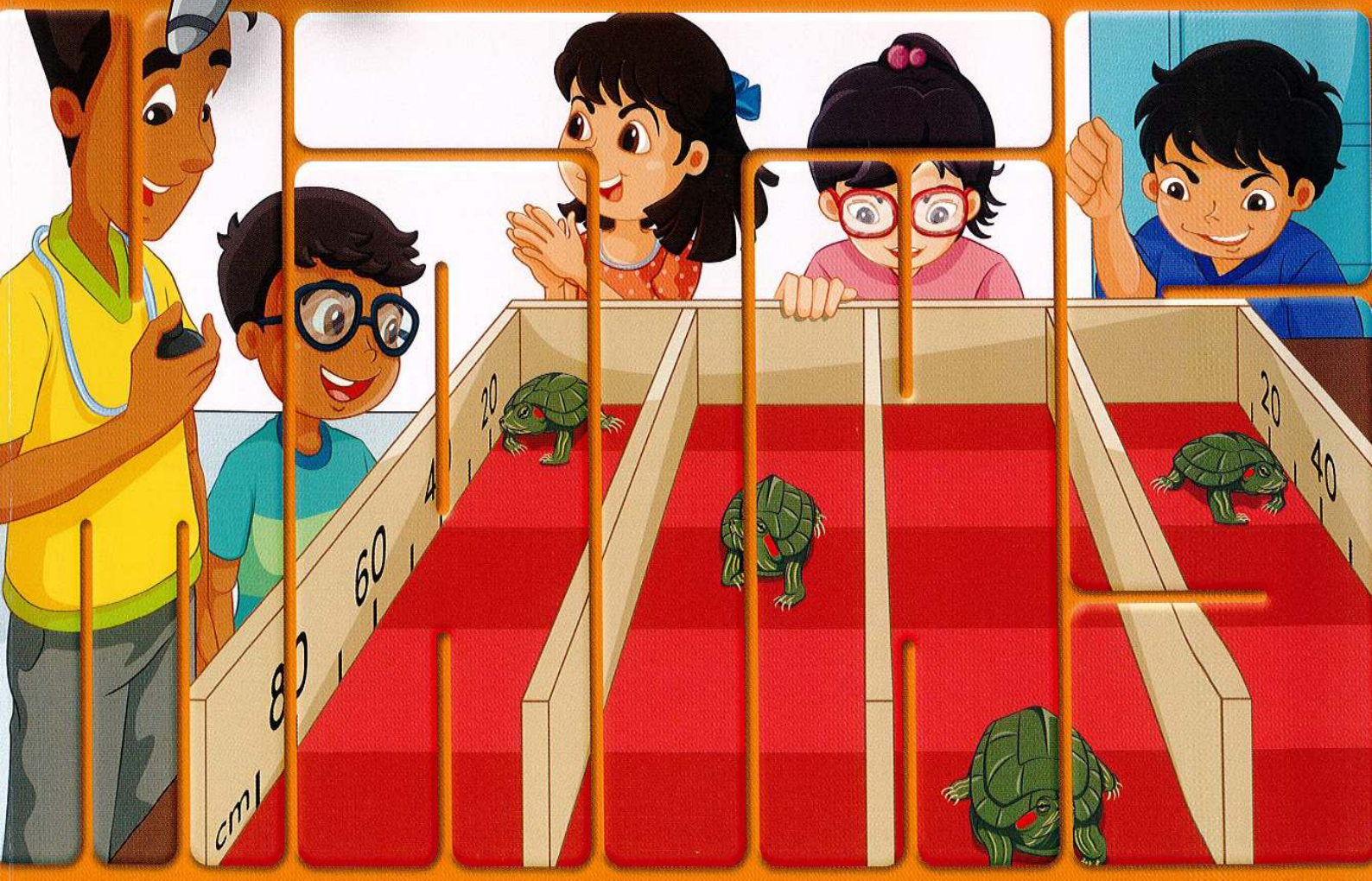
Targeting Mathematics

6B

Dr Eric Chan Chun Ming
Consultant: Prof Berinderjeet Kaur



STAR PUBLISHING PTE LTD

Star Publishing Pte Ltd
115A Commonwealth Drive #05-12
Singapore 149596
Website: www.starpub.com.sg
Email: contactus@starpub.com.sg

ISBN 978-981-4658-65-2

First published 2018

Printed by KHL Printing Co Pte Ltd, Singapore

Acknowledgements

Star Publishing Pte Ltd thanks all the organisations and people who gave their kind permission to reproduce their materials in this book.

Image Credits:
Shutterstock:
vi and **vii** © GraphicsRF; **2** © Dja65; **4** © freesoulproduction, Darth_Vector, Macrovector; **6** © Dr Ajay Kumar Singh, Ortodox; **9** © Botond1977; **10** © A.Ricardo, hvostik; **11**, **14**, **18-19**, **21**, **23** © Botond1977; **26** © Edilus; **30-31**, **33-34**, **36-37** © Botond1977; **37** © fratello; **38-45** © Botond1977; **45** © Alex Mit; **46-47**, **49-50** © Botond1977; **50** © Zelenaya; **52** © Kenishirotie, oksana2010, Pu.Chew, Elnur; **53** © Botond1977; **65** © sita ram; **68**, **71** © Botond1977; **75** © creatOR76, Pack; **77** © BORTEL Pavel-Pavelmidi; **80** © Art of Life, Jemastock, Nattapol Sritongcom; **103** © hvostik; **106** © fratello; **108** © Natsmith1

While every effort has been made to trace the owners of copyrighted materials, there have been some cases where we have been unable to contact them. In cases where these credits have been omitted, we would be glad to make the amendments in future editions of this book.

Preface

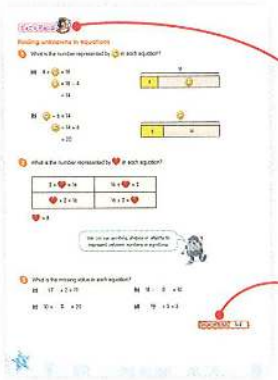
Targeting Mathematics is a series of textbooks and workbooks written based on the latest Primary Mathematics Syllabus provided by the Ministry of Education, Singapore. This series supports the Concrete-Pictorial-Abstract approach and uses ICT tools to enhance conceptual understanding. It incorporates the use of manipulatives, videos and online math activities to enhance teaching of mathematics.

The features in the textbooks are designed to inculcate active learning on the part of pupils. Through their learning experiences, we hope pupils can understand mathematical concepts effectively, acquire the skills for everyday use, build confidence and foster interest in mathematics.

Features

Let's Talk About...

Get pupils ready for the mathematical concepts that will be taught. Teachers facilitate the discussion and get pupils to talk about the picture or a video of it.

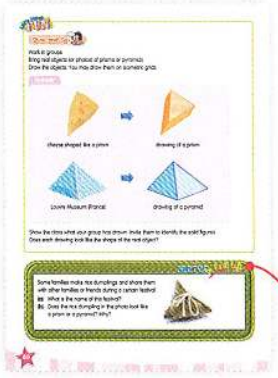


Let's Recall

Get pupils to revise what they have learnt before.

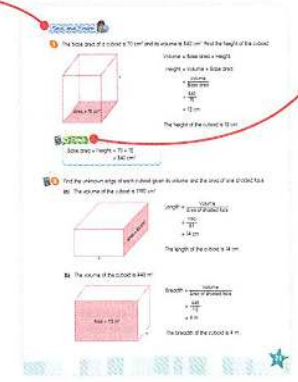
Workbook Links

Provide links to workbooks at appropriate junctures in the textbooks.



See and Learn

Introduce concepts in a visual manner which pupils can relate to and progress further to understand the concepts on an abstract level.



Check

Pupils can use their calculators to check answers.

Maths In Real Life

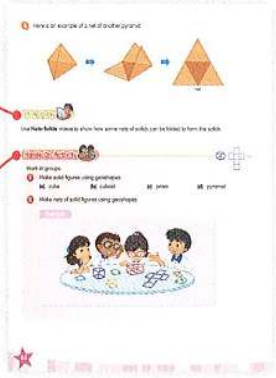
Allow pupils to see the relevance of mathematics in real life situations.

Mastery Checklist

Allow pupils to revise key mathematical concepts.

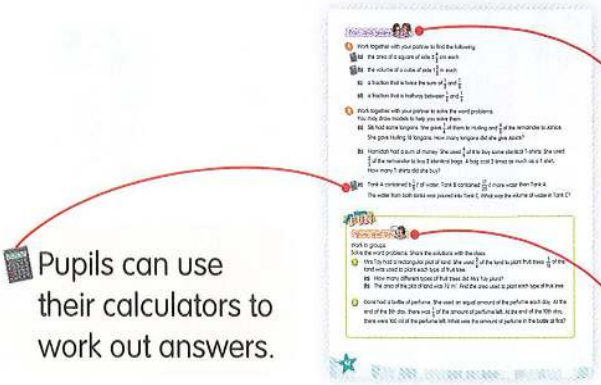
IT Activity

Enable pupils to show what they have learnt or done using another platform.



Hands-On Activity

Encourage pupils to use manipulatives in activities to enhance understanding of mathematical concepts.



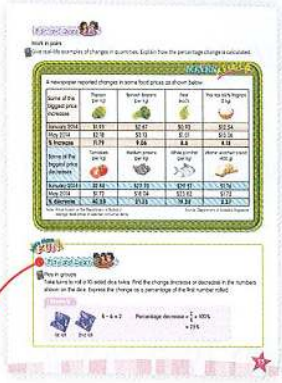
Pupils can use their calculators to work out answers.

Pair and Share

Provide opportunities for pupils to work in pairs to assess their learning.

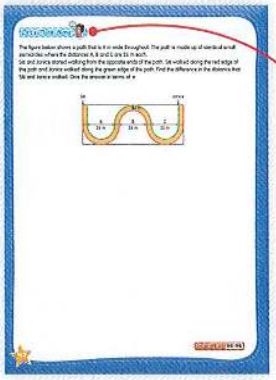
Show and Say

Allow pupils to communicate and share what they have learnt with their classmates.



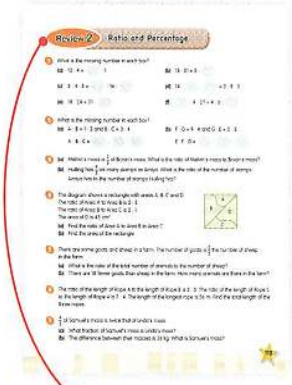
Play and Learn

Engage pupils and reinforce their grasp of mathematical concepts through games and activities.



Let's Think Along...

Encourage pupils to think and reason along as they attempt the activities or exercises.



Review

Allow pupils to revise what they have learnt.

Do and Learn

Enable pupils to check their understanding of mathematical concepts through doing exercises.

Self-Check

Help pupils reflect and self-assess their learning.

Buddies

Janice, Siti, Peter, Ravi and Robi are good buddies who will learn mathematics with our pupils through their comments, prompts or inquiries.

