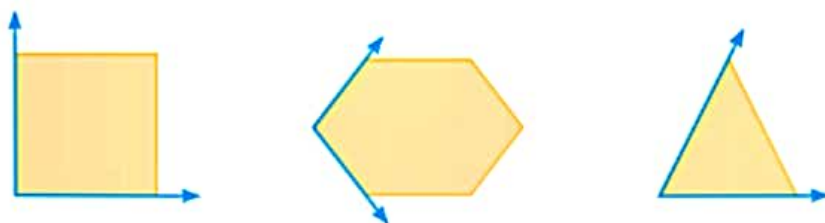
RECOGNISING ANGLES

Put these closed shapes into two groups. Colour the shapes with straight lines in yellow and the shapes with curved lines in blue.

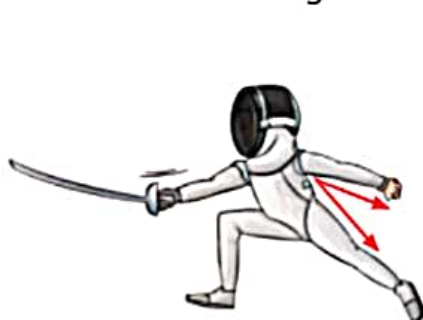


Angles

All the shapes you have coloured above in yellow are called **polygons** and their sides meet at corners.



The two sides that meet at a corner forms an angle. Look at the angles in these games.



Fencing



Cricket



Football



Chess

Straight lines



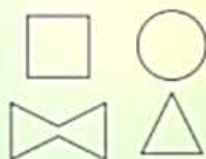
Curved lines



Open shapes



Closed shapes



Exercise 9 A

1. Mark any one angle that you see on each of these.

a.



b.



c.



d.



e.



2. Mark any one angle that you see in each of these traditional Indian dances.



Kathak



Lavani



Dandiya Rass



Bharatnatyam

UNDERSTANDING ANGLES IN GEOMETRIC TERMS

To understand angles in geometric terms, we must first understand some of the basic concepts that are also called the building blocks of geometry.

Point

A **point** is the basic unit of geometry. It shows an exact location.

We represent a point with the help of a dot and name it with a capital letter.

- A This is point A.

Line



When you stand at a seashore, the horizon gives you the idea of a never-ending line.

A **line** is a collection of points going endlessly in both directions along a straight path.

A line has no beginning and no end, so it has no end points. It is named by using two points on it. The symbol for a line is $\longleftrightarrow$. The arrow heads show that the line goes on and on.



Point A and Point B are two points on the line. We call it line AB and write it as $\overleftrightarrow{AB}$ or $\overleftrightarrow{BA}$.

The tip of a pin can be taken as a physical model of a point. In reality, a point in geometry is even smaller than the tip of a pin.



A tennis net can be taken as a physical representation of a line segment. It has a definite starting point and ending point.

Line Segment

A **line segment** is part of a line. It has two endpoints. We name it by its endpoints.

The symbol for a line segment is $\overline{\quad}$.



Points M and N are the two endpoints of the line segment MN. We write it as $\overline{MN}$ or $\overline{NM}$.

Ray

A **ray** is part of a line. It has one endpoint and goes on endlessly in the other direction.

We name a ray beginning with its starting point and any other point on it. The symbol for a ray is $\overrightarrow{\quad}$.



Ray PQ is written as $\overrightarrow{PQ}$.

An arrow that is shot from a bow can be compared to a ray. It has a definite endpoint and it goes continuously in one direction.

Try This!

Which geometrical concept do each of these remind you of?

a.



A road that you cannot see the end or beginning of

b.



The tip of a needle

c.



The rays of the Sun

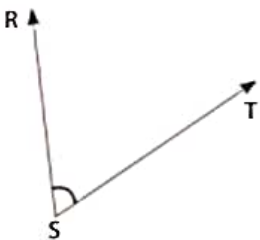
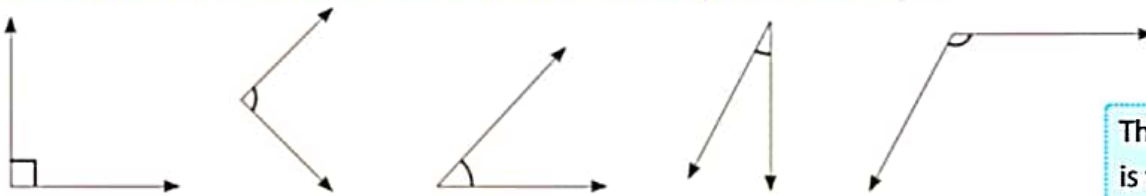
d.



One edge of this book

Parts of an Angle

When two rays have a common endpoint they form an angle.



$\overrightarrow{SR}$ and $\overrightarrow{ST}$ together form an angle. The common endpoint (S) is called the **vertex** of the angle. SR and ST are called the **arms** of the angle. The angle alongside is called **angle RST** or **angle TSR**. The symbol for angle is $\angle$.

We write $\angle RST$ or $\angle TSR$ to name the angle.

The plural of vertex is vertices.

Journal

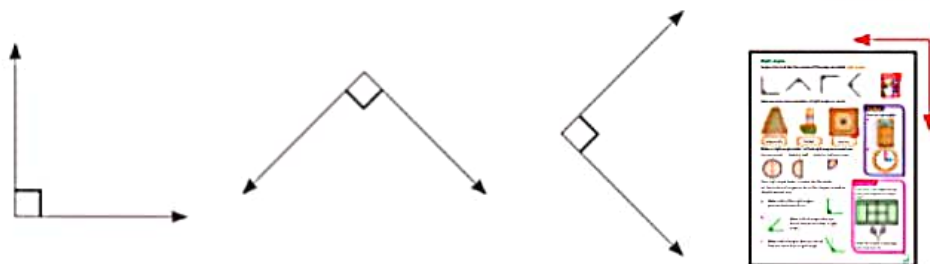
Explain how line segments and lines are alike. How are they different?

FA

The middle letter is always the vertex of the angle.

Right angles

Angles that look like the corners of this page are called **right angles**.



Mathspeak

FA

How do you know that an angle named $\angle PQR$ does not have ray $\overrightarrow{PR}$?

Here are some more examples of right angles in sports.



Hopscotch



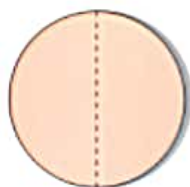
Cricket



Carrom

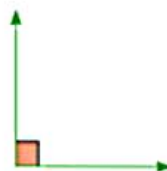
Make a 'right angle tester' to find right angles around you.

Cut out a circle Fold it in half Fold it in half once more



Your 'right angle tester' is ready! Use the tester on the pictures of angles so far in this chapter as well as objects around you.

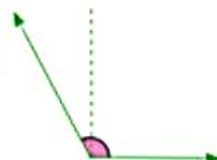
- a. Make a list of the right angles you can find around you.



- b. Make a list of angles that you found that are less than a right angle.



- c. Make a list of angles that you found that are more than a right angle.



Try This!

Mark the right angles.

a.

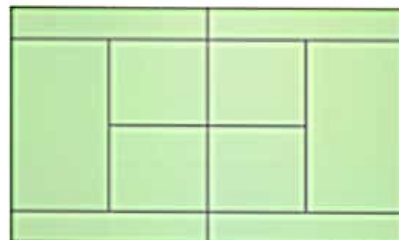


b.



Challenge!

How many right angles can you find in this diagram of a tennis court?



(Hint: The number is more than 30 but less than 50.)

Acute Angles

Angles that are less than a right angle are called **acute angles**.



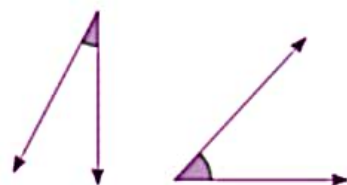
Archery



Cycling



Sailing



Obtuse Angles

Angles that are more than a right angle are called **obtuse angles**.



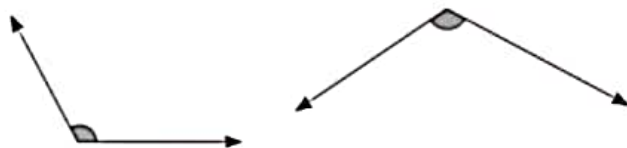
Football



Tennis



Onam boat sailing



Try This!

Mark the angles as acute, obtuse, or straight.

a.

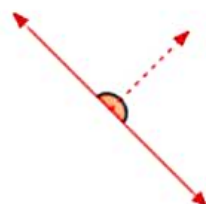
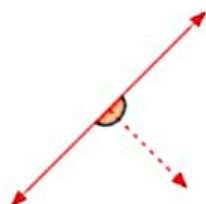
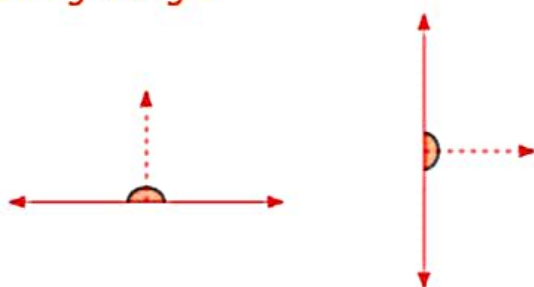


b.



Straight Angles

If you have two right angles next to one another, they form a **straight angle**.



Try This!

Find examples in your classroom of each of the four kinds of angles you have learnt about.



Hurdle race



Malkhamb

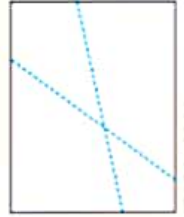
Exercise 9 B

1. Action Exercise

Take three sheets of paper.

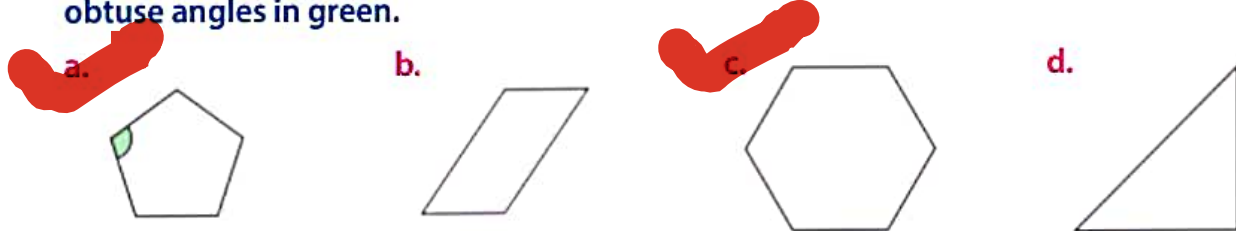
Sheet 1: Fold twice. Once vertically, then horizontally, and open to show right angles on the creases so formed. Mark them in red.

Sheet 2: Fold twice like the diagram and open to show acute angles on the creases so formed. Mark them in blue. Then mark the obtuse angles in green.



Sheet 3: Fold in twice in any manner you choose. Mark the angles you see on the open sheet.

2. In the following figures colour the right angles in red, the acute angles in blue, and the obtuse angles in green.

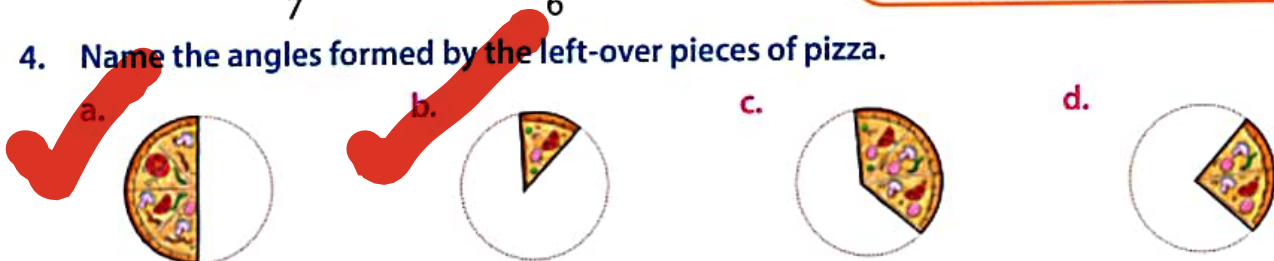


3. Sun Salutation or Surya Namaskar is a sequence of 12 yoga poses. Mark any one angle that you see in each pose and name the kind of angle it represents.

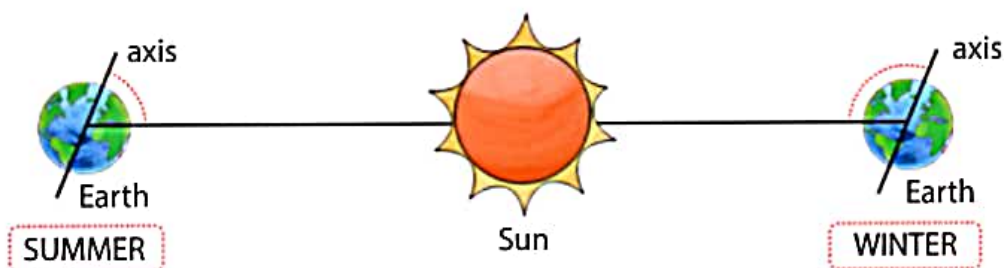


Pose number	Kind of angle
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	

4. Name the angles formed by the left-over pieces of pizza.



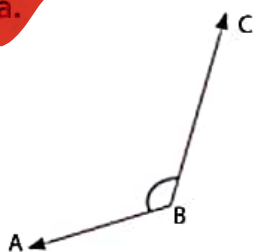
5. The Earth continues to spin around its axis while it revolves around the Sun. The picture below shows the angle made by the Sun and the Earth's axis in summer and winter in the northern hemisphere. Identify the angles.



6. Draw three examples each of acute, obtuse, and right angles that you see around you.

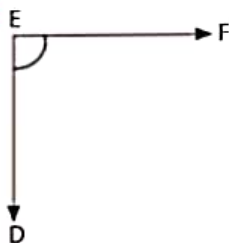
7. Name and identify the following angles.

a.

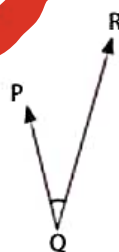


$\angle ABC = \text{obtuse angle}$

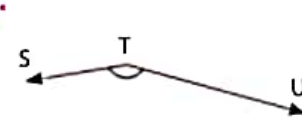
b.



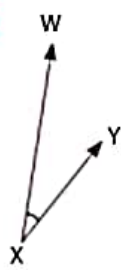
c.



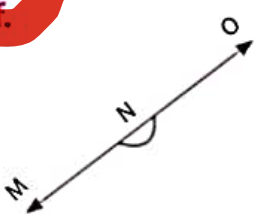
d.



e.



f.



g.



h.

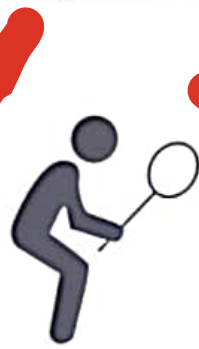


8. The pictures you see below are different poses made while playing badminton. Mark and name the different angles that you see in these pictures.

a.



b.



c.



d.

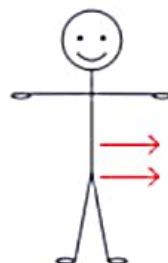


Practice these movements to show the different building blocks of geometry.

Point – Jump in one spot.



Line segment – Jump in one spot, move sideways a few steps with both arms stretched, jump in that spot.



Ray – Jump in one spot, move sideways continuously in the same direction as one outstretched arm.

Line – Keep both arms outstretched and keep moving sideways.

Angles – Use both arms to show, right, acute, obtuse, and straight angles.

Bend your knees to show right, acute, obtuse, and straight angles.

- Your teacher will call out different sets of words and you must move according to the sequence. For example, point – line – acute angle – ray – point.
- Then the same can be done as a performance set to music, individually or as a group.

Data Connect

Open the **Data Bank** on page 243 and study the data on 'Share of Water of Different Oceans on Earth'. Then answer the questions below.

1. Which section of the circle graph has the smallest angle?
2. Which has the largest? What kind of angle does it form?
3. Name the section represented by the largest acute angle.
4. Would the estimate of the section shown by the Indian ocean be more than or less than a right angle?
5. If the two sections represented by the Atlantic and the Indian ocean are combined, what kind of angle would they form?

Project

The Paralympics are a multi-sport event held right after the Olympic Games. The participants are differently abled and may have physical, intellectual or visual impairments. Deepa Malik is the first Indian women to win a Paralympics medal. She won a silver medal in the women's shot put event at the 2016 Rio Games after a throw of 4.61 m.

Mark the angles in her name using the colours shown and count them.



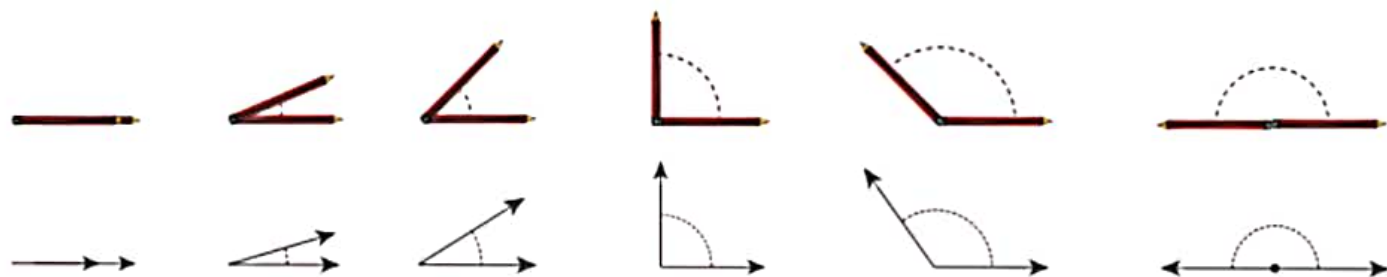
Right angles –

Acute angles –

Obtuse angles –

MORE ABOUT ANGLES

Use two pencils to represent the arms of an angle. Slowly move one pencil as shown. See how the gap between the two pencils slowly increases.



We can measure the gap between the two arms of an angle by using 'degrees'.

A **degree** is a unit of measurement used for measuring angles.

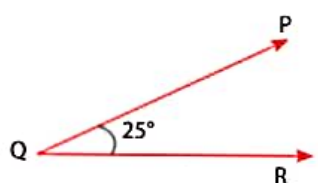


We say that $\angle ABC$ is 2° .

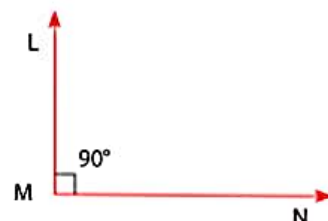
2° is read as 2 degrees.



$\angle XYZ = 10^\circ$



$\angle PQR = 25^\circ$



$\angle LMN = 90^\circ$

The length of the arms do not affect the measure of the angle.



Using a Protractor

You can use a **protractor** to measure angles.

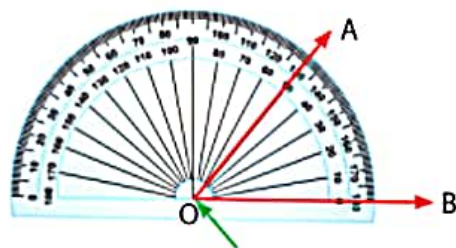
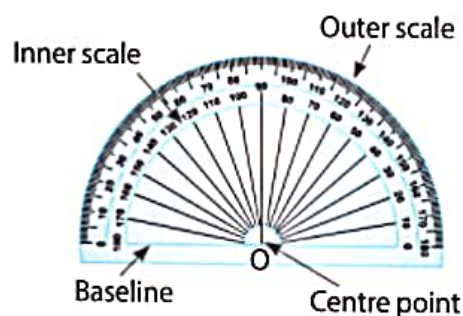
If you look at a protractor carefully, you will see that there are two sets of measurements written on it.

These are called **scales**.

There is an **inner scale** and an **outer scale**, both having 0° to 180° in different directions. The **inner scale** is used to measure angles that open to the right and the **outer scale** is used to measure angles that open to the left.

This is how a protractor is used to measure angles.

Step 1: Place the centre point of the protractor on the vertex of the angle.

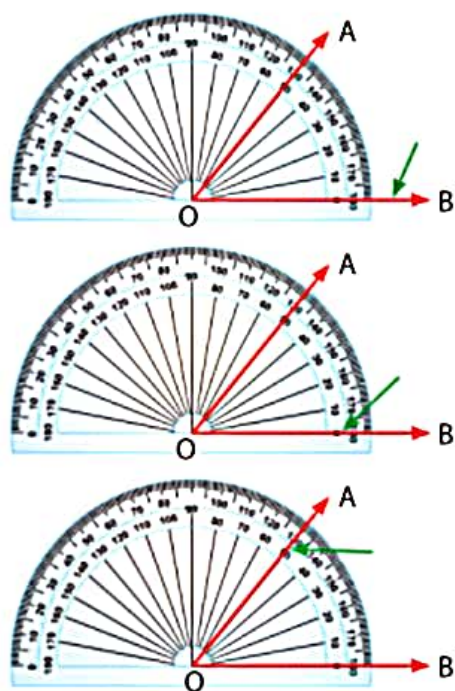


Step 2: Adjust the protractor (without shifting the centre from the vertex) so that one arm of the angle is along the baseline.

Step 3: Look at the scale where the baseline arm points to 0° (inner scale in this example).

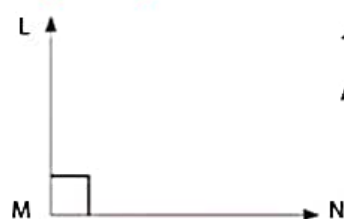
Step 4: Read the measure of this angle where the other arm crosses the scale.

Answer: $\angle AOB = 50^\circ$



Measuring Angles

Right angle



$$\angle LMN = 90^\circ$$

A 90° angle is a **right angle**.

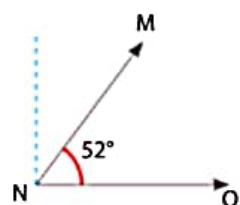
A right angle is represented as



Acute angle

An acute angle is smaller than a right angle; so it is **more than 0° but less than 90°** .

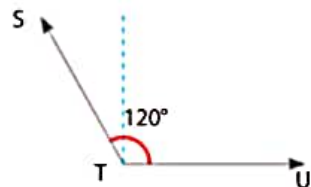
$$\angle MNO = 52^\circ$$



Obtuse angle

An obtuse angle is bigger than a right angle; so it is **more than 90° but less than 180°** .

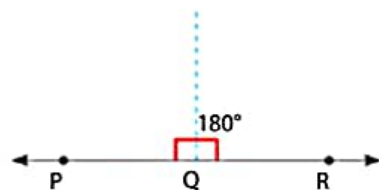
$$\angle STU = 120^\circ$$



Straight angle

It is the same as two right angles next to each other. So it measures exactly 180° .

$$\angle PQR = 180^\circ$$



Try This!

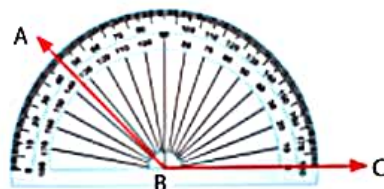
Use a protractor to measure these angles.



Acute angle = ____° Right angle = ____° Obtuse angle = ____°

Common Mistake!

You can avoid this mistake by first observing the angle and deciding what kind of angle it is—obtuse or acute. Secondly, always use the scale where the baseline arm points to zero.



$\angle ABC = 45^\circ$ ✗

$\angle ABC = 135^\circ$ ✓

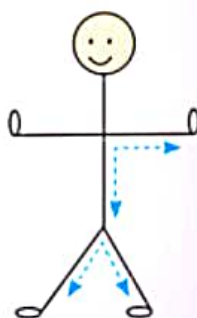
In this example, the baseline points to zero in the inner scale, so we use the inner scale to measure the angle.

Project

FA



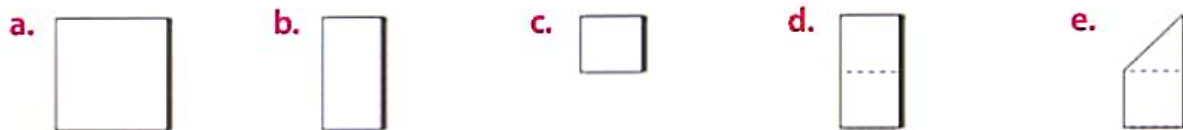
Make a chart showing the physical exercises that you have learnt in school, using simple stick figures. Mark out the angles and measure them.



Exercise 9 C

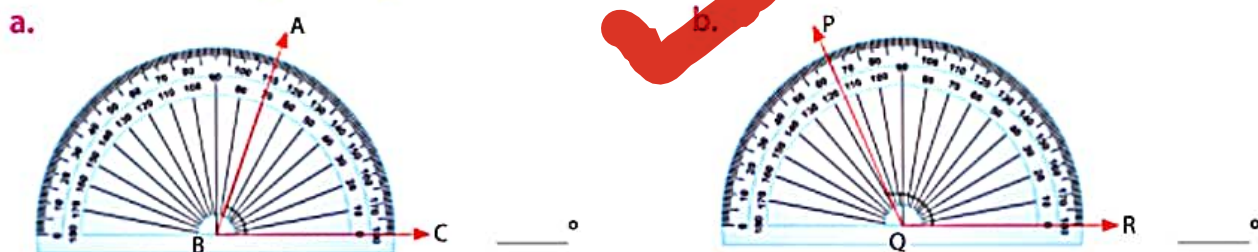
1. Action Exercise

Take a square piece of paper **a.** and fold it in half **b.** Fold it once more **c.** and press down. Open the last fold so that the sheet of paper shows the crease **d.** Take one corner of the paper and get it to meet the crease line **e.**

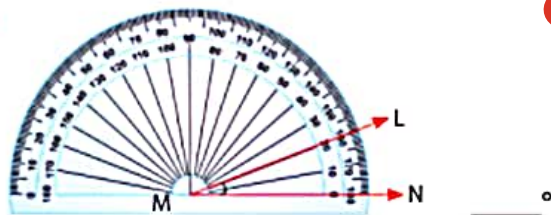


You now have an acute angle, a right angle, an obtuse angle, and a straight angle. Measure each of them with a protractor.

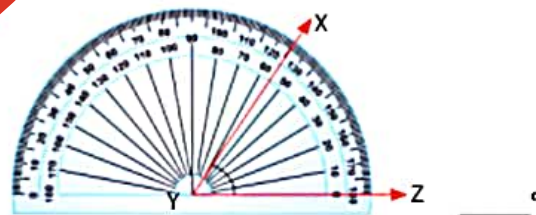
2. Measure these angles using the inner scale.



c.

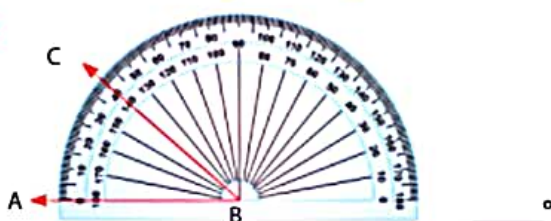


d.

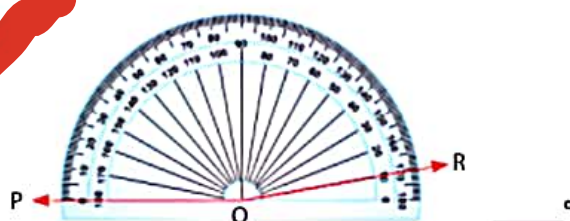


3. Measure these angles using the outer scale.

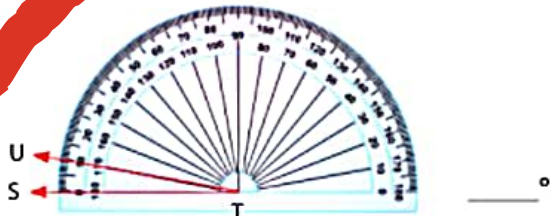
a.



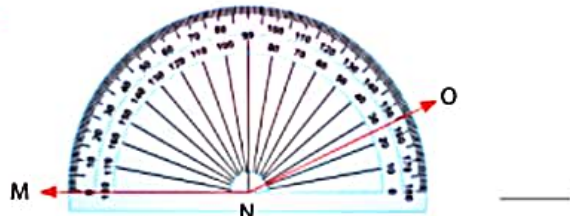
b.



c.



d.



4. Look at the angles below. First write what kind of angle you think it is. Then decide whether to use the outer or inner scale of the protractor to measure the angles. Next measure the angles to check whether your guess was correct.

a.



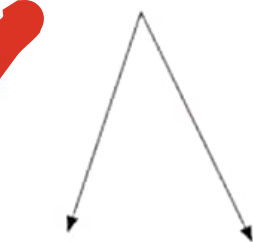
b.



c.



d.



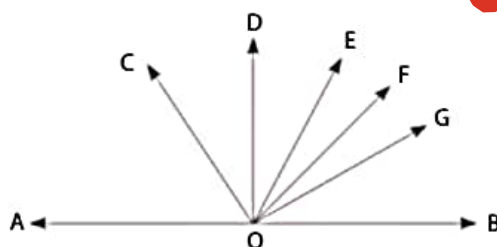
e.



f.



5. Use a protractor to measure the angles.

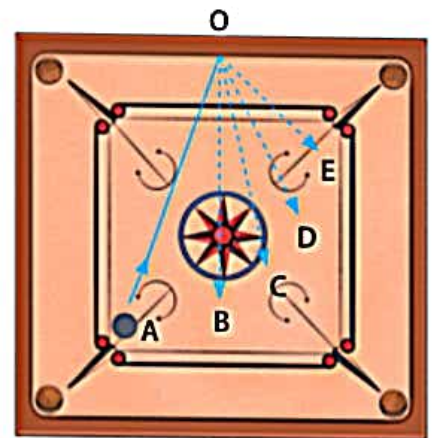
 $\angle AOC =$ $\angle BOD =$ $\angle AOE =$ $\angle BOF =$ $\angle AOG =$ $\angle BOG =$ $\angle AOB =$ $\angle BOC =$ 

6. Draw 10 different angles with a ruler in your notebook. Then measure them with your protractor.

7. This picture shows some of the angles a striker can make on a carrom board.

Name all the angles shown in the picture. You should get 10 angles.

- a. b. c. d. e.
f. g. h. i. j.



8. Mark all the angles you see on this origami penguin. Say how many of each kind you found. Try some origami paper folding and explore the angles you can make.



9. A magnetic compass shows direction. The magnetic end of the compass's needle points toward the north.

- a. If you are standing holding the compass facing east and you then turn to face west. How many degrees did you turn?
b. You are standing facing north. You turn 270 degrees clockwise. Which direction are you facing now?



Journal

Suppose the numbers on the inner scale of your protractor have got rubbed off, how will you use the outer scale to measure an angle that opens to the right?

FA



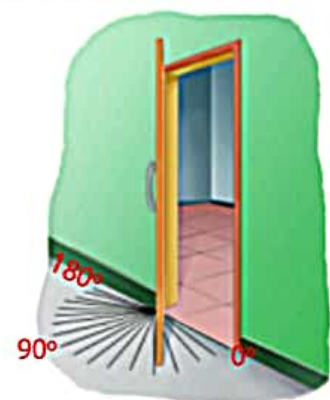
Activity

Work on a door at home or in your classroom.

Keep the door fully shut. Open it a little bit. Mark where the door opens, on the floor. What kind of angle does it form?

When the door is half open what angle does it form? Mark it on the floor.

Then keep the door more than half open. What angle does it form now? When the door is fully open and resting against the wall, what angle does it form?





Measurement

There are many unusual animals in the world. The glass frog with its transparent body, the sloth that can turn its head **270 degrees**, the okapi that looks like a mix of a giraffe and zebra, and the colugo that can glide up to **200 metres** in the air. Like all animals they are important and must be protected.



LOOKING BACK

Measurement of Length

$$1 \text{ m} = 100 \text{ cm}$$

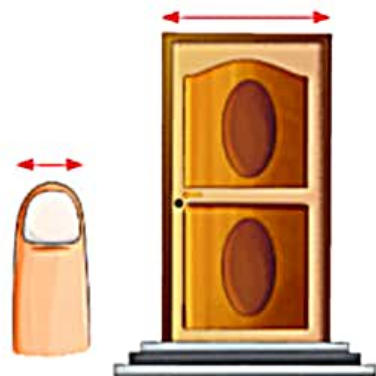
We use centimetres (cm) to measure small lengths and metres (m) for bigger lengths. Your finger is about 1 cm in breadth.

The breadth of a door is about 1 m.

$$1000 \text{ m} = 1 \text{ km}$$



We use kilometres (km) to measure even longer lengths like distances. 100 buses parked one behind the other would be about 1 km long.



Measurement of Mass

We use kilograms (kg) to weigh heavier objects and grams (g) to weigh lighter ones.

$$1 \text{ kg} = 1000 \text{ g}$$

A paper clip is about 1 g. 6 large tomatoes would weigh about 1 kg.



Measurement of Capacity

$$1 \text{ l} = 1000 \text{ ml}$$

We use litres (l) to measure larger quantities of liquid and millilitres (ml) to measure smaller quantities of liquid.

A teaspoon holds about 5 ml. Your water bottle probably holds about 1 l of water.



NCF 2023

Competencies in this chapter
C-3.1, C-3.2: Applicable to the entire chapter
C-3.3, C-3.5: Labelled on specific pages

MEASUREMENT OF LENGTH

A centimetre is too big to measure my pencil point!



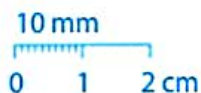
If you were asked to measure the lead tip of your pencil, what would you use?

You would need a smaller unit of measurement than a cm.

Try This!

- Take a grain of rice and measure its length to the nearest mm.
- Find a bangle and measure its thickness to the nearest mm.

If a centimetre is further put into 10 equal parts, each part is called a millimetre (mm).



$$1 \text{ cm} = 10 \text{ mm}$$

$$1 \text{ mm} = \frac{1}{10} \text{ cm}$$



We use millimetres to measure very small lengths or when we want to measure lengths with greater accuracy.

cm	1	2	3	4	5	6	7	8	9
mm	10	20	30	40	50	60	70	80	90

The breadth of the hour hand of your watch is about 1 mm.



The sparklemuffin is a newly discovered colourful dancing peacock spider in Australia. It is less than 5 mm long in real life.



5 mm

Approximate size in real life.

Try This!



Leaf insects, also called walking leaf, are known for their striking leaf-like appearance. Measure the picture.

Length: _____ cm _____ mm or _____ mm

Broadest part: _____ cm or _____ mm

Project

Take coins of different denominations. Measure the diameters in mm. Record your findings both in mm and cm.

FA

Mathspeak

If you were measuring the same object first in cm and then again in mm, which will have the bigger number and why?

FA

RELATING DIFFERENT UNITS OF LENGTH

C-3.3

You have now learnt four units of measurement of length. They are given below in order from big to small.

KILOMETRE (km)	→	More than a metre
METRE (m)	→	BASIC UNIT OF LENGTH
CENTIMETRE (cm)	}	Less than a metre
MILLIMETRE (mm)		

Let us see how they are connected to each other in the place value system.

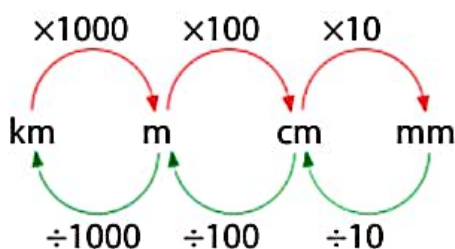
Thousands	Hundreds	Tens	Ones	tenths	hundredths	thousandths
kilometre km	hectometre	decametre	metre m	decimetre	centimetre cm	millimetre mm

Every move to the left increases the value of the unit 10 times.

Every move to the right decreases the value of the unit 10 times.

To convert one unit to the other we can use this table:

Multiply to change from a bigger unit to a smaller unit.



Divide to change from a smaller unit to a bigger unit.

Look at these examples.

- a. Bigger unit to smaller unit
- 2 km = 2000 m (2×1000)
 - 5 m = 500 cm (5×100)
 - 3 cm = 30 mm (3×10)

Remember the rule as BSM
Big to **S**mall
Multiply.

Remember the rule as SBD
Small to **B**ig
Divide.

- b. Smaller unit to bigger unit
- 5000 m = 5 km ($5000 \div 1000$)
 - 300 cm = 3 m ($300 \div 100$)
 - 20 mm = 2 cm ($20 \div 10$)



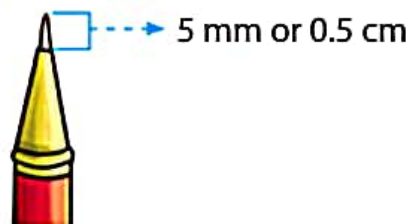
Journal

FA



In the International System of units, also called the metric system, the word kilo represents a thousand, centi is one-hundredth and milli represents one-thousandth. Explain in your own words how these prefixes help you understand and remember the relationship between different units of length.

Expressing Measurements in Different Ways



Diameter:
2 cm 3 mm or 2.3 cm

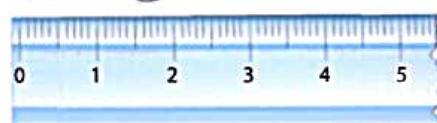
You have already learnt this in the decimals chapter.



5 m 20 cm = 5.20 m (using the bigger unit) = 520 cm (using the smaller unit)
2 cm 3 mm = 2.3 cm (using the bigger unit) = 23 mm (using the smaller unit)
6 km 300 m = 6.300 km (using the bigger unit) = 6300 m (using the smaller unit)

Exercise 10 A

1. Measure. Give your answer in cm and mm.



2. Complete the table.

	Full form	In bigger units	In smaller units
a.	36 m 14 cm	36.14 m	3614 cm
b.		98.98 m	9898 cm
c.	16 m 24 cm		1624 cm
d.	11 cm 2 mm		112 mm
e.		28.7 cm	287 mm
f.	49 cm 8 mm	49.8 cm	

Project

Find your height and the height of the members of your family.
Express it in cm and then in m.

Who is the tallest?

Who is the shortest?



FA

CONVERTING ONE UNIT INTO ANOTHER

C-3.3

Smaller Unit to Bigger Unit

Example 1: The honeypot ant stores liquid inside its own body as living storage to be used later by fellow ants when food is scarce. How long is a row of 11 honeypot ants of 8 mm length each?

11 × 8 = 88 mm is the length of the line in mm.

$$88 \text{ mm} = \boxed{?} \text{ cm}$$

$$88 \div 10 = 8.8 \text{ cm}$$

Answer: The row of honeypot ants is 8.8 cm long.



Millimetre (mm) is the smaller unit and centimetre (cm) is the bigger unit. The rule says **Small to Big Divide (SBD)**.

The chart on page 162 will help you.

Example 2: The orchid mantis is a master of camouflage and looks exactly like a pink orchid flower. If it can leap 25 cm in one jump, how many metres can it go in 75 such jumps?



75 × 25 cm = 1875 cm would have been covered.

$$1875 \text{ cm} = \boxed{?} \text{ m}$$

$$1875 \div 100 = 18.75 \text{ m}$$

Answer: It would have gone 18.75 m.

Example 3: 2695 m = $\boxed{?}$ km

2695 ÷ 1000 = 2.695 km

Answer: 2.695 km

Bigger Unit to Smaller Unit

Example 1: A narwhal is a whale that looks like it has a horn. How many cm is a narwhal that is 3.6 m long?



$$3.6 \text{ m} = \underline{\hspace{2cm}} \text{ cm}$$

$$3.6 \times 100 = 360 \text{ cm}$$

Answer: The narwhal is 360 cm long.

Metre (m) is the bigger unit and centimetre (cm) is the smaller unit. The rule says **Big to small Multiply (BSM)**.

The chart on page 162 will help you.

Example 2: A pile of 100 chapattis is 21 cm.

How thick is 1 chapatti in mm?

21 × 10 = 210 mm -----> To find the thickness of the pile in mm

210 ÷ 100 = 2.1 mm -----> To find the thickness of one chapatti

Answer: One chapatti is 2.1 mm.