TARGETING MATHEMATICS Primary 6B

7 Speed

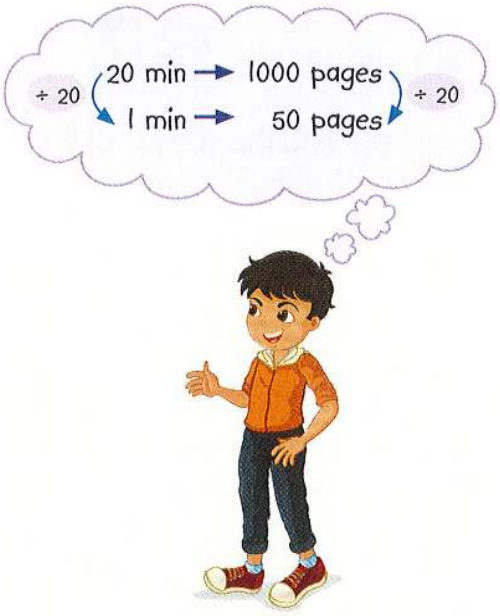
Let's Talk About...

How would you find the speeds of the terrapins in the race?

Let's Recall

Finding rates, total amounts and number of units

1 A photocopier can print 1000 pages in 20 minutes. What is the rate of printing per minute?



20 min → 1000 pages

1 min → 1000 ÷ 20 = 50 pages

The rate of printing is 50 pages per minute.

2 Mrs Sim works as a dishwasher at a food centre. She is paid $56 for working 8 h per day.

(a) Find the rate of pay per hour.

(b) At this rate, how much will she be paid for working 6 h?

(a) 8 h → $56

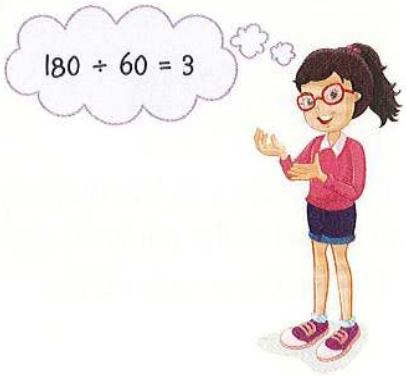
1 h → $56 ÷ 8 = $7

The rate of pay is $7 per hour.

(b) $7 × 6 = $42

She will be paid $42 for 6 h of work.

3 Mei types 60 words per minute. How many minutes does she take to type 180 words?



60 words → 1 min

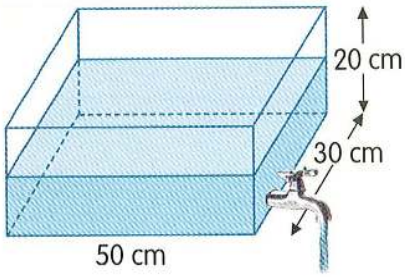
1 word → $\frac{1}{60}$ min

180 words → $\frac{1}{60} \times 180 = 3$ min

Mei takes 3 min to type 180 words.

4 A rectangular tank is completely filled with water at first. A tap is used to drain water from the tank at a rate of 15 ℓ per minute. How long does it take to drain the tank completely?

Volume of tank = $50 \times 30 \times 20$
= 30 000 cm^3
= 30 ℓ

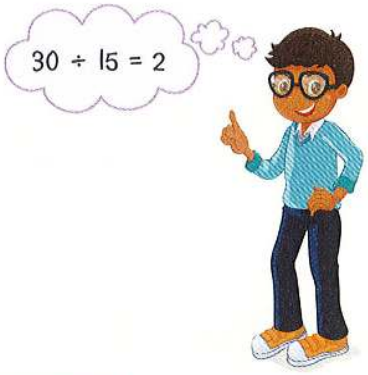


15 ℓ → 1 min

1 ℓ → $\frac{1}{15}$ min

30 ℓ → $\frac{1}{15} \times 30 = 2$ min

It takes 2 min to drain the tank completely.

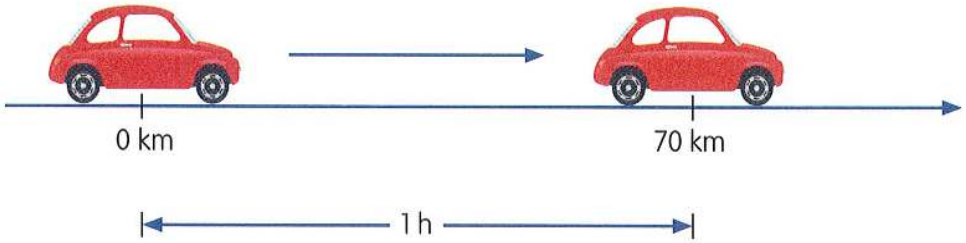


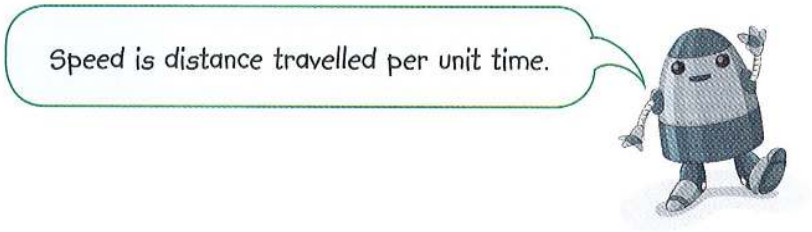
A **rate** is a comparison of two quantities and is expressed as one quantity per unit of another quantity.

Go to WB 6B 1–2

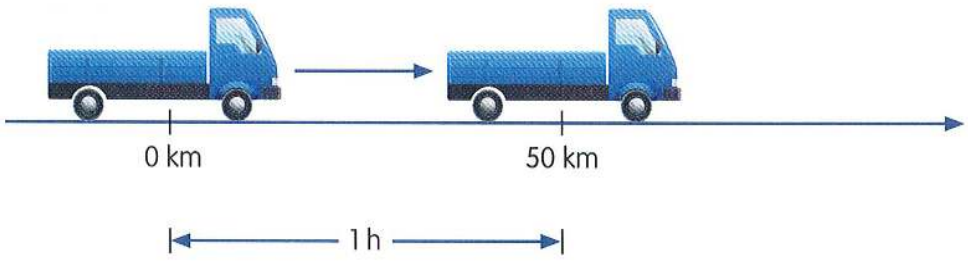
See and Learn

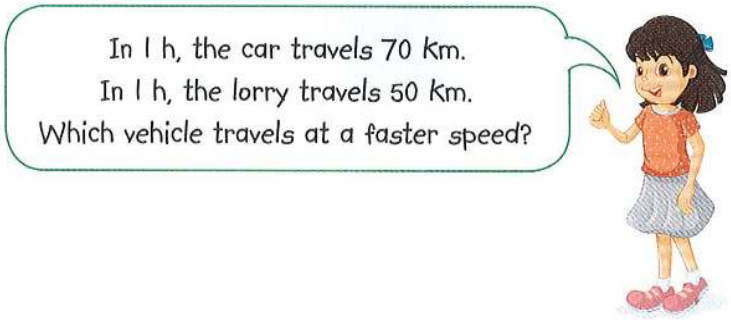
1 A car travels at 70 kilometres per hour or 70 km/h.
The **speed** of the car is **70 km/h**.
In 1 h, the car travels 70 km.





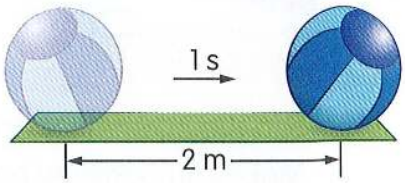
2 The **speed** of the lorry is **50 km/h**.
How many kilometres does the lorry travel in 1 h?



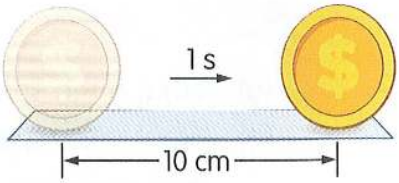


3 Speed may also be measured in m/s, cm/s or m/min.

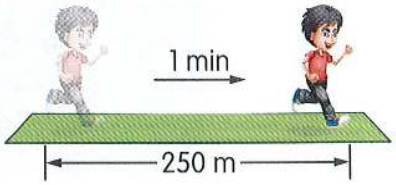
(a) A ball rolls 2 m along a lane in 1 second.
The ball rolls at a speed of 2 m/s.



(b) A coin rolls 10 cm on the floor in 1 second.
The coin rolls at a speed of 10 cm/s.



(c) A jogger runs 250 m along a running track in 1 minute.
The speed of the jogger is 250 m/min.



In 1 second, the ball rolls 2 m.
In 1 second, the coin rolls 10 cm.
Does the ball roll faster than the coin?

Pair and Share

Discuss with your partner.

1 What is the speed for each of the following?

(a) A car travels 90 km in 1 hour
(b) A man swims 100 m in 1 minute
(c) An animal runs 10 m per second

2 Discuss the difference between the following speeds.

(a) 20 m/s and 20 m/min **(b)** 50 cm/s and 50 m/s

Example

If Jane's walking speed is 30 m/min, it means she walks 30 metres in 1 minute!

If John cycles at a speed of 30 km/h, it means he cycles 30 kilometres in 1 hour.

Let's Have FUN

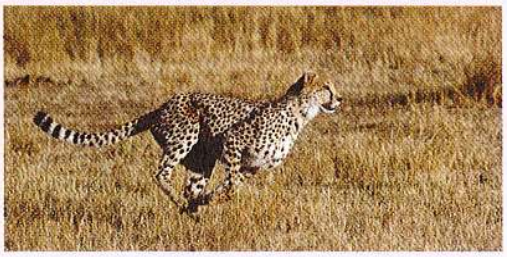
Show and Say

1. Surf the Internet for examples on different speeds of vehicles and animals. Make comparisons between different speeds. Share the information with the class.

Example

(a) What is the speed of the fastest bullet train?

(b) What is the speed of a cheetah?



2. Discuss other examples of speed such as the speed limit on traffic signs, speedometer, fan speed and so on.

Do and Learn

What is the speed for each of the following?

	Speed
(a) John runs 5 m per second.	
(b) Susie walks 50 m in 1 minute.	
(c) A ball rolls 3 m in 1 second.	
(d) A car travels 85 km in 1 hour.	

Go to WB 6B 3–4

Finding Speed, Distance and Time

See and Learn

1 A truck travels 165 km in 3 h. What is the speed of the truck?

Method 1

3 h → 165 km

1 h → 165 ÷ 3 = 55 km (per hour)

Distance ÷ Time = Speed

In 1 h, the distance travelled is 55 km.

Method 2

Speed = Distance ÷ Time
= 165 ÷ 3
= 55 km/h

The speed of the truck is 55 km/h.

2 Michael runs 100 m in 20 seconds. What is his speed in metres per second?

Method 1

20 s → 100 m

1 s → 100 ÷ 20 = 5 m

Method 2

Speed = Distance ÷ Time
= 100 ÷ 20
= 5 m/s

Michael's speed is 5 m/s.