Exercise 10 B

1. Fill in the blanks.

- a. Height of a glass = $0.12\text{ m} = \underline{\hspace{2cm}}\text{ cm}$
- b. Height of a tree = $960\text{ cm} = \underline{\hspace{2cm}}\text{ m}$
- c. Height of a building = $0.1\text{ km} = \underline{\hspace{2cm}}\text{ m}$
- d. Distance from floor to ceiling = $3.8\text{ m} = \underline{\hspace{2cm}}\text{ cm}$
- e. Length of a cricket bat = $0.87\text{ m} = \underline{\hspace{2cm}}\text{ cm}$
- f. Length of a tennis racket = $72\text{ cm} = \underline{\hspace{2cm}}\text{ mm}$
- g. Height of a table = $70\text{ cm} = \underline{\hspace{2cm}}\text{ m}$
- h. Thickness of a pencil = $0.8\text{ cm} = \underline{\hspace{2cm}}\text{ mm}$
- i. Length of a mobile phone = $9.2\text{ cm} = \underline{\hspace{2cm}}\text{ mm}$
- j. Thickness of an encyclopedia = $42\text{ mm} = \underline{\hspace{2cm}}\text{ cm}$



2. Fill in the blanks.

- a. $6.2\text{ km} = \underline{\hspace{2cm}}\text{ m}$
- b. $0.12\text{ km} = \underline{\hspace{2cm}}\text{ m}$
- c. $9.1\text{ km} = \underline{\hspace{2cm}}\text{ m}$
- d. $6300\text{ m} = \underline{\hspace{2cm}}\text{ km}$
- e. $1100\text{ m} = \underline{\hspace{2cm}}\text{ km}$
- f. $2800\text{ m} = \underline{\hspace{2cm}}\text{ km}$

3. Find the thickness of:

- a. 1 coin when a pile of one hundred ₹5 coins is 150 mm high.
- b. 1 biscuit when a pile of 100 biscuits is 580 mm high.
- c. 1 eraser when a pile of 10 erasers is 9.8 cm high.
- d. 1 mobile phone when a pile of 10 mobile phones is 8 cm high.
- e. 10 sheets of cardboard when a pile of 100 sheets of cardboard is 30 cm high.

4. Application in real life.

- a. Mrs Kapoor has two clothes lines in her balcony. One is 5 m long and the other is 4.05 m long. How much longer is the first clothes line than the second?



- b. A rabbit's hop is about 2 m long. How many hops does a rabbit take to travel 1 km ? [Hint: Convert km to m first.]

- c. Varsha runs 3.2 km a day. How far does Varsha run in a week?

- d. Karan has placed a stool on a table to reach the top of his cupboard. If the height of the table is 98 cm , and the stool is 65 cm , at what height in metres is Karan standing?
- e. A bookshelf is 45 cm wide. How many books of width 9 mm can fit in the shelf? [Hint: Convert cm to mm first]
- f. Avinash is 1.8 m tall. Arun is 191 cm tall. How much taller is Arun than Avinash? [Hint: Convert m to cm first]
- g. Monika's shoe is 20.8 cm long. Kabir's shoe is 6 mm longer than Monika's shoe. How long is Kabir's shoe in cm ?

Project

FA

Use a measuring tape and measure the length of the following in cm and mm. Record your findings first only in mm and then only in cm.

1. Length of your table
2. Length of your pencil box
3. Thickness of your eraser
4. Thickness of your maths textbook

Journal



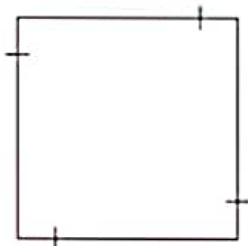
Explain in your own words why you would use division to change a smaller unit to a bigger one. What would happen if you multiplied instead? How would you know that you are wrong?

FA

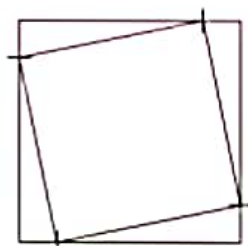


Create Optical Art

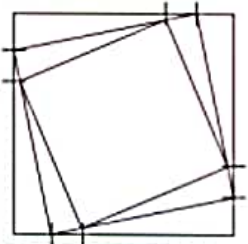
Step 1: Draw a square of sides 10 cm. Mark off 1 cm from each corner as shown.



Step 2: Join the points to create a new square.



Step 3: Now mark off 1 cm again from the corners of the new square and join to make yet another square.



Step 4: Keep repeating the steps and joining to make squares within squares till you can't do that anymore. Colour as shown with black felt pen.



Repeat with other measurements. Experiment with colours.

Challenge!

Three volumes of an encyclopaedia are kept on a shelf as shown. Each volume has pages that are 2 cm thick together and covers that are each 2 mm thick.

If a worm starts eating from page 1 of volume 1 to the last page of volume 3, how far would it travel? (Hint: Keep three books as shown and see where the page numbers start before giving your answer.)



MEASUREMENT OF MASS

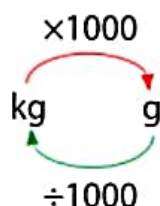
You know that, $1 \text{ kg} = 1000 \text{ g}$.

Let us see how these units are related to each other using the place value system.

Thousands	Hundreds	Tens	Ones	tenths	hundredths	thousandths
kilogram kg	hectogram	decagram	gram g	decigram	centigram	milligram mg

To convert:

Multiply to change from a bigger unit to a smaller unit one.



Divide to change from a smaller unit to a bigger unit one.

Common Mistake!

5 kg 361 g
 $= 5.316 \text{ g}$ ✗
 $= 5.361 \text{ kg}$ ✓

You learnt in the decimal chapter that we can express the same measurement in different ways.

5 kg 361 g = 5.361 kg (using the bigger unit) = 5361 g (using the smaller unit)

Converting from a smaller unit to a bigger one—SBD rule

- a. A pangolin's body is covered in scales and it can make itself into a ball for protection. What does a young pangolin of 454 g weigh in kilos?

➡ 454 g = ? kg

$454 \div 1000 = 0.454 \text{ kg}$

Answer: A young pangolin weighs 0.454 kg.



b. 12350 g = ? kg

➡ $12350 \div 1000 = 12.350 \text{ kg}$

Converting from a bigger unit to a smaller one—BSM rule



- c. A frilled lizard displays its frills when it is frightened and is trying to protect itself. What is the weight in g of a frilled lizard that weighs 0.49 kg?

➡ 0.49 kg = ? g

$0.49 \times 1000 = 490 \text{ g}$

Answer: A frilled lizard weighs 490 g.

d. 2.7 kg = ? g

➡ $2.7 \times 1000 = 2700 \text{ g}$

Challenge!

You have 6 coins of the same type. One is fake and lighter than the rest.

How will you find the fake coin with only two weighings on the balance scale?



Exercise 10 C

1. Fill in the blanks.

- a. $19.386 \text{ kg} = \text{_____ kg _____ g}$ b. $0.832 \text{ kg} = \text{_____ kg _____ g}$
c. $2 \text{ kg } 614 \text{ g} = \text{_____ g}$ d. $8.610 \text{ kg} = \text{_____ g}$
e. $3246 \text{ g} = \text{_____ kg _____ g}$ f. $11296 \text{ g} = \text{_____ kg}$

2. Find the weight in g.

a.



0.42 kg

b.



0.9 kg

c.



1.6 kg

d.



5.19 kg

3. Find the weight in kg.

a.



125 g

b.



900 g

c.



1120 g

d.



9500 g

4. Convert.

- a. $715 \text{ g} = \text{_____ kg}$ b. $0.06 \text{ kg} = \text{_____ g}$ c. $2375 \text{ g} = \text{_____ kg}$
d. $1.04 \text{ kg} = \text{_____ g}$ e. $12.1 \text{ kg} = \text{_____ g}$ f. $8008 \text{ g} = \text{_____ kg}$
g. $932 \text{ g} = \text{_____ kg}$ h. $0.35 \text{ kg} = \text{_____ g}$ i. $6125 \text{ g} = \text{_____ kg}$

5. Solve the following word problems.

- a. One egg has a mass of 50 g. How many eggs are there in 1 kg?
b. Srinath is 1750 g heavier than his friend Kabir. If Kabir weighs 32 kg, what is Srinath's weight?
c. Mrs Anwar bought 500 g apples, 750 g grapes, 250 g strawberries, and 1 kg oranges. How many kilograms of fruit did she buy?

Data Connect

Open the Data Bank on page 244 and study the data on 'Comparing the Size of Some Famous Statues'. Then answer the questions below.

- List out the statues from the tallest to the shortest.
- What is the difference between the height of the tallest and shortest statue in the list? Give your answer in cm.
- One tonne is 1000 kg. The outer facade of the Statue of Unity is made of 1850 tonnes of bronze cladding. How many kg is that?
- Which is the oldest statue in the list? How many years ago was it built?
- Find out the names and locations of the five tallest statues in the world and make a list giving their heights.

MEASUREMENT OF CAPACITY

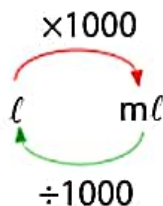
You know that, $1 \ell = 1000 \text{ mL}$.

Let us see how these units are related to each other using the place value system.

Thousands kilolitre	Hundreds hectolitre	Tens decalitre	Ones litre ℓ	tenths decilitre	hundredths centilitre	thousandths millilitre mL
------------------------	------------------------	-------------------	-------------------------	---------------------	--------------------------	--

To convert:

Multiply to change from a bigger unit to a smaller unit one.



Divide to change from a smaller unit to a bigger unit one.

Common Mistake!

$1 \ell 250 \text{ mL}$
 $= 1.250 \text{ mL} \times$
 $= 1.250 \ell \checkmark$

You have learnt in the decimal chapter that we can express the same measurement in different ways.

$1 \ell 250 \text{ mL} = 1.250 \ell$ (using the bigger unit) $= 1250 \text{ mL}$ (using the smaller unit)

Converting a smaller unit to a bigger one—SBD rule

- a. A bactrain camel has two humps. A thirsty camel can drink 13500 mL of water in one minute. How many ℓ is that?

$\Rightarrow 13500 \text{ mL} = ? \ell$

$13500 \div 1000 = 13.5 \ell$

Answer: The camel can drink 13.5ℓ in a minute.

- b. $550 \text{ mL} = ? \ell$

$\Rightarrow 550 \div 1000 = 0.550 \ell$



Converting the bigger unit to a smaller one—BSM rule

- c. An elephant drinks by using its long trunk to suck up 12.5ℓ of water and then pouring it into its mouth. How many mL is that?

$\Rightarrow 12.5 \ell = ? \text{ mL}$

$12.5 \times 1000 = 12500 \text{ mL}$

Answer: The elephant can suck 12500 mL of water.



- d. $0.8 \ell = ? \text{ mL}$

$0.8 \times 1000 = 800 \text{ mL}$

Try This!

a. $7800 \text{ mL} = \underline{\hspace{2cm}} \ell$

b. $260 \text{ mL} = \underline{\hspace{2cm}} \ell$

c. $0.11 \ell = \underline{\hspace{2cm}} \text{ mL}$

d. $9.75 \ell = \underline{\hspace{2cm}} \text{ mL}$

Exercise 10 D

1. Match the following.

- | | |
|----------------|----------------|
| a. 3 ℓ 725 mℓ | i. 14.500 ℓ |
| b. 30 ℓ 725 mℓ | ii. 8685 mℓ |
| c. 8.685 ℓ | iii. 30.725 ℓ |
| d. 80685 mℓ | iv. 3725 mℓ |
| e. 1.450 ℓ | v. 80.685 ℓ |
| f. 14500 mℓ | vi. 1 ℓ 450 mℓ |

2. Find the capacity in mℓ.

a.



1.3 ℓ

b.



15.5 ℓ

c.



0.35 ℓ

d.



0.9 ℓ

3. Find the capacity in ℓ.

a.



335 mℓ

b.



950 mℓ

c.



2500 mℓ

d.



5250 mℓ

4. Convert the following.

- | | | |
|----------------------|-----------------------|----------------------|
| a. 0.4 ℓ = _____ mℓ | b. 8.03 ℓ = _____ mℓ | c. 0.14 ℓ = _____ mℓ |
| d. 750 mℓ = _____ ℓ | e. 15.35 ℓ = _____ mℓ | f. 100 mℓ = _____ ℓ |
| g. 4000 mℓ = _____ ℓ | h. 1840 mℓ = _____ ℓ | i. 1.25 ℓ = _____ mℓ |

5. Problem solving.

- A bottle of juice holds 750 mℓ of juice. Can two such bottles be poured into a jar that holds 1.5 ℓ without any being left over?
- A kettle holds about 900 mℓ of tea. How many tea cups of 150 mℓ each can it fill? (Hint: Use repeated subtraction.)
- A shower drips at the rate of 150 mℓ an hour. How many litres of water would drip from it in 8 hours?

Project

FA

Calculate the amount of water, a tap, that has not been closed properly, loses in a minute, an hour, a day, and a week. Put up the information on a bulletin board and encourage people to save water. (First collect the amount of water that drips in a minute and measure with a measuring glass. Use this measurement to calculate the rest.)



ADDING AND SUBTRACTING MEASUREMENTS

Theme: Measurements in the Kitchen

Example 1: One glass plate has a thickness of 5 mm and the other has a thickness of 7 mm. What is their combined thickness if they are placed one on top of the other?

➡ $5 \text{ mm} + 7 \text{ mm} = \underline{\hspace{1cm}} \text{ mm}$

$12 \text{ mm} = \underline{\hspace{1cm}} \text{ cm } \underline{\hspace{1cm}} \text{ mm}$

Answer: The plates were $\underline{\hspace{1cm}} \text{ cm } \underline{\hspace{1cm}} \text{ mm}$ thick.

cm	mm
1	5
+	7
1	2

Example 2: One kitchen window needs 3 m 75 cm of fabric for curtains and another window needs 2 m 50 cm of fabric. How much fabric should be bought in all?



➡ $3 \text{ m } 75 \text{ cm} + 2 \text{ m } 50 \text{ cm} = \boxed{?}$

$3 \text{ m} + 2 \text{ m} = \underline{\hspace{1cm}} \text{ m}$

$75 \text{ cm} + 50 \text{ cm} = \underline{\hspace{1cm}} \text{ cm}$

$125 \text{ cm} = \underline{\hspace{1cm}} \text{ m } \underline{\hspace{1cm}} \text{ cm}$

$5 \text{ m} + 1 \text{ m } 25 \text{ cm} = \underline{\hspace{1cm}} \text{ m } \underline{\hspace{1cm}} \text{ cm}$

m	cm
3	75
+	2 50
6	25

Answer: $\underline{\hspace{1cm}} \text{ m } \underline{\hspace{1cm}} \text{ cm}$ of fabric should be bought.

Example 3: There are two pressure cookers in the kitchen. One weighs 980 g and the other weighs 1 kg 200 g. How much do they weigh together?

➡ $1 \text{ kg } 200 \text{ g} + 980 \text{ g} = \boxed{?}$

$1 \text{ kg } 200 \text{ g} + 980 \text{ g} = 1 \text{ kg } 1180 \text{ g}$

But $1180 \text{ g} = 1 \text{ kg } 180 \text{ g}$

So $1 \text{ kg} + 1 \text{ kg } 180 \text{ g} = \underline{\hspace{1cm}} \text{ kg } \underline{\hspace{1cm}} \text{ g}$



kg	g
1	200
+	980
2	180

Answer: Both cookers together weigh $\underline{\hspace{1cm}} \text{ kg } \underline{\hspace{1cm}} \text{ g}$.

Example 4: 24 ℓ of water was used one morning in the kitchen. Of this 13 ℓ 500 mℓ was used for washing dishes. How much water was used for drinking?



➡ $24 \text{ ℓ} - 13 \text{ ℓ } 500 \text{ mℓ} = \boxed{?}$

24 ℓ is the same as $23 \text{ ℓ } 1000 \text{ mℓ}$

$23 \text{ ℓ} - 13 \text{ ℓ} = \underline{\hspace{1cm}} \text{ ℓ}$

$1000 \text{ mℓ} - 500 \text{ mℓ} = \underline{\hspace{1cm}} \text{ mℓ}$

Answer: $\underline{\hspace{1cm}} \text{ ℓ } \underline{\hspace{1cm}} \text{ mℓ}$ was used for drinking.

ℓ	mℓ
24	000
-	13 500
10	500

Example 5: Out of 2 kg tomatoes that were bought, 250 g are still remaining. How much was used?

2 kg - 250 g = ?

2 kg is the same as 1 kg 1000 g.

1 kg 1000 g - 250 g = ____ kg ____ g

Answer: ____ kg ____ g tomatoes were used.



kg	g
1	1000
2	000
-	250
1	750

Exercise 10 E

1. Add.

- a. 17 m + 12 m 6 cm b. 6 cm 5 mm + 1 cm 9 mm c. 5 kg 200 g + 6 kg 800 g
d. 1 kg 500 g + 1 kg 750 g e. 2 l 250 ml + 900 ml f. 5 l 600 ml + 2 l 500 ml

2. Subtract.

- a. 10 m - 6 m 50 cm b. 7 cm 8 mm - 1 cm 9 mm c. 2 kg 200 g - 1 kg 100 g
d. 5 kg - 1 kg 250 g e. 2 l 800 ml - 1 l 100 ml f. 10 l 250 ml - 1 l 750 ml

3. Application in real life.

- a. A snail travelled 2 m 32 cm on one day, and 1 m 93 cm on the second day. How far had the snail travelled in all?
b. A worm climbing up a high wall went 12 m on one day, but slipped back by 2 m 35 cm in the evening. How far up had the worm reached that day?
c. A jug that contained 1 l of orange juice was poured out into 3 glasses of 200 ml, 150 ml, and 300 ml. How much juice was left in the jug?
d. A gold brick weighing 4 kg was melted. It lost 150 g of weight during melting. How much gold was left in the brick?
e. A porter was carrying two bags—one weighing 16 kg 800 g and the other weighing 10 kg 950 g. How much weight was the porter carrying?
f. The tailor made a mistake and made the length of the curtain 150 cm when it should have been 175 cm. By how much did he go wrong?



Project

FA

- Find out and list the different situations when weight and capacity measurements are used in the kitchen.
- Create two questions each on weight and capacity that require addition and subtraction to be answered. Ask a friend to solve the questions.



ESTIMATING MEASURES

C-3.5

In real life, we often estimate measurements. But before we estimate we need to have experience of real measurements. Having a reference point of basic measures helps us estimate. The reference point is also called a benchmark. For example, a finger is *about* 1 cm wide. A pencil is *about* 12 finger widths, so the pencil is *about* 12 cm. Given below are some commonly used benchmarks. They will also help you decide which unit to use.



Weight of one tablet of medicine (About 1 g)



Weight of two maths text books (About 1 kg)



Walking for 10 minutes (About 1 km)



Width of an index finger (About 1 cm)



Breadth of a door (About 1 m)



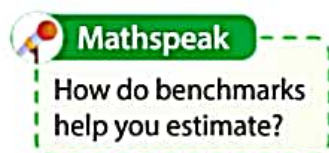
Thickness of a finger nail (About 1 mm)



Medicine in a dropper (About 1 mL)



A bottle of oil (About 1 L)



Mathspeak

How do benchmarks help you estimate?

Try This!

Ring the correct answer. Keep the benchmarks given above in mind.

a.



weight of a ₹5 coin
9 g/500 g

b.



weight of a book
500 g/500 kg

c.



weight of a brinjal
120 kg/120 g

d.



capacity of an aquarium
3 L/30 L

e.



weight of a toothpaste
100 g/100 kg

f.



capacity of a glass
300 mL/30 mL

g.



length of a chalk
8 cm/80 cm

h.



length of a shoe laces
500 cm/50 cm

i.



length of an aeroplane
900 m/70 m

Exercise 10 F

1. Match the object to the estimated measure as shown by the arrow.

a.



b.



c.



d.



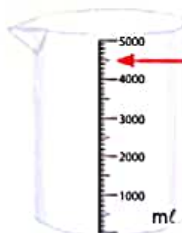
e.



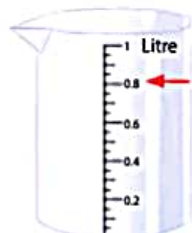
i.



ii.



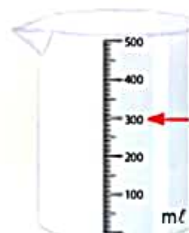
iii.



iv.



v.



2. Fill in the blanks with the correct unit.

- A bicycle weighs about 25 _____.
- A car is about 3 _____ long.
- A bucket holds about 20 _____ of water.
- The length of a latch is about 12 _____.
- A bottle of an aerated drink holds about 300 _____.
- The thickness of a needle is about 2 _____.

First decide whether you need a unit of length, capacity, or mass. Then choose the correct one.



3. Estimate in cm. Then measure to check the estimate.

	Estimate (in cm)	Actual (in cm)	Difference (in cm)
a. Length of your pencil			
b. Length of your thumb			
c. Length of your eraser			
d. Length of your book			
e. Length of your table			

Chapter Check-Up



Colour the circle that describes best how you feel.

I got this!

I'm getting there!

I need help!

Vocabulary Review

- Millimetre/mm
- Height
- Distance
- Length
- Width
- Millilitre/ml
- Kilometre/km
- Metric system
- Litre/l
- Centimetre/cm
- Kilogram/kg
- Mass
- Converting units
- Gram/g
- Capacity
- Decimals
- Metre/m
- Liquid
- Estimating

1. Convert.

- a. $0.8 \text{ km} = \underline{\hspace{2cm}} \text{ m}$ b. $1500 \text{ m} = \underline{\hspace{2cm}} \text{ km}$ c. $8.4 \text{ km} = \underline{\hspace{2cm}} \text{ m}$
 d. $0.18 \text{ m} = \underline{\hspace{2cm}} \text{ cm}$ e. $720 \text{ cm} = \underline{\hspace{2cm}} \text{ m}$ f. $3.5 \text{ m} = \underline{\hspace{2cm}} \text{ cm}$
 g. $1.2 \text{ cm} = \underline{\hspace{2cm}} \text{ mm}$ h. $220 \text{ mm} = \underline{\hspace{2cm}} \text{ cm}$ i. $0.3 \text{ cm} = \underline{\hspace{2cm}} \text{ mm}$

2. Convert.

- a. $850 \text{ g} = \underline{\hspace{2cm}} \text{ kg}$ b. $0.09 \text{ kg} = \underline{\hspace{2cm}} \text{ g}$ c. $1380 \text{ g} = \underline{\hspace{2cm}} \text{ kg}$
 d. $0.90 \text{ kg} = \underline{\hspace{2cm}} \text{ g}$ e. $1.15 \text{ kg} = \underline{\hspace{2cm}} \text{ g}$ f. $2200 \text{ g} = \underline{\hspace{2cm}} \text{ kg}$

3. Convert.

- a. $0.5 \text{ l} = \underline{\hspace{2cm}} \text{ ml}$ b. $0.17 \text{ l} = \underline{\hspace{2cm}} \text{ ml}$ c. $1880 \text{ ml} = \underline{\hspace{2cm}} \text{ l}$
 d. $7.25 \text{ l} = \underline{\hspace{2cm}} \text{ ml}$ e. $200 \text{ ml} = \underline{\hspace{2cm}} \text{ l}$ f. $950 \text{ ml} = \underline{\hspace{2cm}} \text{ l}$

4. Cross out (✗) the wrong one.

- a. Weight of a mobile phone – 15 g/ 150 g b. Tetra pack of juice – 20 ml/200 ml
 c. Length of a laptop – 30 cm/300 cm

5. Application in real life.

- a. Mrs Arora buys 1 m 40 cm of cloth for her younger son and 1 m 80 cm of cloth for her older son. How much cloth does she buy in all?
 b. A full suitcase weighs 9 kg 100 g. A book weighing 750 g is removed from it. What is the weight of the suitcase now?
 c. 1 l 200 ml oil was used up from an oil can of 5 l. How much is left in the can now?

6. Tick (✓) the correct answer.

Give the length of the sticker.



- a. 29 cm b. 2.9 m
 c. 2.9 mm d. 2.9 cm

Keeping in Touch

What kind of angles are these?

- a. $\angle ABC = 40^\circ$ b. $\angle XYZ = 90^\circ$
 c. $\angle PQR = 170^\circ$ d. $\angle MNO = 180^\circ$



Building a House

Perimeter, Area, and Volume

Mathematics is needed in every aspect of building a house and architects need **geometry**, **measurement**, and **calculation** skills. If a large apartment complex has a **rectangular** swimming pool with a **length** of **33.5 m**, **how many** times would a swimmer need to swim the length to cover a minimum distance of **100 m**?



LOOKING BACK

Perimeter is the distance around the edge of a figure.

The perimeter of this stamp is

$$3 \text{ cm} + 3 \text{ cm} + 3 \text{ cm} + 3 \text{ cm} = 12 \text{ cm}$$

Area is the amount of surface a figure covers.

The stamp covers 9 squares of 1 cm sides. The area of this stamp is 9 square centimetres or 9 sq. cm.

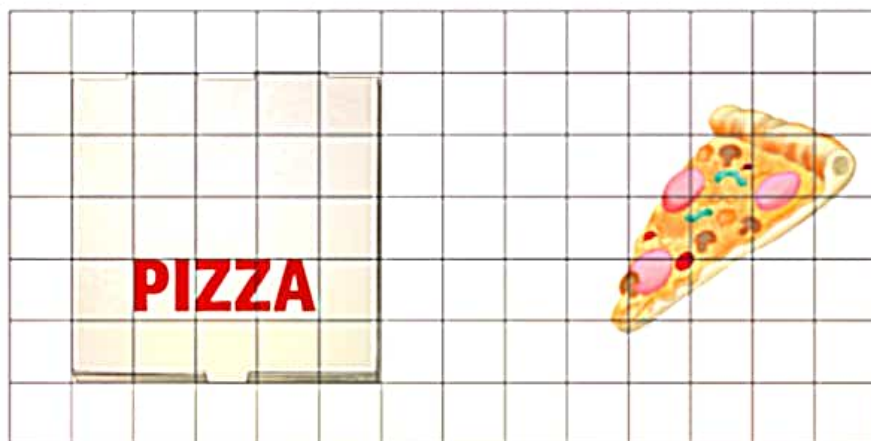


P e r
r i m
e t e r

area

Here is a clue to remember the terms:

Find the perimeter and area of the pizza box and the pizza piece. Take each square to have side of 1 unit. You can use a string to measure the perimeter of the irregular shape.



Mathspeak

You can find the perimeter of a square if you know one of its sides. But you cannot find the perimeter of a rectangle if you know one of its sides. Explain why.

FA

NCF 2023

Competencies in this chapter
C-3.2, C-3.4, C-3.5, 3.6, 3.7, C-4.3:
Labelled on specific pages

PERIMETER OF A RECTANGLE

Example 1: This is a garden in front of a house. A border of stones is being laid around the edge of the entire garden. What will be the total length of the stone border?

➡ The perimeter of the garden will give us the length of the stone border.

The perimeter of the garden is:

$$50 \text{ m} + 35 \text{ m} + 50 \text{ m} + 35 \text{ m} = 170 \text{ m}$$

Since we are adding 2 lengths and 2 breadths of equal size we can also find the perimeter by using a shortcut.

Perimeter of a rectangle = $2 \times (\text{length} + \text{breadth})$

$$P = 2(l + b)$$

$$l = 50 \text{ m} \quad b = 35 \text{ m}$$

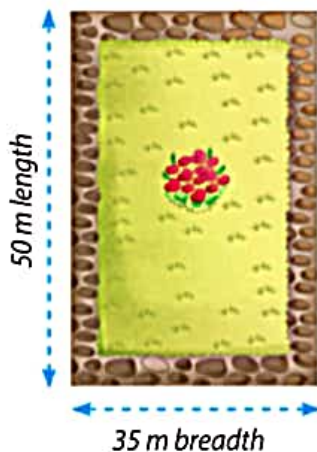
$$P = 2(50 + 35)$$

$$= 2(85)$$

$$= 2 \times 85 = 170$$

Answer: The total length of the stone border will be 170 m.

C-3.2



Common Mistake!

Perimeter = 170 ✗

Perimeter = 170 m ✓

Work within the brackets first.



PERIMETER OF A SQUARE

There are square windows in the rooms of the house. The windows have sides of 95 cm.

The perimeter of the window is:

$$95 \text{ cm} + 95 \text{ cm} + 95 \text{ cm} + 95 \text{ cm} = 380 \text{ cm}$$

All the sides of a square are equal.

So perimeter of a square = side + side + side + side

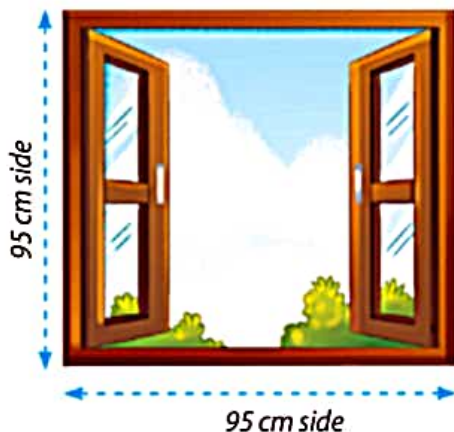
We can also find the perimeter by using a shortcut.

Perimeter of a square = $4 \times \text{length of side}$

$$P = 4 \times 95 = 380 \text{ cm}$$

Perimeter of the window = 380 cm

C-3.2



Try This!

Find the perimeter of these objects using the shortcut.

a. Your maths textbook = l _____ b _____

b. Your table = l _____ b _____

c. Your pencil box = l _____ b _____



Mathspeak

FA

The perimeter of a square and rectangle is always even. Explain why.

Exercise II A

1. Find the perimeter of these objects by using the shortcut.

a.



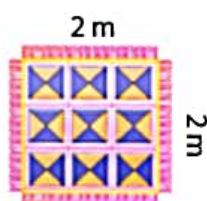
b.



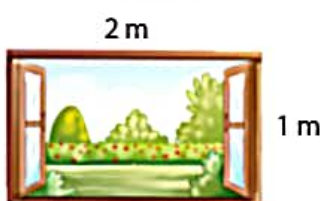
c.



d.



e.



f.



2. Find the perimeter of these squares.

	a.	b.	c.	d.	e.	f.	g.	h.	i.	j.
Side of square in cm	3	5	11	18	25	30	41	55	63	92
Perimeter in cm	12									

3. Find the perimeter of these rectangles.

	a.	b.	c.	d.	e.	f.	g.	h.	i.	j.
l in cm	3	4	4	5	5	6	6	6	8	9
b in cm	2	2	3	4	2	3	4	5	6	7
P in cm	10									

4. The perimeter is given. Find the side of these squares.

	a.	b.	c.	d.	e.	f.	g.	h.	i.	j.
P in m	28	40	64	96	120	172	232	300	384	556
Side of square in m	7									

5. Find two different rectangles with perimeter 12.

6. Find the perimeter of:

- the kitchen cabinet in your house.
- your bed at home.

Challenge!

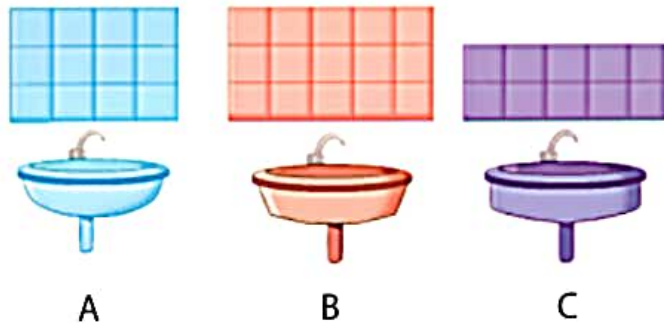
This rangoli has been made of hexagon shapes with all equal sides. Each hexagon has a perimeter of 24 cm. What is the perimeter of the entire rangoli?



AREA OF A RECTANGLE

C-3.4

The masons have finished the tiling in a house. The wall in front of each washbasin has been tiled.



So, area of
Wall A = $3 \times 4 = 12$ sq. units

Wall B = $____ \times ____ = ____$ sq. units

Wall C = $____ \times ____ = ____$ sq. units

Area of the rectangle = length $\times$ breadth

$$A = l \times b$$

Find the area of each tiled wall. Remember the longer side of a rectangle is called length and the shorter side is called width or breadth.

Wall	Length	Breadth	Area (Total number of tiles used)
A	4 units	3 units	12 sq. units
B			
C			

Do you see a relationship between the length, breadth, and area of the rectangle?

This is a shortcut!



Journal

FA



The model given below has been completed for the word 'circle' in the centre. Draw and fill in two similar ones in your journal – one with 'perimeter' written in the centre and one with 'area' written in the centre.

Definition (in your own words)

A circle is a round shaped figure that has no corners or edges.

Facts (or characteristics)

- ★ It is a closed curve.
- ★ The diameter passes through the centre.
- ★ The radius is half the diameter.

Circle

Examples (words or pictures)

Coin, clock, whole pizza



Non-Examples (words or pictures)

Book, TV, pizza slice



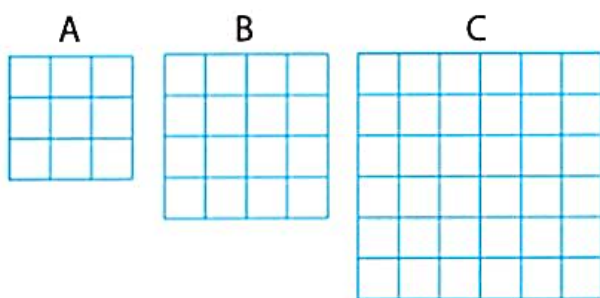
AREA OF A SQUARE

C-3.4

A square is a special rectangle with equal length and breadth.

Fill in the columns for these squares as you did for the rectangles.

Figure	Length	Breadth	Area (Total number of squares)
A	3 units	3 units	9 sq. units
B			
C			



Do you see a relationship between the length, breadth, and area of a square?

Area of a square = Side $\times$ Side

$$A = S \times S$$

So, area of figure A = $3 \times 3 = 9$ sq. units

$$B = ___ \times ___ = ___ \text{ sq. units}$$

$$C = ___ \times ___ = ___ \text{ sq. units}$$

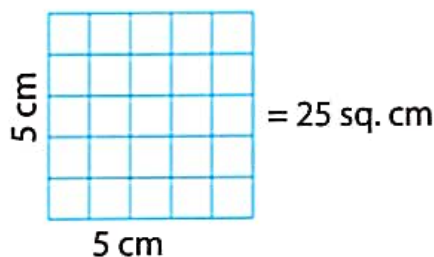
When the unit being used is in cm, the area will be in square centimetres or sq. cm.

Area of a square of sides 5 cm = $5 \times 5 = 25$ sq. cm

Common Mistake!

Area = 36 cm ✗

Area = 36 sq. cm ✓



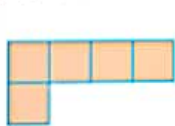
Project

FA

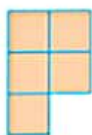


A pentomino is a figure made up of 5 equal squares joined together to share sides.

These are two examples of pentominoes.

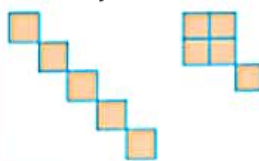


Perimeter = 12 units
Area = 5 sq. units



Perimeter = 10 units
Area = 5 sq. units

These are not pentominoes



These two pentominoes are the same.



It is possible to make 12 different kinds of pentominoes. Explore on a square-lined paper to find all of them. Find the perimeter of each. Once you have found all the 12 pentominoes, stick them on card paper, cut them out, and use them like jigsaw pieces. Try to find a way to fit all the 12 pieces to create a large rectangle.

There is more than one way to do that.

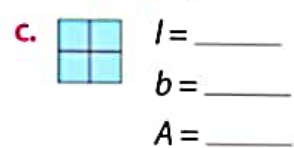
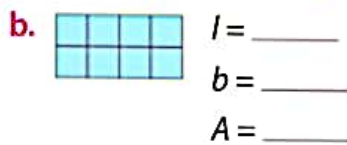
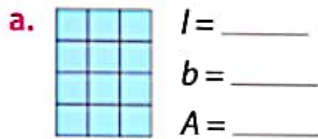


Mathspeak

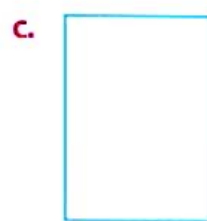
Describe the relationship between the area of a square with sides of 1 m and another square with sides of 100 cm.

Exercise II B

1. Use the shortcut to find the area of these figures. Give your answer in square units.



2. Use a cm ruler to find the length and breadth of these shapes. Then find their area using the shortcut. Give your answer in sq. cm.



3. Find the area of these shapes.

a. $l = 9 \text{ cm}, b = 5 \text{ cm}$

b. $l = 12 \text{ cm}, b = 10 \text{ cm}$

c. $l = 13 \text{ cm}, b = 5 \text{ cm}$

d. $l = 15 \text{ cm}, b = 1.5 \text{ cm}$

e. $l = 9 \text{ cm}, b = 2.1 \text{ cm}$

f. $l = 10 \text{ cm}, b = 5.2 \text{ cm}$

4. Fill in the columns.

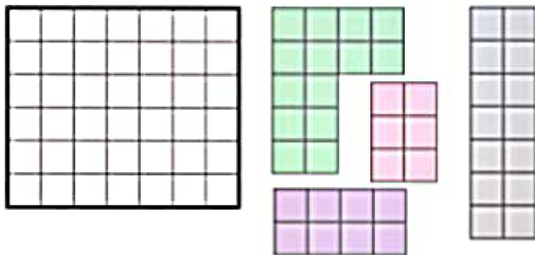
	a.	b.	c.	d.	e.	f.	g.	h.	i.	j.
Length in cm	7	12	8	9			13	17		
Breadth in cm	3				6	4			11	8
Area in sq. cm	21	48	16	36	42	112	130	187	220	136

5. A board game is made up rows and columns of squares. It has an area of 40 sq. units. What are the different possible dimensions in terms of length and breadth that the board game could have?

6. A square has an area of 81 sq. units. What is its perimeter?

Challenge!

The coloured shapes have a total area that is the same as the rectangle. Colour the rectangle to show how the shapes would fit.



Project

FA

Take a double sheet of newspaper and a 30 cm ruler. Measure the length and breadth of the open newspaper and calculate its area and perimeter. Record the same. Fold the newspaper in half and repeat. Record the area and perimeter. Keep repeating till the seventh fold or till the paper cannot be folded any further. Keep recording your findings.

Journal

A square with sides 5 cm has an area of 25 sq. cm. How will the area change if the sides are doubled?

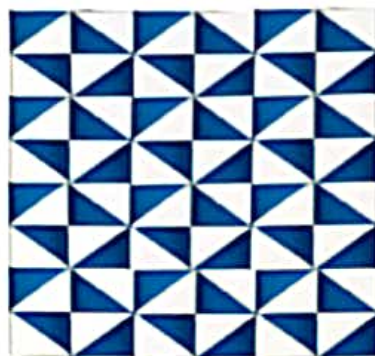
AREA OF A TRIANGLE

C-3.5

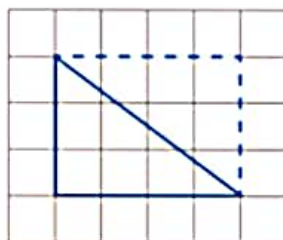
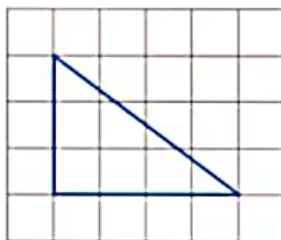
Sometimes while laying tiles, masons cut them into triangles, so that they can lay them in patterns. How do they know how many tiles to cut to fit a particular space?

After finding the area of the space to be covered, they need to first find the area of the triangle.

The rectangle method of finding area of a triangle.



- a. To find the area of a triangle with a right angle, draw a rectangle as shown.



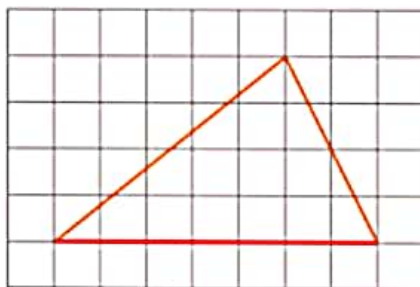
Area of the rectangle is $4 \times 3 = 12$ sq. units.

The area of the triangle is half the area of the rectangle.

Area of the triangle = 6 sq. units.

- b. To find the area of a triangle without a right angle.

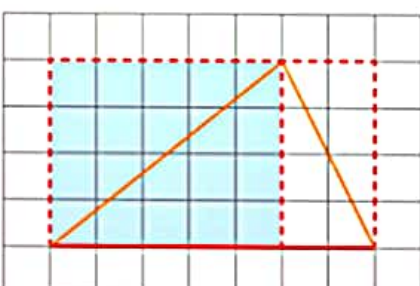
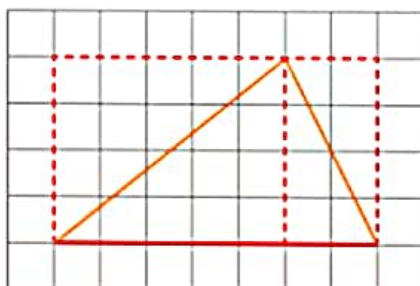
Step 1: Draw a rectangle around the triangle.



Mathspeak

You have a triangle with all sides equal. Its perimeter is 36 cm. Can you find the length of the sides of the triangle? Explain how.

Step 2: Divide the triangle in two parts as shown. Work on one rectangle at a time.

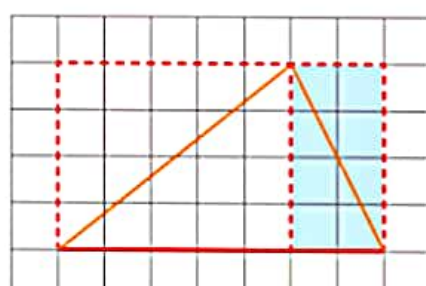


Area of the rectangle

= 20 sq. units

Area of the triangle

= 10 sq. units



Area of the rectangle

= 8 sq. units

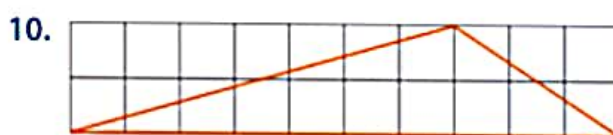
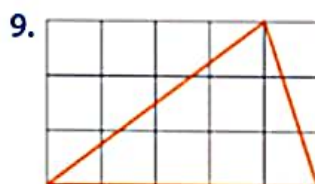
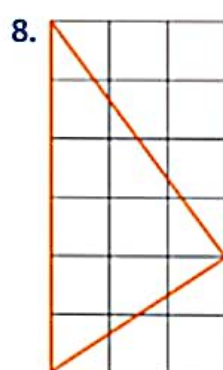
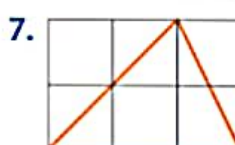
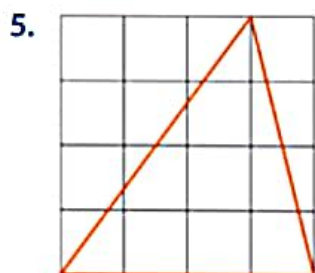
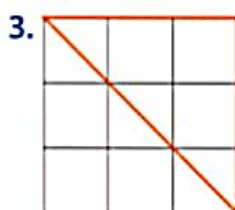
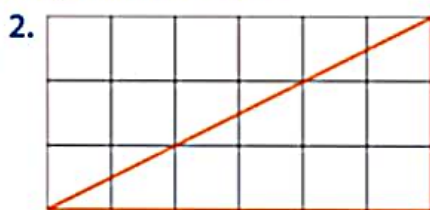
Area of the triangle

= 4 sq. units

Area of the whole triangle = $10 + 4 = 14$ sq. units.

Exercise II C

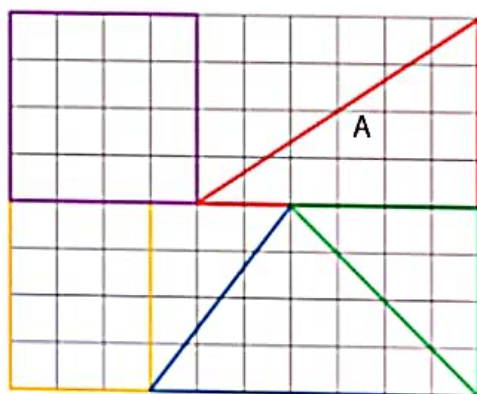
Give the area of the triangle in each figure.



Challenge!

Fill in the names of the shapes by matching the area given in the table. Work on only the shapes with all sides coloured. Take each square to be 1 sq. cm.

- Triangle A = 12 sq. cm
- Triangle B = 14 sq. cm
- Triangle C = 6 sq. cm
- Triangle D = 8 sq. cm
- Rectangle E = 12 sq. cm
- Square F = 16 sq. cm



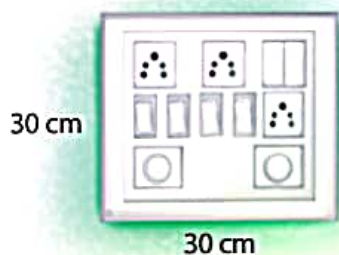
Project

FA

- Look around for a floor tile in your home or in your school. Find the area of the tile in sq. cm. Use a chalk or washable marker and draw a triangle with a right angle. What is the area of the triangle in sq. cm?
- Then on another tile draw a triangle without a right angle. Draw a grid of squares on the tile to find the area of the triangle you have drawn in square units.

DIFFERENT UNITS OF AREA

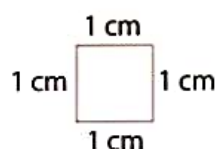
C-3.4



An architect who draws the plan of a house will need to work on different units of area.

When she is drawing the plan for the placement of switch boards on a wall, she will need to use square centimetres.

A square with 1 cm sides is a **square centimetre (sq. cm)**.



A fingernail is about the size of 1 sq. cm.

What is the area of the switch board?

When the architect is designing the layout of the house, she will use square metres.

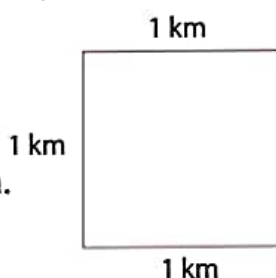
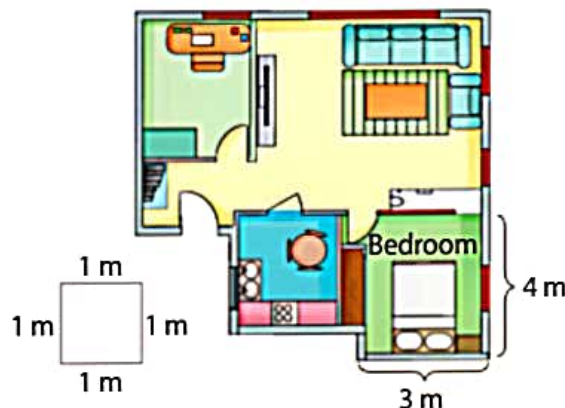
A square with 1 metre sides is a **square metre (sq. m)**.

A single bedsheet is *about* the size of 2 sq. m. If you fold the bedsheet in half along its breadth, the area is *about* 1 sq. m.

What is the area of the bedroom in the plan?

A square with 1 kilometre sides is a **square kilometre (sq. km)**.

A sq. km is a very large unit of area. Your school playground is perhaps smaller than 1 sq. km.



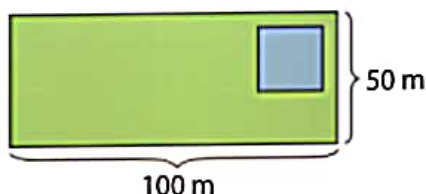
The state of Tripura has an area of about 10,500 sq. km.

sq. cm sq. m sq. km

Units of area in increasing size

Challenge!

A park has a square duck pond of side 10 m. What is the area of the park that is covered with grass?



Try This!

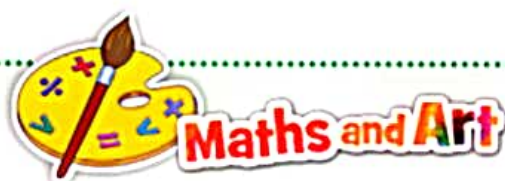
- There are 4 reference points or benchmarks given on this page. List them out.
- Say which unit you would prefer to use to find the area of these—sq. cm, sq. m, or sq. km.

a. Label	b. Swimming pool
c. Strip of tablets	d. TV screen
e. Cricket field	f. City of Bhopal

Activity

Draw a 1 cm by 1 cm square on paper and cut it out. Then make a square metre out of newspaper using adhesive tape. Now answer these.

	Guess	Actual
Number of times you can write 'a' in a sq. cm in your normal handwriting.	_____	_____
Number of rice grains that can fit in a sq. cm.	_____	_____
Number of New Enjoying Mathematics books that can fit in a sq. m.	_____	_____
Number of people that can stand in a sq. m.	_____	_____



FA



Start by tracing the large grey triangle given on this page on a sheet of paper. Keeping the triangle pointing up, draw a dot at the centre of each side. Connect the 3 dots, forming a new, downward pointing triangle. Colour this downward pointing triangle (figure 1). This leaves three uncoloured or white triangles. *If the area of the large triangle is 48 sq. units, then what is the approximate area of the coloured triangle?*

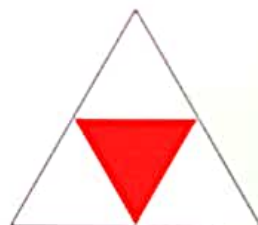


Figure 1

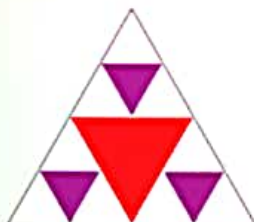
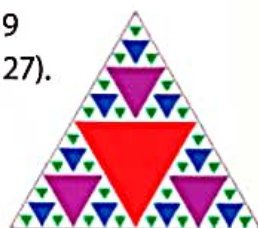


Figure 2

Repeat the steps again by drawing the points in the centre of each of the three white upward pointing triangles, and then joining them (figure 2). Colour in the 3 new downward pointing triangles. How many white triangles remain? ($3 \times 3 = 9$). *What is the approximate area of each of them?*

Repeat in each of the 9 white triangles, connecting them, and colouring in the 9 new downward pointing triangles. How many white triangles remain? ($3 \times 9 = 27$). *Keep repeating till you cannot create any new triangles.*

Make sure you only colour the downward pointing triangles. Also make sure you only connect the centre points of the upward pointing triangles.



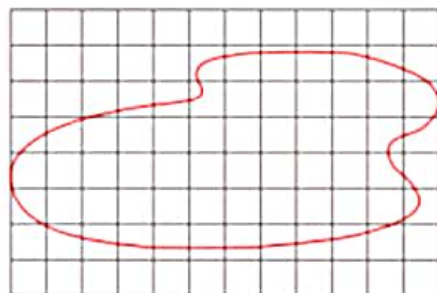
This kind of triangle is called a **Sierpinski triangle** after the mathematician who described how a pattern can be created using simple repetition of different sizes of a shape.

AREA OF IRREGULAR SHAPES

C-3.5



An architect had to design a swimming pool in a large residential complex. He drew out a design for the swimming

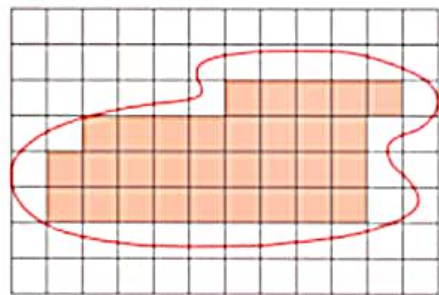


pool on a square-lined paper. What was the area of the swimming pool in sq. units?

How does one find the area of an irregular shape? In class IV you found the area of an irregular shape by counting the whole squares and estimating the rest.

Here is another method you can use.

Step 1: Find the under-estimate by counting only the whole squares. There are 31 whole squares.



Step 2: Find the over-estimate by counting all the squares (whole and part). There are 63 such squares.

[illegible]

Step 3: Add the two figures and divide by 2. (Ignore the remainder if any.)

$$31 + 63 = 94$$

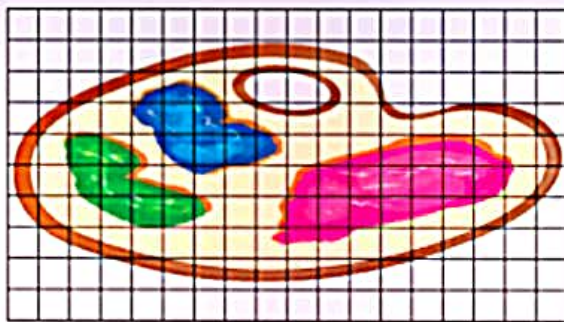
$$94 \div 2 = 47$$

Approximate area =
47 sq. units

On the plan, the area of the swimming pool is about 47 sq. units.

Try This!

Three blobs of water colour paint have been put on a palette.
What is the area of each blob if the squares are of 1 cm sides?



Project

Estimate the area of your thumbprint!

Dip your thumb in paint and press it on square-lined paper to make a thumb impression. Estimate the area in square centimetres.



FA

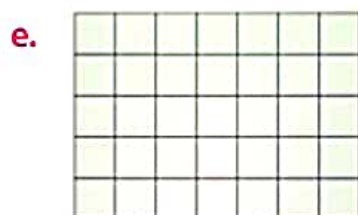
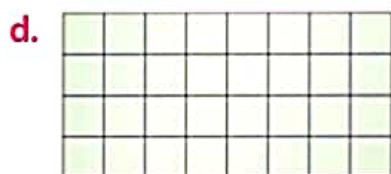
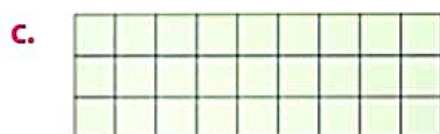
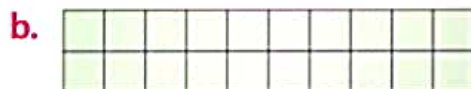
Refer to **Maths Lab Activity** on pg 198.

RELATIONSHIP BETWEEN AREA AND PERIMETER

C-3.6

Rectangles of the Same Perimeter

How many different kinds of rectangles can you make with a perimeter of 24 cm?
(Take the squares below to be $1\text{ cm} \times 1\text{ cm}$.)



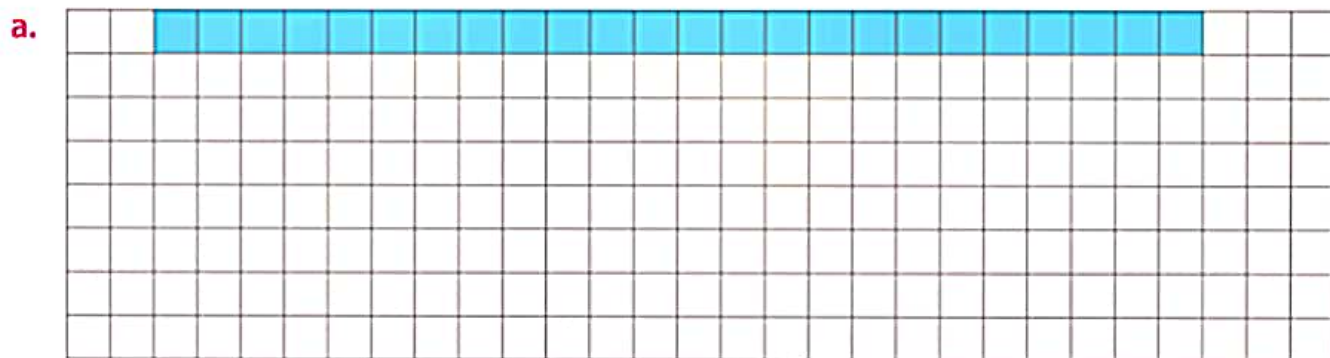
Write down your observation in your own words.

Now find the area of each one.

- a. _____ b. _____ c. _____
d. _____ e. _____ f. _____

Rectangles of the Same Area

How many different rectangles can you make with an area of 24 sq. cm? Find the perimeter of each one. (Take the squares below to be $1\text{ cm} \times 1\text{ cm}$.)



- a. Rectangle = 1×24 b. _____ c. _____ d. _____
Perimeter = 50 cm _____ _____ _____

Data Connect

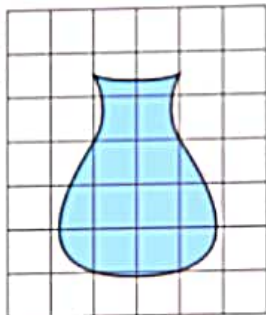
Open the **Data Bank** on page 244 and study the data on 'Comparing the Size of Some Famous Statues'.

The data shows the statues as tracings. Trace the three largest statues on to square-lined paper and find the area and perimeter of the tracings.

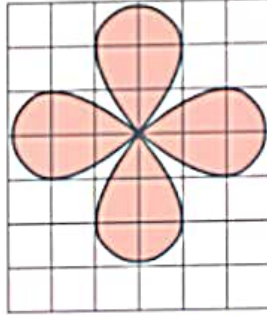
Exercise II D

1. Estimate the area of each of these figures in square units.

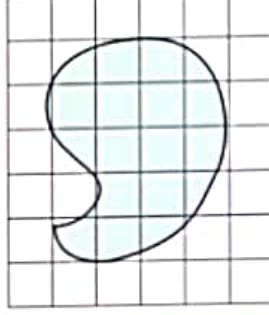
a.



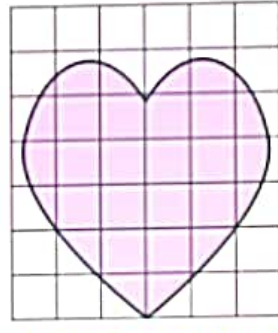
b.



c.



d.



2. Use a 15 cm-long string and join its ends. Place it on a centimetre squared paper to make a square, a circle, a triangle, and a rectangle.

a. Find the area of each shape.

b. Which shape has the largest area?

c. Which shape has the smallest area?

3. Use a centimetre squared paper to create as many different rectangles as you can with:

a. perimeter of 18 cm. Find the area of each rectangle.

b. area of 36 sq. cm. Find the perimeter of each rectangle.

4. Application in real life.

a. The breadth of a garden is 9.3 m and its length is 17.7 m. What is the perimeter of the garden?

b. Prabhu has a rectangular backyard that is 32 m wide and 46 m long. How much fencing will he need to enclose the yard? If fencing costs ₹98 per metre, how much will he have to pay?

c. Sapna walks around a square park whose side is 70 m. One day she walked around the park 5 times. How much did she walk in all?

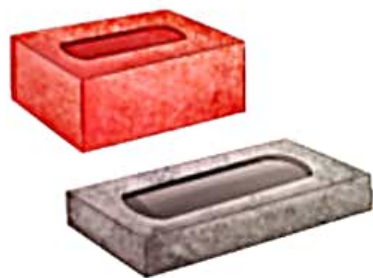
d. A square picture has a frame of length 100 cm. What is the length of each side? What is its area?

5. Look at the rectangle. What is its perimeter and area? Now draw another rectangle with the same perimeter but different area.



VOLUME

C-3.5



A bricklayer at a construction site has two kinds of bricks. One made of clay and one of concrete. How does he compare their sizes? When we want to compare the size of solid objects we do so by measuring the amount of space they occupy. This is also called the **volume** of the object.

We can understand the **volume** of an object like a breadbox by measuring how much it can hold.

Let us understand this with an example.

The twins Shweta and Swati were comparing the size of their snack boxes. Shweta's box was a little longer while Swati's box seemed a little higher. But they could not decide whose box was bigger.

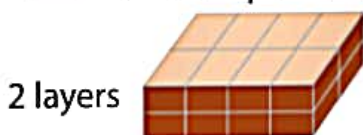


Their mother cut their sandwiches into small pieces and told them to find out how many they could fit in each of their boxes.

Shweta put one layer of 8 pieces.



Then she put one more layer of 8 pieces. There was no more space left in her snack box.



Shweta's box could hold $(8 \times 2) = 16$ sandwich pieces.

Swati could fit only 6 pieces in one layer in her box.



She could fit two more such layers in the box. Then the box was full.



Swati's box could hold $(6 \times 3) = 18$ sandwich pieces.

Swati's snack box is bigger because it could hold more pieces.

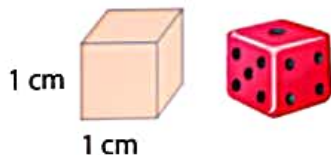
We can say that Swati's snack box has a greater 'volume' than Shweta's snack box.

The volume of an object is the amount of space it occupies.

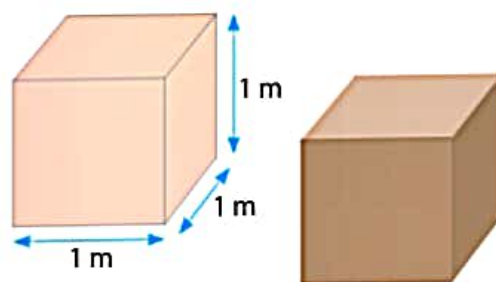
In order to find the volume of objects we fill them up with cubes. We can choose one of three kinds:



A millimetre cube (mm cube) is about the size of a grain of sugar.



A centimetre cube (cm cube) is about the size of a die.



A metre cube (m cube) is about the size of a very large carton.

A mm cube is used to measure the volume of very small objects.

A m cube is used to measure the volume of large objects.

Let us find the volume of this bread box by filling it with cm cubes.

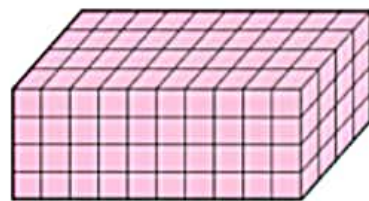
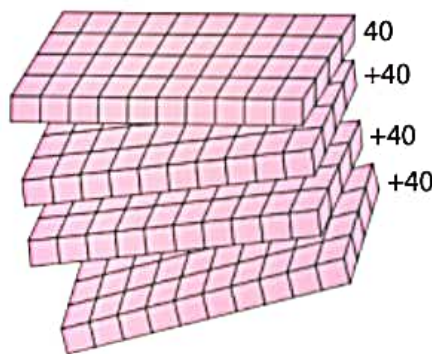
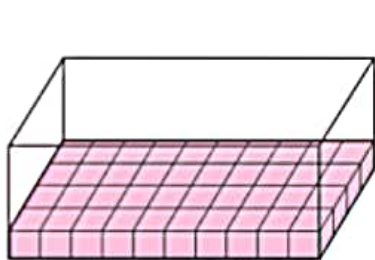


Put in the cm cubes to fill the base of the box.

10 rows of 4 cubes each make up a layer in the bread box.

$10 \times 4 = 40$ cubes in one layer. The box gets filled up with four such layers.

There are $4 \times 40 = 160$ cubes in the box.



Since the box can hold 160 one-cm cubes, the volume of the box is said to be 160 cubic centimetres.

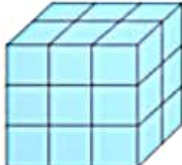
The unit of measurement of volume is cubic centimetres and is written as cu. cm.

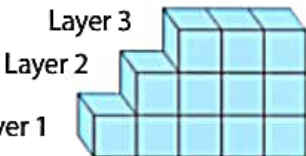
Volume of the bread box = 160 cu. cm

1 mm cubes give the volume in cubic millimetres and is written as cu. mm.

1 m cubes give the volume in cubic metres and is written as cu. m.

Find the volume of these solids. Each cube is of 1 cm sides.

a.  One layer = $3 \times 2 = 6$ cubes
3 layers = $6 \times 3 = 18$ cubes
Answer: Volume = 18 cu. cm

b.  Add the different layers
Layer 1 5
Layer 2 4
Layer 3 3

12

Answer: Volume = 12 cu. cm

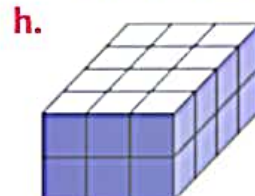
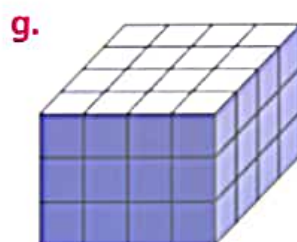
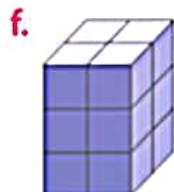
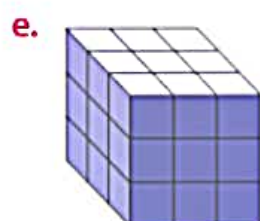
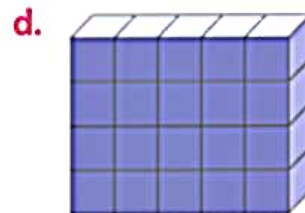
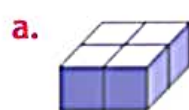
Whether a box is full or empty it takes up the same amount of space on your shelf. So both have the same volume.

Common Mistake!

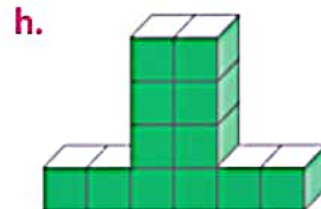
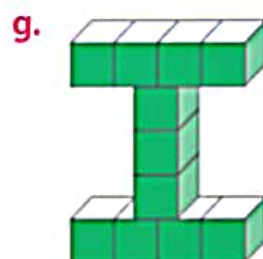
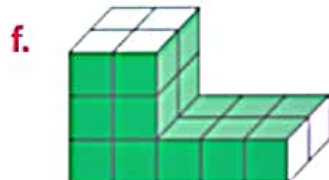
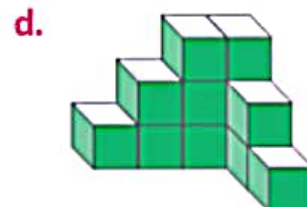
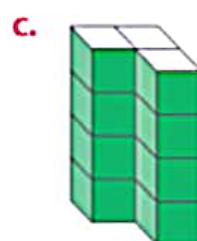
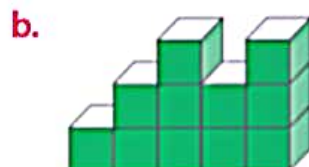
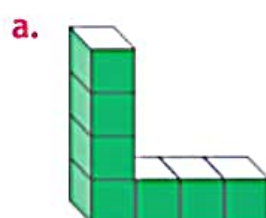
Volume = 18 cm ✗
= 18 cu. cm ✓

Exercise II E

1. Find the volume of each of these. Give your answer in cu. cm. (Take each to be a cm cube)

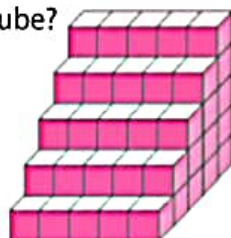


2. Find the volume of each of these solid shapes. Give your answer in cu. cm. (Take each to be a cm cube)

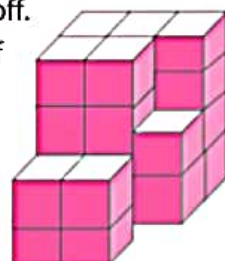


Challenge!

a. Some of the smaller cubes of this larger cube have fallen off. What was the volume of the original cube?



b. Some of the smaller cubes of this cuboid have fallen off. What was the volume of the original cuboid?



CALCULATING VOLUME

We can use a shortcut to calculate the volume of a cube or a cuboid.

While finding the volume of a cube or a cuboid, you have been first counting the **number of cubes in a layer** and then finding the number of layers.

Cubes per layer $\times$ Number of layers = Volume

Length $\times$ **Breadth** $\times$ Height = Volume

This can be used as a shortcut to calculate the volume.

Volume = length $\times$ breadth $\times$ height

$$V = l \times b \times h$$

- a. Find the volume of this cuboid.

Volume of the cuboid = $l \times b \times h$

$$V = 7 \text{ cm} \times 4 \text{ cm} \times 4 \text{ cm}$$

$$V = 112 \text{ cu. cm}$$

Answer: Volume of the cuboid is 112 cu. cm.

- b. Find the volume of this cube.

Volume of a cube = $l \times b \times h$

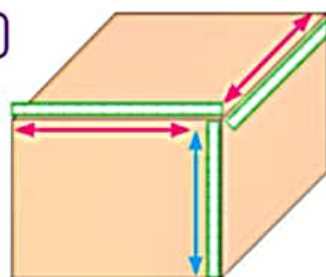
$$V = 10 \text{ cm} \times 10 \text{ cm} \times 10 \text{ cm}$$

$$V = 10 \times 10 \times 10 \text{ cu. cm}$$

$$V = 1000 \text{ cu. cm}$$

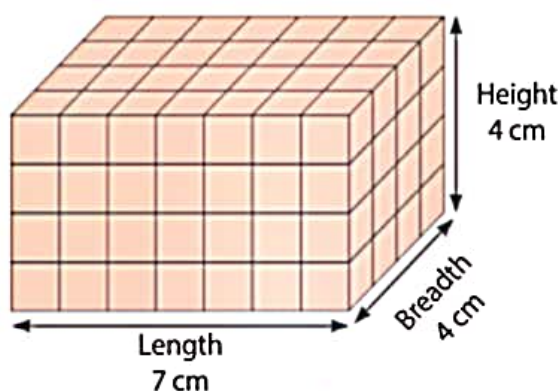
Answer: Volume of the cube is 1000 cu. cm.

C-3.5



Cuboid

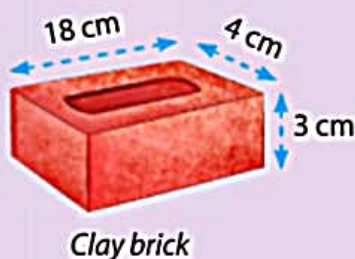
Since $l \times b = \text{area}$, you can also think of the shortcut as, **Area $\times$ Height = Volume.**



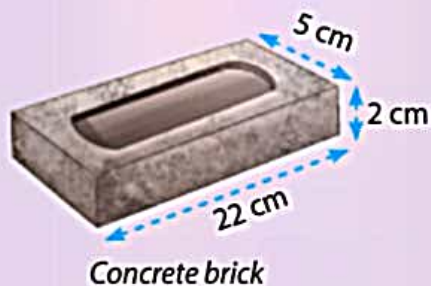
Another word for breadth is width.

Try This!

- a. Find the volume of the two kinds of bricks that the bricklayer has. Which is bigger, the concrete brick or the clay brick?
- b. Use a cm ruler and find the volume of your maths textbook, your snack box, and your pencil box.



Clay brick



Concrete brick

CALCULATING VOLUME

We can use a shortcut to calculate the volume of a cube or a cuboid.

While finding the volume of a cube or a cuboid, you have been first counting the **number of cubes in a layer** and then finding the number of layers.

Cubes per layer $\times$ Number of layers = Volume

Length $\times$ **Breadth** $\times$ Height = Volume

This can be used as a shortcut to calculate the volume.

Volume = length $\times$ breadth $\times$ height

$$V = l \times b \times h$$

- a. Find the volume of this cuboid.**

Volume of the cuboid = $l \times b \times h$

$$V = 7 \text{ cm} \times 4 \text{ cm} \times 4 \text{ cm}$$

$$V = 112 \text{ cu. cm}$$

Answer: Volume of the cuboid is 112 cu. cm.

- b. Find the volume of this cube.**

Volume of a cube = $l \times b \times h$

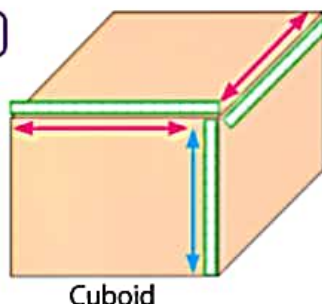
$$V = 10 \text{ cm} \times 10 \text{ cm} \times 10 \text{ cm}$$

$$V = 10 \times 10 \times 10 \text{ cu. cm}$$

$$V = 1000 \text{ cu. cm}$$

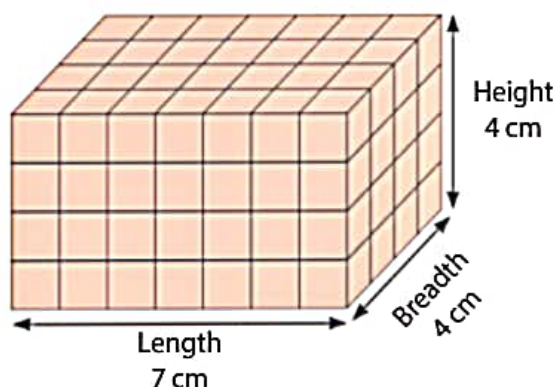
Answer: Volume of the cube is 1000 cu. cm.

C-3.5



Cuboid

Since $l \times b = \text{area}$, you can also think of the shortcut as, **Area $\times$ Height = Volume.**

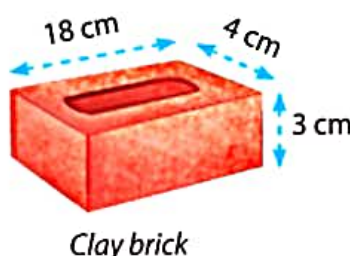


Another word for breadth is width.

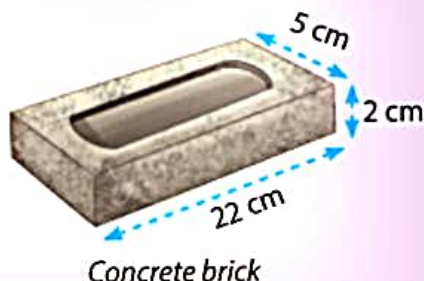


Try This!

- Find the volume of the two kinds of bricks that the bricklayer has. Which is bigger, the concrete brick or the clay brick?
- Use a cm ruler and find the volume of your maths textbook, your snack box, and your pencil box.



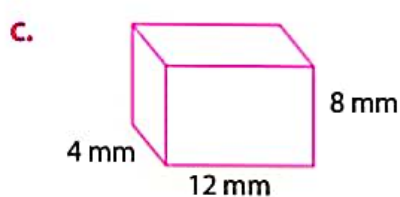
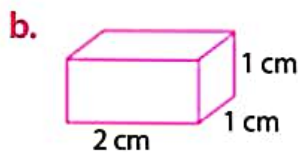
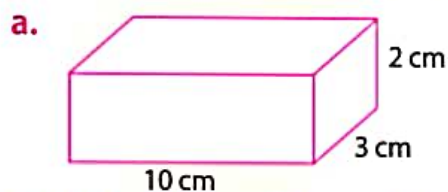
Clay brick



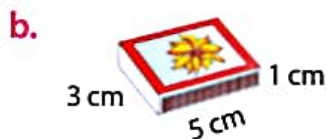
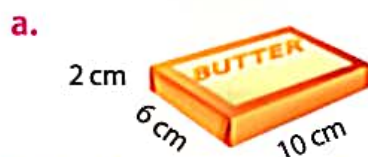
Concrete brick

Exercise II F

1. Find the volume of these solids.



2. Find the volume of these objects.



3. Find the volume of each of the following. Give the correct unit for each.

a. $l = 12 \text{ mm}$
 $b = 20 \text{ mm}$
 $h = 13 \text{ mm}$
 $V = \underline{\hspace{2cm}}$

b. $l = 15 \text{ cm}$
 $b = 9 \text{ cm}$
 $h = 11 \text{ cm}$
 $V = \underline{\hspace{2cm}}$

c. $l = 8 \text{ m}$
 $b = 3 \text{ m}$
 $h = 16 \text{ m}$
 $V = \underline{\hspace{2cm}}$

4. Complete the table.

	Length	Breadth	Height	Volume
a.	3 m	8 m	7 m	
b.	6 cm	4 cm		120 cu. cm
c.	14 cm		8 cm	448 cu. cm
d.		11 mm	10 mm	1210 cu. mm

Hint: Divide 120 by the product of 6 and 4 to get the height.

5. Application in real life.

- A book is 24 cm long, 14 cm wide, and 2 cm high. What is the volume of 2 such books piled one on top of the other?
- The drawer in Kalpana's cupboard is 30 cm long, 10 cm high, and 45 cm wide. What is the volume of the drawer?
- A square baking dish with sides of 20 cm has a height of 7 cm. What is the volume of the cake that can be baked in it?
- A rectangular planter is 40 cm long, 20 cm wide, and 15 cm high. What is the volume of the mud that it can hold?

Journal

If you have to find the volume of a solid with l and b in mm and height in cm, can you directly multiply all three? Why or why not? What would you do if you had a question like that?

FA

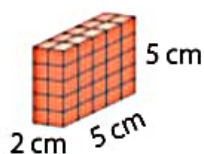


FINDING THE VOLUME OF OTHER SOLIDS

C-3.7

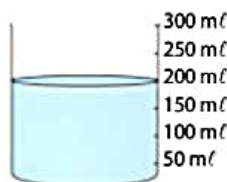
Here is another way to find the volume of solids.

Take a measuring glass and fill it with water up to the 200 ml mark.



Use fifty interlocking 1-centimetre cubes and fix them to make a cuboid with length 5 cm, breadth 2 cm, and height 5 cm.

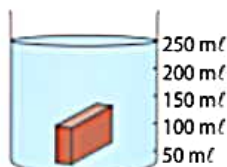
What is the volume of the cuboid? ____ cu. cm



Put the cuboid into the water in the measuring glass.

By how much has the level of water risen? ____ ml

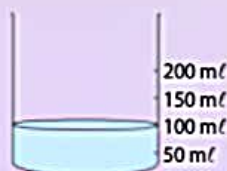
That means a cuboid of 50 cu. cm occupies the same space as 50 ml of water!



Try This!



What is the volume of the ball?



Exercise II G

1. By how many ml would the water level rise if you place objects with these volumes in the measuring glass?

a. 20 cu. cm



b. 60 cu. cm

c. 75 cu. cm

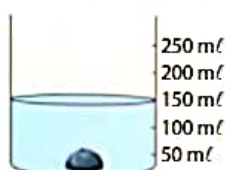
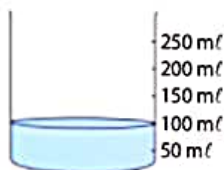
2. What is the volume of objects that make the level of water rise by:

a. 9 ml

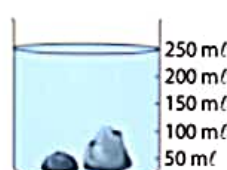
b. 30 ml

c. 96 ml

3. A measuring glass has 100 ml water. Study the pictures carefully to find the volumes of Stone A and Stone B when they are dropped into it.



Stone A



Stones A and B



Chapter Check-Up



Colour the circle that describes best how you feel.

I got this!

I'm getting there!

I need help!

Vocabulary Review

- | | | | |
|--------------------|-------------------|--------------------|---------------------|
| • Perimeter | • Irregular shape | • Over-estimate | • Area |
| • Square units | • Under-estimate | • Approximate | • Volume |
| • Space | • Cubic units | • Edge | • Square metre |
| • Cubic centimetre | • Cubic metre | • Cubic millimetre | • Square centimetre |
| • Layers | • Figure | • Square kilometre | |

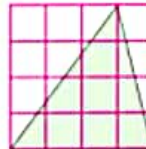
1. Find the perimeter and area of:



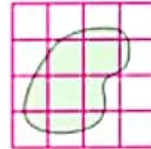
- a square with sides 7 cm.
- a rectangle of sides 5 m and 11 m.

2. Find the area of these shapes in square units.

a.



b.



3. Which unit will you use to measure these areas—sq. cm, sq. m, or sq. km?

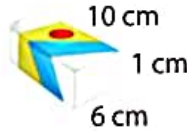
- | | | |
|----------------------|-------------------------|-----------------------------|
| a. A mobile phone | b. The base of a glass | c. A large curtain |
| d. The area of a zoo | e. The area of Vadodara | f. The area of a watch dial |

4. Use a shortcut to find the volume of these cuboids.

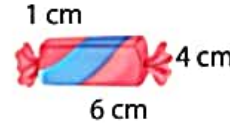
a.



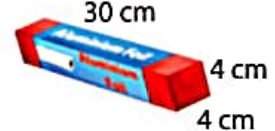
b.



c.



d.



5. Find the volume of these shapes. Give your answer in cu. cm. (Take each to be a cm cube).

a.



b.



c.



d.



6. How many rectangles can you make with a perimeter of 12 cm? Find the area of each.

7. a. A playground has length 415 m and breadth 230 m. What is the perimeter and area of the playground?

b. Find the length of a room whose area is 96 sq. m and breadth is 6 m.

8. Tick (✓) the correct answer.

A hole dug in the ground is 5 m long, 3 m broad, and 6 m deep.
Find the volume of earth that was removed.