3 Town A and Town B are 108 km apart. A van takes 2 h to travel from Town A to Town B. What is the speed of the van?

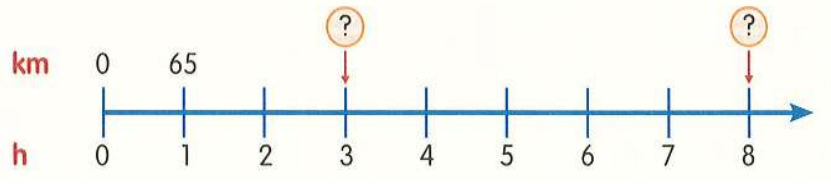
Speed = Distance ÷ Time
= 108 ÷ 2
= 54 km/h

The speed of the van is 54 km/h.

Speed = Distance ÷ Time

4 Mr Tan drives his car at a speed of 65 km/h. At this speed, how far does he travel in

(a) 3 h? **(b)** 8 h?



A speed of 65 km/h means the distance covered in 1 hour is 65 km.

(a)

Method 1

1 h → 65 km

3 h → 65 × 3 = 195 km

Speed × Time = Distance

Method 2

Distance = Speed × Time
= 65 × 3
= 195 km

He travels 195 km in 3 h.

(b)

Method 1

1 h → 65 km

8 h → 65 × 8 = 520 km

Method 2

Distance = Speed × Time
= 65 × 8
= 520 km

He travels 520 km in 8 h.

5 A toy car moves at a speed of 6 cm/s. At this speed, how far does it travel in 5 s?

Method 1

1 s → 6 cm

5 s → 6 × 5 = 30 cm

Method 2

Distance = Speed × Time
= 6 × 5
= 30 cm

The toy car travels 30 cm in 5 s.

6 John cycles at a speed of 450 m/min. How many kilometres does he cycle in 30 min?

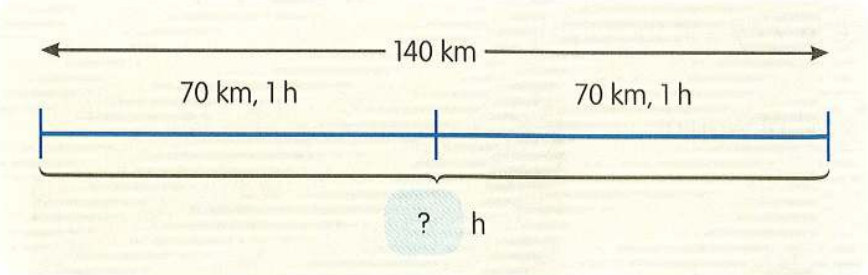
Distance = Speed × Time
= 450 × 30
= 13 500 m

13 500 m = 13.5 km

He cycles 13.5 km in 30 min.

Distance = Speed × Time

7 The speed of a bus is 70 km/h. Find the time the bus takes to travel 140 km.



Method 1

70 km → 1 h

140 km → 140 ÷ 70 = 2 h

Distance ÷ Speed = Time

Method 2

Time = Distance ÷ Speed
= 140 ÷ 70
= 2 h

The bus takes 2 h to travel 140 km.

8 A train travelled 240 km at a speed of 80 km/h. Find the time taken for the journey.

Method 1

80 km → 1 h

240 km → 240 ÷ 80 = 3 h

Method 2

Time = Distance ÷ Speed
= 240 ÷ 80
= 3 h

The time taken for the journey was 3 h.

9 The distance from Town X to Town Y is 153 km. Mr Chew travels from Town X to Town Y at a speed of 51 km/h. How long will he take to reach Town Y?

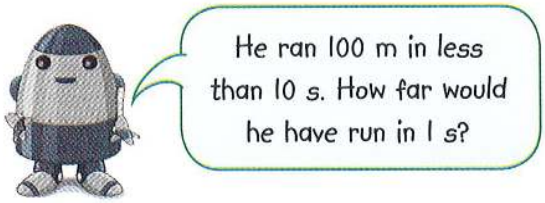
Time = Distance ÷ Speed
= 153 ÷ 51
= 3 h

Mr Chew will take 3 h to reach Town Y.

Time = Distance ÷ Speed

MATHS in real life

Usain Bolt won the 100-m race in 9.69 s in the Olympic Games in 2008.
What does this mean?
If he were to run 100 m in 10 s, what would his speed be?



Pair and Share

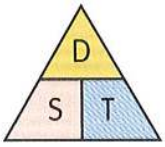
Work with your partner.
Use examples to show the 3 related quantities (distance, time and speed). Share how one quantity can be calculated given the other 2 quantities.

Example

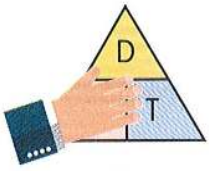
1. Ravi went on a road trip with his parents. His father drove at a speed of 85 km/h and reached a town in 2 h. What was the distance they travelled?

2. Point A and Point B are 16 km apart. Dave cycles from Point A to Point B in 2 h. What is his cycling speed?

Use the diagram to help you remember the relationship between distance, time and speed.



D → Distance
S → Speed
T → Time

 Distance = Speed × Time	 $\text{Time} = \frac{\text{Distance}}{\text{Speed}}$	 $\text{Speed} = \frac{\text{Distance}}{\text{Time}}$

Do and Learn

1. What is the speed, distance travelled or time taken by aircrafts A, B and C?

Aircraft	Distance travelled	Time taken	Speed
A	4500 km	8 h	
B		14 h	774 km/h
C	709.5 km		473 km/h

2. A van was travelling at 55 km/h. At this speed, how far can it travel in 4 h?

3. A toy train covers a distance of 12 m in 3 seconds. Find the speed of the toy train.

4. Marcos swam 800 m in 40 min. What was his speed?

5. Shanti cycled 840 m in 3 min. What was her speed?

6. An eagle flies at a speed of 50 km/h. At this speed, how long will the eagle take to fly a distance of 75 km?

7. An aeroplane flew at a speed of 650 km/h. Find the distance the aeroplane flew in $2\frac{1}{2}$ h.

8. Siti rolls a tennis ball gently on a cement floor. The tennis ball covers 60 cm in 4 seconds. Find its speed.

9. Janice ran at a speed of 5 m/s during a 100-m race. How long did she take to run the race?

10. Mr Tay drove from Town X to Town Y at a speed of 55 km/h. He took 3 h to reach Town Y. What was the distance between Town X and Town Y?

11. Jonathan ran at a speed of 7 m/s. How long did he take to run 105 m?

12. Raja walked for 10 minutes at a speed of 85 m/min from his flat to the library. If he had walked at a speed of 100 m/min, how many minutes would he have taken?

Go to WB 6B 5–10

Self-Check

I know how to find distance, speed or time given the other two related quantities.

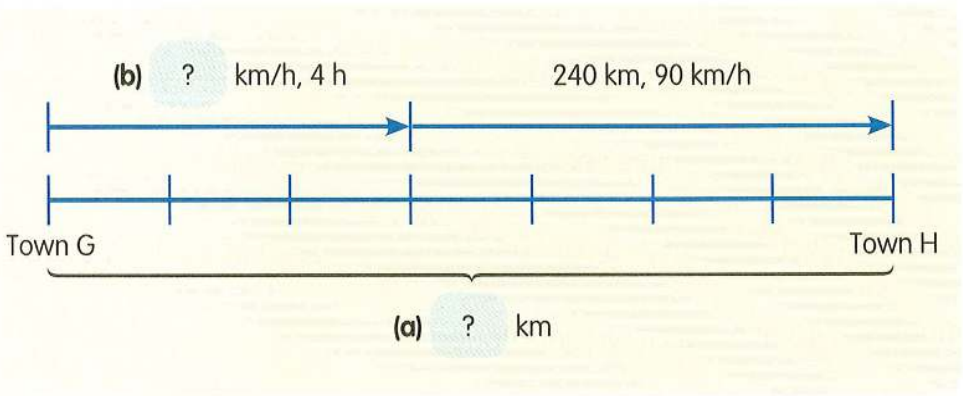
Word Problems (Involving Speed with Two Parts in a Journey)

See and Learn

1 Mr Sim drove from Town G to Town H. He took 4 h to drive $\frac{3}{7}$ of the journey. For the remaining 240 km, he drove at a constant speed of 90 km/h.

(a) Find the distance between Town G and Town H.

(b) Find his speed for the first $\frac{3}{7}$ of the journey.



(a) Distance for $\frac{4}{7}$ of the journey = 240 km

Distance for $\frac{1}{7}$ of the journey = 240 ÷ 4
= 60 km

Distance for $\frac{7}{7}$ of the journey = 7 × 60
= 420 km

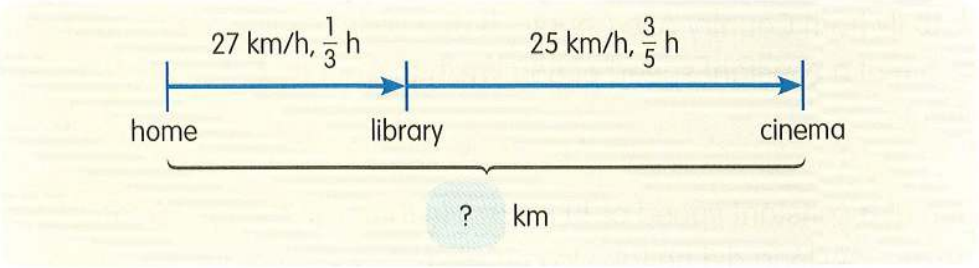
The distance between Town G and Town H was 420 km.

(b) Distance for $\frac{3}{7}$ of the journey = 3 × 60
= 180 km

Speed = Distance ÷ Time
= 180 ÷ 4
= 45 km/h

Mr Sim's speed for the first $\frac{3}{7}$ of the journey was 45 km/h.

2 Ravi took $\frac{1}{3}$ h to cycle from his home to the library at a constant speed of 27 km/h. He then took $\frac{3}{5}$ h to cycle from the library to the cinema at a constant speed of 25 km/h. How far did Ravi cycle?



Distance from Ravi's home to the library $= 27 \times \frac{1}{3}$

$= 9$ km

Distance from the library to the cinema $= 25 \times \frac{3}{5}$

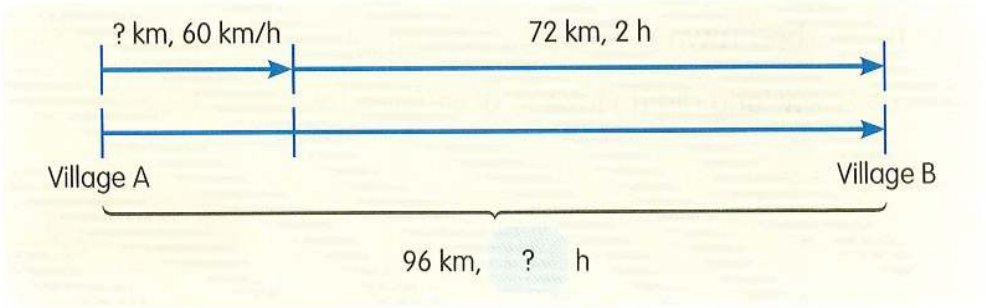
$= 15$ km

Total distance $= 9 + 15$

$= 24$ km

Ravi cycled 24 km.