- | | |
|-------------|-------------|
| a. 90 cu. m | b. 90 sq. m |
| c. 14 m | d. 14 sq. m |

Keeping in Touch



a. 0.7 l = _____ ml

b. 155 m = _____ cm

c. 1550 g = _____ kg

d. 0.84 kg = _____ g

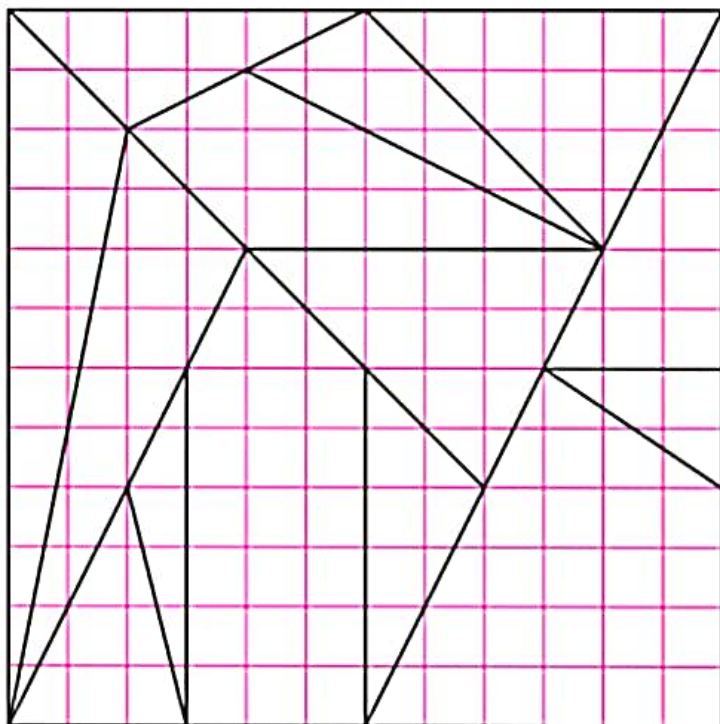
e. 3.15 m = _____ cm

f. 850 ml = _____ l

Objective: To use an ancient puzzle called stomachion to explore area.

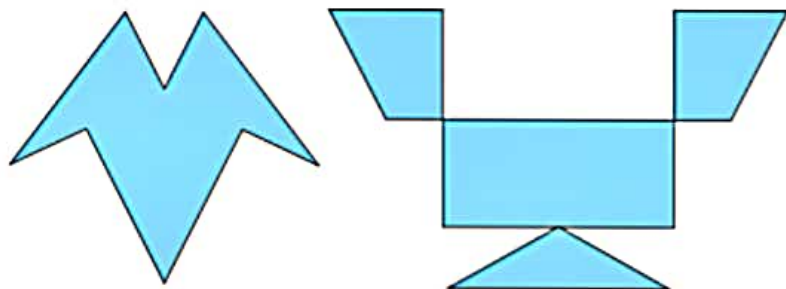
Materials Required: Paper, pencil, and scissors.

Preparation: Work with a friend. Trace out the following shape on paper. Paste on card paper if you like. Colour it and cut out all 14 pieces.



Method:

- Name the parts on the template above from A to N and list the approximate area of each part. You can use the method shown on page 188.
- Work to reassemble the cut pieces into a square again by using a different arrangement this time.
- Try to create some of these shapes using your stomachion.



Extension

Find out more about this ancient puzzle which is also known as Archimedes' Stomachion. What is same, and what is different about a Stomachion and a Tangram?

Background: A simple machine called a pantograph helps you make copies of drawings.

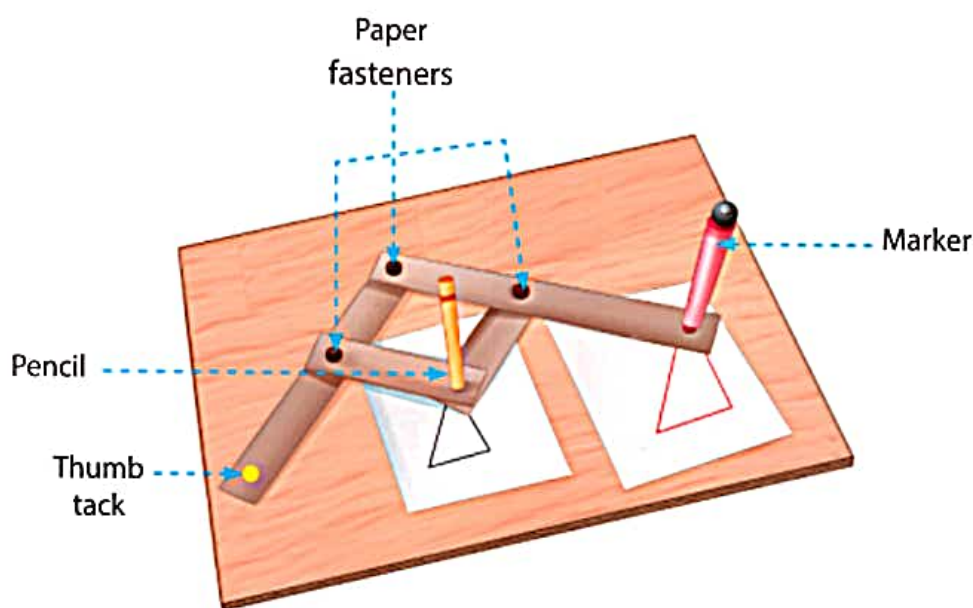
Materials: Cardboard for cutting, large cardboard for placing your pantograph, scissors, blank paper, adhesive tape, pointed instrument like a divider or a hole puncher, ruler, marker, pencil, three paper fasteners, and one thumb tack.

Preparation:

- Cut out two $16\text{ cm} \times 2\text{ cm}$ cardboard strips and two $8\text{ cm} \times 2\text{ cm}$ cardboard strips. Carefully poke holes at both ends of all four strips with your pointed instrument. *Take care not to hurt yourself or others.* Poke another hole in the middle (at 8 cm) of both the longer strips.
- Place the strips as shown in the figure. Use three paper fasteners and fix through the overlapping holes as shown.

Procedure:

- Take the large cardboard piece and fix the pantograph firmly onto it with the help of a thumb tack through the hole of the long strip (see image).
- Push a pencil through the overlapping holes and a marker through the hole on the extreme right as shown.
- Now, take a sheet of paper and draw any shape on it. Place it under the part of pantograph which has the pencil and tape it onto the cardboard. Take the other sheet of paper, place it under the marker, and tape it onto the cardboard.
- Now, draw over your shape again with the pencil. Can you see what is happening to the paper under the marker? Have you made a duplicate shape of the same, larger, or smaller size?
- Experiment with the pantograph. Try different shapes. How can you make a smaller copy?




A

- $l = 20 \text{ m}, b = 5 \text{ m}$, Area = _____
- Volume of a cube of sides $5 \text{ m} =$ _____.
- When two rays have a common endpoint they form an _____.
- $20 \text{ cm} \times 5 =$ _____ m
- A straight angle $= 90^\circ +$ _____ $^\circ$.
- Factors of 31 are _____.
- A cube that is opened makes a _____.
- LCM of 3 and 12 is _____.
- 23.15 m in smaller units is _____.

B

- 102 cm in bigger units is _____.
- $1 \text{ kg} =$ _____ g + 900 g
- 8.1 km in smaller units is _____.
- $8.3 \text{ cm} =$ _____ mm
- $5 \text{ kg} - 600 \text{ g} =$ _____ kg _____ g
- $l = 2 \text{ cm}, b = 2 \text{ cm}, h = 2 \text{ cm}$,
Volume = _____
- A _____ shows exact location.
- $350 \text{ mL} + 650 \text{ mL} =$ _____ ℓ
- Area of a square room of sides 10 m is _____.

C

- $9 \ell 800 \text{ mL} + 600 \text{ mL} =$ _____ ℓ _____ mL
- $6 \text{ cm} - 5 \text{ mm} =$ _____ cm _____ mm
- $95 \text{ mm} =$ _____ cm
- HCF of 13 and 23 is _____.
- $1 \text{ km} = 800 \text{ m} +$ _____ m
- Sides of a square with area 49 sq. cm is _____.
- $8 - 1.9 =$ _____
- $200 \text{ m} \times 10 =$ _____ km
- $9500 \text{ m} =$ _____ km
- 79 in Roman numerals is _____.

D

- Perimeter of a square of sides 200 m is _____.
- The digit in the thousandths place of 184.095 is _____.
- A _____ is used to measure angles.
- A cube of $1 \text{ cm} \times 1 \text{ cm} \times 1 \text{ cm}$ has a volume of _____ cu. cm .
- $6 - \frac{3}{5} =$ _____
- A _____ angle is the largest angle.
- $300 \text{ g} \times 30 =$ _____ kg
- $2.25 \text{ m} =$ _____ cm



Dabbawalas of Mumbai

Time and Temperature

The **dabbawalas** of Mumbai deliver lunches from homes to offices. They use bicycles and trains to deliver the boxes across the city in a short period of time using a **coding system** on the box. The system has been in existence for almost **125 years** and about **5,000 dabbawalas** move about **1,75,000** lunch boxes every day with efficiency and almost no mistakes.



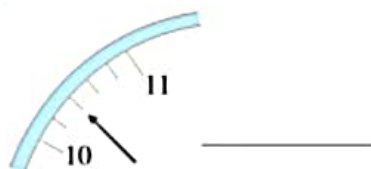
LOOKING BACK

1. Write how many minutes past the hour?

a.



b.



2. Fill in the blanks.

- 3:30 p.m. is written as _____ in the 24-hour clock.
- 2 hours before midnight is 10:00 _____.
- 2 hours before 12 noon is _____.
- There are _____ number of days from December 12 to January 11 (do not include January 11).
- There are _____ number of days from March 23 to May 18 (include both days).
- A play that started at 5:45 p.m. was 2 hours 30 minutes long. When did it get over?
- Another play that started at 6:30 p.m. got over at 8:55 p.m. How long was the play?

3. On the timeline given below show how you normally spend a school day.



READING TIME WITH SECONDS

While reading time with seconds we follow the **hour: minute: second** format.

The hour hand is the shortest, and the second hand is the longest on the face of a clock.



10:00:00

Ten o'clock

Second hand and minute hand both on 12. Hour hand on 10.



10:00:01

One second past 10 o'clock

The second hand starts its journey around the clock. 1 second has passed after 10 o'clock. The second hand is on the first mark.



10:01:00

One minute past 10 o'clock

The second hand has gone around the clock once. 60 seconds or one minute has passed. The minute hand is now on the first mark.



10:40:30

40 minutes and 30 seconds past 10 o'clock



11:00:00

Eleven o'clock

The minute hand has gone around the entire clock once and 60 minutes have passed. The hour hand has moved to 11.

HOUR : MINUTE : SECOND

Try This!

Match the time to the clock.

a.



i.

4:15:20

b.



ii.

7:45:55

c.



iii.

3:20:15

d.



iv.

7:50:45

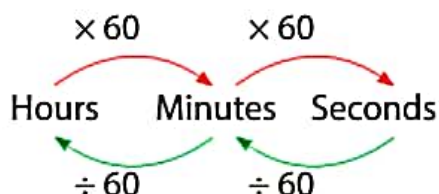
CONVERTING UNITS OF TIME FROM ONE TO ANOTHER

One hour has 60 minutes.

One minute has 60 seconds.

So, one hour has $60 \times 60 = 3600$ seconds.

Multiply to change from a bigger unit to a smaller unit.



Divide to change from a smaller unit to a bigger unit.

Converting a bigger unit into a smaller unit

Example 1: If it takes 4 hours from the time a lunch box is collected from a person's home and delivered to his or her office, how much is that in minutes?

4 hours = ? minutes

$4 \times 60 = 240$ minutes

Answer: 4 hours = 240 minutes



Example 2: If the *dabbawala* takes $2\frac{1}{2}$ minutes to collect the empty box from the third floor of an office building and go down the steps to his bicycle, how much is that in seconds?

$2\frac{1}{2} \times 60 = ?$ seconds

$2 \times 60 = 120$ seconds and $\frac{1}{2}$ minute = 30 seconds

$120 + 30 = 150$ seconds

Answer: $2\frac{1}{2}$ minutes = 150 seconds

Converting a smaller unit into a bigger unit

Example 1: 920 minutes = ? hours

$$\begin{array}{r} 15 \text{ hours} \\ 60 \overline{) 920} \\ \underline{- 60} \\ 320 \\ \underline{- 300} \\ 20 \text{ minutes} \end{array}$$

Example 2: 200 seconds = ? minutes

$$\begin{array}{r} 3 \text{ minutes} \\ 60 \overline{) 200} \\ \underline{- 180} \\ 20 \text{ seconds} \end{array}$$

Answer: 200 seconds = 3 minutes 20 seconds

Answer: 920 minutes = 15 hours 20 minutes

Challenge!



This 24-hour clock is 15 minutes slow. What is the correct time? _____

Exercise 12 A

1. Change to minutes.

- a. 8 hours b. 11 hours
c. 7 hours d. 9 hours 20 minutes
e. 3 hours 12 minutes f. 4 hours 42 minutes

3. Change to seconds.

- a. 13 minutes b. 5 minutes
c. 26 minutes d. $10\frac{1}{2}$ minutes
e. 15 minutes f. 45 minutes

5. Application in real life.

- a. A television programme had 11 minutes of advertisements in it. How many seconds were the advertisements for?
b. It takes Manisha 38 seconds to climb up the steps of her house. In one week if she spends 504 seconds doing this, how many minutes has she spent climbing up the steps in a week?
c. An advertisement on radio lasted for 30 seconds. If the same advertisement is played daily for 10 days, for how many minutes will it be played?
d. Smriti jogged for $1\frac{1}{2}$ hours on Monday and 90 minutes on Tuesday. On which day did she jog longer?

2. Change to hours and minutes.

- a. 720 minutes b. 132 minutes
c. 130 minutes d. 360 minutes
e. 410 minutes f. 500 minutes

4. Change to minutes and seconds.

- a. 840 seconds b. 480 seconds
c. 280 seconds d. 600 seconds
e. 93 seconds f. 950 seconds



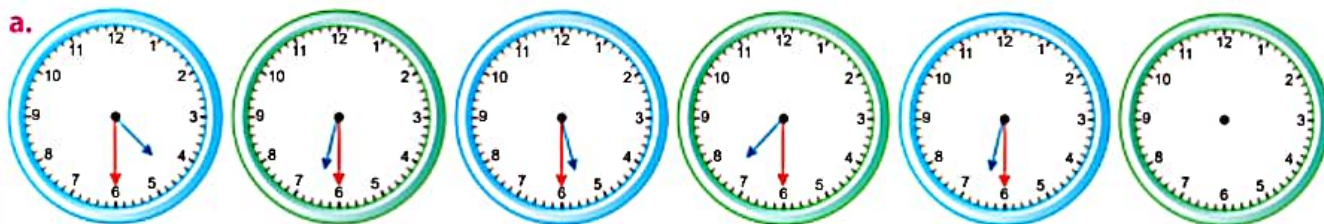
Project

FA

Many world and olympic sports records are made with differences of even less than a second. For example, Usain Bolt of Jamaica won the 100 m race at the Beijing Olympics in 2008 with 9.69 seconds. That is less than 10 seconds! Find other similar sports records and list them in your notebook.

Challenge!

What comes next?



- b. 1:06 p.m. 2:11 p.m. 3:16 p.m. 4:21 p.m. ?



ADDING AND SUBTRACTING MEASURES OF TIME

Example 1: 5 h 50 min + 1 h 45 min = ?

5 + 1 = ____ h

50 + 45 = ____ min

95 minutes is the same as ____ hour ____ minutes.

6 h + 1 h 35 min = ____ hours ____ minutes.

Answer: ____ hours ____ minutes

Try another way

$$\begin{array}{r}
 5 \text{ h } 50 \text{ min} \\
 + 1 \text{ h } 45 \text{ min} \\
 \hline
 7 \text{ h } 35 \text{ min}
 \end{array}$$

50 min + 45 min = 95 min

95 min = 1 hour (60 min) + 35 min



There are not enough minutes. So changed 1 hour to minutes.

Example 2: 3 h 20 min – 1 h 40 min = ?

We cannot subtract 40 mins from 20 mins.

3 h 20 min is the same as 2 h 80 min.

2 h 80 min – 1 h 40 min = ____ h ____ min

Answer: ____ h ____ min

Try another way

$$\begin{array}{r}
 3 \text{ h } 20 \text{ min} \\
 - 1 \text{ h } 40 \text{ min} \\
 \hline
 \end{array}$$

We cannot subtract 40 min from 20 min. So, regroup 1 hour to 60 min.

3 hours 20 minutes is regrouped to 2 hours 80 minutes.

$$\begin{array}{r}
 2 \text{ h } 80 \text{ min} \\
 - 1 \text{ h } 40 \text{ min} \\
 \hline
 1 \text{ h } 40 \text{ min}
 \end{array}$$

Common Mistake!

$$\begin{array}{r}
 1 \text{ h } 55 \text{ min} \\
 + 2 \text{ h } 50 \text{ min} \\
 \hline
 4 \text{ h } 05 \text{ min} \quad \times
 \end{array}$$

$$\begin{array}{r}
 1 \text{ h } 55 \text{ min} \\
 + 2 \text{ h } 50 \text{ min} \\
 \hline
 3 \text{ h } 105 \text{ min} \quad \times
 \end{array}$$

$$\begin{array}{r}
 1 \text{ h } 55 \text{ min} \\
 + 2 \text{ h } 50 \text{ min} \\
 \hline
 4 \text{ h } 45 \text{ min} \quad \checkmark
 \end{array}$$

$$\begin{array}{r}
 1 \text{ h } 25 \text{ min} \\
 - 1 \text{ h } 40 \text{ min} \\
 \hline
 85 \text{ min} \quad \times
 \end{array}$$

$$\begin{array}{r}
 1 \text{ h } 85 \text{ min} \\
 - 1 \text{ h } 40 \text{ min} \\
 \hline
 45 \text{ min} \quad \checkmark
 \end{array}$$

Try This!

- 7 h 25 min + 2 h 35 min
- 4 h 10 min – 2 h 40 min

Mathspeak

Explain how adding and subtracting units of time is different from adding and subtracting numbers using place value.

FA

WORKING WITH BIGGER UNITS OF TIME

Example 1: Raghu has been working as a *dabbawala* in Mumbai for the last 10 years 5 months. His younger brother Raju is also a *dabbawala* and has been working for 7 years 9 months. How much longer has Raghu been working than Raju?

10 years 5 months – 7 years 9 months = ?

10 years 5 months is the same as 9 years 17 months.

9 years 17 months – 7 years 9 months = ?

9 years – 7 years = _____ years

17 months – 9 months = _____ months

Regroup 1 year to 12 months.
So 5 months + 12 months
= 17 months



Try another way

$$\begin{array}{r} 10 \text{ years} \quad 5 \text{ months} \\ - 7 \text{ years} \quad 9 \text{ months} \\ \hline \end{array}$$

We cannot subtract 9 months from 5 months, so regroup 1 year to 12 months.

$$\begin{array}{r} 9 \text{ years} \quad 17 \text{ months} \\ - 7 \text{ years} \quad 9 \text{ months} \\ \hline 2 \text{ years} \quad 8 \text{ months} \end{array}$$

10 years 5 months regrouped to 9 years 17 months (5 months + 12 months).

Answer: Raghu has been working 2 years 8 months longer than Raju.

Example 2: 3 years 8 months + 4 years 6 months

3 years 8 months + 4 years 6 months = 7 years 14 months

14 months is the same as 1 year 2 months.

7 years + 1 year 2 months = 8 years 2 months

Try another way

$$\begin{array}{r} 3 \text{ years} \quad 8 \text{ months} \\ + 4 \text{ years} \quad 6 \text{ months} \\ \hline \quad \quad 14 \text{ months} \end{array}$$

$$\begin{array}{r} 3 \text{ years} \quad 8 \text{ months} \\ + 4 \text{ years} \quad 6 \text{ months} \\ \hline 8 \text{ years} \quad 2 \text{ months} \end{array}$$

Regroup 14 months to 1 year 2 months.

Answer: 8 years 2 months

Project

FA

Imagine a world without measurement for time.

Make a list of 10 things that could happen if time was not measured as it is today.

Exercise 12 B

1. Add.

- a. 5 min 30 s + 5 min 30 s
- b. 1 min 20 s + 3 min 45 s
- c. 2 h 25 min + 45 min
- d. 1 h 40 min + 1 h 40 min
- e. 3 years 7 months + 4 years 5 months
- f. 10 years 7 months + 11 years 7 months

2. Subtract.

- a. 8 min 10 s – 7 min 2 s
- b. 13 min – 5 min 35 s
- c. 9 h 20 min – 3 h 40 min
- d. 8 h 40 min – 3 h 50 min
- e. 5 years 3 months – 2 years 3 months
- f. 8 years 6 months – 6 years 8 months

3. Application in real life.

- a. Anisha practised for her school elocution competition for 35 minutes on one day and 45 minutes on the next day. How long did she practise in all?
- b. Harish went to school for 11 years 6 months and college for 5 years 9 months. How many years of education did he have in all?
- c. A postman delivered parcels for 2 hours 15 minutes, and letters for 3 hours 45 minutes. For how long was he out delivering parcels and letters?
- d. Jayashree could swim a particular length in 3 minutes 22 seconds. After some practice, she could swim the same length in 2 minutes 40 seconds. By how much time had her speed improved?
- e. A normal train from Chennai to Bangalore takes 6 hours 10 minutes. The Shatabdi Express takes 4 hours 45 minutes. How much time do you save by travelling on the Shatabdi?

FINDING THE STARTING TIME OR FINISHING TIME

To Find the Finishing Time

Example 1: Ajay started collecting *dabbas* at 8:30 a.m. He finished 3 hours 32 minutes later. What time did he finish?

Starting time—8:30 a.m.

Finishing time—after 3 hours 32 minutes

To find out at what time Ajay finished collecting *dabbas*, we need to add the elapsed time to the starting time.

Starting time + Elapsed time = Finishing time

We have to count forward to find the finishing time.

8:30 + 3 hours 32 minutes = ?

Count in parts: 8:30 a.m. + 3 hours = 11:30 a.m.

11:30 a.m. + 32 minutes = 12:02 p.m.

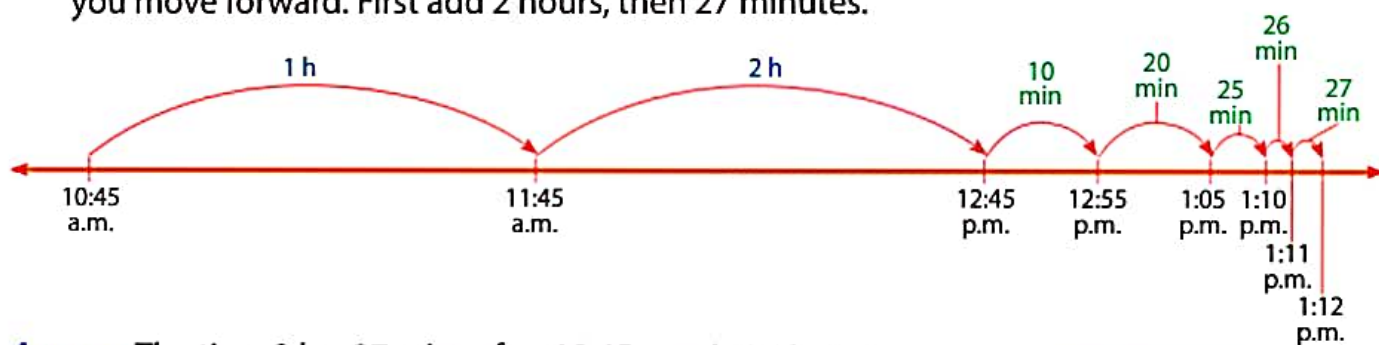
Answer: Ajay finished collecting *dabbas* at 12:02 p.m.



The time spent during an event or activity is the duration of the event or 'elapsed time'.

Example 2: Find the time 2 hours 27 minutes after 10:45 a.m.

➡ Draw a blank number line that begins at 10:45. Mark the timings on the number line as you move forward. First add 2 hours, then 27 minutes.



Answer: The time 2 hrs 27 mins after 10:45 a.m. is 1:12 p.m.

To Find the Starting Time

Example 1: Devesh woke up at 7:30 a.m. after sleeping for 8 hours 45 minutes. What time did he go to bed?

➡ Here, we have the finishing time and the elapsed time, but not the starting time.

Finishing time – Elapsed time = Starting time

We have to **count backwards** from the finishing time to find the starting time.

7:30 a.m. – 8 hours 45 minutes = ?

Count back in parts:

7:30 a.m. – 8 hours = 11:30 p.m.

11:30 p.m. – 45 minutes = 10:45 p.m.

Check your answer by counting forward.

10:45 p.m. + 8 hours = 6:45 a.m.

6:45 a.m. + 45 minutes = 7:30 a.m.

Answer: Devesh had gone to bed at 10:45 p.m.



Common Mistake!

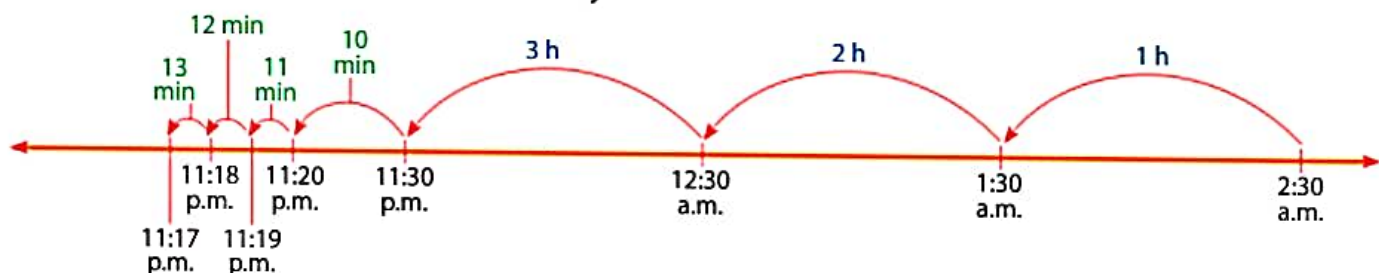
★ 11:45 a.m. + 30 minutes
= 12:15 a.m. ✗
= 12:15 p.m. ✓

★ 12:30 p.m. – 45 minutes
= 11:45 p.m. ✗
= 11:45 a.m. ✓

Example 2: Find the time 3 hours 13 minutes before 2:30 a.m.

➡ Draw a blank number line that ends with 2:30 a.m. Mark the timings on the number line as you move back.

First count back 3 hours, followed by 13 minutes.



Answer: The time 3 hours 13 minutes before 2:30 a.m. is 10:44 p.m.

Try This!

Fill in the missing information. Use a.m. or p.m.

	Starting time	Elapsed time	Finishing time
a.	1:05 p.m.	4 hours 40 minutes	
b.	11:15 a.m.	2 hours 45 minutes	
c.		5 hours 15 minutes	6:00 p.m.
d.		3 hours 20 minutes	3:20 a.m.

To Find the Finishing Date

Example 1: Sudhir started his training as a *dabbawala* on 17th August. He finished 33 days later. On which date did he finish?

Starting date → 17th August Duration → 33 days

Finishing date = ?

Starting date + Duration = Finishing date

We need to **count forward** to find the finishing date. We can do that in parts.

- 17th Aug to 31st Aug = 15 days (counting both days)
- 33 days – 15 days = 18 days
- 18 days after 31st August takes us to 18th September

Answer: Sudhir finished his training on 18th September.



AUGUST						
M	T	W	T	F	S	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

To Find the Starting Date

Example 1: Rijul had stopped the *dabba* service to his office for 21 days and restarted on 11th July. When did he stop the service?

We need to **count back** in parts to find the starting date.

- 10th July to 1st July = 10 days
- 21 days – 10 days = 11 days
- 11 days before 1st July takes us to 20th June (30th → 20th June = 11 days)

Check your answer by counting forward:

20th June to 30th June = 11 days

1st July to 10th July = 10 days

21 days

Answer: Rijul had stopped the *dabba* service on 20th June.

JUNE						
M	T	W	T	F	S	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

Try This!

Starting date	Duration	Finishing date
a. 21 st May	16 days	
b. 19 th January	19 days	
c.	13 days	2 nd April
d.	24 days	10 th May

Exercise 12 C

Application in real life.

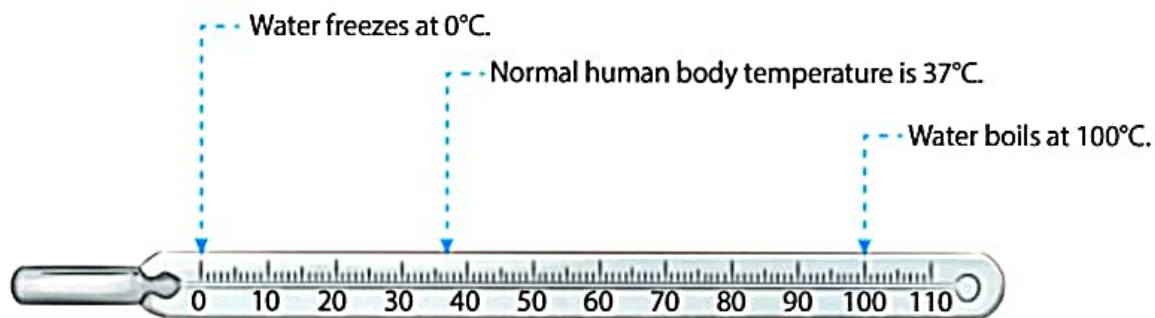
1. Apoorva's school Sports Day is on March 20th. She wants to start practising 30 days earlier. When should she start? (Take February to have 28 days.)
2. Nikhil's birthday party started at 11:45 a.m. and finished 3 hours 40 minutes later. When did the party finish?
3. Meera started knitting a muffler on Independence Day. If she completed it in 25 days, on which day did she finish it?
4. Prachi started practising the *veena* at 1:15 p.m. and finished 1 hour 20 minutes later. What time did she finish?
5. Madhur joined a 2-week driving class that got over on September 3rd. When did it begin?

MEASUREMENT OF TEMPERATURE

Temperature is the measure of how hot or how cold something is. We use thermometers to measure temperature.

Celsius Scale

The metric system uses a scale called the **Celsius scale** in the thermometer. On the Celsius scale, **water freezes at 0°C and boils at 100°C**.



Knowledge of outdoor temperature helps us in judging the weather conditions.

0°C – 10°C: Cold weather	21°C – 25°C: Mild weather	31°C – 35°C: Hot weather
11°C – 20°C: Cool weather	26°C – 30°C: Warm weather	36°C – 40°C and above: Very hot weather

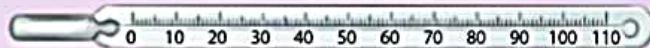
Try This!

Mark on the thermometer.

a. 10°C

b. 25°C

c. 40°C



Exercise 12 D

1. Circle the temperature that is close to the situation described.

a. Warm day

35°C / 5°C

b. Cold drink

5°C / 30°C

c. Ice

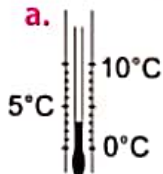
0°C / 100°C

d. Feverish person

38.5°C / 35.8°C

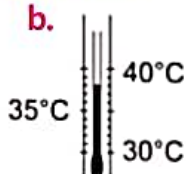
2. Read these temperatures.

a.



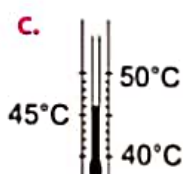
About ____°C

b.



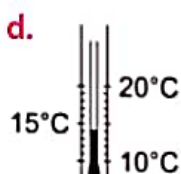
About ____°C

c.



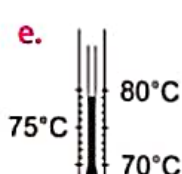
About ____°C

d.



About ____°C

e.



About ____°C

3. Human beings, birds, and many other animals are said to be warm-blooded. The temperature of their bodies does not change with a change in outside temperature. These are the normal body temperatures of warm-blooded creatures:

Bat 28°C

Hedgehog 35°C

Human being 37°C

Spiny ant eater 30°C

Bird 40°C

Fish, snakes, and frogs are called cold-blooded animals because their body temperature changes according to their surroundings. Here is the range of these animals' body temperature:

Salmon 0° to 20°C

Frog 7° to 30°C

Lizard 18° to 45°C



Answer these questions.

- How much warmer is a bird's body than a bat's body?
- How much colder is the body temperature of a spiny ant eater as compared to a hedgehog?
- By how many degrees can the body temperature of a lizard increase or decrease?
- What is the minimum body temperature of a salmon?
- What is the maximum body temperature of a frog?

Data Connect

Open the Data Bank on page 242 and study the data on 'Some Important Environmental Dates'. Then answer the questions below.

- How many days are there between World Water Day and World Environment Day?
- Uday's birthday falls 28 days before World Oceans day. When is his birthday?
- How many days are there between the two important environmental dates in March?
- Ambika started a trek on Earth Day and returned 14 days later. When did she return?
- If today is May 6th, which environmental day comes after 33 days?



Colour the circle that describes best how you feel.

I got this!

I'm getting there!

I need help!

Vocabulary Review

- a.m.
- p.m.
- Duration
- Estimating
- Elapsed time
- Approximately
- Finishing time
- Starting time
- Celsius scale

1. Fill in the blanks.

- 3 h 20 min = _____ min
- 560 min = _____ h _____ min
- $11\frac{1}{2}$ min = _____ s
- 980 s = _____ min _____ s
- 15 min - 3 min 20 s = _____
- 4 years 7 months + 2 years 8 months = _____
- 2 h 40 min + 3 h 30 min = _____
- 3 years 3 months - 1 year 4 months = _____

2. Find the time.

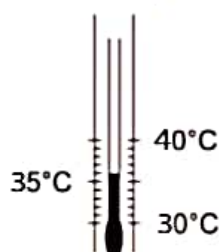
- 3 h 20 min after 11:45 a.m.
- 4 h 50 min before 7:20 p.m.

3. Find the date.

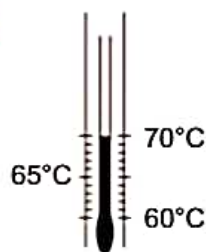
- 13 days after 28th August
- 25 days before 16th November

4. Read the temperature.

a.



b.



5. Tick (✓) the correct answer.

On Monday, Anu practised singing for 2 hours 10 minutes. On Tuesday, she practised for 1 hour 40 minutes. How much longer did she practise on Monday than Tuesday?

- 3 hours 50 minutes
- 1 hour 30 minutes
- 30 minutes
- 1 hour

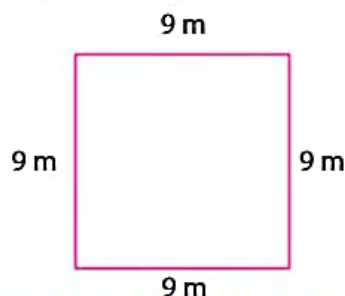
Keeping in Touch

What is the area and perimeter of these shapes?

a.



b.





Mr Sen's *dabba* is packed and ready to be sent to his office. Follow the *dabba* as it travels from his home to his office.



The *dabba* is filled with a hot meal and collected at 9:20 in the morning from the house by the *dabbawala*.



It reaches Borivali station by bicycle at 9:50 a.m. where it is sorted according to its destination. It is then put on a train at 10:20 a.m. and travels for 55 minutes till it reaches Dadar station.



The *dabba* is then taken by a wooden cart or bicycle



to the office and it is delivered there at 12:40 p.m.

The *dabba* from home to office



The *dabba* is then put on another train for its final destination at 11:45 a.m. It reaches Churchgate station after 20 minutes.

At Dadar station all the *dabbawalas* meet and the *dabbas* are exchanged according to the location it has to finally reach.



Use the information above to answer these questions.

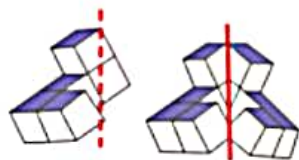
1. How long does the *dabba* take from Mr Sen's house to Borivali station?
2. How much time is spent on sorting at Borivali station?
3. At what time does it reach Dadar station?
4. How long does the exchange at Dadar station take?
5. At what time does the *dabba* reach Churchgate station?
6. How long does it take the *dabba* to get from Churchgate station to the office?
7. How long is the entire journey of the *dabba* from home to office?
8. If the empty *dabba* is returned to Mr Sen's house 7 hours and 25 minutes after it left home in the morning, at what time is it delivered back home?



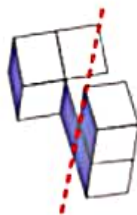
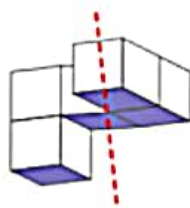
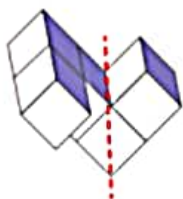
Critical Thinking Skills



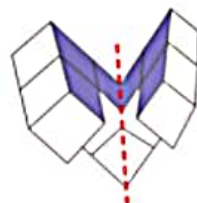
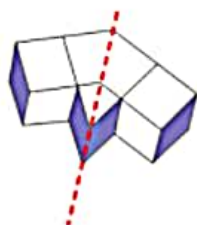
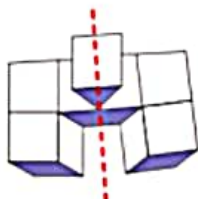
Visual Thinking



This is an arrangement of cubes and its image is reflected along the dotted line. Match the cubes to their reflected images.



Reflected Images



Logical Thinking

Biren follows a certain rule while choosing numbers as a pin to unlock his computer.

He can choose any of these numbers – 2042, 4164, 5255, 7497

He will not choose numbers – 5205, 3903, 8168, 7177

Which of these will he choose as his next pin number if he keeps to his rule?

2142, 1771, 6366, 1826



Number Sense

Sunaina does a set of exercises for 2 minutes 40 seconds and then takes 20 seconds rest. If she starts at 11 o'clock, what will she be doing at 11:15? Exercising or resting?

Visual Thinking

A teacher is putting up 4 charts on the wall. If each chart needs one thumb tack on each corner, what is the least number of thumb tacks the teacher will need?



Mapping Skills

Earlier people used paper maps to help them find their way to a place. Today, **millions** of people around the world use the **GPS** or **Global Positioning System** to find the exact location of something. The **GPS** system consists of over **30** operational satellites almost **20,000 km** above the Earth. They travel at a speed of **14,000 km** per hour and go around the Earth twice in less than **24** hours.



UNDERSTANDING MAPS

A map shows a place from above – much like a bird's eye view of the place. It shows where things are located. For example, a map of your classroom will show where the doors, the board, the teacher's desk are. There are many kinds of maps like world maps, country maps, and city maps. A city map will show streets and important buildings.

Every map has these important components:

- A title
- It will show you **direction** with the help of a **compass rose**
- It will have a **key**, telling you the meaning of the different symbols on the map
- It will also give you an idea of the actual size of the place represented on the map. This is done with the help of a **scale**.

Map of the Zoo



NCF 2023

Competencies in this chapter
C-2.2: Applicable to the entire chapter



Try This!

Find and label the title, the compass rose, and the scale on the map of the zoo given above.

Title

The **title** gives you the subject of the map and tells you what information the map contains.

Direction

Every map uses an image called a compass rose to show **direction**.

A compass rose shows the directions north, east, south, and west.

If the direction is between the north and east, it is called the north-east direction.



If the direction is between the south and west, it is the _____ direction.

If the direction is between the north and west, it is the _____ direction.



Remember the directions starting from the North and going clockwise with this sentence—**Nine Elephants Shift Wood**.

Try This!



1. In which direction is the minute hand pointing?
2. Answer the questions given below by studying the map of Punjab.

- a. Which is the northern-most town?
- b. Name the town to the south of Faridkot.

- c. Rupnagar is to the _____ of Ludhiana.
- d. Which town is to the most extreme west of Punjab?
- e. Which town is to the immediate east of Sangrur?
- f. If you were travelling from Moga to Amritsar, in which direction would you be travelling?

Map of Punjab



FA

Draw a large square on the floor with chalk as shown.

Four students may stand on the corners of the square with a card showing each of the 4 directions. One student may stand in the centre.

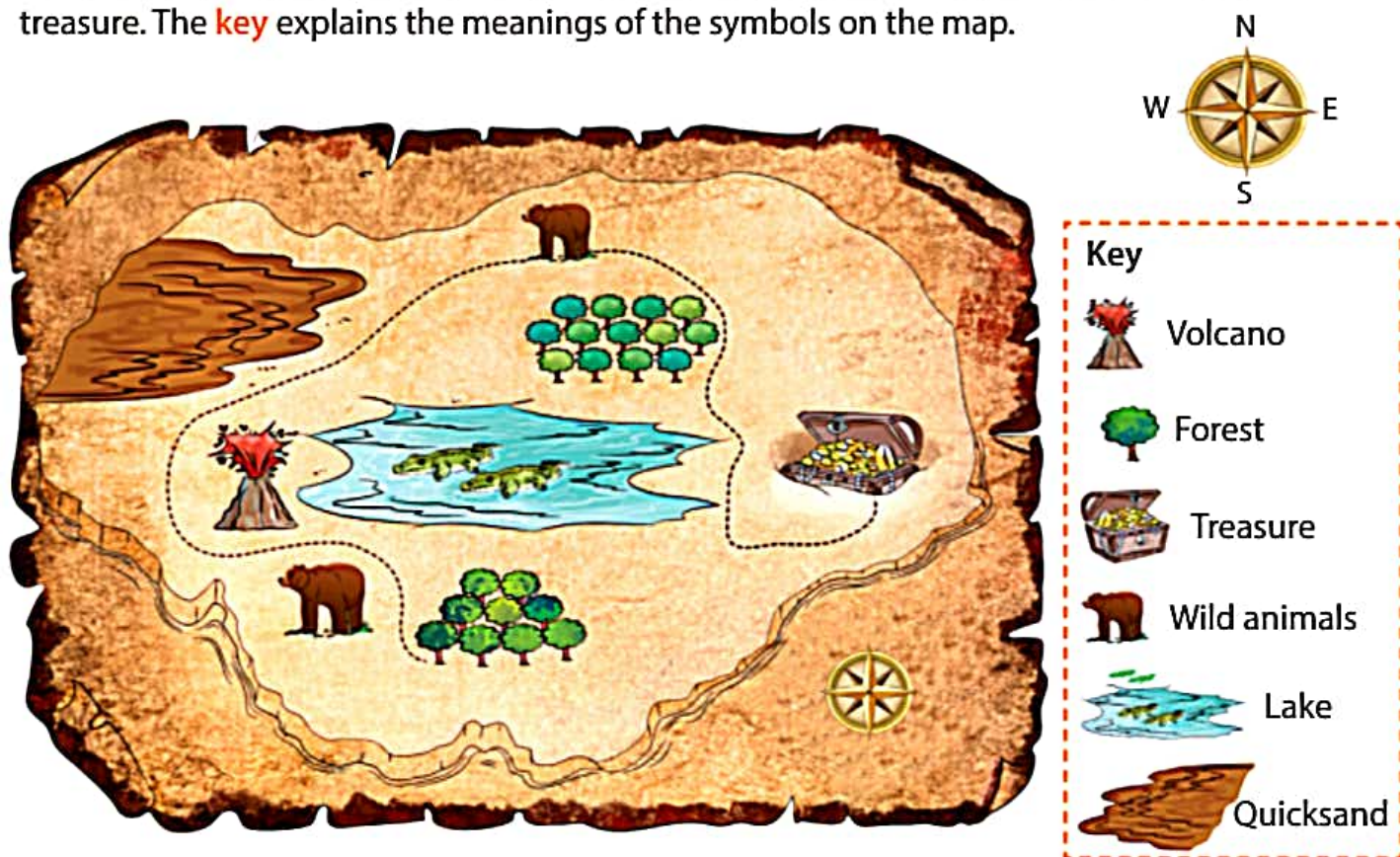
The teacher calls out instructions for the student in the centre to follow.

- Stand facing north. Take a quarter turn in the clockwise direction. Which direction are you facing now?
- Face west. Take two half turns in the clockwise direction. Which direction are you facing now?
- Face south. Take a quarter turn in the anti-clockwise direction. Which direction are you facing now?



Keys in Maps

Have you ever played treasure hunt? This is supposed to be a pirate's map of a hidden treasure. The **key** explains the meanings of the symbols on the map.

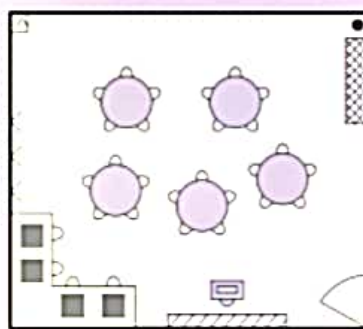


Try This!

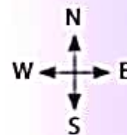
Study the map with its key and answer the questions.

- How many students can sit for group work at one time in the maths lab?
- What is diagonally in the corner across the door?
- What do you approach if you turn right as you enter from the door?
- What is in the south-west corner of the room?
- What is behind the teacher's desk?
- What could you change about this arrangement to improve it? Draw your own map.

Maths Lab Map



- Key**
- Waste paper basket
 - Teacher's Desk
 - Computer
 - Students' table
 - Chair
 - White board
 - Equipment cupboard
 - Sink
 - Window
 - Door



Journal

Of all the components you have learnt so far, which, in your opinion, is the most important element of a map—the title, the direction, or the key? Justify your answer.

FA



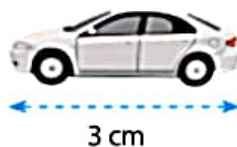
Scale

Whether it is map of your classroom or a large place like a country, all maps show large areas on a small sheet of paper. Places that are a few centimetres apart on a map may actually be hundreds of kilometres apart in reality.

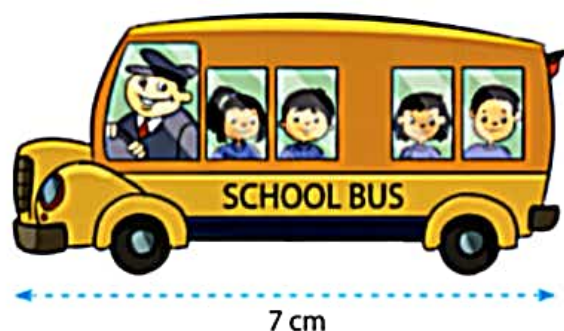
Maps not only help us understand locations but also help us see how big or small places are in comparison to other places.

Maps do this with the help of a special idea. They use a **scale**. Let us understand scale with the help of these pictures.

This is the picture of a car. In the picture the car is 3 cm long. 1 cm in the picture is the same as 1 m of the real car. This is the 'scale' of the drawing.

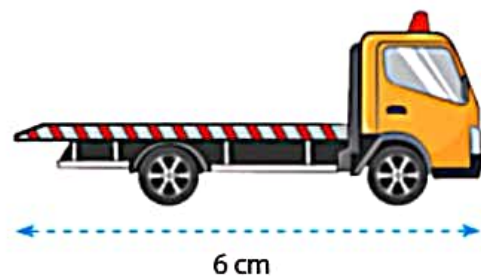


The scale is $1 \text{ cm} = 1 \text{ m}$
So the length of the car is 3 m.



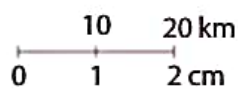
Using the scale $1 \text{ cm} = 1 \text{ m}$, the length of the bus is 7 m.

What about this truck?



The scale here is
 $1 \text{ cm} = 2 \text{ m}$
So, the length of the real truck will be
 $6 \times 2 \text{ m} = 12 \text{ m}$.

How is this idea used in a map?



On this scale the line is 2 cm long. 2 cm on a map represents 20 km — so each cm on the map is actually 10 km.



Try This!

a. Scale is $1 \text{ cm} = \frac{1}{2} \text{ m}$

Length of the bicycle = _____



b.

How much is 1 cm on the map in reality?

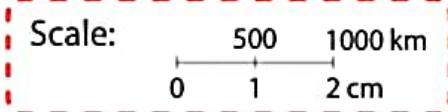
Mathspeak

If you had to draw your classroom floor on a sheet of paper, what scale would you use?

FA

Finding distances with the help of the scale

Example 1: This has been taken from a map of India. Find the distance between Ahmedabad and Kolkata using the scale given below it.



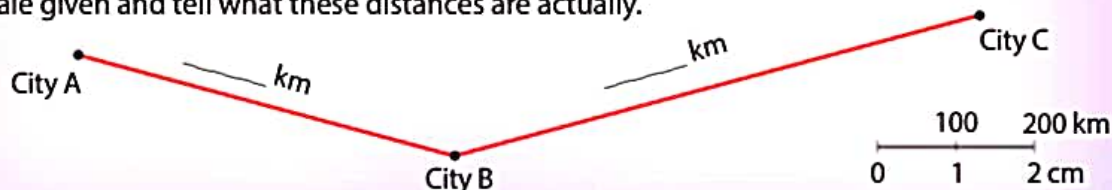
Step 1: Use a ruler to measure the length of the line joining the two cities—4 cm

Step 2: Apply the scale shown, 1 cm = 500 km, so 4 cm = $4 \times 500 = 2000$ km.

Answer: The distance between Ahmedabad and Kolkata is about 2000 km.

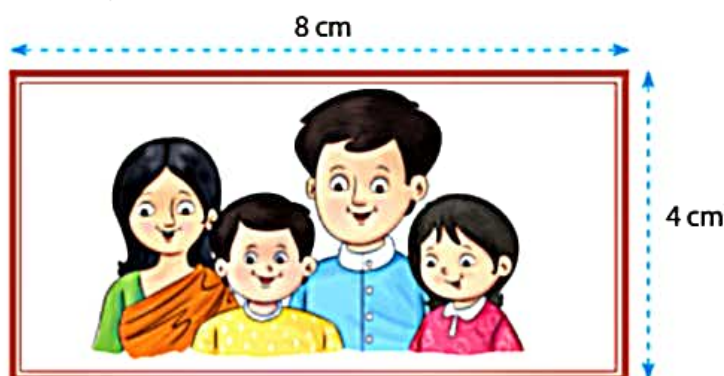
Try This!

Use the scale given and tell what these distances are actually.



How is the idea of scales used in pictures?

These are pictures of Natasha with her family. The second one has been blown up to twice the size of the first one.

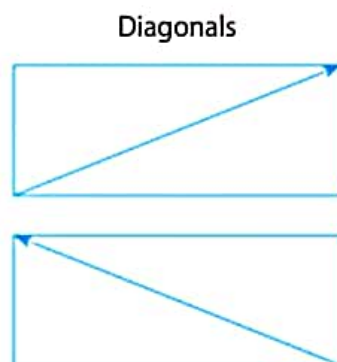
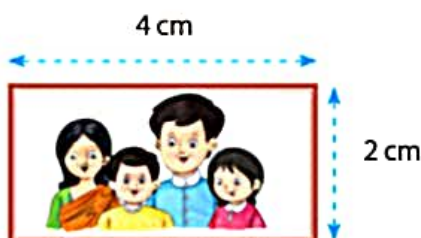


The larger picture has twice the length and width of the original picture. Measure the diagonals of the two pictures. What do you notice?

What is the area of the first picture?

Is the area of the second picture double that of the first picture?

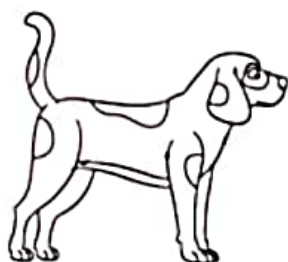
Calculate to find out. What is the relationship? Why has it happened?



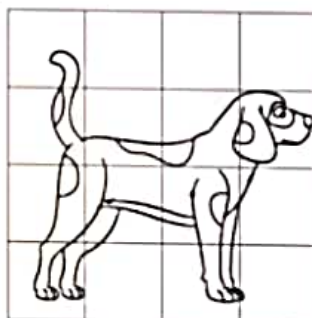
Find the area of the new picture. Is it half that of the first picture? What about the diagonal?

Natasha has drawn this picture of her pet dog. She can either increase or reduce the size of the drawing by taking the help of squares.

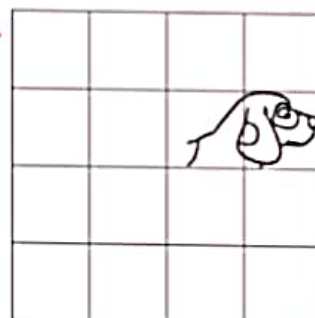
a.



b.



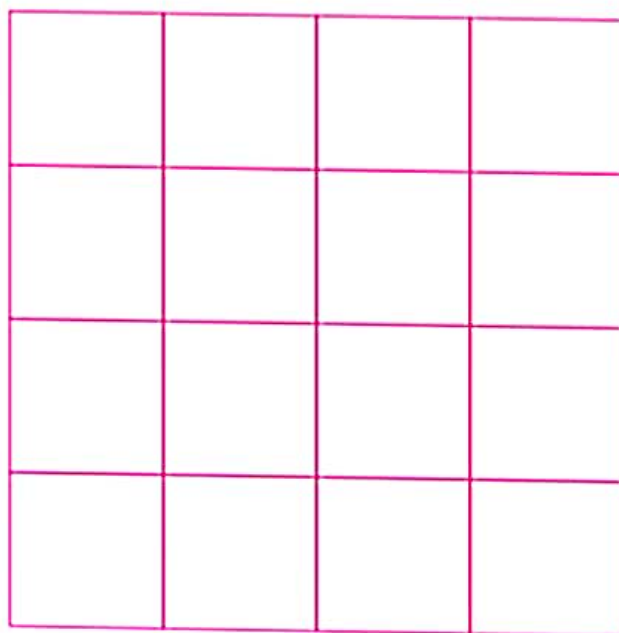
c.



She has first copied the picture in the same size; so the scale that is 1 cm square in the original picture (a) is 1 cm square in the copy (b).

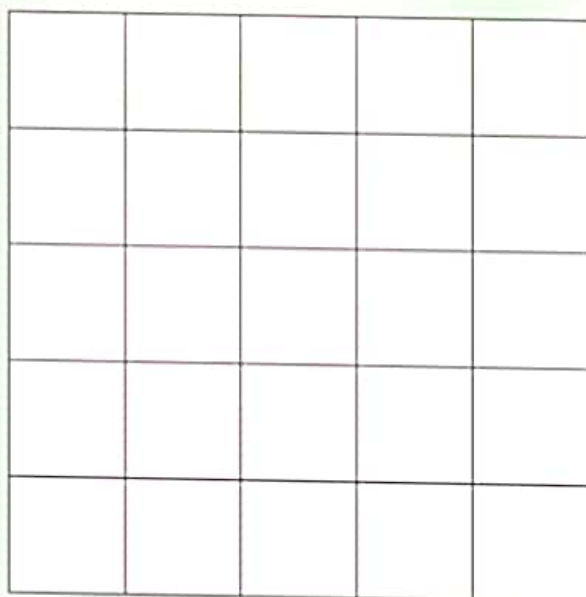
Complete the picture by copying it square to square in (c).

Use the 2 cm squares on the right to enlarge the same picture.



Maths and Art

FA



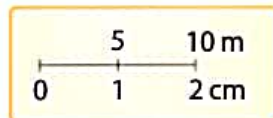
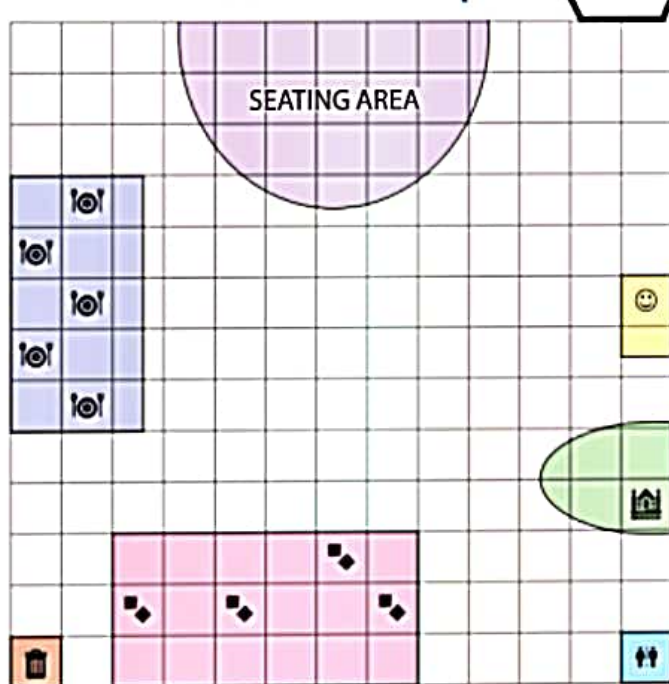
This is part of a famous painting in the Ajanta caves in Aurangabad, Maharashtra. It has been shown on a $\frac{1}{2}$ cm square grid. Blow-up the picture by copying it into squares of $1\frac{1}{2}$ cm.

PUTTING IT TOGETHER – TITLE, DIRECTION, KEY, AND SCALE

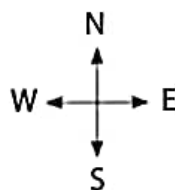


Natasha's school had a fete in the playground. This is a map of the fete.

School Fete Map



KEY: Games stall Dustbin Food stall
 Toilets Bouncy castle Face painting
 gate



Note:

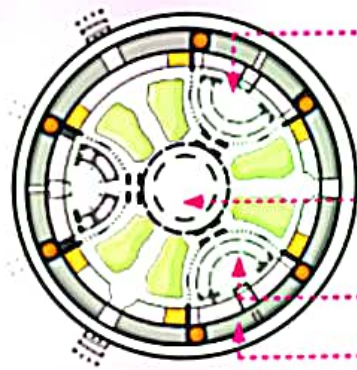
Take the squares to have sides of 1 cm.

Study the map and answer the questions.

1. If you walk south after you enter the gate, what is the first stall you will see?
2. Do you think the dustbin has been placed well? Explain your answer.
3. If you go south-west from the bouncy castle, where will you be?
4. What is the area of the food stalls enclosure? Use the scale.
5. What is the approximate area of the seating area in sq. m?
6. What is the perimeter of the games area in metres?
7. What is the area of the entire playground in sq. m?

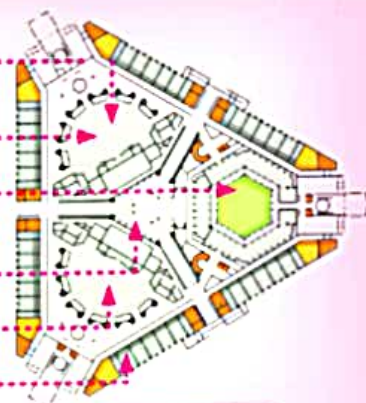
Journal

Study the two maps given alongside. What is the same and what is different between the old parliament and the new parliament building in Delhi?



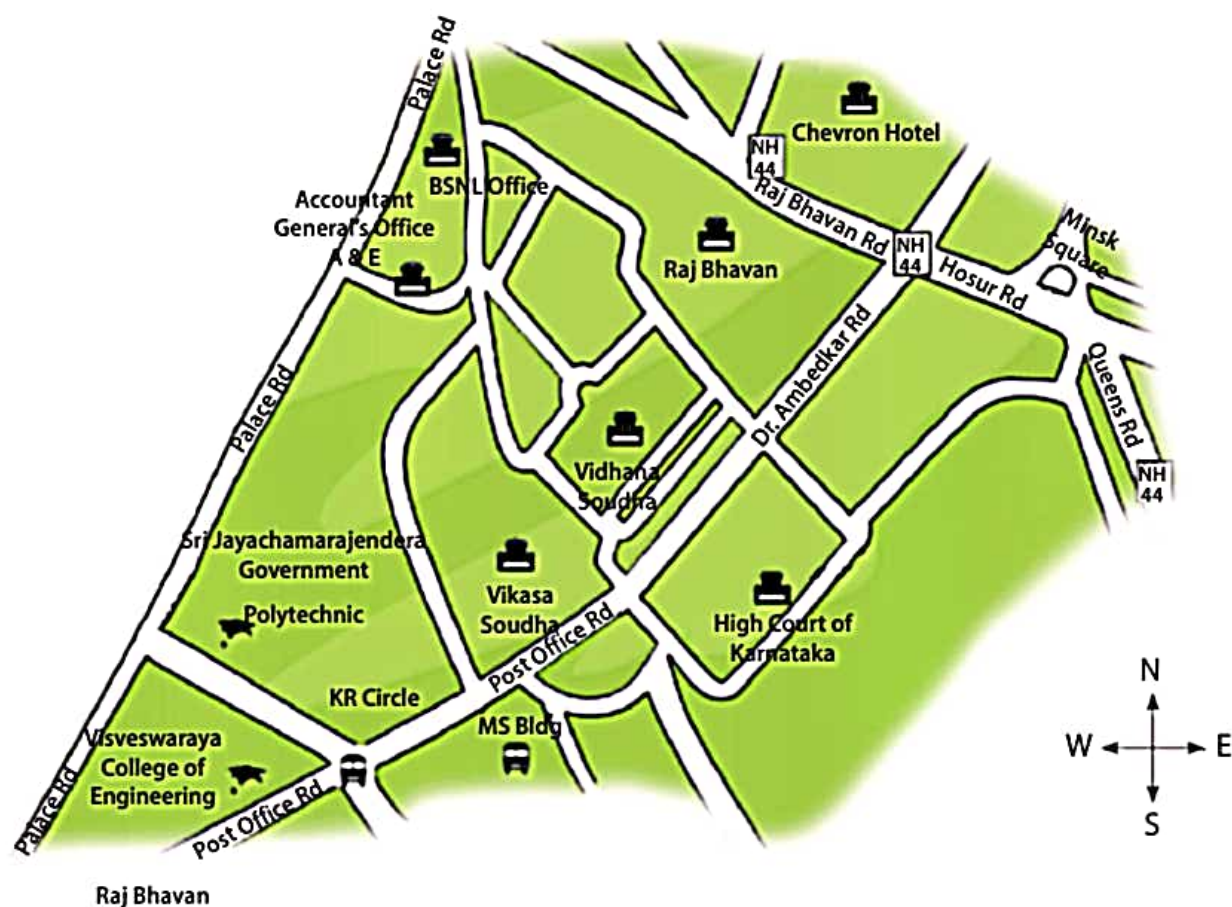
Old Parliament

Lok Sabha
 Joint Session
 Central Lounge
 Central Hall
 Constitutional Hall
 Rajya Sabha
 Offices



New Parliament

Using a Map

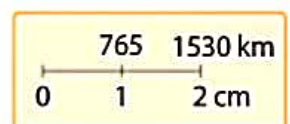
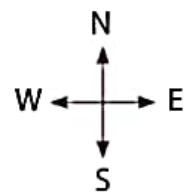


Given above is a map of the location of the Vidhana Soudha, the State Legislature situated in Bengaluru, capital of Karnataka. Study the map and answer the questions.

1. Mark these on the map.
 - a. Vidhana Soudha
 - b. Vikasa Soudha
 - c. High Court of Karnataka
 - d. Raj Bhavan
 - e. Visveswaraya College of Engineering
 - f. Accountant General's Office
2. What institution lies to the south-east of the Vidhana Soudha? _____
3. Mark the portion of NH 44 (National Highway 44) that you can see on the map.

4. Name the roads that form NH 44. _____
5. If you are walking down Raj Bhavan Road with the Raj Bhavan to your right what will you see on your left? _____
6. If you are in the BSNL office and get on to the road going south, which institution will you reach if you take a right?

Map of India and her Neighbours



1. Name India's neighbours in the east that share a border with her.
2. Name India's neighbours in the west that share a border with her.
3. Which is the northernmost country of Asia?
4. If you are at the southernmost tip of Vietnam, which countries will you cross to travel to Bangladesh?
5. Keep the scale in mind and use estimation to find:
 - a. The approximate distance between New Delhi and Beijing.
 - b. The approximate aerial distance between New Delhi and Singapore.

Use a centimetre scale to help you in Question 5.



Data Connect

Open the Data Bank on page 244 and study the data on 'Air Quality Index of the Biggest Cities in India'. Then answer the questions below.

1. Give the AQI of the two northern most city and name it.
2. Give the AQI of the eastern most city and name it.
3. Name the cities with the lowest and highest AQI on this map.
4. If you move north-east from Mumbai, which city will you reach that is shown on this map?
5. Name the two cities in UP and state their AQI.
6. If you move south-west from Jaipur, in which city would you be?

Chapter Check-Up



Colour the circle that describes best how you feel.

I got this!

I'm getting there!

I need help!

Vocabulary Review

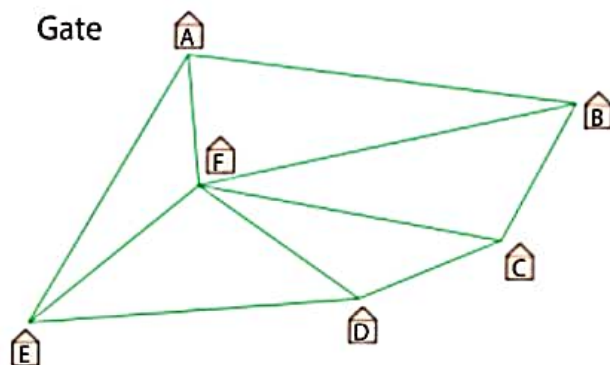
- Scale
- Location
- Diagonal
- Key
- Direction
- Title
- Square centimetre
- Compass rose



- This is a map of the Khanna brothers' farm. Each brother has his own cottage in different parts of the farm. Raju, the postman, comes to deliver mail to them every day. He enters and exits the farm at the gate near cottage A.

Using a scale of $1 \text{ cm} = 100 \text{ m}$, use a ruler to measure and answer these questions.

- What is the shortest route that Raju can take to cottage C? What is the distance on the map and what is the actual distance?
- On one day only cottage B and D have mail. What is the least distance that Raju can walk to them and back out of the gate?
- The day that Raju has to deliver mail to all the brothers he uses the shortest route possible. Find that route and the distance he has to walk to do that.



- The map of Tamil Nadu given alongside shows some of its well-known tourist destinations.

- Name the town that is to the immediate east of Tiruchirappalli.
- Name the town to the west of Kancheepuram.
- Which town is at the southern most tip?
- If you are travelling from Puducherry to Chennai in which direction will you be going?

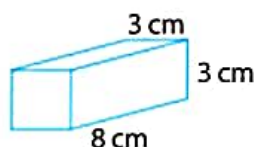


- Take any cartoon picture from a book and draw a 1 cm square grid over the original picture. Then draw a 2 cm square grid on a blank sheet of paper. Copy the picture onto the grid.



Keeping in Touch

Find the volume of this box.

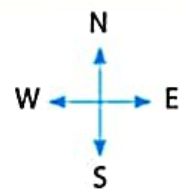
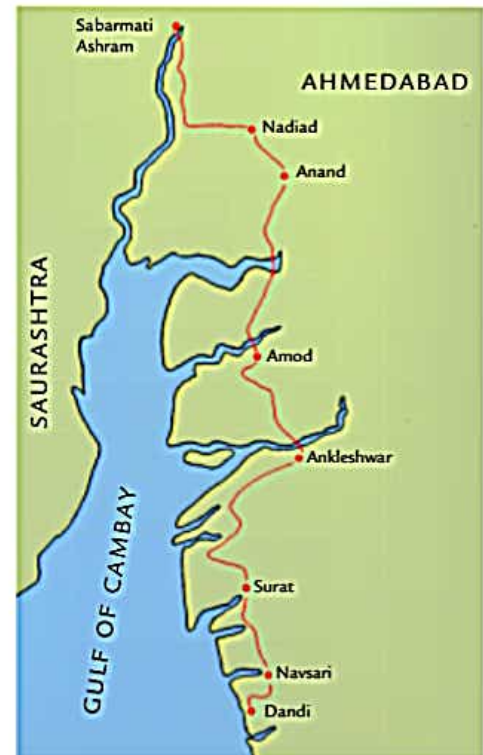




The map below shows the route that Mahatma Gandhi took on his famous Dandi March to defy the British salt tax. The march began on March 12, 1930 from his ashram at Sabarmati in Gujarat and ended on 6th April at Dandi.



Map of India



1. How many days long was the march?
2. In which direction did Gandhiji walk on the salt march?
3. Some of his followers came from Goa. In which direction did they travel to meet Gandhiji at Sabarmati?
4. Madhya Pradesh is to the _____ of Gujarat and Rajasthan is to its _____.
5. Which states does someone who is travelling from West Bengal to Sabarmati have to cross to get there?

How does the GPS system work?

Background: Each GPS satellite sends out signals which can be followed by a GPS receiver on Earth. GPS receivers can be found in watches, phones, tablets, computers, cars, and several other devices.

Find out more about these related career choices.

- A systems analyst
- A computer programmer
- A computer engineer



To calculate your location, a GPS receiver must receive the signal from at least 3 satellites.

The activity below will tell you how it works.

Materials: Compass to draw circles, pencils, and map given on next page.

Preparation: Students may work independently or in pairs.

Procedure: You are out on a trek in the Thar desert and you are lost. You have a map with you, but you don't know where you are on the map. You need to find your exact location. You see this sign on the side of the road.

Jaisalmer 338 km

Jodhpur 247 km

Jaipur 351 km

Use the map on the following page.

Step 1: You know that you are in a place 338 km from Jaisalmer. As per the scale on your map, $65 \text{ km} = 1 \text{ cm}$. So, $338 \text{ km} = 5.2 \text{ cm}$. Using 5.2 cm as the radius and Jaisalmer as the centre, draw a circle (draw only that part of the circle that fits on the page). This is not enough to tell your exact location as you could be anywhere on the circle. *This is what satellite 1 does.*

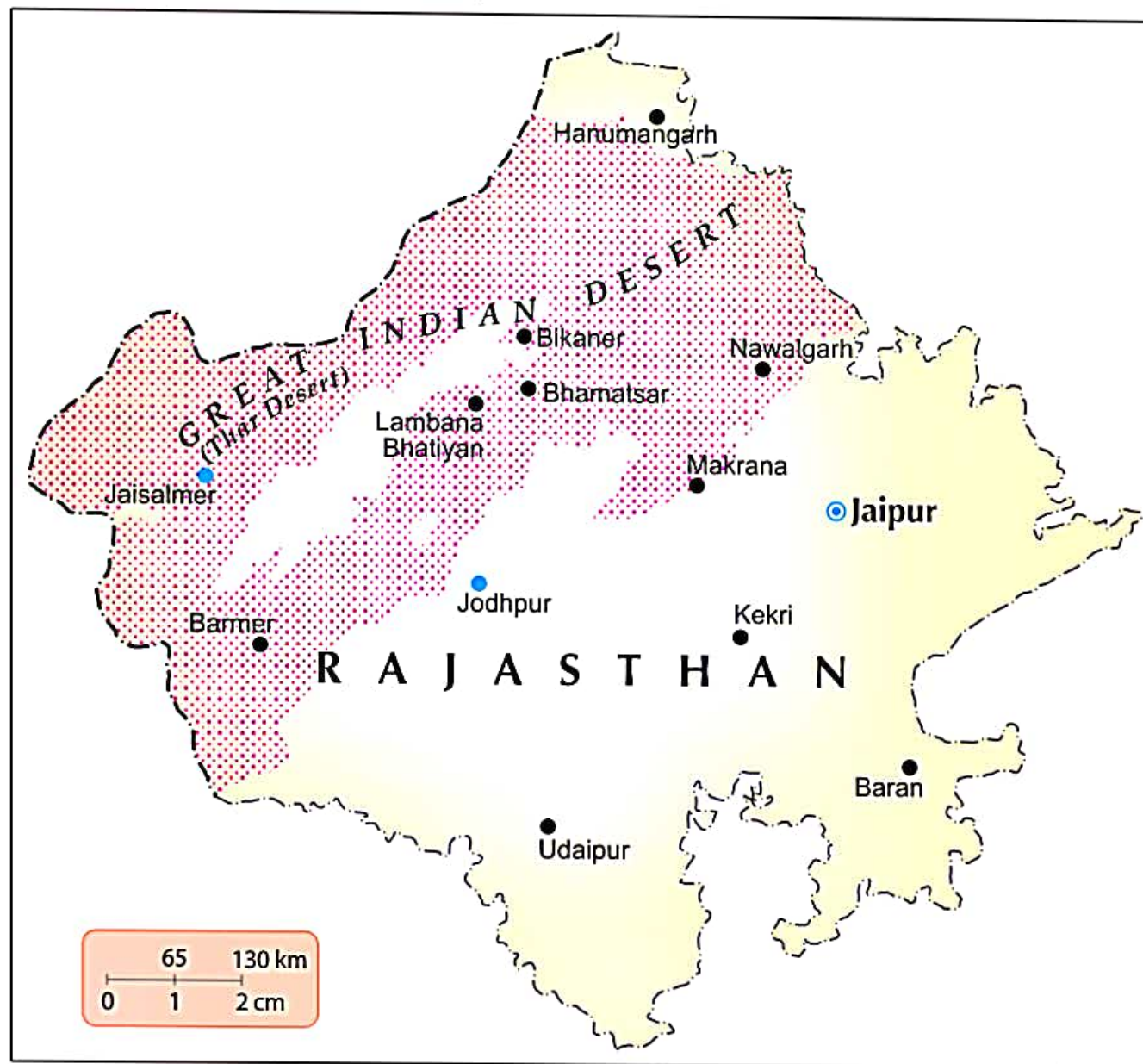
Step 2: Jodhpur is 247 km from where you are. Using the scale, $247 \text{ km} = 3.8 \text{ cm}$ on your map. Use Jodhpur as the centre and draw a circle with radius of 3.8 cm. *This would be the information from Satellite 2.*

Your location has now been narrowed down to a smaller area and you could be anywhere on the part of the overlapping circles.

Step 3: Jaipur is 351 km from where you are. Using the scale, take Jaipur as the centre and draw a circle with radius 5.4 cm on the map. What do you find? Have you been able to find your exact location? *Satellite 3 finally pinpoints your exact location.*

WHERE ARE YOU ON THIS MAP?

Draw a  on the spot once you find your location.

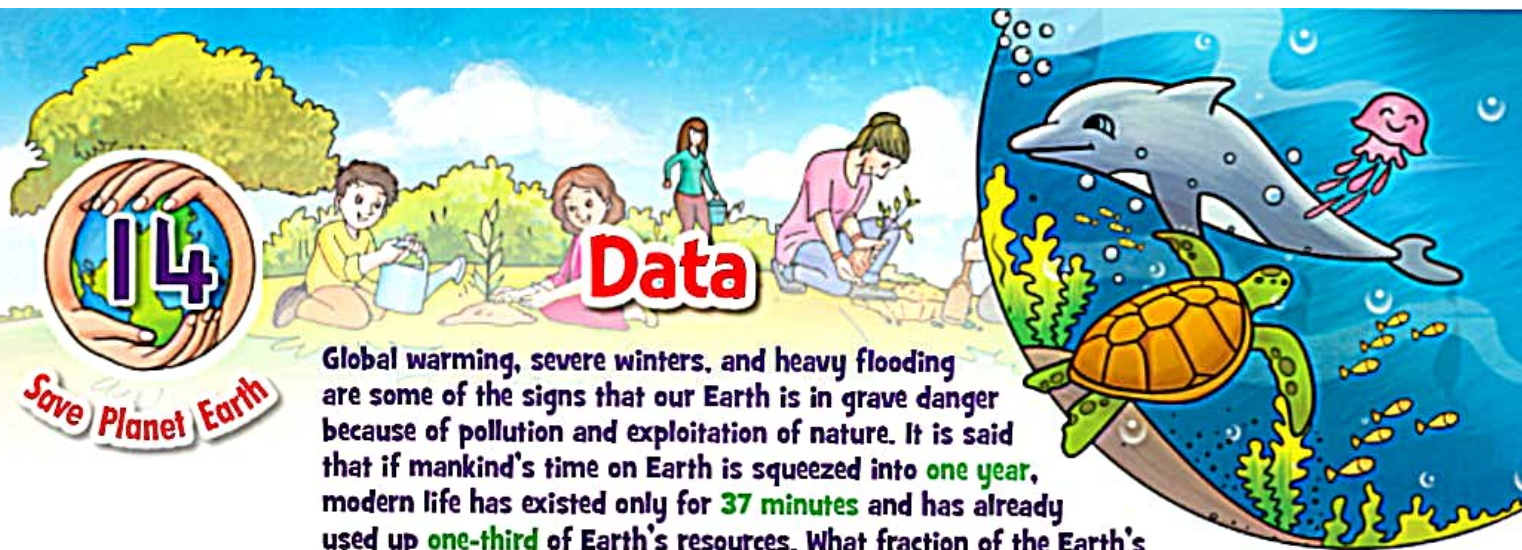


Number Facts

- The first GPS satellite was launched in 1978. By 1994, 24 satellites were in space.
- Each satellite is built to last about 10 years.
- A GPS satellite weighs about 900 kg and is about 5 m across with the solar panels extended.

Extension

Among the hundreds of uses that the GPS system has, it also helps track endangered animals. Find out more about this. Also list other ways in which the GPS has helped lives of human beings.



Global warming, severe winters, and heavy flooding are some of the signs that our Earth is in grave danger because of pollution and exploitation of nature. It is said that if mankind's time on Earth is squeezed into **one year**, modern life has existed only for **37 minutes** and has already used up **one-third** of Earth's resources. What fraction of the Earth's resources are left?

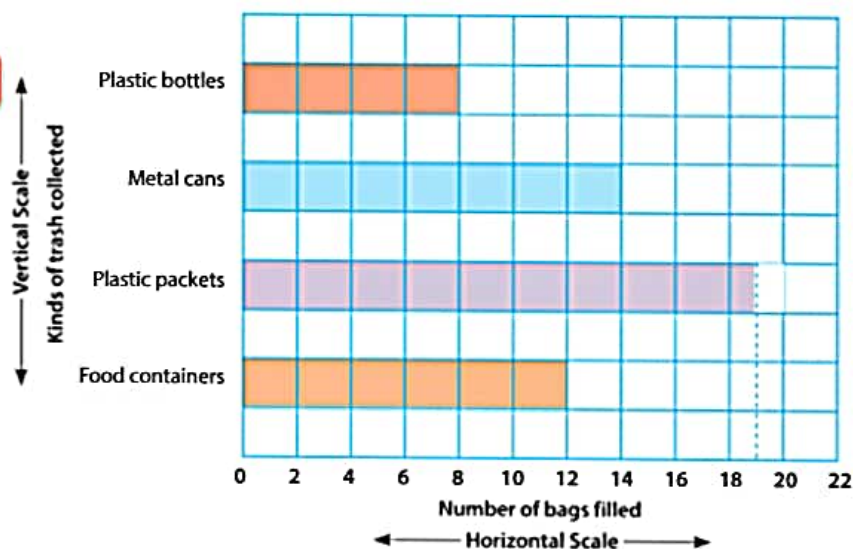


LOOKING BACK



When we throw things into the oceans we are polluting them. The oceans and all the creatures and plants in them play a very important role in protecting our planet and reducing global warming.

The environmental club of a school goes to the beach once a week to clean it up. This horizontal bar graph shows the number of bags of the different kinds of trash they collected from the seashore.



Mathspeak

FA

Explain how to read the bar that shows plastic packet collection.

1. What does each square represent?
2. How many bags of plastic packet trash were filled?
3. How many more bags were filled with metal cans than plastic bottles?
4. How many bags of trash did the students collect in all?
5. Make a question of your own using the data on the graph.



NCF 2023

Competencies in this chapter
C-4.3: Labelled on specific pages

CIRCLE GRAPHS

Circle graphs show information in different parts and put them together to form a whole. Here the whole consists of 24 towns.

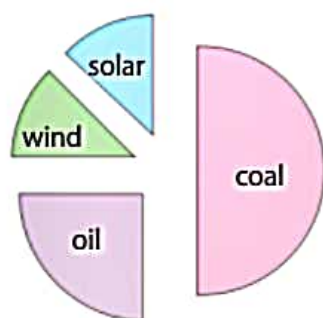
Many kinds of electrical energy are obtained from burning oil or coal. This process releases carbon dioxide into the air which leads to global warming. Today we try to use clean energy like that from the sun (solar power) or wind which not only does not pollute the air but there is also an endless supply of it.

Energy source	Number of towns	Fraction of the whole (24 towns)
Coal	12 towns	12 out of 24 or $\frac{12}{24} = \frac{1}{2}$ 
Oil	6 towns	6 out of 24 or $\frac{6}{24} = \frac{1}{4}$ 
Solar	3 towns	3 out of 24 or $\frac{3}{24} = \frac{1}{8}$ 
Wind	3 towns	3 out of 24 or $\frac{3}{24} = \frac{1}{8}$ 
Total	24 towns	

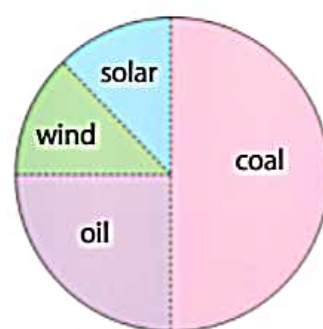
Main source of energy

coal	12 towns
oil	6 towns
solar	3 towns
wind	3 towns

SOURCES OF ENERGY



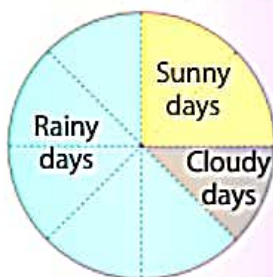
SOURCES OF ENERGY



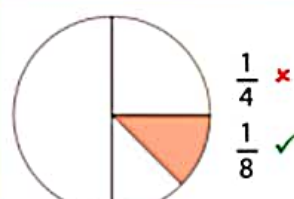
Try This!

This circle graph shows the weather for 4 weeks in Mumbai during the month of June.