3 Mrs Seah drove 96 km from Village A to Village B. She drove at a constant speed of 60 km/h for the first part of the journey. Then she drove the remaining 72 km for 2 h before reaching Village B. How many hours did the whole journey take?



Distance for the first part of the journey $= 96 - 72$

$= 24$ km

Time taken for the first part of the journey = Distance ÷ Speed

$= 24 \div 60$

$= \frac{2}{5}$ h

Total time $= \frac{2}{5} + 2$

$= 2\frac{2}{5}$ h

The whole journey took $2\frac{2}{5}$ h.

Do and Learn

Solve the word problems.

1. An aeroplane took 8 h to fly from Country A to Country B at a constant speed of 900 km/h. It then flew for another 5 h at a constant speed of 850 km/h to Country C. Find the total distance covered by the aeroplane.

2. A marathoner ran 14 km at a constant speed of 10 km/h. He then ran the remaining 28 km at a constant speed of 7 km/h. How long did he take to complete the marathon?

3. Sanjit drove from Point A to Point B. He took 2 h to drive $\frac{4}{9}$ of the distance. For the remaining 150 km, he drove at a constant speed of 75 km/h.

   (a) Find the distance between Point A and Point B.

   (b) Find his speed for the first part of the journey.

4. David drove $\frac{2}{3}$ of his journey at a constant speed of 75 km/h. He completed the remaining 180 km in 3 h. What was the total time taken for the whole journey?

5. Megan took 40 min to cycle from her house to a park. She cycled at a constant speed of 15 km/h. She decreased her speed to 12 km/h when she cycled home from the park along the same route. How many hours did she take to cycle home?

6. John left Town X at 9.30 a.m. and drove to Town Z. After travelling $\frac{5}{8}$ of the journey at a constant speed of 90 km/h for $\frac{1}{2}$ h, he reached Town Y. For the remaining journey to Town Z, he travelled at a constant speed of 54 km/h. How long did he take to drive from Town Y to Town Z?

Go to WB 6B 11–14

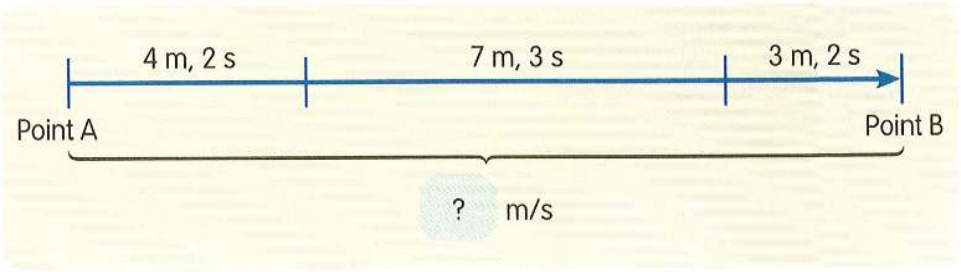
Self-Check

I know how to solve word problems on speed involving two parts in a journey.

Average Speed

See and Learn

1 Kumar ran from Point A to Point B without stopping. He ran the first 4 m in 2 s, the next 7 m in 3 s and the last 3 m in 2 s. Find Kumar's average speed from Point A to Point B.

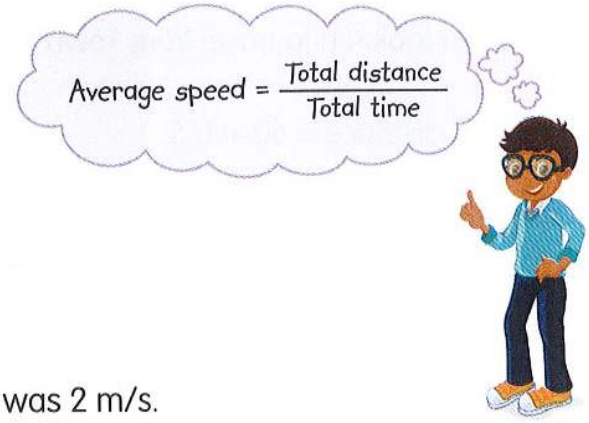


Total distance = 4 + 7 + 3
= 14 m

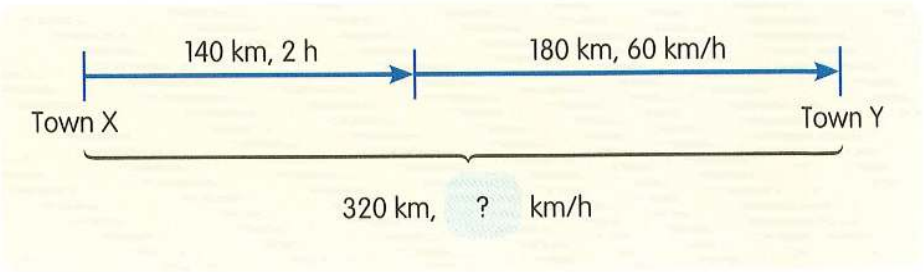
Total time = 2 + 3 + 2
= 7 s

Average speed = Total distance ÷ Total time
= 14 ÷ 7
= 2 m/s

Kumar's average speed from Point A to Point B was 2 m/s.



2 Dave drove 320 km from Town X to Town Y. He took 2 h for the first 140 km. For the remaining 180 km of the journey, he drove at 60 km/h. Find his average speed for the whole journey.



Time taken for remaining 180 km = 180 ÷ 60
= 3 h

Total time taken = 2 + 3
= 5 h

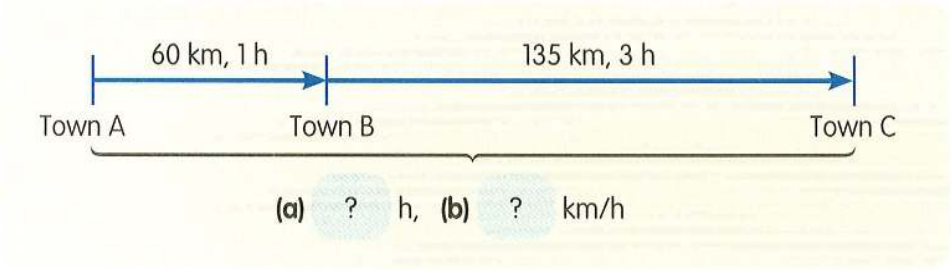
Average speed = Total distance ÷ Total time
= 320 ÷ 5
= 64 km/h

Dave's average speed for the whole journey was 64 km/h.

3 Mr Lim took 1 h to travel 60 km from Town A to Town B. He took 3 h to travel 135 km from Town B to Town C.

(a) Find the total time Mr Lim took to travel from Town A to Town C.

(b) Find the average speed for the whole journey.



(a) Total time = 1 + 3
= 4 h

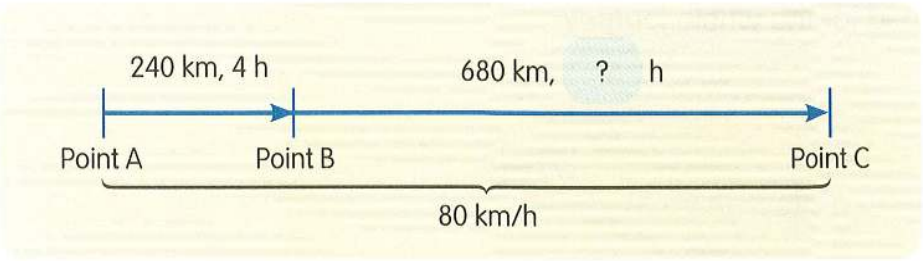
Mr Lim took 4 h to travel from Town A to Town C.

(b) Total distance = 60 + 135
= 195 km

Average speed = Total distance ÷ Total time
= 195 ÷ 4
= $48\frac{3}{4}$ km/h or 48.75 km/h

The average speed for the whole journey was 48.75 km/h.

4 A train travelled 240 km from Point A to Point B in 4 h. Then it travelled 680 km from Point B to Point C. Its average speed for the whole journey from Point A to Point C was 80 km/h. Find the time the train took to travel from Point B to Point C.



Distance from Point A to Point C = 240 + 680
= 920 km

Total time taken = Total distance ÷ Average speed
= 920 ÷ 80
= $11\frac{1}{2}$ h

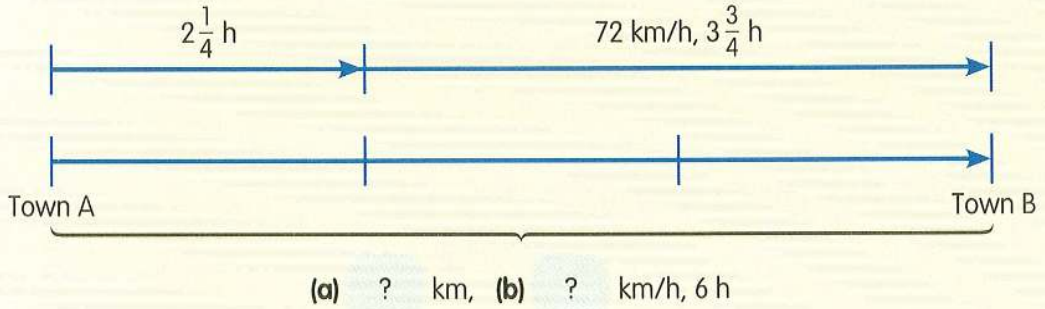
Time taken to drive from Point B to Point C = $11\frac{1}{2} - 4$
= $7\frac{1}{2}$ h

The train took $7\frac{1}{2}$ h to travel from Point B to Point C.

5 Mdm Sharifah drove 6 h from Town A to Town B. She took $2\frac{1}{4}$ h to drive $\frac{1}{3}$ of the journey. She took $3\frac{3}{4}$ h to complete the remaining journey at a speed of 72 km/h.

(a) Find the total distance Mdm Sharifah drove.

(b) Find her average speed for the whole journey.



(a) ? km, **(b)** ? km/h, 6 h

(a) Distance for $\frac{2}{3}$ of the journey $= 72 \times 3\frac{3}{4}$

$= 270$ km

Distance for $\frac{1}{3}$ of the journey $= 270 \div 2$

$= 135$ km

Total distance travelled $= 135 \times 3$

$= 405$ km

Mdm Sharifah drove 405 km.

(b) Average speed = Total distance ÷ Total time

$= 405 \div 6$

$= 67\frac{1}{2}$ km/h

Her average speed for the whole journey was $67\frac{1}{2}$ km/h.

Do and Learn

Solve the word problems.

1. Mingli drove 40 km from Town X to Town Y in $\frac{1}{2}$ h. Then she drove 120 km from Town Y to Town Z in $1\frac{1}{2}$ h. Find the average speed for the whole journey.

2. The distance between Point A and Point B was 12 km. Mr Samad jogged from Point A to Point B and back to Point A. His average jogging speed was 8 km/h. Find the time he took to jog the total distance.

3. Bala drove for 2 h at a speed of 80 km/h for the first part of a journey. He drove 181 km for the rest of the journey. He took $5\frac{1}{2}$ h for the whole journey.
   (a) What was the total distance he travelled?
   (b) What was his average speed for the whole journey?

4. Ramli drove from Town J to Town K which were 435 km apart. He drove for $2\frac{1}{4}$ h before increasing his speed to 80 km/h for the remaining 300 km of the journey.
   (a) How long did he take to complete the whole journey?
   (b) What was his average speed for the whole journey?

5. Siva took 5 h to cycle from Town Y to Town Z. He took $3\frac{1}{2}$ h to cycle $\frac{3}{5}$ of the journey. He took $1\frac{1}{2}$ h to cycle the remaining part of the journey at a speed of 20 km/h.
   (a) Find the total distance Siva cycled.
   (b) Find his average cycling speed for the whole journey.

Go to WB 6B 15–18

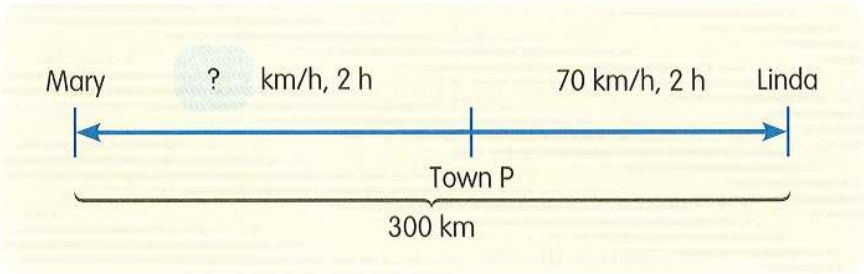
Self-Check

I know how to solve word problems involving average speed.

Word Problems (Involving Speed with Two Moving Objects)

See and Learn

1. Mary and Linda started driving from Town P but travelled in opposite directions. After driving for 2 h, they were 300 km apart. Linda's driving speed was 70 km/h. What was Mary's driving speed?



Distance covered by Linda = 70 × 2
= 140 km

Distance covered by Mary = 300 – 140
= 160 km

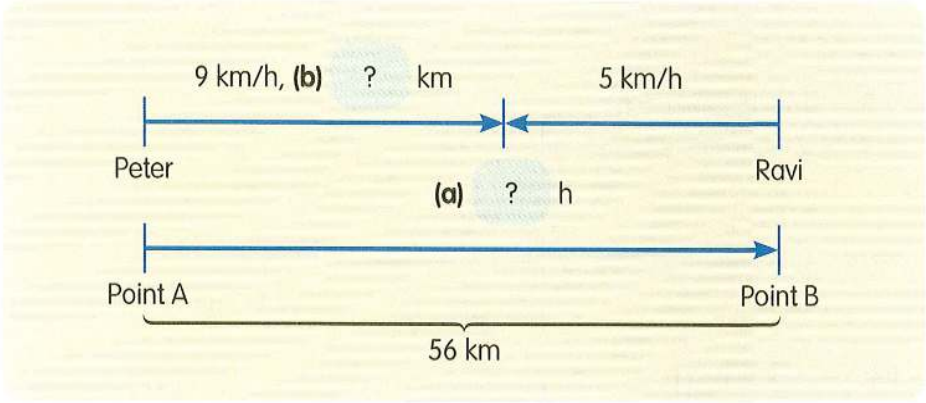
Speed of Mary = 160 ÷ 2
= 80 km/h

Mary's driving speed was 80 km/h.

2 Point A and Point B are 56 km apart. Peter runs from Point A to Point B at a constant speed of 9 km/h. At the same time, Ravi runs from Point B to Point A at a constant speed of 5 km/h.

(a) What is the time taken for both boys to meet?

(b) How far has Peter run when he meets Ravi?



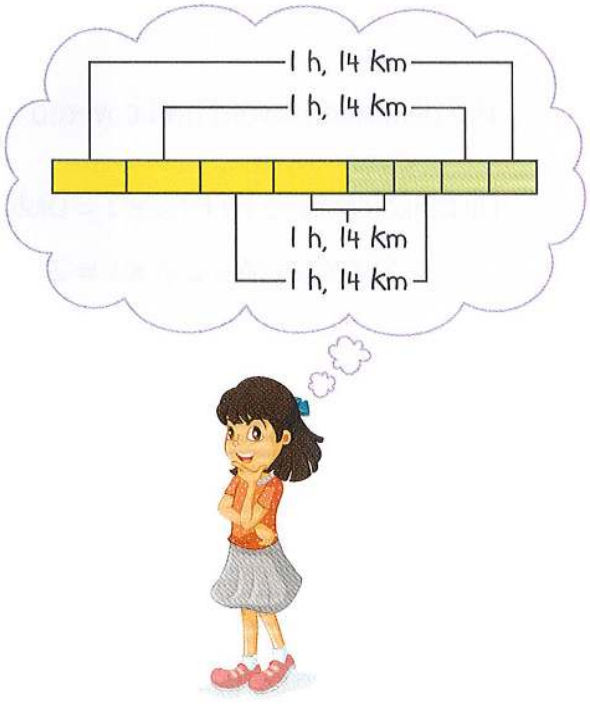
(a) Distance covered by Peter and Ravi in 1 h = 9 + 5
= 14 km

Time taken for Peter and Ravi to meet = 56 ÷ 14
= 4 h

The time taken for both boys to meet is 4 h.

(b) Distance covered by Peter = 9 × 4
= 36 km

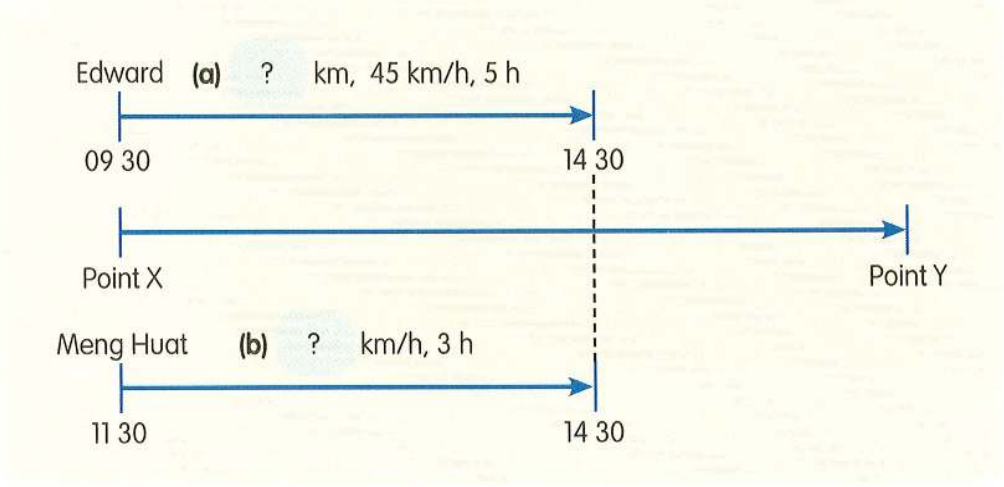
Peter has run 36 km when he meets Ravi.



3 At 09 30, Edward started driving from Point X to Point Y at a constant speed of 45 km/h. At 11 30, Meng Huat started driving at a constant speed from Point X to Point Y. Meng Huat caught up with Edward after driving for 3 h.

(a) Find the distance Edward had covered when he met Meng Huat.

(b) Find Meng Huat's driving speed.



(a) 09 30 to 11 30 → 2 h

Time taken by Edward to drive when he met Meng Huat = 3 + 2
= 5 h

Distance covered by Edward = 45 × 5
= 225 km

The distance Edward had covered when he met Meng Huat was 225 km.

(b) Distance covered by Edward = Distance covered by Meng Huat

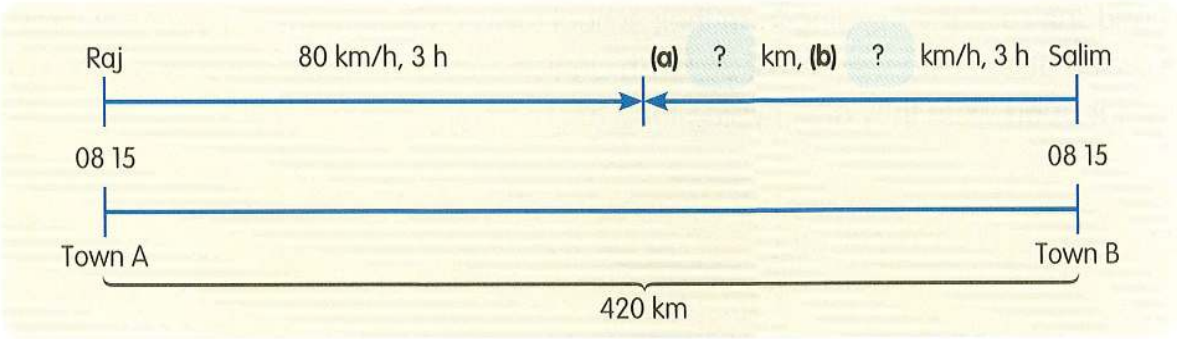
Speed of Meng Huat = 225 ÷ 3
= 75 km/h

Meng Huat's driving speed was 75 km/h.

4 Town A and Town B were 420 km apart. Raj set off at 08 15 from Town A and drove towards Town B at a constant speed of 80 km/h. At the same time, Salim set off from Town B and drove towards Town A at a constant speed. They met 3 h later.

(a) Find the distance covered by Salim.

(b) Find Salim's speed for the journey.



(a) Distance covered by Raj $= 80 \times 3$
$= 240$ km

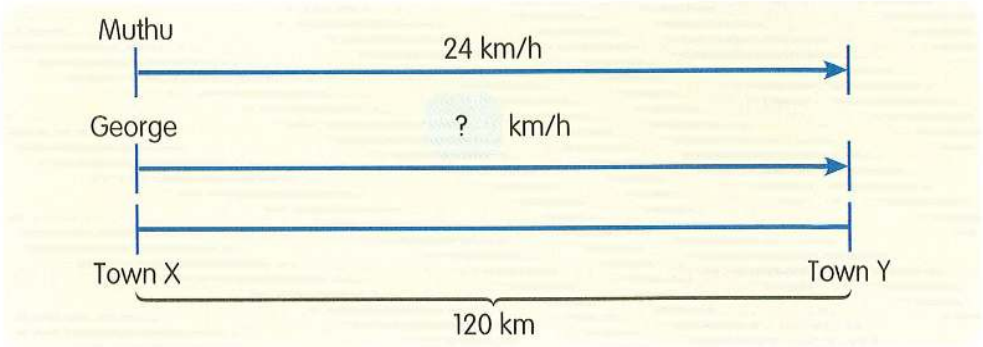
Distance covered by Salim $= 420 - 240$
$= 180$ km

The distance covered by Salim was 180 km.

(b) Speed of Salim $= 180 \div 3$
$= 60$ km/h

Salim's speed for the journey was 60 km/h.

5 Muthu cycled at a constant speed of 24 km/h from Town X to Town Y which were 120 km apart. George travelled the same route $\frac{1}{2}$ h later than Muthu but reached Town Y $\frac{1}{2}$ h earlier than Muthu. Find George's speed.