- $\frac{5}{8} / \frac{3}{4}$ of the days were rainy days. (Cross out the wrong one.)
- $\frac{1}{4} / \frac{1}{2}$ of the days were sunny days. (Cross out the wrong one.)
- $\frac{1}{8} / \frac{1}{4}$ of the days were cloudy.
- If the circle chart shows 28 days.
 - _____ days were rainy.
 - _____ days were sunny.
 - _____ days were cloudy.



Common Mistake!



Mathspeak

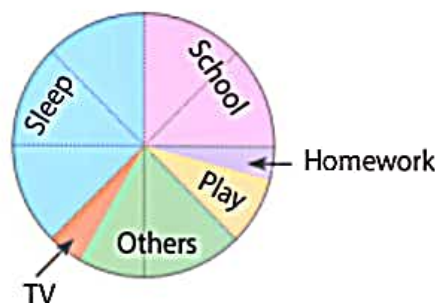
Explain why it is easier to compare data on a circle graph than a table.

FA

Exercise 14 A

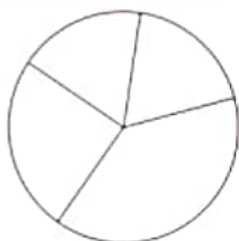
1. This circle graph shows how Rishabh spent his day. A day has 24 hours. The circle has been divided into 8 equal parts with dotted lines. So each part represents 3 hours. You can fill in the details on the table with the help of the circle graph.

Number of hours	Activity
6 hours	
9 hours	
1 hour	Homework
2 hours	
5 hours	
1 hour	



2. 100 people were asked which kind of movies were their favourite. Look at the table that gives their replies. Colour and label the circle graph accordingly.

Favourite movie	Number of people
Adventure	24
Comedy	20
Mystery	20
Drama	36



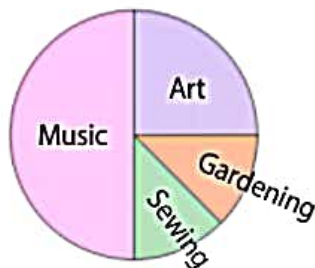
3. This circle graph shows the votes for the class election. If there are 40 students in the class, estimate the number of votes each person who stood for the election got.

- a. i. Ada (Hint: $\frac{1}{4}$ of 40) _____ votes ii. Rashi _____ votes
 iii. Mira (Hint: $\frac{1}{8}$ of 40) _____ votes iv. Anita _____ votes
 b. Who won the election?
 c. Which two students got the same number of votes? How many more votes did Rashi get than Mira?



4. The circle graph shows the hobby classes that 48 students of class V chose. Fill in the table to show the number of students that chose each hobby.

Hobby	Number of Students
Music	
Art	
Gardening	
Sewing	



TALLY MARKS



Air pollution is one of the biggest reasons for climate change. The more carbon dioxide that we send up into the air, the hotter our Earth gets. We should walk, use public transport, or find other ways to travel that pollute the air less.

Students of class V went to the school office to find out the different ways the staff came to work every day. They used tally marks to record the answers.

| is 1 || is 2 |||| is 4
 |||| is 5 ||||| is 7 ||||| |||| is 10

Modes of transport to school for office staff

Modes of transport	Tally marks	Number of people
Bus		10
Train/Metro		
Car		
Bicycle		
Walking		

1. Fill in the last column.
2. How many people are there in the school office?
3. Which is the least popular way of travelling to office?
4. Which is the most popular way?
5. How many more people use the bus than bicycles?

Try This!

Copy this table in your notebook. Collect the information with the help of tally marks as each student calls out the information.

Students in Class V who have brothers and sisters

	Tally marks	Number of students
No brothers and sisters		
Only brothers		
Only sisters		
Both brothers and sisters		

Challenge!

Shefali has made these marks to count the number of days to her birthday. Each section represents a different month in which the tallies were made. On which date did she start the tally marks? On which date is her birthday?



--	--	--

(Hint: Begin by finding out which month does the middle section represent.)

Exercise 14 B



1. Complete the tally chart.

Number of hours the students of Class V watch TV in a day

Number of hours	Tally marks	Number of students
Less than $\frac{1}{2}$ hour	II	
Between $\frac{1}{2}$ and 1 hour	IIII IIII	
Between 1 and 2 hours	IIII IIII II	
Between 2 and 3 hours	IIII IIII	
More than 3 hours	III	



Mathspeak

FA

Study the data in Q1. If you had to ask one more student and guess the answer, do you think there is a higher chance that the answer will be less than $\frac{1}{2}$ hour or a higher chance that the answer will be between 1-2 hours? Why do you think this?

2. Members of a nature club saw these insects on their nature walk. Build a tally chart using the pictures. Then build a bar chart based on the information.



3. Use the pictograph given below to build a tally chart first and then a bar graph.

Flowers in a Bouquet

Roses	    
Lilies	      
Asters	  
Tulips	   
Key: Each symbol stands for 2 flowers	

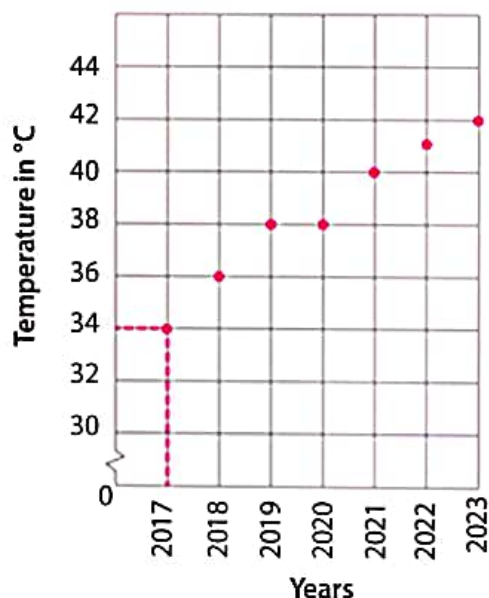
LINE GRAPHS



Rising temperatures is one of the major problems of climate change.

The information below shows the highest temperature in a city in the month of May over a period of 7 years. This information can also be shown on a chart using dots.

Year	2017	2018	2019	2020	2021	2022	2023
Temp°C	34	36	38	38	40	41	42



If you follow the dotted line you will see that the first dot shows that the temperature was 34°C in the year 2017.

Use a ruler to check the other dots. What does the dot between 40°C and 42°C mean?

Vertical
scale

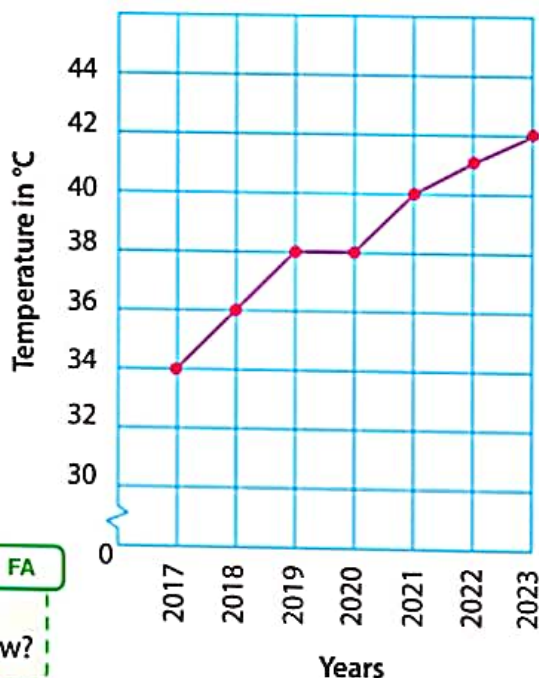
Horizontal
scale

If you join the dots you will see how the temperatures have been rising over the last seven years. This kind of graph is called a line graph. A line graph uses line segments to show how data changes over a specified period of time.

The line from 34°C to 36°C shows us how the temperature went up from 2017 to 2018.



Did you notice that on the vertical scale there is a break between 0 and 30? That is because there is no recorded data between 0°C and 30°C and we do not need to show it on vertical scale.



Mathspeak

What does the line graph convey to you in terms of how temperatures have been changing over time? How do you know?

FA

Answer the questions given below using the line graph on the previous page.

1. What was the temperature in the year 2018?
2. Which year has recorded the highest temperature?
3. Which two years have the same temperature?
4. By how much has the temperature risen from the year 2017 to the year 2023?
5. What do you understand about temperature levels in general for the last 7 years?

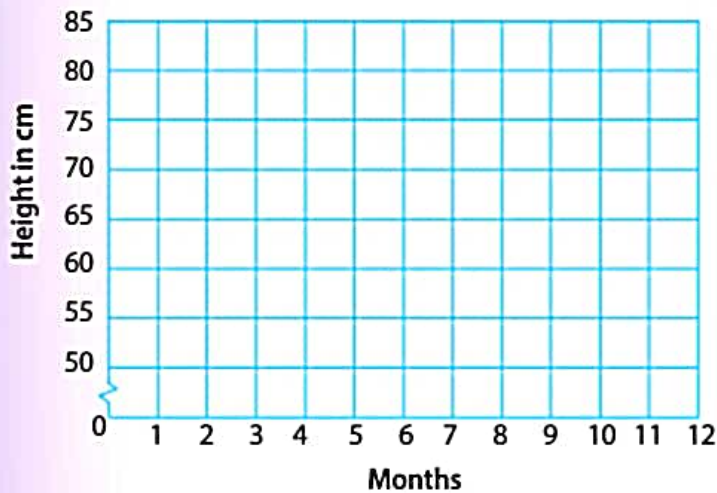
Try This!



Place the dots on the graph using the information given. Then connect the dots with lines to make a line graph.

Mrs Menon kept a record of her baby's height from the time he was born till he was 12 months of age. She put a dot on the chart every time she took his height.

0 month (at birth)	-	50 cm
1 month	-	55 cm
3 months	-	65 cm
6 months	-	70 cm
9 months	-	75 cm
12 months	-	80 cm

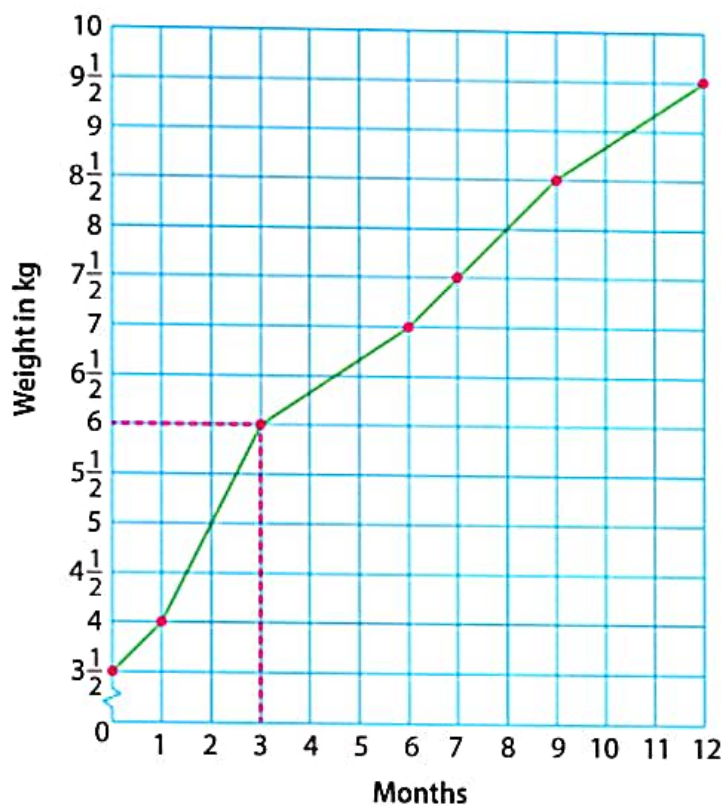


Join the dots to make a line graph. Use the graph to answer the questions.

- a. What was the baby's height at birth? _____
- b. How many cm did he grow in his first month? _____
- c. How many cm did he grow from his birth to his third month? _____
- d. How many cm did he grow from 3 months to 6 months? _____
- e. What was his height at 12 months? _____

Exercise 14 C

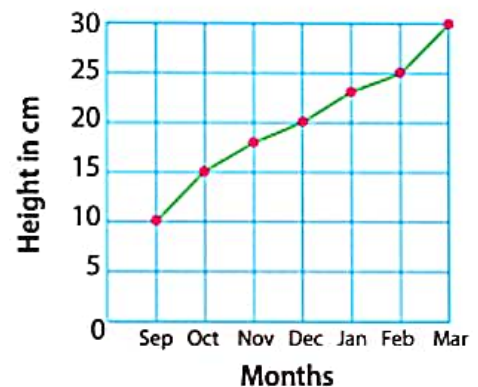
1. This graph shows a baby's weight in kg for the first 12 months after birth. Answer the questions by using the graph.



Use a ruler to help you read the graph. For example, the vertical red line shows the baby's age as 3 months and the horizontal red line shows that he was 6 kg then.

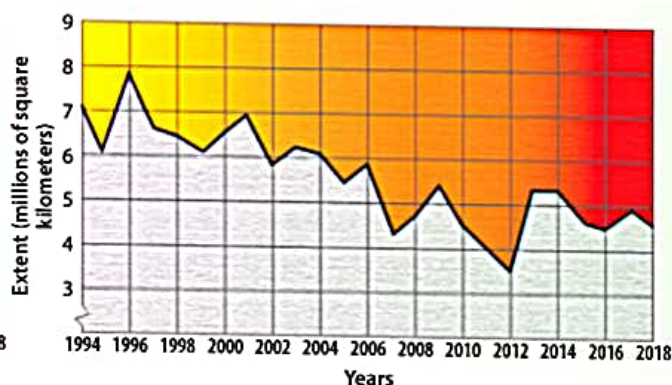
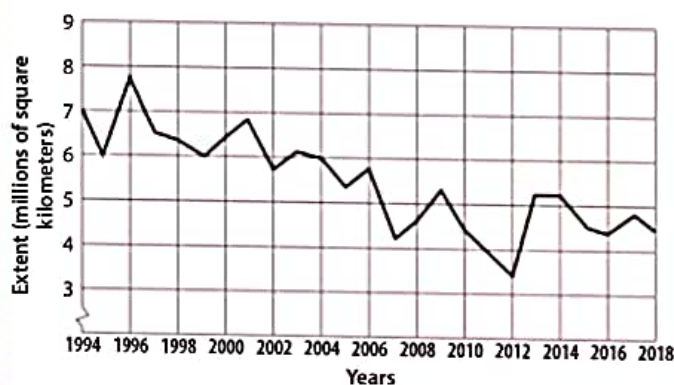


- What was the baby's weight when he was born? _____
 - What was his weight at 1 month? _____
 - What was his weight at 6 months? _____
 - What was his weight at 12 months? _____
 - How many kg did he gain in his first 3 months? _____
 - How much weight did he gain from his 7th to 9th month? _____
2. Shisher planted a rose plant in his garden. He kept a record of its growth with the help of a line graph. Answer the questions by looking at the graph.
- How tall was the plant when he planted it in September?
 - What was its height in the month of March?
 - Can you estimate the height of the plant in January?
 - How many cm did it grow from September to March?



Graphs give you a very clear picture of data that it reflects. You can convert the line graph into art to convey that meaning even more clearly.

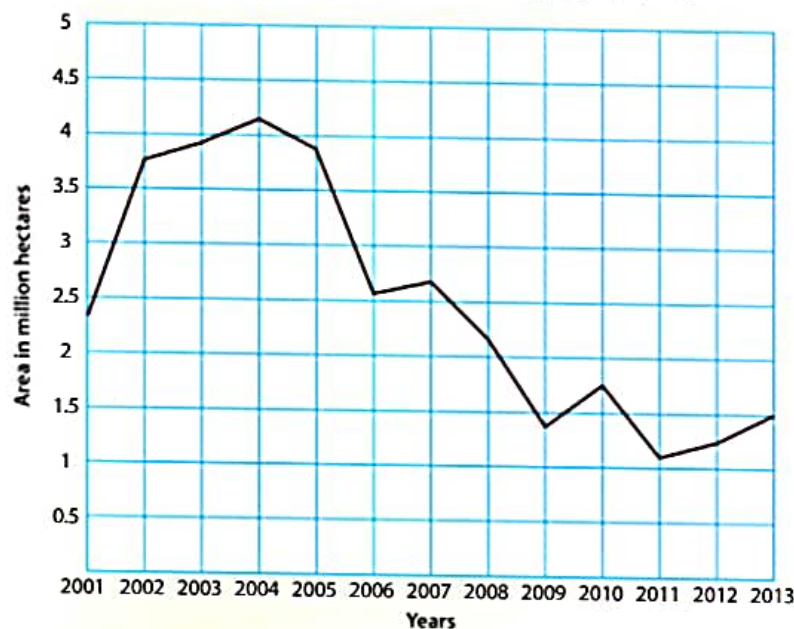
This line graph shows how the ice in the Arctic Sea has been reducing over time. An artist has conveyed the meaning of the data through the use of colour - the decreasing amounts of ice (grey) and the increased heat in the atmosphere (shades of yellow turning red).



The line graph given alongside shows a decrease in forest cover on Earth over a period of time.

- Do an internet search on the reasons for this and use your creativity to convey these facts on the graph.
- Copy the graph on a sheet of paper and then draw pictures and colour without losing the main line graph.

Line graph on decrease in forest cover



Data Connect

Open the Data Bank on page 243 and make your own data file using the data based on 'If you Started Reading in Grade 1'. Then follow the instructions and fill in the table.

Chapter Check-Up



Colour the circle that describes best how you feel.



Vocabulary Review

- Pictograph
- Bar graph
- Circle graph
- Label
- Represent
- Horizontal scale
- Tally marks
- Data
- Symbol
- Vertical scale
- Line graph
- Information

1. The circle graph shows the number of hours Anshuman spends studying different subjects every week out of a total study time of 12 hours.

- Give the fraction shown by the circle graph for each subject.
- How many hours does he spend studying Maths every week?
- How much time is spent on Science?
- If he spends 3 hours studying English and Social Studies together, how much time does he spend on each?



2. Study the table and answer the questions.

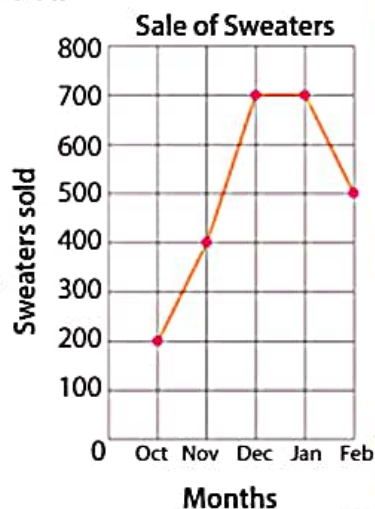
Favourite recess snacks of students in Class V-A

Snack	Tally marks	Number
Sandwich	III III III	
Chips	III III III III III I	
Samosa	III III III	
Cake	III II	

- Fill in the last column of the table.
- Which is the most popular snack in class?
- Which is the least popular?
- Which two snacks are equally popular?
- How many more children like chips than cake?
- How many children are there in all in Class V-A?

3. Study the graph and answer the questions.

- Which two months had the maximum sale of sweaters?
- Which month had the least sale?
- How many sweaters were sold in November?
- How many fewer sweaters were sold in February than January?
- How many more sweaters were sold in December than October?



Keeping in Touch

- Find the time 2 hours 45 minutes after 11:15 p.m.
- Find the date 16 days before 3rd May.



- a. If today is 15th April, what will be the date after 20 days? _____
- b. Are $\frac{3}{4}$ and $\frac{9}{16}$ equivalent?
- c. Give XLIX in Hindu-Arabic numbers.
- d. How many minutes in 5 hours?
- e. Complete the pattern: 10:30, 12:00, 1:30, 3:00 _____
- f. Give the sum of the place values of 7 in 37,94,871: _____
- g. A person who slept for 10 hours woke up at 8:00 a.m. When did he go to sleep? _____
- h. How many hours in 600 minutes? _____
- i. Build the smallest number using 6, 2, 8, 4, 0.
- j. How many seconds in 6 minutes? _____

- k. Give the reciprocal of $\frac{8}{11}$: _____
- l. Complete the pattern: Monday, Thursday, Sunday, _____
- m. S.P. = ₹320, C.P. = ₹500, Loss = _____
- n. One hour 20 minutes after 10:45 p.m. is _____.
- o. Build the largest possible number using 5, 0, 3, 8, 7, 6: _____.
- p. Two hours 15 minutes before 7:05 a.m. is _____.
- q. Write 8381296 in the international system.

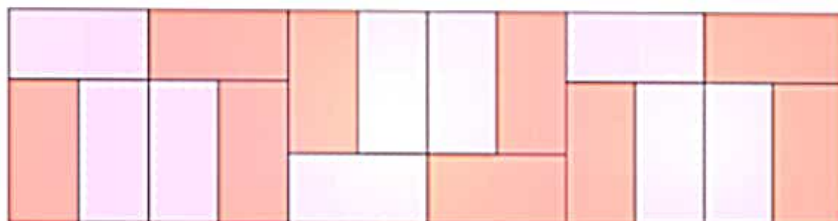
- r. Complete the pattern Jan 1st, Feb 28th, Mar 1st, April 30th, _____.
- s. How many days from 1st November to 31st January?
- t. Give the prime factors of 71.



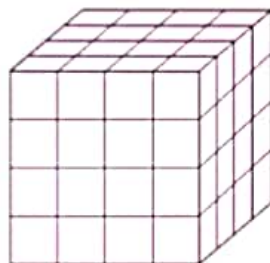
(Based on chapters 11, 12, 13, 14)

SA

1. This footpath has been paved with rectangular stones that are each 15 cm wide and 30 cm long.
 - a. What is the total area of the grey stones?
 - b. What is the area and perimeter of the entire footpath?



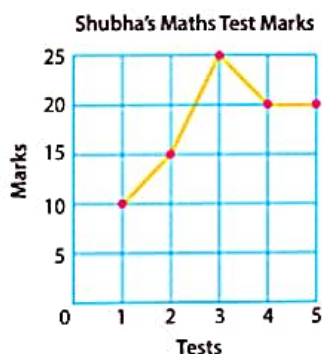
2. What is the volume of the large cube that has been made up of smaller cubes? Take each small cube to have a volume of 1 cu. cm.
3. These are the five students who appeared for the Maths Olympiad and the time it took them to answer all the questions. List their names in the order they completed, starting from the person who took the least time.



Anirudh: 2 hours 17 minutes 6 seconds
 Ajoy: 7268 seconds
 Ankit: 2 hours 23 minutes 25 seconds
 Abhiram: 147 minutes 40 seconds
 Ayush: 135 minutes 5 seconds

4. Study the graph to answer the following questions.

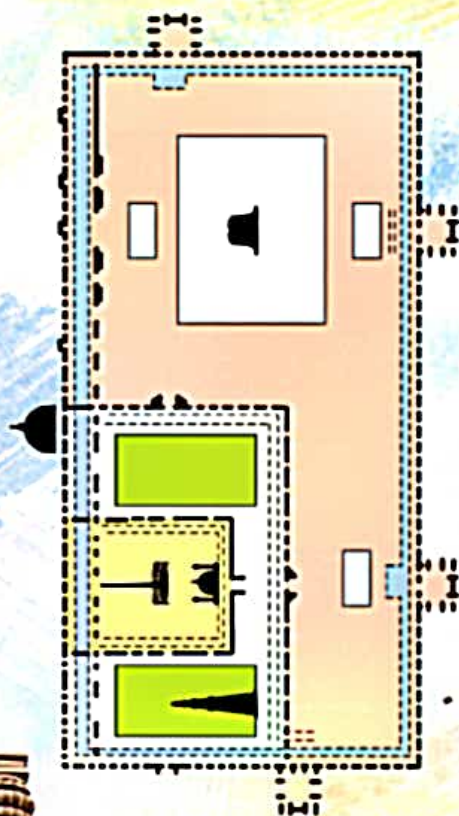
- a. Which test did Shubha do best in?
- b. What were her lowest marks?
- c. Which two tests did she get the same marks?
 How much was that?



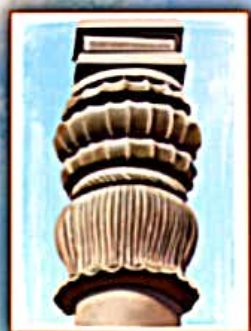
5. Say **sometimes**, **always**, or **never** as applicable for each of these statements.
 - a. A map needs a scale.
 - b. A compass rose is used for distance.
 - c. Every map needs a key.
 - d. The title describes what the map is about.
 - e. A map gives a bird's eye view of a place.

MAP OF THE COMPLEX

- Which monument is to the north of the complex?
- The gate to the south-east of the Qutub Minar is called the Alai Darwaza. Mark it on the map.
- If you walk along the boundary from the Qutub minar, to Iltutmish's tomb, what kind of angle would you make?



A Maths Walk through THE QUTUB MINAR COMPLEX



Key

- Qutub Minar
- Alai Minar
- Gate

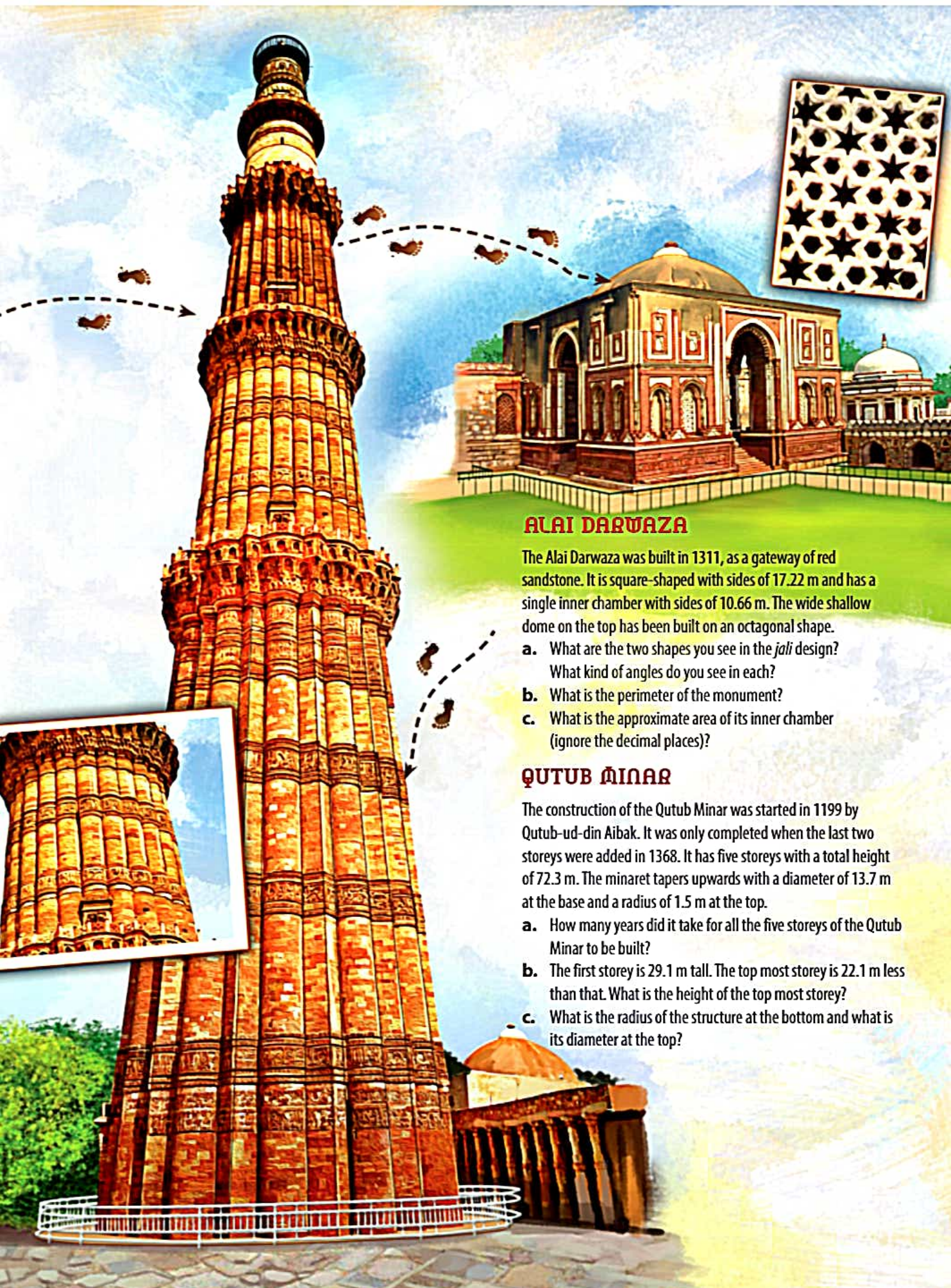
- Iron Pillar
- Mosque
- Iltutmish's Tomb

IRON PILLAR

The Iron pillar is believed to have been crafted in the 4th century in the honour of King Chandragupta II. The pillar has not shown signs of deep rust after all these years. It weighs about 6,500 kg. It is 7.3 m high from its base and 1 m is buried into the ground. It has 6 lines or 3 stanzas written in ancient Brahmi script.

- How many centuries has the iron pillar stood without getting rusted?
- How many g is 6,500 kg? Give your answer in words and numerals.
- What fraction of the entire pillar is dug into the ground? Give your answer in cm.
- Copy the pattern on the top of the pillar and draw the line of symmetry through it.





ALAI DARWAZA

The Alai Darwaza was built in 1311, as a gateway of red sandstone. It is square-shaped with sides of 17.22 m and has a single inner chamber with sides of 10.66 m. The wide shallow dome on the top has been built on an octagonal shape.

- What are the two shapes you see in the *jali* design? What kind of angles do you see in each?
- What is the perimeter of the monument?
- What is the approximate area of its inner chamber (ignore the decimal places)?

QUTUB MINAR

The construction of the Qutub Minar was started in 1199 by Qutub-ud-din Aibak. It was only completed when the last two storeys were added in 1368. It has five storeys with a total height of 72.3 m. The minaret tapers upwards with a diameter of 13.7 m at the base and a radius of 1.5 m at the top.

- How many years did it take for all the five storeys of the Qutub Minar to be built?
- The first storey is 29.1 m tall. The top most storey is 22.1 m less than that. What is the height of the top most storey?
- What is the radius of the structure at the bottom and what is its diameter at the top?

Data Bank



THE WATER FOOTPRINT OF FOOD

The glass of milk you drank this morning needed a lot of water to be able to reach you. Right from the water the cows drank, to the water used to grow the grass that the cows ate, to the water used to clean the machines in the dairy, these are just few of the things that go to make the **water footprint** of milk.

Food item	Quantity	Water needed (in litres)
Chocolate	1 kg	17,196
Butter	1 kg	5,553
Rice	1 kg	2,497
Apple	1 kg	822
Banana	1 kg	790
Potatoes	1 kg	287
Milk	1 litre	1,020
Egg	1 egg	196
Almonds	1 kg	16,098

SOME IMPORTANT ENVIRONMENTAL DATES



March 3rd
World Wildlife Day



June 5th
World Environment Day



March 22nd
World Water Day



June 8th
World Oceans Day



April 22nd
Earth Day

RAPID TRANSPORT - METRO LINES IN INDIA (As on September 2021)

Place	Complete length (in km)	Under construction (in km)	Place	Complete length (in km)	Under construction (in km)
Kolkata	38.56	101.86	Chennai	54.15	118.91
Delhi	348.51	110.18	Kochi	25	2.94
Bengaluru	56.1	79.2	Hyderabad	67	2.94
Mumbai	11.4	193.35	Ahmedabad	6	54.10

FASTEST LAND ANIMALS



Blue Wildebeest

Average speed: 90 kmph



Springbok Antelope

Average speed: 80 kmph



Lion

Average speed: 80 kmph



Cheetah

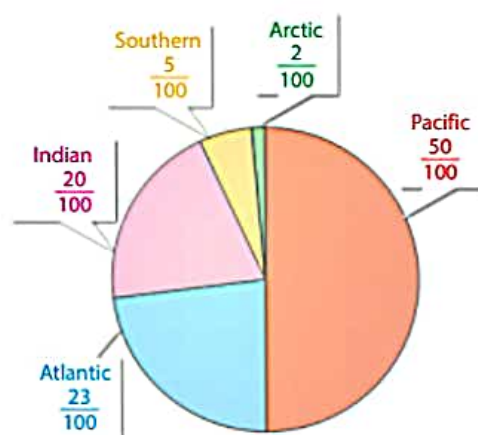
Average speed: 113 kmph



Pronghorn Antelope

Average speed: 98 kmph

SHARE OF WATER OF DIFFERENT OCEANS ON EARTH



IF YOU STARTED READING IN GRADE 1

If you read 1 hour every day, by the time you reach grade 6 you would have read **27,37,500 words**.

If you read 30 minutes every day, by the time you reach class 6 you would have read **13,68,750 words**.

If you read 10 minutes every day, by the time you reach class 6 you would have read **4,56,250 words**.

Make your own data file.

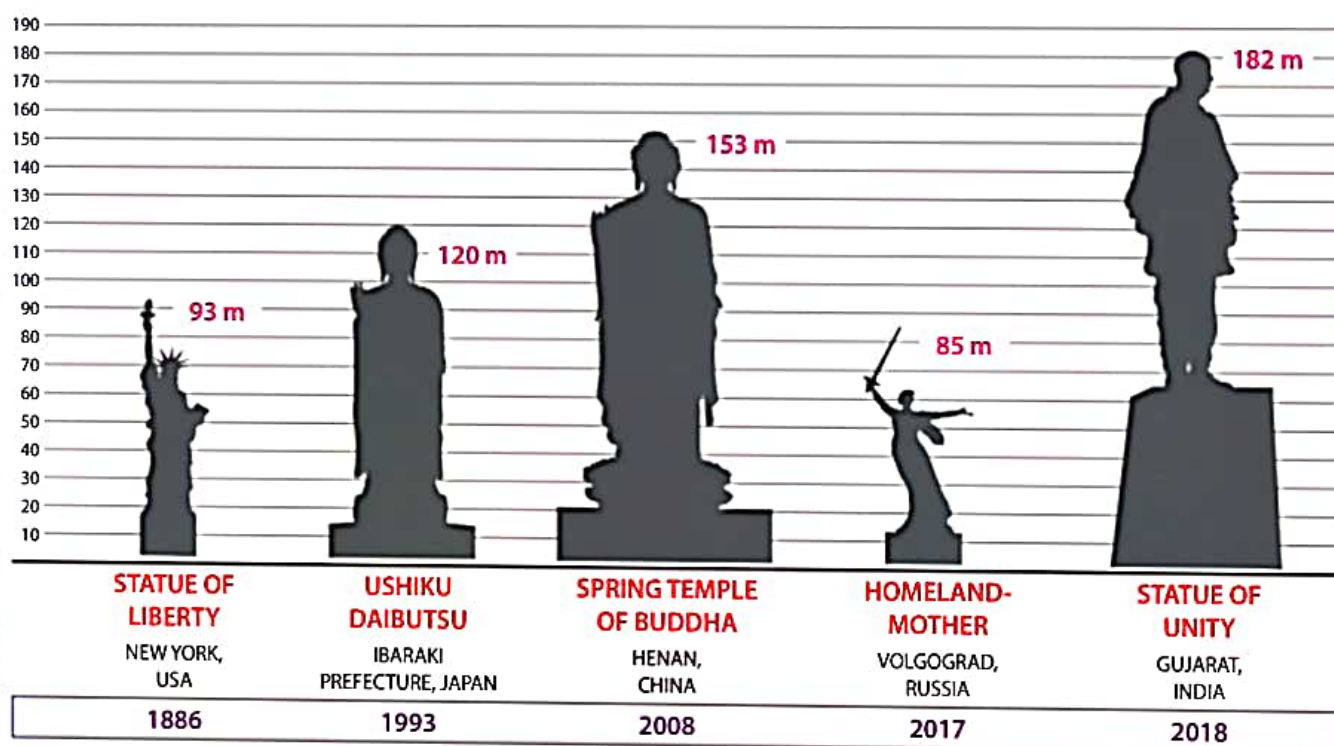
Find out how many words you can read in a minute. Set the timer or stopwatch for one minute.

- Start reading. Make sure that you're reading at a normal rate, and that you understand what you read.
- Count the number of words you read. (You can use word count if you are reading on a computer screen.)
- Do this three times. Find the average number of words you can read in a minute.
- Get one person younger and one person older than you to do the same.
- Record the data for all three people below. (WPM stands for Words Per Minute)

READING SPEED IN WORDS PER MINUTE (WPM)

	Younger than you (name)	Your name	Older than you (name)
Name			
WPM (round 1)			
WPM (round 2)			
WPM (round 3)			
Average			

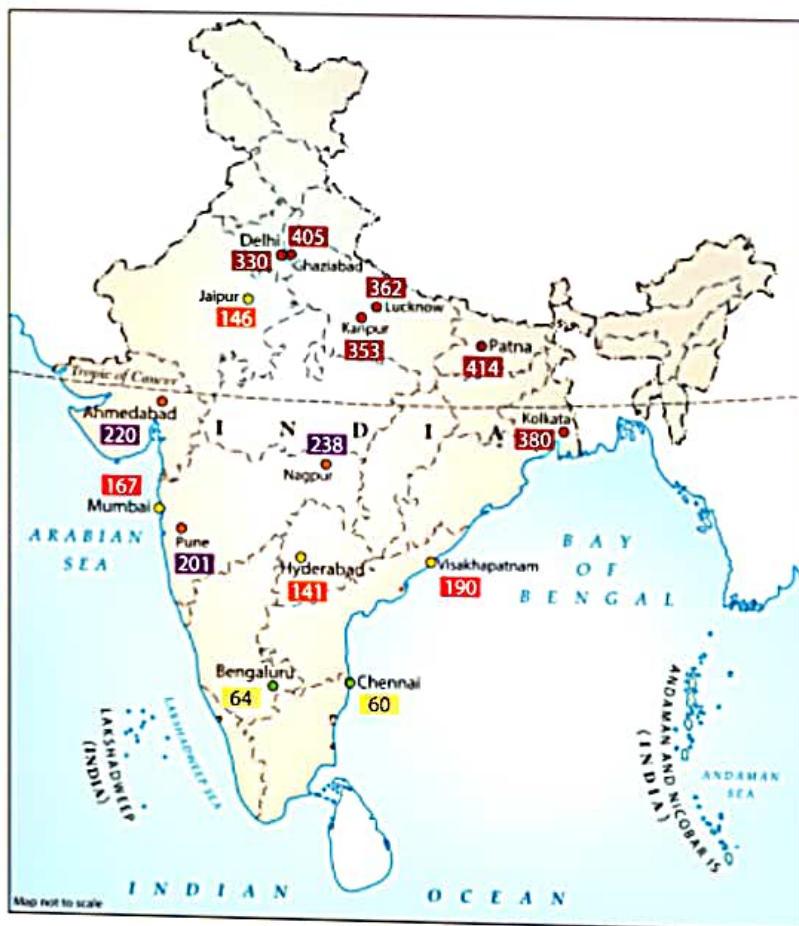
COMPARING THE SIZE OF SOME FAMOUS STATUES



AIR QUALITY INDEX OF THE BIGGEST CITIES IN INDIA

Air Quality Index (AQI) Range	Air Quality Condition	Colors
0 to 50	Good	Green
51 to 100	Moderate	Yellow
101 to 150	Unhealthy for Sensitive Groups	Orange
151 to 200	Unhealthy	Red
201 to 300	Very Unhealthy	Purple
301 to 500	Hazardous	Maroon

The levels of health concern are symbolised by the different colours in the table.