Time taken by Muthu $= 120 \div 24$
$= 5$ h

Time taken by George $= 5 - \frac{1}{2} - \frac{1}{2}$
$= 4$ h

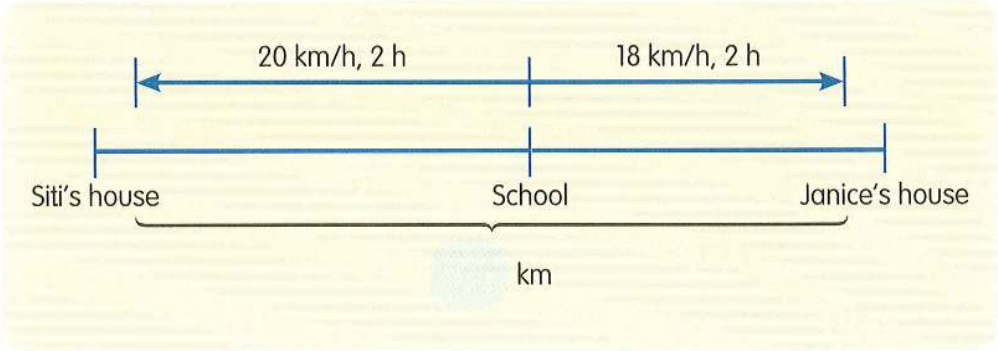
George's speed $= 120 \div 4$
$= 30$ km/h

George's speed was 30 km/h.

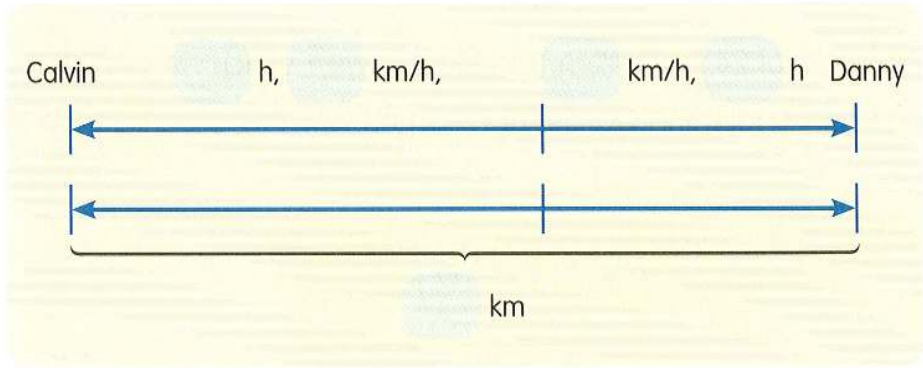
Pair and Share

Work with your partner to solve the word problems.
You may draw diagrams to show the solutions.
Explain your solutions to the class.

1. Siti and Janice started cycling from their school towards their homes in opposite directions. Siti cycled at a constant speed of 20 km/h. Janice cycled at a constant speed of 18 km/h. How far apart were they after cycling for 2 h?



2. Calvin and Danny started driving from the same place but in opposite directions. After $\frac{2}{3}$ h, they were 100 km apart. Danny drove at a constant speed of 60 km/h while Calvin did not change his speed throughout the journey. Find Calvin's driving speed.



3. The distance between Park A and Park B is 84 km. Mindy cycles from Park A to Park B at a constant speed of 10 km/h. Rahimah cycles from Park B to Park A at a constant speed of 11 km/h. How far will Rahimah have cycled when she meets Mindy?

Do and Learn

Solve the word problems.

1. Dave and Boon Lee started driving at a constant speed from the same place but travelled in opposite directions. After driving for 4 h, they were 416 km apart. Dave's driving speed was 68 km/h. What was Boon Lee's driving speed?

2. The distance between Village P and Village Q is 360 km. A truck travels from Village P towards Village Q at a constant speed of 50 km/h. A car travels from Village Q towards Village P along the same route at a constant speed of 70 km/h. How far from Village Q is the car driver when he meets the truck driver?

3. At 11 30, James started travelling from Town A to Town B at a constant speed of 50 km/h. At 13 00, Bob started travelling from Town A to Town B. Bob caught up with James after 2 h. Find Bob's speed.

4. Estate A and Estate B were 30 km apart. Benson ran from Estate A to Estate B at a constant speed of 10 km/h. $\frac{1}{2}$ h later, Jaya started running from Estate A to Estate B and reached Estate B $\frac{1}{2}$ h earlier than Benson. Find Jaya's running speed.

5. Jack and Jill started walking at 08 30 from Point X to Point Y which were 1080 m apart. When Jack reached Point Y in 30 min, Jill had walked $\frac{5}{6}$ of the distance.
   (a) What time did Jill reach Point Y?
   (b) What was Jill's walking speed?

6. Town P and Town Q were 60 km apart. At 12 15, Roy left Town P and cycled towards Town Q at a speed of 12 km/h. At the same time, Ramli left Town Q and cycled towards Town P at a speed of 15 km/h along the same route. Both boys did not change their speeds throughout. How far apart were the two boys after cycling for 20 minutes?

7. Both Mr Tan and Mr Lim drove at a constant speed from Town Y to Town Z. Mr Tan started his journey $\frac{1}{2}$ h earlier than Mr Lim. However, Mr Lim reached Town Z $\frac{2}{3}$ h earlier than Mr Tan. When Mr Lim reached Town Z, Mr Tan had travelled $\frac{4}{5}$ of the journey and was 60 km from Town Z. Explain your solutions based on the following questions.
   (a) What was the distance between Town Y and Town Z?
   (b) How many kilometres did Mr Tan travel in 1 hour?

Go to WB 6B 19–26

Self-Check

I know how to solve word problems on speed involving two moving objects.

Let's Think Along...

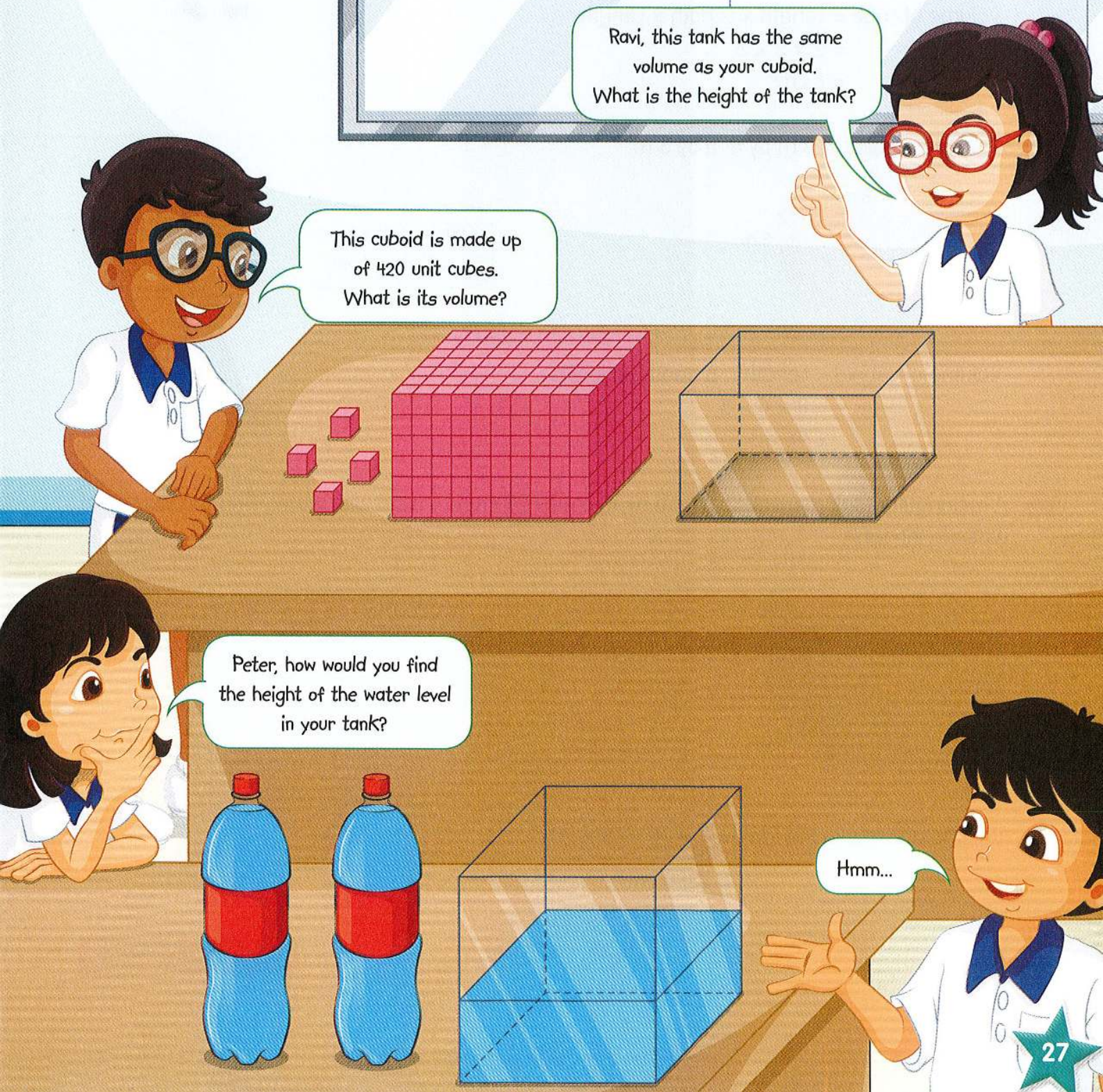
Ben and Ali ran around a 400-m track. They started running from the same point at the same time. Ben ran at a constant speed of 180 m/min. Ali's speed was 30 m/min slower than Ben's throughout. How many complete rounds would Ben have finished when he had run 450 m more than Ali?

Go to WB 6B 27–28

8 Volume

Let's Talk About...

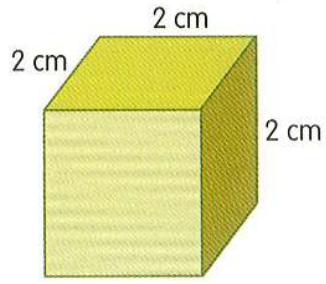
The children are learning about volume.

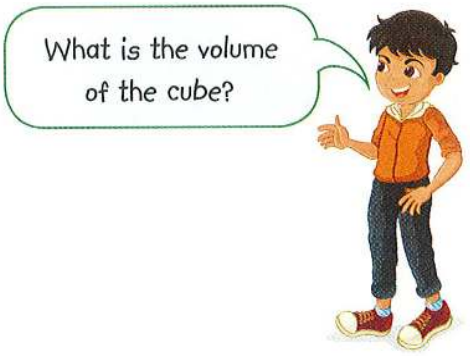


Let's Recall

Volume of cubes, cuboids and liquids

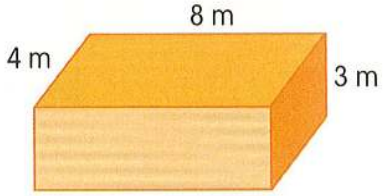
1 A cube measures 2 cm by 2 cm by 2 cm.

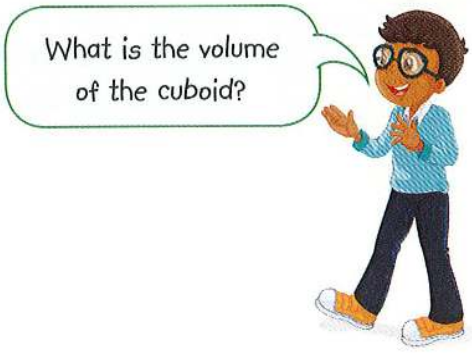




Volume of cube = Length × Length × Length
= 2 × 2 × 2
= 8 cm^3

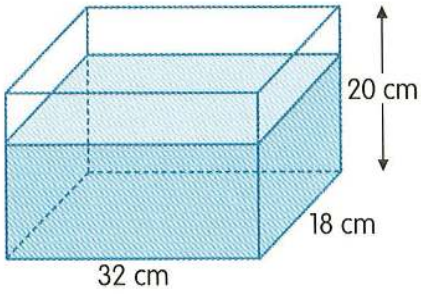
2 A cuboid measures 8 m by 4 m by 3 m.





Volume of cuboid = Length × Breadth × Height
= 8 × 4 × 3
= 96 m^3

3 A rectangular tank measuring 32 cm by 18 cm by 20 cm is $\frac{2}{3}$ filled with water. Find the volume of water in the tank.



Volume of water in the tank = $\frac{2}{3}$ × 32 × 18 × 20
= 7680 cm^3

Go to WB 6B 29–30

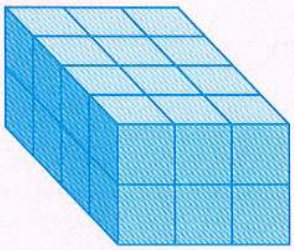
Finding an Edge of a Cuboid

Find one edge given the volume and two other edges

Hands-On Activity

Work in groups.
Use 24 unit cubes to build different cuboids with the same volume.

Example



Length × Breadth × Height = Volume

Record the missing dimensions.

Cuboid	Length (units)	Breadth (units)	Height (units)	Volume (cubic units)
A	4	3		24
B				24
C				24

$$\text{Height} = \frac{\text{Volume}}{\text{Length} \times \text{Breadth}}$$
$$= \frac{24}{4 \times 3}$$
$$= \frac{24}{12}$$
$$= 2 \text{ units}$$

How is one dimension of a cuboid related to its volume and the other dimensions?

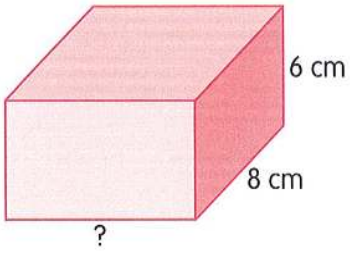
Height of cuboid $= \dfrac{\text{Volume}}{\text{Length} \times \text{Breadth}}$

Length of cuboid $= \dfrac{\text{Volume}}{\quad \times \quad}$

Breadth of cuboid $= \dfrac{\text{Volume}}{\quad \times \quad}$

See and Learn

1 A cuboid has a volume of 432 cm^3. Its height is 6 cm and its breadth is 8 cm. What is the length of the cuboid?



$$\text{Volume} = \text{Length} \times \text{Breadth} \times \text{Height}$$

$$\text{Length} = \frac{\text{Volume}}{\text{Breadth} \times \text{Height}}$$

$$= \frac{432}{8 \times 6}$$

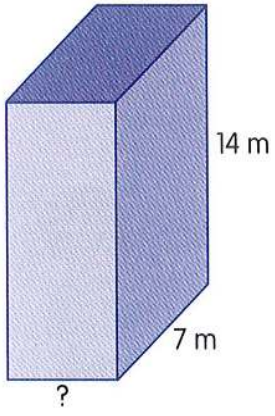
$$= 9 \text{ cm}$$

The length of the cuboid is 9 cm.

Check

$$\text{Length} \times \text{Breadth} \times \text{Height} = 9 \times 8 \times 6$$
$$= 432 \text{ cm}^3$$

2 The volume of a cuboid is 490 m^3. Its length is 7 m and its height is 14 m. Find the breadth of the cuboid.



$$\text{Volume} = \text{Length} \times \text{Breadth} \times \text{Height}$$

$$\text{Breadth} = \frac{\text{Volume}}{\text{Length} \times \text{Height}}$$

$$= \frac{490}{7 \times 14}$$

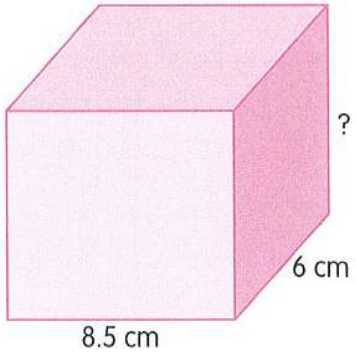
$$= 5 \text{ m}$$

The breadth of the cuboid is 5 m.

Check

$$\text{Length} \times \text{Breadth} \times \text{Height} = 7 \times 5 \times 14$$
$$= 490 \text{ m}^3$$

3 A cuboid has a volume of 357 cm^3. Its length is 8.5 cm and its breadth is 6 cm. What is the height of the cuboid?



$$\text{Volume} = \text{Length} \times \text{Breadth} \times \text{Height}$$

$$\text{Height} = \frac{\text{Volume}}{\text{Length} \times \text{Breadth}}$$

$$= \frac{357}{8.5 \times 6}$$

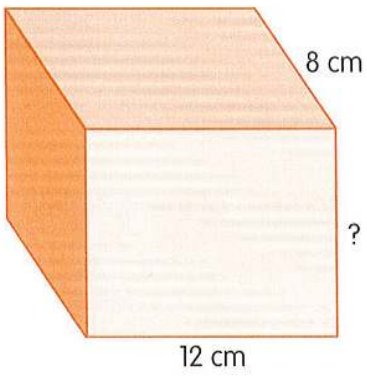
$$= 7 \text{ cm}$$

The height of the cuboid is 7 cm.

Check

Length × Breadth × Height = 8.5 × 6 × 7
= 357 cm^3

4 A box is 12 cm long and 8 cm wide. It has a volume of 912 cm^3. What is the height of the box?



$$\text{Height} = \frac{912}{12 \times 8}$$

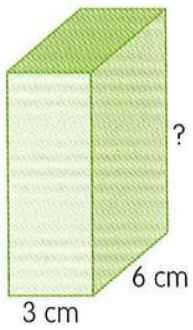
$$= 9.5 \text{ cm}$$

The height of the box is 9.5 cm.

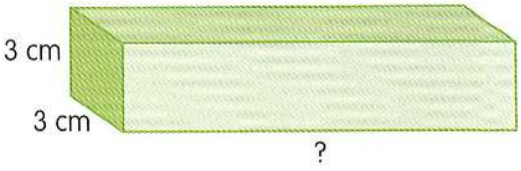
Do and Learn

The volume of each cuboid is 144 cm^3. Find the unknown edge of each cuboid.

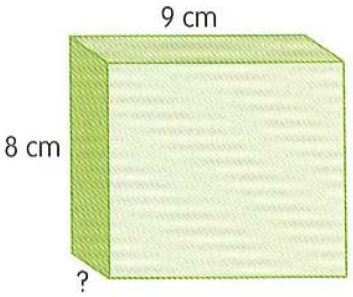
(a)



(b)



(c)



Go to WB 6B 31–32

Find one edge given the volume and area of one face

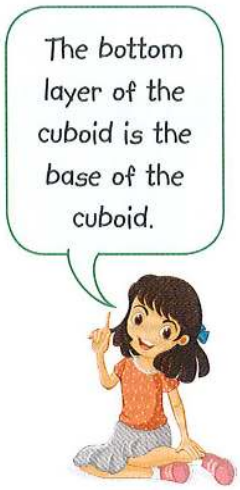
Hands-On Activity

Work in groups.

Use 1-cm cubes to build different cuboids of volume 24 cm^3 each.

(a) Record the dimensions.

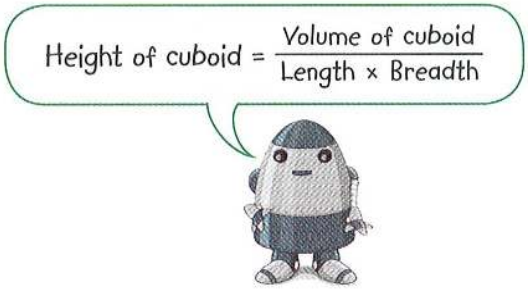
Cuboid	Volume (cm^3)	Base with		Base area (cm^2)	Height (cm)
		Length (cm)	Breadth (cm)		
A	24	4	3	$4 \times 3 = 12$	
B	24				
C	24				

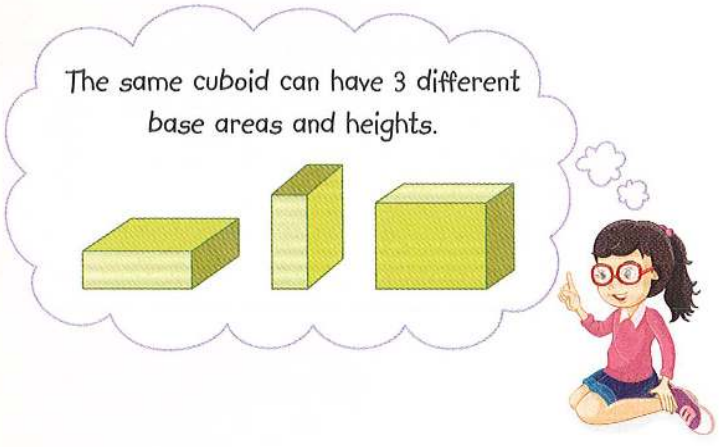


(b) Base area of cuboid = _____ × _____

(c) How is the height of the cuboid related to the volume and the base area of the cuboid?

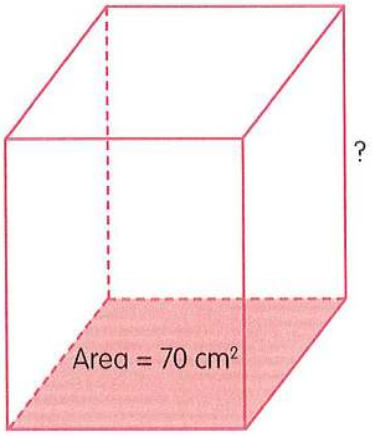
Height of cuboid = _____





See and Learn

1 The base area of a cuboid is 70 cm^2 and its volume is 840 cm^3. Find the height of the cuboid.



Volume = Base area × Height

Height = Volume ÷ Base area

$$= \frac{\text{Volume}}{\text{Base area}}$$

$$= \frac{840}{70}$$

$$= 12 \text{ cm}$$

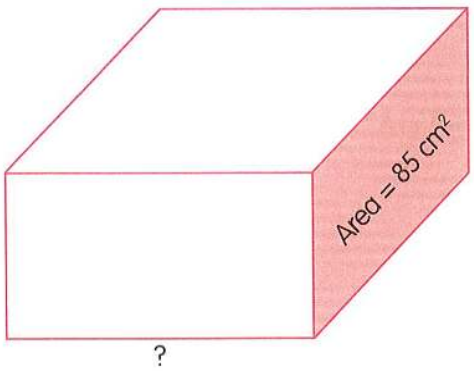
The height of the cuboid is 12 cm.