Answers to Selected Questions

Chapter 1: Place Value

Challenge - Page 11

3,64,052: Three lakh, sixty-four thousand, fifty-two

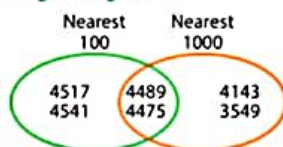
Exercise 1B

- a. Smallest - 11,25,889 Greatest - 98,85,211
b. Smallest - 10,46,779 Greatest - 97,76,410
- a. Smallest - 1,12,36,789 Greatest - 9,98,76,321
b. Smallest - 1,00,03,457 Greatest - 7,77,54,310
- a. 45,69,499 b. 87,15,999 c. 5,09,999 d. 19,99,999
- a. 9,29,500 b. 79,99,000 c. 1,00,00,000 d. 1,98,97,951

Exercise 1C

- a. 50 b. 390 c. 1,010 d. 92,410 e. 11,000
- a. 600 b. 900 c. 6,900 d. 14,900 e. 58,000
- a. 1,000 b. 10,000 c. 4,000 d. 36,000 e. 98,000

Challenge - Page 16



Exercise 1D

- a. 1,300,000 Earths could fit inside the Sun.
b. The Moon is about 356,400 kilometres from the Earth.
c. There are about 1,013,913 words in the English language.
- a. 712,801 Seven hundred twelve thousand, eight hundred one
b. 602,590 Six hundred two thousand, five hundred ninety
c. 1,016,800 One million, sixteen thousand, eight hundred
d. 5,397,284 Five million, three hundred ninety-seven thousand, two hundred eighty-four
- a. 30,000 b. 6,000,000 c. 100,000 d. 100,000
- Indian
a. 8,50,009 Eight lakh, fifty thousand, nine
b. 16,70,112 Sixteen lakh, seventy thousand, one hundred twelve
c. 42,90,281 Forty-two lakh, ninety thousand, two hundred eighty-one
d. 5,30,563 Five lakh, thirty thousand, five hundred sixty-three
International
a. 850,009 Eight hundred fifty thousand, nine
b. 1,670,112 One million, six hundred seventy thousand, one hundred twelve
c. 4,290,281 Four million, two hundred ninety thousand, two hundred eighty-one
d. 530,563 Five hundred thirty thousand, five hundred sixty-three

Challenge - Page 21

- a. $|X + | = X$ b. $|X| - | = X$ c. Turn it upside down.

Exercise 1E

- a. 24 b. 90 c. 57 d. 44 e. 75 f. 82
- a. > b. < c. < d. <
- a. LXV b. LXXIV c. XL d. XI

Chapter Check-Up

- a. Eleven lakh, nine hundred forty-eight
 $10,00,000 + 1,00,000 + 900 + 40 + 8$
b. Seventy-eight lakh, ninety-eight thousand, one
 $70,00,000 + 8,00,000 + 90,000 + 8,000 + 1$
c. Five crore, sixty-seven lakh, three thousand, six hundred seventy
 $5,00,00,000 + 60,00,000 + 7,00,000 + 3,000 + 600 + 70$
- a. 30,70,306 b. 4,17,00,195
- a. 8 thousand b. 60 thousand c. 9 crore
- Greatest: 77,75,321; Smallest: 11,12,357 6. a. < b. >
- a. A 15-year old boy would have lived for 131,400 (One hundred thirty-one thousand four hundred) hours.
b. 2,401,596 (Two million, four hundred one thousand, five hundred ninety-six) people travelled by planes this year.
- a. The municipal corporation spent ₹5,95,000 on repairing the roads.
b. 400 people attended the meeting of coin collectors in the city.
c. The Rajdhani Express was delayed by 5 hours. 9. d. XCV

Chapter 2: Addition, Subtraction, and Their Applications

Exercise 2A

- 114 2. 102 3. 118 4. 157
- 133 6. 90 7. 140 8. 18
- 53 10. 68 11. 32 12. 45
- 33 14. 12 15. 22

45	31	32	42
34	40	39	37
38	36	35	41
33	43	44	30

Challenge - Page 27

Exercise 2B

- a. Profit ₹35 b. Loss ₹20 c. Loss ₹18 d. Profit ₹710
- a. C.P. < S.P. = Profit ₹540 c. C.P. < S.P. = Profit ₹540
d. C.P. > S.P. = Loss ₹180 e. C.P. < S.P. = Profit ₹675
- a. C.P. + overheads = ₹1,071 S.P. = ₹1,235 Profit ₹164
c. C.P. + overheads = ₹2,495 S.P. = ₹2,300 Loss ₹195
d. C.P. + overheads = ₹7,733 S.P. = ₹9,818 Profit ₹2,085
e. C.P. + overheads = ₹11,188 S.P. = ₹10,050 Loss ₹1,138
- a. Loss ₹750 b. ₹900 c. Profit ₹499 d. ₹1,850 e. Loss ₹1,100

Exercise 2C

- a. ₹2,190 b. ₹2,528 c. ₹9,650 d. ₹72,050
- a. ₹1,006 b. ₹3,955 c. ₹9,629 d. ₹16,776
- a. ₹277 b. ₹633 c. ₹1,910 d. ₹3,870
- a. ₹5,250 b. ₹18,490 c. ₹2,090 d. ₹14,880 e. ₹20,150

Exercise 2D

- ₹4,38,465 2. 350 g 3. 8,784 km 4. 25,750 visitors 5. 168 chairs

Challenge - Page 36

2999, 3000, 3001

Exercise 2E

- a. 336 b. 5,248 c. 2,085 d. 10,973 e. 8,270 f. 26,409
- a. 1,279 b. 59,052 c. 71,774 d. 10,948
- a. ₹22 b. 715 stickers c. 9,601 books d. 704 pieces

Chapter Check-Up

- a. 49,581 b. 7,99,908 c. 8,999 d. 5,92,683
- a. 75 b. 15 c. 72 d. 53
- a. Gain ₹3,125 b. ₹5,527 c. ₹855
- a. 9,110 b. 1,746 c. 1,244 kilograms
- d. Not enough information

Chapter 3: Multiplication, Division, and Their Applications

Exercise 3A

- a. 700 b. 700 c. 800 d. 1,200 e. 1,100
f. 900 g. 700 h. 700 i. 600 j. 900
- a. 280 b. 360 c. 720 d. 480
- a. 200 b. 200

Challenge - Page 42

Page numbers 14 and 15

Exercise 3B

- a. 1441, 14541, 145541, 1455541
b. 11, 111, 1111, 11111 c. 3333, 33633, 336633, 3366633

Exercise 3C

- Q: 248, R: 38 2. Q: 733, R: 28 3. Q: 969, R: 2 4. Q: 397, R: 45
- Q: 693, R: 7 6. Q: 815, R: 6 7. Q: 839, R: 10 8. Q: 696, R: 30
- Q: 809, R: 21 10. Q: 1,316, R: 4 11. Q: 1,201, R: 20 12. Q: 562, R: 17

Exercise 3D

- B 2. D 3. C 4. E 5. A

Exercise 3E

- a. 20 b. ₹11 c. 125 cm d. 15 min
- a. C1: 224, Average - 56 C2: 312, Average - 78 C3: 212, Average - 53
C4: 384, Average - 96 C5: 568, Average - 142
b. Class - 5 c. Class - 3 d. 340
- a. 380 points b. 48, 49, 51, 52 (one probable answer) c. 60 km

Exercise 3F

- a. 70 kmph b. 15 kmph c. 1080 kmph d. 120 kmph
- a. 30 kmph b. 8 kmph c. 4 kmph

Exercise 3H

- 5 hours 2. ₹1,252 3. 24 houses
- 92 minutes 5. Capsicum - 5, Onion - 20

Chapter Check-Up

3. a. Q: 238, R: 2 b. Q: 409, R: 5 c. Q: 2,206, R: 8
7. a. 63,840 onions b. 73 boxes c. ₹450 8. d. 15 kmph

Critical Thinking Skills –Page 57

Logical Thinking Arrowpoint is 17 km north of Deerpoint.

Number Sense

1. a. 5 Options: 10 combinations

M	T	O	C	P
MT	TO	OC	CP	
MO	TC	OP	(1)	
MC	TP	(2)		
MP	(3)			
(4)				

Visual Thinking



- b. 6 Options: 15 combinations
7 Options: 21 combinations
c. 8 Options: 28 combinations

2. 7225

Pattern 1 is got by adding 605 every time.

Pattern 2 breaks up each number into 2 parts. The first two numbers of each part are multiples of 6 and the next 2 are the multiples of 5.

Chapter 4: Factors

Exercise 4A

2. a. Yes, as $100 \div 4 = 25$, so each box will have 25 cards.
b. No, $56 \div 6 = Q:9, R:2$, which means 6 is not a factor of 56.

Challenge – Page 60 40, 80

Challenge – Page 63 28th of the month

Exercise 4B

2. a. 3×17 b. $2 \times 2 \times 3 \times 5$ c. $2 \times 3 \times 3 \times 5$
d. $2 \times 2 \times 2 \times 2 \times 2$ e. $2 \times 2 \times 2 \times 3$ f. $3 \times 3 \times 7$
g. $3 \times 3 \times 3 \times 3$ h. $2 \times 2 \times 2 \times 3 \times 3$
3. a. Prime number b. $3 \times 5 \times 5$ c. 3×7
d. Prime number e. Prime number f. $2 \times 3 \times 3 \times 3$

Exercise 4C

3. a. 20 b. 4 c. 1 d. 2 e. 2 f. 4
4. a. 2 b. 8 c. 5 d. 16
e. 4 f. 9 g. 9 h. 1

Chapter Check-Up

2. $1 \times 36; 2 \times 18; 3 \times 12; 4 \times 9; 6 \times 6$ 3. 21, 22, 24, 25, 26, 27, 28, 30
8. a. 2 or 4 b. 4 9. b. 2, 3, 5, 7, 11, 13, 17, 19

Chapter 5: Multiples

Exercise 5A

1. a. Common multiples – 18, 36 LCM 18
b. Common multiples – 10, 20, 30 LCM 10
c. Common multiples – 6, 12, 18 LCM 6
d. Common multiple – 12 LCM 12
3. a. 16 b. 50 c. 200 d. 80 e. 400
5. a. After 60 seconds b. 24

Chapter Check-Up

3. a. 60 b. 70 c. 54 d. 45 e. 120 f. 240
4. 24th September 5. c. 24

Chapter 6: Fractions

Exercise 6A

3. a. $\frac{3}{12}$ b. $\frac{9}{15}$ c. $\frac{3}{18}$ d. $\frac{3}{15}$ e. $\frac{6}{15}$ f. $\frac{12}{15}$
4. b. $\frac{1}{4} = \frac{2}{8} = \frac{3}{12} = \frac{4}{16}$ c. $\frac{2}{3} = \frac{4}{6} = \frac{6}{9} = \frac{8}{12}$
d. $\frac{2}{5} = \frac{4}{10} = \frac{6}{15} = \frac{8}{20}$ e. $\frac{3}{4} = \frac{6}{8} = \frac{9}{12} = \frac{12}{16}$
5. Some possible answers:
a. $\frac{1}{4}$ b. $\frac{2}{7}$ c. $\frac{7}{8}$ d. $\frac{1}{3}$ e. $\frac{1}{2}$ f. $\frac{11}{15}$
8. a. E b. NE c. NE d. NE e. E f. E

Exercise 6B

2. Some possible answers:
a. $\frac{1}{3}$ b. $\frac{1}{2}$ c. $\frac{3}{4}$ d. $\frac{2}{3}$ e. $\frac{1}{2}$ f. $\frac{2}{3}$

- g. $\frac{4}{5}$ h. $\frac{2}{3}$ i. $\frac{4}{5}$ j. $\frac{1}{5}$ 3. c, d, f, g, and h.

Challenge – Page 86 $\frac{2}{7}, \frac{3}{7}, \frac{5}{10}, \frac{9}{5}, \frac{1}{3}$

Exercise 6C

1. a. > b. > c. < d. <
2. a. > b. > c. > d. < e. < f. > g. < h. >
3. a. $\frac{9}{21} < \frac{9}{19} < \frac{9}{16} < \frac{9}{15} < \frac{9}{10}$ b. $\frac{2}{8} < \frac{2}{6} < \frac{2}{4} < \frac{2}{3}$
c. $\frac{1}{15} < \frac{3}{15} < \frac{6}{15} < \frac{12}{15} < \frac{14}{15}$ d. $\frac{3}{12} < \frac{2}{6} < \frac{2}{4} < \frac{7}{8}$
e. $\frac{1}{3} < \frac{1}{2} < \frac{2}{3} < \frac{3}{4}$ f. $\frac{1}{2} < \frac{6}{10} < \frac{2}{3} < \frac{4}{5} < \frac{5}{6}$
4. a. $\frac{10}{14} > \frac{10}{15} > \frac{10}{20} > \frac{10}{22} > \frac{10}{35}$ b. $\frac{15}{19} > \frac{11}{19} > \frac{10}{19} > \frac{9}{19} > \frac{8}{19}$
c. $\frac{1}{2} > \frac{1}{3} > \frac{1}{5} > \frac{1}{6}$ d. $\frac{3}{4} > \frac{5}{12} > \frac{2}{6} > \frac{1}{8}$
e. $\frac{5}{6} > \frac{3}{4} > \frac{2}{3} > \frac{3}{5}$ f. $\frac{11}{12} > \frac{7}{9} > \frac{3}{4} > \frac{2}{3} > \frac{5}{8}$

Exercise 6D

1. a. $\frac{3}{8}$ b. $\frac{7}{9}$ c. $\frac{7}{8}$ d. $\frac{4}{6}$ e. $\frac{7}{10}$ f. $\frac{3}{4}$ g. $\frac{5}{8}$ h. $\frac{7}{10}$
2. a. $\frac{1}{2}$ b. $\frac{1}{2}$ c. $1\frac{1}{8}$ d. $1\frac{3}{10}$ e. $1\frac{11}{36}$ f. $1\frac{3}{8}$ g. $1\frac{23}{30}$ h. $1\frac{11}{12}$

Exercise 6E

1. $8\frac{1}{2}$ 2. $5\frac{5}{7}$ 3. $3\frac{1}{2}$ 4. $4\frac{5}{12}$ 5. $1\frac{37}{56}$
6. $5\frac{4}{5}$ 7. $5\frac{5}{12}$ 8. $5\frac{9}{10}$ 9. $6\frac{11}{18}$ 10. $7\frac{1}{4}$

Exercise 6F

1. $\frac{1}{12}$ 2. $\frac{1}{4}$ 3. $\frac{1}{12}$ 4. $\frac{1}{12}$ 5. $\frac{9}{28}$
6. $\frac{1}{24}$ 7. $\frac{3}{10}$ 8. $\frac{1}{6}$ 9. $\frac{1}{8}$ 10. $\frac{47}{110}$

Exercise 6G

1. a. $2\frac{1}{2}$ b. $5\frac{1}{5}$ c. $9\frac{1}{7}$ d. $1\frac{9}{10}$ e. $4\frac{1}{4}$
f. $\frac{2}{3}$ g. $7\frac{1}{3}$ h. $2\frac{4}{5}$ i. $4\frac{1}{4}$ j. $5\frac{1}{5}$
2. a. Add; $\frac{3}{4}$ of pocket money b. Add; $\frac{17}{24}$ of homework
c. Subtract; $2\frac{3}{8}$ litres d. Subtract; $1\frac{5}{6}$ metres e. Subtract; $\frac{1}{15}$ cup

Exercise 6H

3. a. $\frac{3}{8}$ b. $\frac{8}{15}$ c. $\frac{3}{8}$ d. $2\frac{11}{12}$ e. $1\frac{1}{15}$ f. $\frac{4}{35}$ g. $\frac{1}{4}$ h. $\frac{2}{15}$
4. a. $\frac{7}{24}$ b. $\frac{3}{8}$ c. $\frac{5}{6}$ d. $\frac{1}{3}$ e. $\frac{5}{7}$ f. $\frac{1}{3}$ g. 1 h. $\frac{3}{7}$

Exercise 6I

1. a. $\frac{2}{7}$ b. $\frac{1}{15}$ c. $\frac{6}{35}$ d. $\frac{1}{14}$ e. $\frac{1}{36}$
f. $\frac{3}{64}$ g. $\frac{1}{5}$ h. $\frac{1}{49}$ i. $\frac{2}{25}$ j. $\frac{1}{18}$
2. a. 15 b. 21 c. 48 d. 12 e. 12
f. 8 g. $12\frac{1}{2}$ h. 6 i. 9 j. 10

3. a. less than b. more than

Exercise 6J

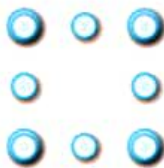
1. a. $\frac{6}{7}$ b. $\frac{5}{6}$ c. $\frac{3}{5}$ d. $\frac{2}{3}$ e. $\frac{5}{8}$
f. $1\frac{2}{7}$ g. 1 h. 3 i. $2\frac{2}{3}$ j. $1\frac{1}{5}$
2. a. Multiply; $4\frac{1}{5}$ cans b. Divide; $\frac{2}{9}$ pizza c. Divide; $\frac{1}{20}$ collection
d. Divide; 12 servings

Chapter Check-Up

1. Some possible answers:
a. $\frac{4}{5} = \frac{8}{10} = \frac{12}{15}$ b. $\frac{7}{9} = \frac{14}{18} = \frac{21}{27}$ 2. a. $\frac{2}{3}$ b. $\frac{9}{10}$
3. a. < b. < c. > d. >
6. a. 50 candles b. $4\frac{1}{4}$ hours c. $1\frac{7}{12}$ hours 7. a. and c

Critical Thinking Skills – Page 105

Visual Thinking



Two counters are placed one on top of the other at the corners.

Chapter 7: Decimals

Exercise 7A

- a. 8 b. 4 c. 1 d. 5 e. 6
- a. 4.7 b. 58.96 c. 5.78
- a. 1.8, 1.9, 2.0 b. 5.95, 5.96, 5.97 c. 12.1, 12.2, 12.3
d. 8.00, 8.01, 8.02 e. 6.05, 6.06, 6.07 f. 4.26, 4.27, 4.28

Exercise 7C

- a. 3.45 m b. 4.07 m c. 1.12 m
d. 2.340 km e. 1.045 km f. 5.090 km
- a. 6.300 kg b. 9.125 kg c. 3.550 kg
d. 4.700 t e. 3.250 t f. 2.985 t

Challenge – Page 110

- a. 23.45 kg b. 11.5 years old c. 131.5 cm

Exercise 7D

- a. < b. < c. = d. > e. < f. <

Exercise 7E

- a. 8.3, 8.06, 8.059, 8.013 b. 4.2, 4.02, 3.8, 3.48
c. 19.46, 19.4, 1.95, 1.945 d. 8.66, 8.06, 6.8, 6.08
e. 80.2, 80.002, 8.63, 8.6 f. 3.91, 3.9, 3.09, 3.019
- a. 0.04, 0.14, 1.04, 1.14 b. 19.09, 19.9, 20, 20.01
c. 14.19, 14.9, 19.14, 19.4 d. 6, 6.23, 6.32, 6.4
e. 0.99, 1.1, 6, 9.09 f. 7.02, 7.162, 7.2, 7.23
- a. Team B b. Swapneel c. Shamin
d. First – Prashant; Last – Rohan; Prashant, Suraj, Ananth, Rohan

Challenge – Page 113

- a. 0.872 b. 0.278 c. 7.82

Exercise 7F

- a. 26.91 b. 16.09 c. 10.8 d. 612.2 e. 12.5
f. 178.31 g. 10.46 h. 35.11
- a. < b. > c. = d. >

Exercise 7G

- a. 5.16 b. 9.17 c. 2.68 d. 6.27 e. 0.9 f. 5.71
g. 0.39 h. 1.96
- a. 4.85 b. 3.72 c. 8.35 d. 3.05 e. 7.9 f. 11.04
- a. Subtract; 78.5 km b. Add; 9.25 cm c. Add; 5.83 cm

Exercise 7H

- a. 1016; 101.6; 10.16 b. 1560; 156.0; 15.60
- a. 47.7 b. 92.4 c. 21.6 d. 129.2
e. 6.9 f. 58.73 g. 0.2 h. 0.06
- a. 410.2 Earth days b. 147 Earth hours c. 717.9 hours

Exercise 7I

- a. 282.5 b. 8.1 c. 12.3 d. 110
e. 1673 f. 319 g. 140 h. 800

Exercise 7J

- a. 0.06 b. 12.4 c. 0.05 d. 0.34
- a. 9.13 b. 0.13 c. 45.37 d. 56.2
e. 5.91 f. 0.36 g. 3.06 h. 0.4
- a. 15.05 b. 2.15 c. 0.775 d. 4.575
e. 1.85 f. 0.65 g. 0.534 h. 9.45

Exercise 7K

- a. Multiply; 17.5 litres b. Multiply; 34.5 km
c. Divide; 0.22 m d. Divide; 4.5 g

Chapter Check-Up

- a. 0.073 b. 0.009 c. 0.462 d. 0.003 e. 1.14 f. 0.238
- a. zero point zero nine five b. zero point one zero one
c. one point four three
- a. 80.2; 80.5; 99.25; 99.52 b. 9.89; 9.4; 8.5; 8.09
- a. 8.87 b. 28.95 c. 1.9 d. 11.85
e. 63.36 f. 0.20 g. 0.85 h. 6.66

Number Sense 25, 36, 49, 64

Logical Thinking



- a. 24.27 g b. 42.2 points c. 3.75 km d. 28.68 minutes
- d. ₹552.50

Chapter 8: Shapes, Patterns, and Nets

Exercise 8B

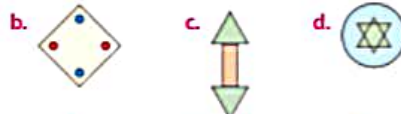
- H, I, O, S, X, Z

Challenge – Page 135

Largest 4-digit number – 8888

Smallest 4-digit number – 1001

Challenge – Page 136



Challenge – Page 137

- a. Maharashtra b. Rajasthan c. Uttar Pradesh d. Kerala e. Assam

Challenge – Page 140

- a. b. c.

Chapter Check-Up

- II, 88, 808, 818, 1001, 1881
- a. $\frac{1}{2}$ turn b. $\frac{1}{2}$ turn c. $\frac{1}{4}$ turn d. $\frac{1}{2}$ turn e. $\frac{1}{2}$ turn f. $\frac{1}{4}$ turn 5. d.

Chapter 9: Geometry Basics

Challenge – Page 147 40 right angles

Exercise 9B

- a. Straight angle b. Acute angle c. Obtuse angle d. Right angle
- a. $\angle ABC$ = obtuse angle b. $\angle DEF$ = right angle
c. $\angle PQR$ = acute angle d. $\angle STU$ = obtuse angle
e. $\angle WXY$ = acute angle f. $\angle MNO$ = straight angle
g. $\angle XYZ$ = right angle h. $\angle LMN$ = acute angle

Chapter Check-Up

- a. line b. line segment c. right angle d. rays e. 90; 180 4. b.

Critical Thinking Skills – Page 159

Visual Thinking

1st and 3rd cubes are the same.

Number Sense

The lengths of the ribbon are, 19 cm, 18 cm, 17 cm, and 16 cm.

Logical Thinking

- a. False b. False, divisor has to be $\frac{1}{2}$ c. True

Chapter 10: Measurement

Exercise 10A

- a. 98 m 98 cm b. 16.24 m c. 11.2 cm d. 28 cm 7 mm e. 498 mm

Exercise 10B

- a. 12 cm b. 9.6 m c. 100 m d. 380 cm e. 87 cm
f. 720 mm g. 0.70 m h. 8 mm i. 92 mm j. 4.2 cm
- a. 6,200 m b. 120 m c. 9,100 m d. 6.3 km e. 1.1 km
f. 2.8 km
- a. 1.5 mm b. 5.8 mm c. 0.98 cm = 9.8 mm
d. 0.8 cm = 8 mm e. 3 cm
- a. 95 cm b. 500 hops c. 22.4 km d. 1.63 m
e. 50 books f. 11 cm g. 21.4 cm

Challenge – Page 166 6 cm 8 mm

Challenge – Page 167

Step 1: Place 3 coins on each pan. The side that goes up has the lighter coin.

Step 2: Out of the set of 3 coins, place 1 coin on each pan. If one of the pan goes up, you have found the lightest coin. If both the pans are balanced, then the third coin (not placed on the pan) is the lightest.

Exercise 10C

- a. 19 kg 386 g b. 0 kg 832 g c. 2,614 g
d. 8,610 g e. 3 kg 246 g f. 11,296 kg
- a. 420 g b. 900 g c. 1,600 g d. 5190 g
- a. 0.125 kg b. 0.9 kg c. 1.12 kg d. 9.5 kg
- a. 0.715 kg b. 60 g c. 2.375 kg d. 1,040 g e. 12,100 g
f. 8.008 kg g. 0.932 kg h. 350 g i. 6.125 kg
- a. 20 eggs b. 33.75 kg c. 2.5 kg

Exercise 10D

- a. 1,300 mL b. 15,500 mL c. 350 mL d. 900 mL
- a. 0.335 t b. 0.95 t c. 2.5 t d. 5.25 t
- a. 400 mL b. 8,030 mL c. 140 mL d. 0.75 t e. 15,350 mL
f. 0.1 t g. 4 t h. 1.84 t i. 1,250 mL
- a. Yes b. 6 cups c. 1.2 t

Exercise 10E

- a. 29 m 6 cm
d. 3 kg 250 g
- a. 3 m 50 cm
d. 3 kg 750 g
- a. 4 m 25 cm
d. 3 kg 850 g
- b. 8 cm 4 mm
e. 3 l 150 ml
e. 1 l 700 ml
e. 9 m 65 cm
e. 27 kg 750 g
- c. 12 kg
f. 8 l 100 ml
f. 1 kg 100 g
f. 8 l 500 ml
c. 350 ml
f. 25 cm

Exercise 10F

- a. kg
b. m
c. l
d. cm
e. ml
f. mm

Chapter Check-Up

- a. 3 m 20 cm cloth
b. 8 kg 350 g
c. 3 l 800 ml
d. 2.9 cm

Chapter II: Perimeter, Area, and Volume

Exercise 11A

- a. 240 cm
e. 6 m
- b. 20 cm
g. 164 cm
- b. 12 cm
g. 20 cm
- b. 10 cm
g. 58 cm
- c. 44 cm
h. 220 cm
c. 14 cm
h. 22 cm
c. 16 cm
h. 75 cm
- d. 72 cm
i. 252 cm
d. 18 cm
i. 28 cm
d. 24 cm
i. 96 cm
- e. 100 cm
j. 368 cm
e. 14 cm
j. 32 cm
e. 30 cm
j. 139 cm
- f. 120 cm
f. 18 cm
f. 43 cm

Challenge - Page 180 96 cm

Exercise 11B

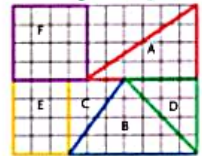
- a. 45 sq. cm
d. 22.5 sq. cm
- b. 120 sq. cm
e. 18.9 sq. cm
- c. 65 sq. cm
f. 52 sq. cm
- b. 4 cm
g. 10 cm
- c. 2 cm
h. 11 cm
- d. 4 cm
i. 20 cm
- e. 7 cm
j. 17 cm
- f. 28 cm

Challenge - Page 183

One possible answer:



Challenge - Page 185



Exercise 11D

- a. 54 m
d. 25 cm; 625 sq. cm
- b. 156 m; ₹15,288
- c. 1,400 m or 1.4 km

Exercise 11E

- a. 4 cu. cm
e. 27 cu. cm
- a. 7 cu. cm
e. 6 cu. cm
- b. 8 cu. cm
f. 12 cu. cm
f. 18 cu. cm
- c. 3 cu. cm
g. 48 cu. cm
g. 11 cu. cm
- d. 20 cu. cm
h. 24 cu. cm
d. 12 cu. cm
h. 12 cu. cm

Challenge - Page 193 125 cu. cm; 36 cu. cm more

Exercise 11F

- a. 60 cu. cm
d. 12,000 cu. cm
- a. 120 cu. cm
d. 11 mm
- a. 3,120 cu. mm
b. 5 cm
c. 4 cm
- a. 168 cu. m
b. 13,500 cu. cm
c. 2,800 cu. cm

Exercise 11G

- a. 20 ml
d. 9 cu. cm
- b. 60 ml
b. 30 cu. cm
- c. 75 ml
c. 96 cu. cm

Chapter Check-Up

- a. Perimeter - 28 cm; Area - 49 sq. cm
b. Perimeter - 32 m; Area - 55 sq. m
- a. sq. cm
e. sq. km
- a. 64 cu. cm
5. a. 18 cu. cm
- b. 60 cu. cm
b. 12 cu. cm
- c. 24 cu. cm
c. 14 cu. cm
- d. 480 cu. cm
d. 12 cu. cm
- Three, 5 sq. cm, 8 sq. cm, 9 sq. cm
- A: P: 1,290 m A: 95,450 sq. m
b. 16 m

Chapter I2: Time and Temperature

Challenge - Page 203 00:05

Exercise 12A

- a. 480 min
d. 560 min
- b. 660 min
e. 192 min
- c. 420 min
f. 282 min

- a. 12 h
d. 6 h
- a. 780 s
d. 630 s
- a. 14 min
d. 10 min
- a. 660 s
d. She jogged for the same amount of time on both days.
- b. 2 h 12 min
e. 6 h 50 min
b. 300 s
e. 900 s
b. 8 min
e. 1 min 33 s
b. 8 min 24 s
- c. 2 h 10 min
f. 8 h 20 min
c. 1560 s
f. 2700 s
c. 4 min 40 s
f. 15 min 50 s
c. 5 min

Challenge - Page 204

- a. 8:30
b. 5:26 p.m.

Exercise 12B

- a. 11 min
d. 3 h 20 min
- a. 1 min 8 s
d. 4 h 50 min
- a. 1 h 20 min
d. 42 s
- b. 5 min 5 s
e. 8 years
b. 7 min 25 s
e. 3 years
b. 17 years 3 months
e. 1 h 25 min
- c. 3 h 10 min
f. 22 years 2 months
c. 5 h 40 min
f. 1 year 10 months
c. 6 h

Exercise 12C

- 18th February
4. 2:35 p.m.
- 3:25 p.m.
5. 21st August
- 8th September

Exercise 12D

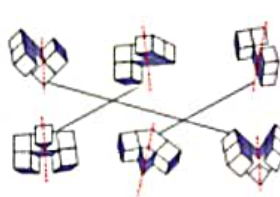
- b. 5°C
c. 0°C
d. 38.5°C

Chapter Check-Up

- a. 200 min
d. 16 min 20 s
g. 6 h 10 min
- a. 3:05 p.m.
3. a. 10th September
- b. 9 h 20 min
e. 11 min 40 s
h. 1 year 11 months
b. 2:30 p.m.
b. 22nd October
5. c. 30 minutes

Critical Thinking Skills - Page 214

Visual Thinking



Logical Thinking 6366 (The first and last digit are the same and the middle two digits are the product of those.)

Number Sense Exercising
Visual Thinking



Chapter I4: Data

Exercise 14A

- 6 hours - School
9 hours - Sleep
1 hour - Homework
2 hours - Play
5 hours - Others
1 hour - TV
- a. i. Ada - 10 votes
iii. Mira - 5 votes
b. Anita
c. Ada and Rashi got same number of votes. Rashi got 5 votes more than Mira.

Challenge - Page 231

Started 22nd January; Birthday 12th March

Exercise 14C

- a. 3 $\frac{1}{2}$ kg
2. a. 10 cm
- b. 4 kg
b. 30 cm
- c. 7 kg
c. About 23 cm
- d. 9 $\frac{1}{2}$ kg
d. 20 cm
- e. 2 $\frac{1}{2}$ kg
f. 1 kg

Chapter Check-Up

- a. Maths $\frac{1}{2}$; Science $\frac{1}{4}$; English $\frac{1}{8}$; Soc. Studies $\frac{1}{8}$
b. 6 hours
c. 3 hours
d. 1 h 30 min on each
- b. Chips
c. Cake
e. 19 children
f. 63 children
- a. December and January
c. 400 sweaters
d. 200 sweaters
e. 500 sweaters

A Maths Walk Through the Qutub Minar Complex

Map of the Complex

a. Alai Minar
c. Right angle

Iron Pillar

a. 18 centuries
b. 65 lakh g; 65,00,000 g
c. $\frac{10}{83}$ cm

Alai Darwaza

a. Star shape: acute angle
b. 68.88 m
c. 100 sq. m approximately

Qutub Minar

a. 170 years
b. 7 m
c. Radius: 6.85 m, Diameter: 3 m



LOOKING BACK

Multiplication

- This is a 4 by 3 array showing us $4 \times 3 = 12$.



- This is a 3 by 4 array showing us $3 \times 4 = 12$.



$$4 \times 3 = 12$$

Factors
Product

You can break up one factor into smaller numbers to find the product.

$$5 \times 17 = 5 \times (10 + 7) = (5 \times 10) + (5 \times 7) = 50 + 35 = 85$$

- You can also break up both factors into smaller numbers to find the product.

$$46 \times 15$$

$\times$	10	5
40	400	200
6	60	30

$$400 + 200 + 60 + 30 = 690$$

$$46 \times 15 = 690$$

Division

Division is the inverse of multiplication. You can check your division with multiplication.

$$\text{Quotient} \times \text{Divisor} + \text{Remainder} = \text{Dividend}$$

$$(5 \times 3) + 1 = 15 + 1 = 16$$

- Solve by breaking up one or two factors.

a. 7×18

b. 25×16

c. 235×5

- Multiply.

a. 317×90

b. 814×145

- Divide and check your answer.

a. $261 \div 18$

b. $2408 \div 23$

$$\begin{array}{r}
 5 \leftarrow \text{Quotient} \\
 \text{Divisor } \rightarrow 3 \overline{) 16} \leftarrow \text{Dividend} \\
 \underline{- 15} \\
 1 \leftarrow \text{Remainder}
 \end{array}$$

MORE ABOUT MULTIPLICATION

- a. You know that you can multiply factors in any order and get the same product.

i. $4 \times 3 \times 5$ can be multiplied as $4 \times 3 \times 5 = 12 \times 5 = 60$
 or $4 \times 3 \times 5 = 4 \times 15 = 60$
 or $4 \times 3 \times 5 = 4 \times 5 \times 3 = 20 \times 3 = 60$

Try this with a bigger number to multiply mentally.

ii. $4 \times 9 \times 25 = 4 \times 25 \times 9 = 100 \times 9 = 900$
 $4 \times 9 \times 25 = 900$

- b. You can also break up one factor and use the strategy given above.

$12 \times 25 = 3 \times 4 \times 25$ (break up 12 into 3×4)
 $3 \times 4 \times 25 = 3 \times 100 = 300$
 $12 \times 25 = 300$

- c. If you **double** one factor and **halve** the other, the product is the same.

$3 \times 8 = 24$ $\downarrow$ double $6 \times 4 = 24$ $\downarrow$ half $6 \times 4 = 24$	$14 \times 30 = ?$ $\downarrow$ half $7 \times 60 = 420$ $\downarrow$ double $7 \times 60 = 420$
---	--

Learn these well:

$2 \times 50 = 100$

$4 \times 25 = 100$

Mental Maths

FA

83×102

$$\begin{array}{r} 100 + 2 \\ 83 \times 100 = 8300 \\ 83 \times 2 = + 166 \\ \hline 8466 \end{array}$$

8×29

$$\begin{array}{r} 30 - 1 \\ 8 \times 30 = 240 \\ 8 \times 1 = - 8 \\ \hline 232 \end{array}$$

Solve:

a. 73×102

b. 101×62

c. 6×19

d. 5×29

Exercise 3 A

1. Multiply. Show the strategy you are using.

a. $2 \times 7 \times 50$

b. $7 \times 4 \times 25$

c. $5 \times 8 \times 20$

d. $4 \times 6 \times 50$

e. $4 \times 11 \times 25$

f. 36×25

g. 14×50

h. 35×20

i. 24×25

j. 45×20

2. Solve using doubling and halving strategy.

a. 14×20

b. 12×30

c. 18×40

d. 16×30

3. Fill in the boxes.

a. If $2 \times 50 = 100$, then $4 \times 50 = \boxed{}$

b. If $4 \times 25 = 100$, then $8 \times 25 = \boxed{}$

Challenge!

Shilpi is reading a book. She places her bookmark between two page numbers which when multiplied give a product of 210. What are the page numbers?

MULTIPLYING WITH BIGGER NUMBERS

Multiplying by a 2-digit Number

Example 1: UNICEF helps the Government of India in its vaccination programme. If 4,375 children were vaccinated in each of the 47 towns across India, how many children were vaccinated in all?

➡ $4375 \times 47 = ?$

Step 1: Multiply by ones

Step 2: Multiply by tens

Step 3: Add



$$\begin{array}{r} 4375 \\ \times 47 \\ \hline 30625 \end{array} \rightarrow (4375 \times 7)$$

$$\begin{array}{r} 4375 \\ \times 47 \\ \hline 30625 \\ 175000 \end{array} \rightarrow (4375 \times 7) \\ \rightarrow (4375 \times 40)$$

$$\begin{array}{r} 4375 \\ \times 47 \\ \hline 30625 \\ + 175000 \\ \hline 205625 \end{array} \rightarrow (4375 \times 7) \\ \rightarrow (4375 \times 40) \\ \rightarrow (4375 \times 47)$$

Answer: 2,05,625 children were vaccinated in all.

Multiplying by a 3-digit Number



Example 2: The UN supports programmes that supply clean drinking water worldwide. If 6,945 drinking water connections were given to each of the 427 villages in one year, how many water connections were given in all?

➡ $6945 \times 427 = ?$

$$\begin{array}{r} 6945 \\ \times 427 \\ \hline 48615 \\ 138900 \\ + 2778000 \\ \hline 2965515 \end{array} \rightarrow (6945 \times 7) \\ \rightarrow (6945 \times 20) \\ \rightarrow (6945 \times 400)$$

Remember

- ★ 2-digit number $\times$ 2-digit number cannot give a product of more than 4 digits.
- ★ 3-digit number $\times$ 3-digit number cannot give a product of more than 6 digits.
- ★ 3-digit number $\times$ 2-digit number cannot give a product of more than 5 digits.

Answer: 29,65,515 water connections were given in all.

Project

2	4	6	8	10
12	14	16	18	20
4	8	12	16	20
24	28	32	36	40

Write the first four even number tables (2, 4, 6, and 8) in the format shown alongside. Study the patterns formed, both within each table and between the columns and rows of all four tables. Discuss with a friend. Have you both found the same patterns? Are there any patterns you did not notice?



Multiplying with Zeros

When you multiply by 10, 100, and 1000 the product will have at least the same number of zeros as the factors. Pay special attention to example 3.

Example 1: $40 \times 70 = 2800$

Example 2: $3300 \times 900 = 2970000$

Example 3: $6800 \times 5000 = 34000000$



Mathspeak

FA

If you know 3×70 , how can you use that to find 6×70 ?

Multiplying with Zeros in the Factors

$$\begin{array}{r} 5346 \\ \times 409 \\ \hline 48114 \\ 00000 \leftarrow \\ + 2138400 \\ \hline 2186514 \end{array}$$

You do not need to show an extra line for multiplication by 0 tens.

$$\begin{array}{r} 5346 \\ \times 409 \\ \hline 48114 \\ + 2138400 \\ \hline 2186514 \end{array}$$

Try This!

a. 30×60

b. 4400×200

c. 2400×5000

d. 9352×607

e. 1876×390

Project

What do you notice about the numbers 1, 4, 9, 16, ...?
You can get these by multiplying a number by itself.

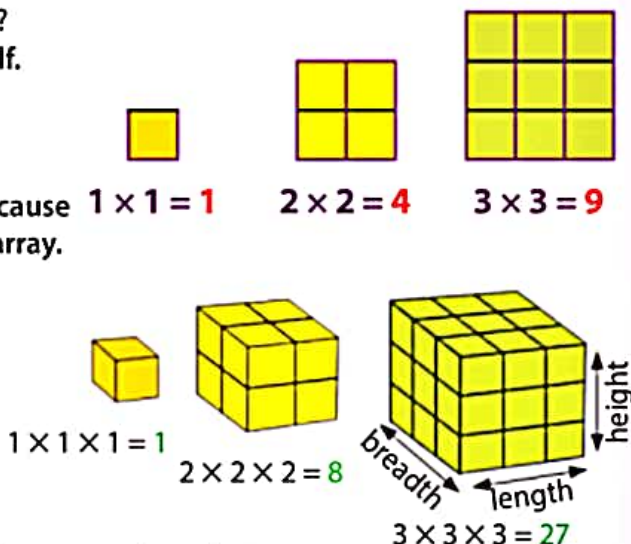
$1 \times 1 = 1$, $2 \times 2 = 4$, $3 \times 3 = 9$, $4 \times 4 = 16$, etc.

These numbers are also called **square numbers** because $1 \times 1 = 1$, $2 \times 2 = 4$, $3 \times 3 = 9$ they form a square when you arrange them as an array.

When we multiply a number by itself 3 times, it is called a cube number.

1, 8, 27, ... are **cube numbers**.

$1 \times 1 \times 1 = 1$, $2 \times 2 \times 2 = 8$, $3 \times 3 \times 3 = 27$, etc.



- Write the first eight square numbers and use grid paper to show their arrays.
- Write the first six cube numbers.

Exercise 3 B

1. Multiply.

a. 5986×42

b. 9764×29

c. 8645×38

d. 4876×92

e. 4724×466

f. 403×809

g. 5983×604

h. 4010×506

2. Calculate only till you see the pattern. Then fill in according to the pattern.

a. $131 \times 11 =$ _____

b. $1 \times 9 + 2 =$ _____

c. $101 \times 33 =$ _____

$131 \times 111 =$ _____

$12 \times 9 + 3 =$ _____

$101 \times 333 =$ _____

$131 \times 1111 =$ _____

$123 \times 9 + 4 =$ _____

$101 \times 3333 =$ _____

$131 \times 11111 =$ _____

$1234 \times 9 + 5 =$ _____

$101 \times 33333 =$ _____

DIVISION

Example 1: The UN International Day of Yoga is celebrated the world over on June 21st every year. One year if 59,598 yoga mats were distributed free of cost in 23 yoga centres across India, how many yoga mats were given to each centre?



➡ $59598 \div 23 = ?$

Method 1:

$$\begin{array}{r} 2591 \\ 23 \overline{) 59598} \\ \underline{-46} \\ 135 \\ \underline{-115} \\ 209 \\ \underline{-207} \\ 28 \\ \underline{-23} \\ 5 \end{array}$$

Method 2:

$$\begin{array}{r} 2000 + 500 + 90 + 1 = 2591 \\ 23 \overline{) 59598} \\ \underline{-46000} \rightarrow (23 \times 2000) \\ 13598 \\ \underline{-11500} \rightarrow (23 \times 500) \\ 2098 \\ \underline{-2070} \rightarrow (23 \times 90) \\ 28 \\ \underline{-23} \rightarrow (23 \times 1) \\ 5 \end{array}$$

Check:

$$\begin{array}{r} 2591 \\ \times 23 \\ \hline 59593 \\ + 5182 \\ \hline 59598 \end{array}$$

Answer: Each yoga centre received 2591 yoga mats.

Exercise 3 C

Divide and check your answer.

1. $12686 \div 51$

2. $49872 \div 68$

3. $86243 \div 89$

4. $19498 \div 49$

5. $49903 \div 72$

6. $48091 \div 59$

7. $18468 \div 22$

8. $60582 \div 87$

9. $46943 \div 58$

10. $53960 \div 41$

11. $30045 \div 25$

12. $19687 \div 35$

WRITING THE REMAINDER AS A FRACTION

You have learnt in Class IV, when you solve a division problem and get a remainder in the answer, you may or may not use the remainder in the answer depending on the question.

Example 1: Suraj is trekking from the UNESCO world heritage site Hampi in Karnataka, to Pattadakal, another world heritage site. He walks 136 km over 11 days to do this. If he walks the same distance every day, how many km did he walk each day?



Here the quotient shows us how many whole km Suraj walked each day.

$$\begin{array}{r} 12 \\ 11 \overline{) 136} \\ \underline{- 11} \\ 26 \\ \underline{- 22} \\ 4 \end{array}$$

The remainder shows 4 km which was also covered by him during the 11 days of walking that cannot be ignored.

So we show that information as a

$$\text{fraction} = \frac{4}{11} \left(\frac{\text{Remainder}}{\text{Divisor}} \right)$$

Answer: Suraj walked $12\frac{4}{11}$ km on each day.

Mathspeak

FA

A factory was sending 253 T-shirts to a shop. The T-shirts were packed in boxes of 10 each. How many boxes were needed? Can you give your answer as a fraction here? Why or why not?

Exercise 3 D

Solve. Then say which of these you will use in your answer. Give the answer.

- A. Only the quotient B. Quotient + 1 C. Quotient and the remainder
D. Only the remainder E. Quotient and remainder as a fraction

- Arjun has to pack 56 pastries into boxes that can hold 6 pastries each. He has to pack all the pastries. How many boxes will he need?
- Ashish is taking 53 people on a heritage walk. If he takes people in groups of 8 each, how many people will there be in the last group?
- A shopkeeper is arranging 28 laptops on shelves that can hold 5 laptops on a shelf. How many shelves will be full? How many laptops will be on the shelf that is not full?
-  A 1,000 ml pack of ice cream was shared equally by 7 people. How much did each person get?
- If 67 pencils were distributed equally among 9 students, how many pencils did each student get?



AVERAGES

Example 1: Shirish does voluntary work with the UNICEF, teaching children in small villages. He says he has taught for an **average** of 3 hours everyday last week. What does that mean?

➡ Let us look at the hours he spent teaching. Then let us show this with the help of dots.

Monday	5 hours
Tuesday	2 hours
Wednesday	1 hour
Thursday	2 hours
Friday	5 hours
5 days	15 hours

Monday	○ ○ ○ ○ ○
Tuesday	○ ○
Wednesday	○
Thursday	○ ○
Friday	○ ○ ○ ○ ○

If we arrange the dots so that each day has the same number of dots this is how it will look.

You can try this with counters or rajma seeds.

Monday	○ ○ ○
Tuesday	○ ○ ○
Wednesday	○ ○ ○
Thursday	○ ○ ○
Friday	○ ○ ○

When rearranged each row has 3 dots.

So the **average** number of hours Shirish worked each day of the week was 3 hours.

We can find the average without dots like this:

Divide the total number of hours taught by the number of days taught.

$$15 \div 5 = 3$$

Average = Sum of quantities ÷ Total number of quantities

- It is important to understand that the average does not always have to be one of the numbers in the group.
- You cannot find the average of quantities that are expressed in different units. They must all be converted to the same unit to find the average.

Common Mistake!

15 cm, 5 m, 25 cm
= average is 15 cm ✗
15 cm, 500 cm, 25 cm
= average is 180 cm ✓

Activity

To find the average of 4, 8, and 9.

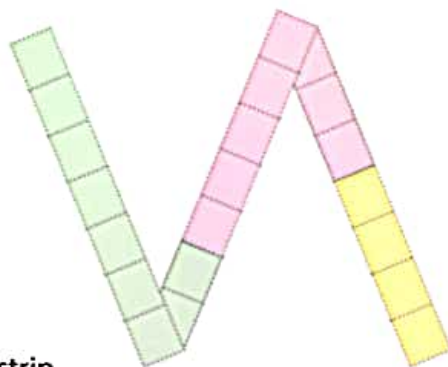
Cut separate strips of 4 squares, 8 squares, and 9 squares.



Join them together with the help of adhesive tape to make one long strip.

Then fold and cut into three equal parts. What is the length of each part? _____

Try This: Find the average of 9, 5, 6, and 4 using the same activity.



Example 2: After an earthquake, the UN organised to deliver food trucks to the affected areas. An average of 123 trucks were delivered daily on Monday, Tuesday, and Wednesday. How many trucks of food in all were delivered on those three days?

Each day has an average delivery of 123 trucks of food.

Monday + Tuesday + Wednesday (3 days)

$$123 + 123 + 123 = 369 \text{ or } 123 \times 3 = 369$$

Answer: In all, 369 trucks of food were delivered on the three days.



Mathspeak

FA

You have found an average of 5 numbers. If the largest number is left out, will the average of the remaining 4 numbers increase or decrease as compared to the earlier average? If the smallest number is left out, will the average increase or decrease? Explain your thinking.

Project

Make a list of the height (in cm) of the students in your class who belong to the same school house as you. Find the average height of the group. If there is a remainder, how will you use the remainder in your answer?

Exercise 3 E

1. Find the average of these numbers.

a. 15, 14, 21, 30

b. ₹15, ₹8, ₹14, ₹6, ₹12

c. 124 cm, 137 cm, 114 cm, 125 cm

d. 20 minutes, 15 minutes, 13 minutes, 12 minutes

2. This table shows the number of newspapers collected by students of Classes 1, 2, 3, 4, and 5 to donate to an animal shelter over the month of December.

Classes	1 st week	2 nd week	3 rd week	4 th week	Total Collection	Average Collection
Class 1	38	49	75	62		
Class 2	71	63	88	90		
Class 3	45	54	52	61		
Class 4	90	85	110	99		
Class 5	148	130	171	119		

a. Find the total collection of each class. Then find their average collection.

b. Which class has the highest average?

c. Which class has the lowest average?

d. Find the average collection of all 5 classes.

3. Solve.

a. Anu, Azim, Jo, and Aastha got an average of 95 points each in a spelling competition. What was their total score?

b. Make a list of 4 different numbers whose average works up to 50.

c. On a driving holiday, a family travelled 75 km, 49 km, 81 km, 36 km, and 59 km in the first 5 days of the week. What was the average distance travelled by them per day?

Journal

Write down at least one real-world application of averages that you can think of.

SPEED, DISTANCE, AND TIME

You must have often seen lightning in the sky before you heard the thunder. That is because the speed of light is much faster than the speed of sound.

Light travels at 3,00,000 km per second and sound travels at 343 m per second.

Speed is calculated by dividing the distance travelled by the time it takes to travel that distance.

In everyday life, we need to calculate the speed of cars, trains, planes, or even a person walking. If a car goes 340 km in 4 hours, its speed is:

$$340 \div 4 = 85 \text{ kilometres per hour (kmph)}$$

Exercise 3 F

1. Find the speed.

a.



I have gone 350 km in 5 hours.
What is my speed?

b.



I have gone 75 km in 5 hours
What is my speed?

c.



I have flown 7,560 km in 7 hours.
What is my speed?

d.



I have gone 720 km in 6 hours.
What is my speed?

2. Find the speed.

- a. Distance travelled—120 km b. Distance travelled—64 km c. Distance travelled—12 km
Time taken—4 hours Time taken—8 hours Time taken—3 hours

Data Connect



Open the Data Bank on page 243 and study the data on 'Fastest Land Animals'. Then answer the questions below.

1. Write the names of the animals starting from the fastest going to the slowest in the list.
2. In an hour, how much further would a pronghorn antelope have gone as compared to a springbok antelope?
3. Usain Bolt is the fastest man in the world with an average speed of almost 45 kmph. Which animal has twice the speed of Usain Bolt?
4. A lion can go 80 km in 60 min. How far can it go in a minute? (Give your answer as a fraction.)
5. If a high speed cyclist can go at twice the speed of a cheetah, what would the cyclist's speed be?

PROBLEM SOLVING

Building Skills—Ask the Question

In this section you will learn how to frame a question when you know the facts and the answer.

The school library receives 14 cartons of 25 books each. These have to be kept equally in 7 cupboards.

Answer: 50 books.

What is the question?

On reading the problem and the answer, we realise that the figure of 50 books is arrived at by:

- $14 \times 25 = 350$, giving the total number of books received.
- $350 \div 7 = 50$, giving the number of books kept in each cupboard.

So the question must be:

‘How many books were kept in each cupboard?’



Mental Maths



PA

Break up the dividend to divide mentally.

$$69 \div 3 = ?$$

Think: $69 = 60 + 9$

$$60 \div 3 = 20$$

$$9 \div 3 = 3$$

$$20 + 3 = 23$$

$$69 \div 3 = 23$$

Solve:

a. $63 \div 3$

b. $48 \div 4$

c. $68 \div 2$

d. $36 \div 3$

e. $82 \div 2$

Exercise 3 G



The problems given below have the answers but not the questions. Write the question that fits the answer.

1. Jamal pasted 952 stamps equally on 17 pages.

Answer: 56 stamps

2. An average of 98 people visited the bookshop daily in the month of June.

Answer: 2,940 people

3. 5 friends went on a bird walk. Each saw 12 birds in a day. They saw the same number of birds on each of the 10 days that they went bird watching.

Answer: 600 birds

4. Jasraj sold one second hand car for ₹1,10,500 and two second hand scooters for ₹7,500 each.

Answer: ₹95,500

5. A paper kite was flying 95 m above the ground. Another kite was flying 19 m above that.

Answer: 114 m



Mathspeak

FA

If you got a remainder of 14 after correctly solving a division question, what does it tell you about the divisor? How do you know?

PROBLEM SOLVING USING MODELS

Multiplication Models

Example 1: Sujith made 53 flags for Independence Day. His friend Pranay made 6 times that number. How many flags did they make altogether?

We can represent Sujith's flags with one box.



Sujith's flags -----> 53

Pranay made 6 times that number, represented by six boxes.

Pranay's flags -----> 53 53 53 53 53 53

We have to find how many flags were made in all.

Sujith's flags -----> 53

Pranay's flags -----> 53 53 53 53 53 53



Flags in all

$$\begin{array}{r} 53 \\ \times 7 \\ \hline 371 \end{array}$$

Answer: They made 371 flags in all.



Example 2: Priya practised playing her guitar for 2 hours every day during the month of June. How many hours did she practise in the month?

June has 30 days.

In one day she practised for 2 hours



When there are too many boxes to show, we can use such models.

$$30 \times 2 = 60 \text{ hours}$$

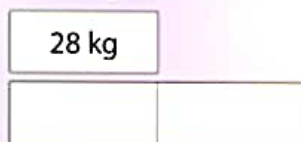
Answer: Priya practised playing her guitar for 60 hours in the month of June.

Try This!

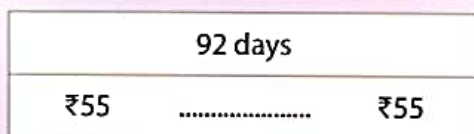


Model with a bar diagram.

a. Ashutosh weighs 28 kg. His older brother weighs twice that. What is their combined weight?



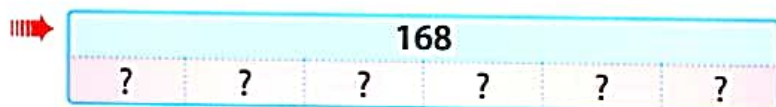
b. Biju earns ₹55 a day selling popcorn. How much would he earn over 92 days?



Division Models

Finding how many in a group (Equal Sharing)

Example 1: A mobile phone shop has 168 phones on display. If they were displayed equally in 6 glass cases, how many phones were there in each case?



The bar on top shows the total number of phones to be put into groups.

The second bar shows that it has been put into 6 equal groups.

$168 \div 6 =$ Number of phones in each glass case.

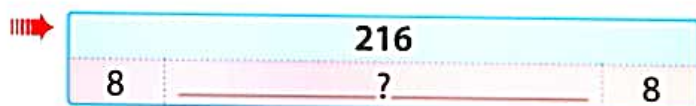


Divide to find the answer.
 $168 \div 6 = 28$

Answer: Each glass case has 28 mobile phones on display.

Finding how many groups (Equal Grouping)

Example 2: A flower seller has 216 strings of flowers. He wants to sell them in bunches of 8 strings. How many bunches can he make?



Divide to find the answer.
 $216 \div 8$



Here the bar on top shows the total number of flower strings.

We do not know how many bunches of 8 strings each can be made, so we don't know how many parts to put the second bar into. We show this with the help of a question mark in the centre of the bar.

$216 \div 8 = 27$ bunches

Answer: The flower seller can make 27 bunches of 8 strings each.

Two-Step Problem



Example 1: A fruit vendor's cart has only oranges and apples. The weight of all the fruit is 48 kg. The weight of the apples on the cart was three times as much as the weight of the oranges. How many kilos of apples and how many kilos of oranges were there on the cart?

If the weight of the oranges is shown as



Then the weight of the apples are



So $48 \div 4 =$ the value of one



$$48 \div 4 = 12$$

So, one box represents 12 kg. There are 12 kg of oranges.

Apples are three times that weight, i.e., $3 \times 12 \text{ kg} = 36 \text{ kg}$.

Answer: There were 12 kg of oranges and 36 kg of apples on the cart.

Together both the apples and oranges weigh 48 kg.

Check:

$$12 \text{ kg} + 36 \text{ kg} = 48 \text{ kg}$$

Exercise 3 H

Solve. You can use models if you like.

1. A teacher had 60 books to correct. If he can correct 12 books in one hour, how many hours does he need to correct all the books?
2. An office paid ₹6,260 for 5 new desks. How much did each desk cost?
3.  A newspaper delivery man delivers 72 newspapers every day. If he delivers 3 papers to each house, how many houses does he deliver to?
4. Anaida finished her homework in 23 minutes on Sunday. On Saturday, she needed 3 times that amount of time. How much time does she spend on her homework on both days together?
5. A large pizza has toppings of capsicum and onion. In total, there are 25 pieces of both on the pizza. If there are 4 times as many onion pieces as capsicum pieces, how many pieces of each vegetable are there on the pizza?



C-4.1



Vedic Square Patterns

Take a multiplication square (A) and convert all the double digit numbers to single digits by adding the digits in each product, more than once if necessary (e.g. $49 = 4 + 9 = 13$ and $1 + 3 = 4$). This is a vedic square (B).

Make 9 copies of the vedic square. Colour all the 1s on one of the vedic squares and join them. Do you see a pattern? Try different ways of joining the 1s to create different designs.

Multiplication Square: A

×	1	2	3	4	5	6	7	8	9
1	1	2	3	4	5	6	7	8	9
2	2	4	6	8	10	12	14	16	18
3	3	6	9	12	15	18	21	24	27
4	4	8	12	16	20	24	28	32	36
5	5	10	15	20	25	30	35	40	45
6	6	12	18	24	30	36	42	48	54
7	7	14	21	28	35	42	49	56	63
8	8	16	24	32	40	48	56	64	72
9	9	18	27	36	45	54	63	72	81

Vedic Square: B

1	2	3	4	5	6	7	8	9
2	4	6	8	1	3	5	7	9
3	6	9	3	6	9	3	6	9
4	8	3	7	2	6	1	5	9
5	1	6	2	7	3	8	4	9
6	3	9	6	3	9	6	3	9
7	5	3	1	8	6	4	2	9
8	7	6	5	4	3	2	1	9
9	9	9	9	9	9	9	9	9

1	2	3	4	5	6	7	8	9
2	4	6	8	1	3	5	7	9
3	6	9	3	6	9	3	6	9
4	8	3	7	2	6	1	5	9
5	1	6	2	7	3	8	4	9
6	3	9	6	3	9	6	3	9
7	5	3	1	8	6	4	2	9
8	7	6	5	4	3	2	1	9
9	9	9	9	9	9	9	9	9

Repeat with all the 2s, 3s, and so on up to 9 on different vedic squares.



Chapter Check-Up



Colour the circle that describes best how you feel.

I got this!

I'm getting there!

I need help!

Vocabulary Review

- | | | | | | |
|------------|-----------|--------------|------------|------------|------------|
| • Quotient | • Factor | • Product | • Dividend | • Fraction | • Inverse |
| • Average | • Divisor | • Bar models | • Array | • Speed | • Distance |



1. Multiply. Show the strategy you are using.

- a. $2 \times 7 \times 50$ b. 36×25 c. 25×20 d. $4 \times 9 \times 25$

2. Multiply.



- a. 345×907 b. 4654×45 c. 3487×398

3. Divide and check your answer.

- a. $5476 \div 23$ b. $26590 \div 65$ c. $77218 \div 35$

4. Solve. Decide how you will use the remainder in the answer.

- a. A farmer puts 150 kg of peas equally into 18 cartons to be taken to the market. How many kg of peas were there in each carton?
b. He then packed 200 eggs into trays that could hold 12 eggs each. How many trays did he need to pack all the eggs?



5. Find the average of the following:

- a. 24 kg, 32 kg, 43 kg, 16 kg, 75 kg b. 19 days, 20 days, 3 weeks, 32 days

6. Solve.

- a. A plane flies 1,620 km in 4 hours. What is the speed of the plane?
b. A teacher corrected an average of 45 test papers a day on Wednesday, Thursday, and Friday. How many papers did she correct on all three days together?

7. Solve with the help of models if you like.

- a. A sack holds 560 onions. How many onions can fit in 114 such sacks?
b. A tile factory had to pack 1,825 tiles in boxes of 25 tiles each. How many boxes were needed?
c. Sumeet donated ₹75 to the Red Cross. Akansha donated 5 times that amount. How much did they donate together?

8. Tick (✓) the correct answer.

A herd of elephants walked a distance of 45 km in 3 hours. What was their speed?

- a. 15 km b. 135 kmph c. 45 kmph d. 15 kmph

Keeping in Touch



- a. $9010 + 3462$ b. $8957 + 6384$ c. $10500 - 8629$ d. $6001 - 3842$



Learn

When you need to mentally divide by 6, first divide by 2, then divide by 3

$$96 \div 6 = ?$$

$$\text{Think } 96 \div 2 = 48$$

$$\text{And } 48 \div 3 = 16$$

$$\text{So } 96 \div 6 = 16$$

This works for questions where there is no remainder.



When you need to mentally divide by 8, just divide by 2 three times.

$$104 \div 8 = ?$$

$$\text{Think } 104 \div 2 = 52$$

$$\text{Then } 52 \div 2 = 26$$

$$\text{And } 26 \div 2 = 13$$

$$\text{So } 104 \div 8 = 13$$

Practice

a. $96 \div 8 =$

b. $72 \div 6 =$

c. $84 \div 6 =$

d. $136 \div 8 =$

e. $108 \div 6 =$

f. $128 \div 8 =$

Use

a. $34 \times 30 =$ _____

b. Add the product of 5 and 5 to 275.

c. $91 \times 101 =$ _____

d. _____ $- 5000 = 15000$

e. _____ $+ 9000 = 18864$

f. How many times 50 is 2,500?

g. $5000 \div 50 =$ _____

h. 1200 eggs = _____ dozen eggs

i. How many 6s in 6,666?

j. $58350 - 6000 =$ _____

k. $97 + 39 =$ _____

l. $150 - 89 =$ _____

m. If $13 \times 9 = 117$, then $13 \times 18 =$ _____

n. CP = ₹1,000, SP is half of CP.
What is the loss?

o. $4 \times 19 =$ _____

p. _____ $\div 5 = 80$

q. If $28 \times 5 = 140$, then $14 \times 5 =$ _____

r. _____ $\times 20 = 160$

s. What is twice the product of 10 and 10? _____

t. What is half the sum of 23 and 23?

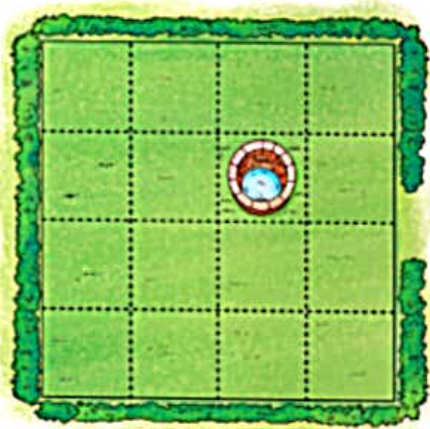
u. $132 \div 6 =$ _____

v. $112 \div 8 =$ _____



Logical Thinking

A group of friends want to meet up for a picnic at Deerpoint. Shibu is driving the car and he picks up his friends from Arrowpoint, Bearpoint, and Clearpoint. Bearpoint is 4 km south of Clearpoint. Clearpoint is 6 km south of Arrowpoint. Bearpoint is 7 km north of Deerpoint. How far is Arrowpoint from Deerpoint?



Visual Thinking

This is a map of a farm. The location of the well is shown on the map. The farmer wants to plant five different kinds of crops in the rest of the farm but all in equal parts. Show how he will do it.

Number Sense

1. There are five options of pizza toppings – mushrooms, tomatoes, onions, capsicum, and paneer. A restaurant allows you only two toppings at a time.
 - a. How many different combinations of toppings can you have? (Hint: Work systematically to find your answer.)
 - b. Now find how many combinations of two toppings you can have with six options of toppings? Seven options of toppings?
 - c. Do you see a pattern? Give the next number in the pattern.



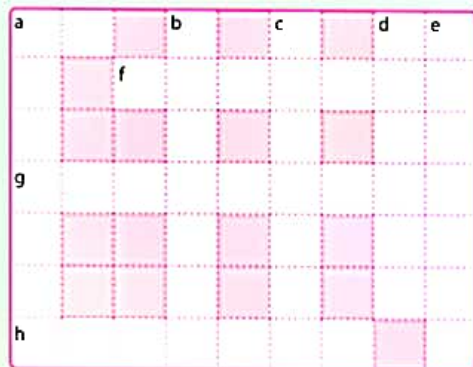
2. What comes next?

4805, 5410, 6015, 6620, _____

Find two ways in which the next number fits the pattern.



1. Cross-number puzzle.



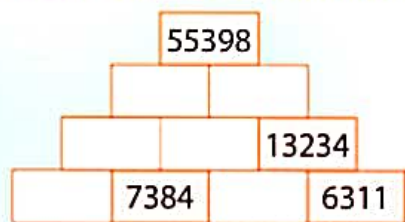
Clues across

- The value of a digit is divided by this number as it moves to the right in the place value chart.
- The largest two-digit number.
- What is 10,000 more than 23,38,901?
- Rearrange the digits 3, 7, 5, 2, 5, 9, 0, 0, 6 to form the biggest number possible.
- Give the next number in the pattern.
80,11,497 81,11,497 82,11,497

Clues down

- Give the difference between the face value and the place value of the digit 2 in the number 5,27,87,890.
- What is 1,00,000 less than 64,45,121?
- Give the next number in the pattern.
38,33,659 38,43,659 38,53,659
- How many six-digit numbers are there in all?
- Give the standard form of ninety-one lakh, twenty thousand, four hundred twelve.

- The number on top of two other numbers in the number pyramid is their sum. Fill in the boxes with the help of addition and subtraction.



- Fill in the boxes.

$$\begin{array}{r}
 \begin{array}{|c|c|c|} \hline \square & \square & 6 \\ \hline \end{array} \\
 83 \begin{array}{|c|c|c|} \hline \square & 6 & \square \\ \hline \end{array} 3 \\
 - 83 \\
 \hline
 1 \begin{array}{|c|c|c|} \hline \square & 4 & \\ \hline \end{array} \\
 - 83 \\
 \hline
 5 \begin{array}{|c|c|c|} \hline \square & \square & \square \\ \hline \end{array} \\
 - \begin{array}{|c|c|c|} \hline \square & \square & \square \\ \hline \end{array} \\
 \hline
 \begin{array}{|c|c|c|} \hline \square & \square & \square \\ \hline \end{array} 1
 \end{array}$$

- Complete the multiplication grid. Find the numbers that are being multiplied.

×	?	?
?	4500	400
?	270	24

- Would you say that these statements are true always, sometimes, or never? Give reasons.

- A number with 5 in the tens place is rounded to the next higher hundred.
- When you multiply by zeros, the product will only have the number of zeros you are multiplying by.
- The average is the total number of quantities divided by the sum of quantities.
- In Roman numerals V and L can be repeated.
- Cost price less loss is the selling price.



Explorers

Multiples

Some explorers sailed across dangerous oceans, some went to the moon, others spent months in deep forests and all of them helped us understand our world better. Antarctica has 24 hours of daylight in summer, so explorers set their own schedule to eat, work, and sleep. If an explorer in the Antarctica keeps 11 hours in every 24 hours of time to explore, what fraction of time is spent exploring in a day?



LOOKING BACK



$$1 \times 6$$

6

$$2 \times 6$$

12

$$3 \times 6$$

18

$$4 \times 6$$

24

$$5 \times 6$$

30

The numbers 6, 12, 18, 24, and 30 are all **multiples** of 6. We find the multiples of a number by multiplying it by 1, 2, 3, 4, and so on.

To find if one number is a multiple of another, we must divide.

Is 42 a multiple of 3? $42 \div 3 = Q\ 14, R = 0$. So, 42 is a multiple of 3.

Is 83 a multiple of 7? $83 \div 7 = Q\ 11, R = 6$. So, 83 is not a multiple of 7.



Common Multiples

Multiples of 4 = 4, 8, 12, 16, 20, 24, 28, 32, 36, ...

Multiples of 6 = 6, 12, 18, 24, 30, 36, ...

Common multiples of 4 and 6 are 12, 24, 36, ...



1. Use the number line to find the common multiples of 3 and 7.



2. Write the numbers from 1 to 50. Circle the multiples of 4. Put a square around the multiples of 6. List the common multiples.

Remember

- ★ A number is a multiple of itself.
- ★ Every multiple of a number is greater than or equal to the number itself.
- ★ There is no end to the multiples you can get for a particular number.
- ★ Every number is a multiple of 1.

NCF 2023

Competencies in this chapter
C-4.1, C-4.2, C-4.3: Labelled on specific pages

LOWEST COMMON MULTIPLE



Example 1: An explorer has set up two automatic cameras in the forest to take pictures of animals at night. One camera goes off every 4 seconds, the other one does so every 3 seconds. If both cameras have taken a picture at the same time just now, after how long will they next take a picture at the same time?

Let us begin by listing the time each one will go off and then marking when they will take pictures at the same time.



Camera A	Camera B
4 sec	3 sec
8 sec	6 sec
12 sec	9 sec
16 sec	12 sec
20 sec	15 sec
24 sec	18 sec
28 sec	21 sec
32 sec	24 sec
36 sec	27 sec
	30 sec
	33 sec
	36 sec

Multiples of 3 = 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, ...

Multiples of 4 = 4, 8, 12, 16, 20, 24, 28, 32, 36, ...

Common multiples of 3 and 4 are 12, 24, 36, and so on.

The lowest common multiple of 3 and 4 is 12.

The lowest common multiple (LCM) here will tell us when both cameras will take pictures again at the same time.

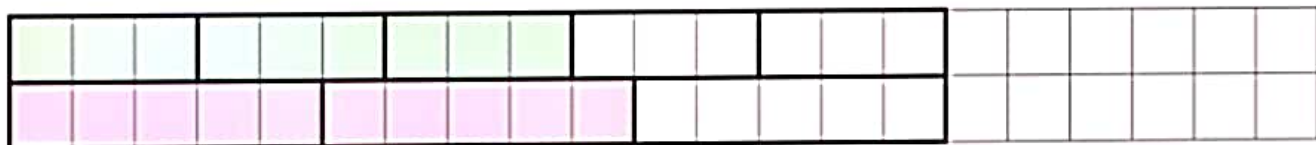
Answer: Both cameras will again take a picture at the same time after 12 seconds.

Activity

Find the LCM of 3 and 5.

Take a square-lined paper. Colour two rows alternately with rectangles of 3 squares and 5 squares each. What is the *shortest length* that you can make such that both rows are complete at the same point with neither row being shorter or longer than the other? _____ squares

LCM of 3 and 5 is _____.



Repeat the activity with three numbers – 3, 4, and 6.

Finding LCM Using the Number Line

Look at the number line that shows the multiples of 2 on top and the multiples of 3 below:



The place where the two multiples meet are the common multiples of 2 and 3.

They are 6, 12, 18, 24, ...

The smallest of these is the first place where both multiples meet, that is at 6.

6 is the lowest common multiple (LCM) of 2 and 3.

The **LCM** of two or more numbers is the smallest number that can be divided by those numbers without leaving a remainder.

Journal

Explain how you know whether a number is a multiple of another number.

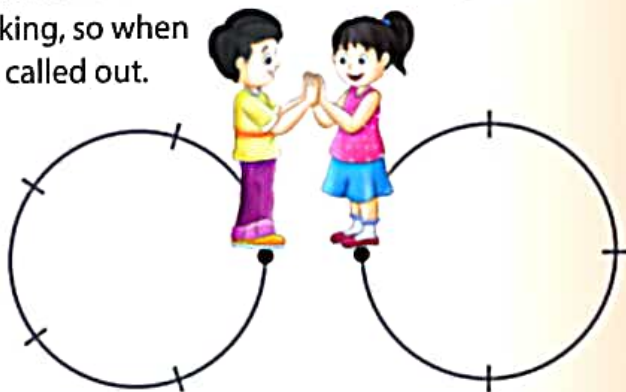


FA

To find the LCM of 4 and 5.

Draw two large circles on the floor. Mark out 5 equal parts on one circle and 4 equal parts on the other. One student each stands on the points marked with a dot as shown.

- The student standing on the first circle goes in an **anticlockwise** direction calling out numbers in order while stepping on each marking, so when he/she returns to the dot, number 5 would be called out.
- The student continues moving on the circle calling out 6, 7, and so on.
- At the same time, on the second circle, the other student does the same, moving in a **clockwise** direction. Both the students call out the numbers together.
- The first time they find they are next to each other again on the dot they clap each other's hands.
- The number that they call out will be the LCM of 4 and 5.



The activity can be continued to find other multiples too.

Mathspeak

FA

Ashish had to find the HCF and LCM of two numbers. His answer was 3 and 24, but he forgot to write which was the HCF and which was the LCM. Can you tell which is which and why you think so?

Finding LCM by Prime Factorisation

Example 1: A group of explorers in a deep tunnel shaped cave are setting up lights on the floor as well as the ceiling of the cave. They are placing ceiling lights every 20 metres and floor lights every 16 metres. At what distance will a floor and ceiling light be one above the other for the first time?



➡ We must find the LCM of 20 and 16 to find the answer to the question.

Let us find the LCM of 20 and 16 using prime factorisation.

Step 1: Find the prime factors of 20.

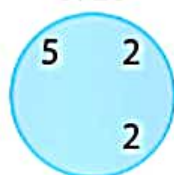
Step 2: Find the prime factors of 16.

Step 3: Mark the common factors.

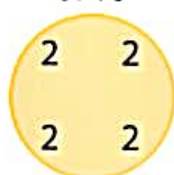
Step 4: Multiply the common factors and the factors that are not common. LCM = 80

$$\begin{array}{l}
 2 \times 2 \times 5 \\
 2 \times 2 \times 2 \times 2 \\
 \hline
 2 \times 2 \times 2 \times 2 \times 5 = 80
 \end{array}$$

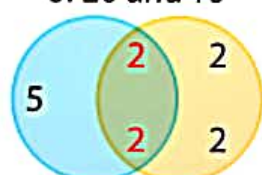
Prime factors
of 20



Prime factors
of 16



Common prime factors
of 20 and 16



To find the LCM multiply $5 \times 2 \times 2 \times 2 \times 2 = 80$

Answer: A floor and ceiling light will be one above the other for the first time at 80 m.

Example 2: Find the LCM of 18, 30, and 50.

➡ Prime factorisation of 18 = $2 \times 3 \times 3$

Prime factorisation of 30 = $2 \times 3 \times 5$

Prime factorisation of 50 = $2 \times 5 \times 5$

$$2 \times 3 \times 3 \times 5 \times 5 = 450$$

Answer: LCM = 450

Example 3: Find the LCM of 3, 7, and 8.

➡ $3 = 3 \times 1$; $7 = 7 \times 1$; $8 = 2 \times 2 \times 2$

$$\text{LCM} = 3 \times 7 \times 2 \times 2 \times 2$$

Answer: LCM = 168

Common Mistake!

LCM of 6 and 30?

$$6 = 2 \times 3; \quad 30 = 2 \times 3 \times 5$$

★ Multiplying all the factors

$$\text{LCM} = 2 \times 2 \times 3 \times 3 \times 5 \quad \times$$

★ Multiplying only the common factors

$$\text{LCM} = 2 \times 3 \quad \times$$

★ Multiplying the common factors and the remaining factors

$$\text{LCM} = 2 \times 3 \times 5 \quad \checkmark$$

Exercise 5 A

1. First find 6 multiples of each of these numbers and then find the common multiples. Finally, find the LCM.

	Numbers	First 6 multiples	Common multiples	LCM
a.	6, 9			
b.	5, 10			
c.	3, 6			
d.	3, 2, 4			

2. Use the number line to find the common multiples and lowest common multiple of 3 and 5.



3. These numbers have already been factorised for you. Find the LCM of the pairs given.

$$8 = 2 \times 2 \times 2$$

$$25 = 5 \times 5$$

$$16 = 2 \times 2 \times 2 \times 2$$

$$10 = 2 \times 5$$

a. 8, 16

b. 25, 10

c. 8, 25

d. 16, 10

e. 25, 16

4. Find the LCM of these numbers using prime factorisation.

a. 16, 24

b. 18, 20

c. 10, 18

d. 15, 35

e. 25, 30

f. 18, 32

g. 10, 15, 20

h. 16, 12, 32

5. Solve:

- a. A giant wheel with a red cart on top takes 30 seconds to take a full turn. Another giant wheel with a green cart on top takes 20 seconds to take a full turn. If both start at the same time, after how long will the green and red cart be on top at the same time again?
- b. What is the smallest multiple that 6 and 8 have in common?

Project

C-4.1

This poster has been made using the words 'Thank You'. It is the shortest possible poster that can be made with complete words. THANK has 5 letters and YOU has 3 letters.

The LCM of 5 and 3 is 15. The shortest length of the poster is 15 squares.

T	H	A	N	K	T	H	A	N	K	T	H	A	N	K
Y	O	U	Y	O	U	Y	O	U	Y	O	U	Y	O	U

Make a similar poster using square-lined paper saying, 'Best Wishes'. What is the length of the shortest poster you can make with complete words?

Chapter Check-Up



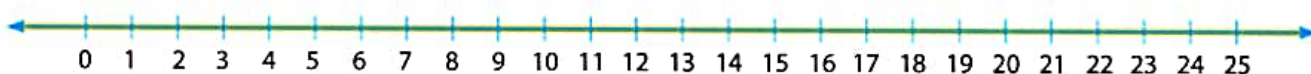
Colour the circle that describes best how you feel.



Vocabulary Review

- Multiple
- Common multiples
- Lowest common multiple
- Factorisation
- Prime factorisation

1. Use the number line to find the common multiples and lowest common multiple of 4 and 6.



2. Complete the LCM chart.

LCM	1	2	3	4	5	6	7	8	9
1	1								
2		2							
3									
4							28		
5									

3. Find the LCM of these numbers using prime factorisation.

- a. 15, 12 b. 35, 14 c. 18, 27
d. 5, 9, 15 e. 8, 10, 12 f. 6, 10, 16

4. A fruit vendor visits Raghav's building every 3 days and Prateek's building every 4 days. If he visited both these buildings on September 12, on which day will he visit both buildings next?

5. Tick (✓) the correct answer.

Plates come in packs of 6. Spoons come in packs of 8. If you have to buy the same number of spoons and plates for a picnic, what is the smallest number of each you should buy?

- a. 64 b. 36 c. 24 d. 48

Keeping in Touch



Find the HCF of 56 and 14 using prime factorisation.



Background: Cicadas are large flying insects that make a loud humming sound. They are mainly found in warm countries. Certain cicadas spend most of their lives underground and come

Find out more about these related career choices.

- Zoologist
- Botanist
- Ecologist

out after 13 years or 17 years exactly, depending on the group they belong to. **Both 13 and 17 are prime numbers.**

Scientists believe that this helps the cicadas protect their kind by reducing their chances of mixing with other cicadas which come out anywhere between 1 to 9 years.

Let us do an activity to understand this better.

Materials: 4 grids of 10×10 squares, red and green pencils.

Preparation: Fill the grids with numbers from 1 to 100. Students may work in pairs.

Procedure:

- Take one grid. To show that there are some cicadas that come out every 6th year and some that come out every 9th year, we can mark the multiples of 6 with a red circle and the multiples of 9 with a green cross. We can see from the grid that the first time these two groups will meet, will be year 18. *How often will these two groups meet over 100 years?*
- Now repeat the activity on a different grid with 6-year and 7-year cicadas. Though every 7 years is more often than every 9 years, it is a prime number. How often will these two groups meet over 100 years? What do you observe? Will they meet more or less often than the 6- and 9-year cicadas?
- Repeat with 6-year and 13-year cicadas. What do you observe?
- Finally, find out how often the two groups of 13-year and 17-year cicadas will meet. *What is your final observation?*

6-year and 9-year cicada chart

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Extension

People who work with internet security often use prime numbers in their codes. So while a computer can easily multiply two large prime numbers to give a product, a hacker will find it difficult to do the reverse.

Can you create a secure password using capital letters, small letters, and a prime number?

Learn

Find the LCM of 4 and 12.

12 is a multiple of 4, so
LCM of 4 and 12 is 12.

Find the LCM of 9 and 72.

72 is a multiple of 9, so
LCM of 9 and 72 is 72.

Of two numbers, if one is a multiple of the other, the greater number is the LCM.

Practice

Find the LCM of:

a. 2 and 18

b. 7 and 49

c. 3 and 15

d. 9 and 108

e. 5 and 65

f. 6 and 54



Use

a. HCF of 17 and 19 = _____

b. LCM of 8 and 64 = _____

c. $53 \times 101 =$ _____

d. S.P. = ₹700, Profit ₹70, C.P. = _____

e. C.P. - _____ = S.P.

f. S.P. + _____ = C.P.

g. Roman numeral for 83 is _____.

h. Prime factors of 67 are _____.

i. $450 - 39 =$ _____

j. _____ $\times 30 = 900$

k. How much more is 450 than 415?

l. Average of 3, 6, 9 = _____

m. HCF of 4 and 5 is 1, so HCF of 40 and 50 is _____.

n. 73984 rounded to the nearest 1000 is _____.

o. $760 - 59 =$ _____

p. $64 + 28 =$ _____

q. $60000 - 100 =$ _____

r. $169 + 31 =$ _____

s. Prime factors of 27 are _____.

t. C.P. = ₹5000, Loss = ₹500, S.P. = _____