Check

Base area × Height = 70 × 12
= 840 cm^3

2 Find the unknown edge of each cuboid given its volume and the area of one shaded face.

(a) The volume of the cuboid is 1190 cm^3.



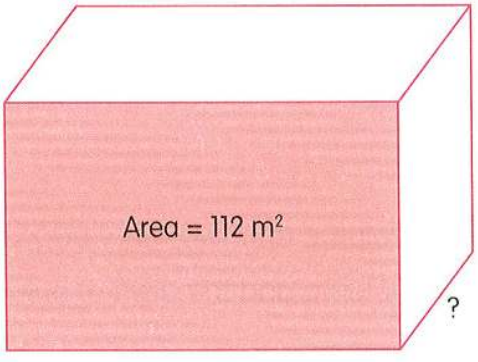
$$\text{Length} = \frac{\text{Volume}}{\text{Area of shaded face}}$$

$$= \frac{1190}{85}$$

$$= 14 \text{ cm}$$

The length of the cuboid is 14 cm.

(b) The volume of the cuboid is 448 m^3.



$$\text{Breadth} = \frac{\text{Volume}}{\text{Area of shaded face}}$$

$$= \frac{448}{112}$$

$$= 4 \text{ m}$$

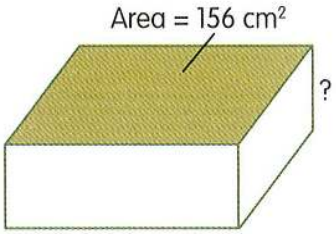
The breadth of the cuboid is 4 m.

Pair and Share

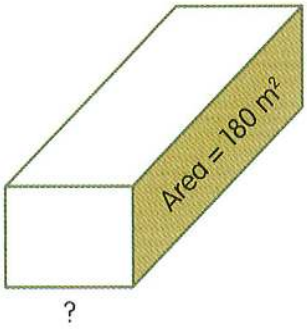
Work with your partner.

Find the unknown edge of each cuboid.

(a) Volume of cuboid = 780 cm^3



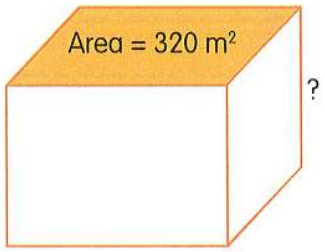
(b) Volume of cuboid = 1620 m^3



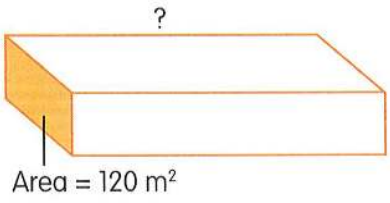
Do and Learn

1 The volume of each cuboid is 4800 m^3. The area of one of its faces is given. Find the unknown edge.

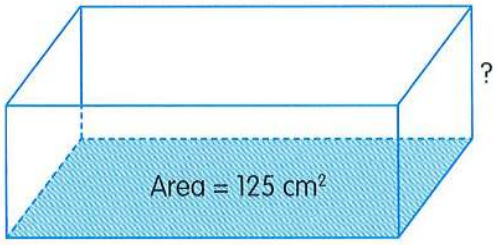
(a)



(b)



2 A box has a base area of 125 cm^2 and its volume is 750 cm^3. What is the height of the box?



Go to WB 6B 33–34

Self-Check

(a) I know how to find an unknown edge of a cuboid given its volume and two other edges.

(b) I know how to find an unknown edge of a cuboid given its volume and the area of one of its faces.

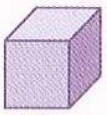
Finding an Edge of a Cube

Find one edge given the volume or area

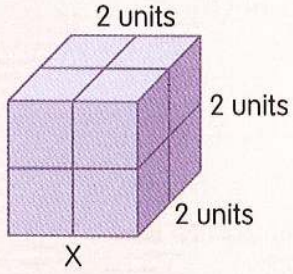
Hands-On Activity

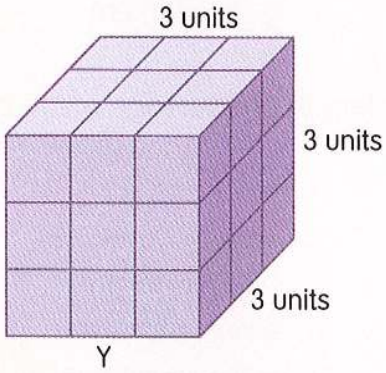
Work in groups.

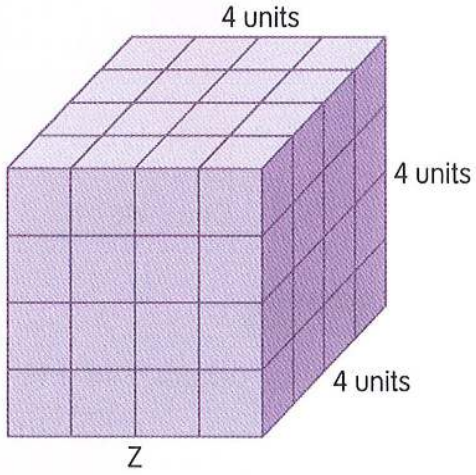
Use unit cubes to build the following cubes.
Then find the volume of each cube formed.


W
(unit cube)

(a) Each side of Cube X is 2 units.
(b) Each side of Cube Y is 3 units.
(c) Each side of Cube Z is 4 units.







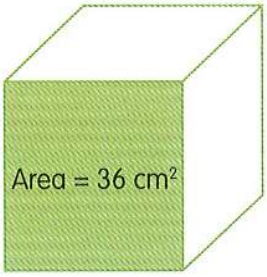
Cube	Length = Breadth = Height (units)	Volume = Length × Length × Length (cubic units)
W	1	1 × 1 × 1 = 1
X	2	
Y	3	
Z	4	

Since the length of each side of a cube is the same:

Length × Length × Length = Volume

See and Learn

1 The shaded face of the cube has an area of 36 cm^2. Find the length of one edge of the cube.



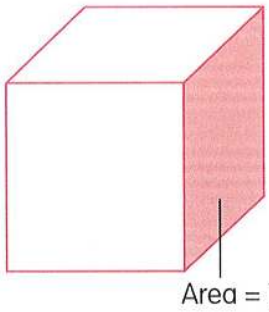
Length × Length = Area

6 cm × 6 cm = 36 cm^2

Length = 6 cm

The length of one edge of the cube is 6 cm.

2 The area of each face of a cube is 196 cm^2. Find the length of one edge of the cube.



Length × Length = Area

Length = $\sqrt{\text{Area}}$

= $\sqrt{196}$

= 14 cm

The length of one edge of the cube is 14 cm.

Check

Length × Length = 14 × 14

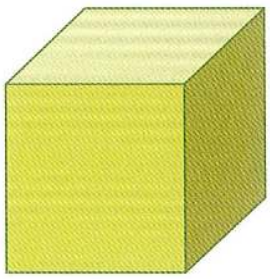
= 196 cm^2

The length of a square is the same as the square root of its area.

$\sqrt{}$ is the symbol for **square root**. $\sqrt{196}$ is read as the **square root of 196**.

Length of square = $\sqrt{\text{Area}}$

3 Find the length of one edge of a cube of volume 125 cm^3.



Length × Length × Length = Volume

5 cm × 5 cm × 5 cm = 125 cm^3

Length = 5 cm

The length of one edge of the cube is 5 cm.

4 A cubical box has a volume of 343 cm^3. What is the length of one edge of the box?

$$\text{Length} \times \text{Length} \times \text{Length} = \text{Volume}$$
$$\text{Length} = \sqrt[3]{\text{Volume}}$$
$$= \sqrt[3]{343}$$
$$= 7 \text{ cm}$$

The length of one edge of the box is 7 cm.

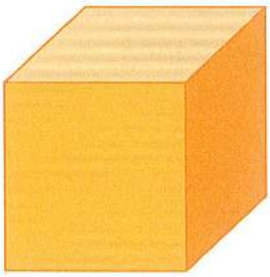
Check

$\text{Length} \times \text{Length} \times \text{Length} = 7 \times 7 \times 7$
$= 343 \text{ cm}^3$

The length of a cube is the same as the cube root of its volume.

$\sqrt[3]{}$ is the symbol for **cube root**.
$\sqrt[3]{343}$ is read as the **cube root of 343**.

5 The volume of a cube is 1728 m^3. What is the length of one edge of the cube?



$\text{Volume} = 1728 \text{ m}^3$
$\text{Length} = \sqrt[3]{1728}$
$= 12 \text{ m}$

The length of one edge of the cube is 12 m.

Length of cube = $\sqrt[3]{\text{Volume}}$

Pair and Share

Work with your partner.

1 Find the length of an edge of each cube given the area of one face. Then find length × length.

(a) 49 cm^2 **(b)** 225 cm^2 **(c)** 361 m^2

Does length × length = area of square face?

2 Find the length of an edge of each cube given the volume. Then find length × length × length.

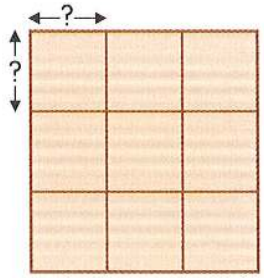
(a) 216 cm^3 **(b)** 729 cm^3 **(c)** 2744 m^3

Does length × length × length = volume of cube?

Let's Have FUN

Show and Say

Work in groups.
The figure below is a square of area 81 cm^2. It is made up of 9 smaller squares.
Find the length of the side of each smaller square.
Share the solution with the class.

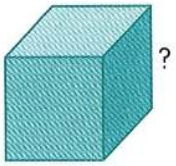


Do and Learn

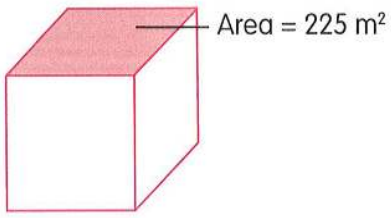
1. Find the value of each of the following.
   (a) $\sqrt{144}$ **(b)** $\sqrt{289}$ **(c)** $\sqrt{361}$

2. Find the value of each of the following.
   (a) $\sqrt[3]{1331}$ **(b)** $\sqrt[3]{3375}$ **(c)** $\sqrt[3]{4096}$

3. Find the height of a cube of volume 5832 cm^3.



4. The shaded face of the cube has an area of 225 m^2.
   What is the length of one edge of the cube?



Go to WB 6B 35–36

Self-Check

(a) I know how to find the length of an edge of a cube given its volume.
(b) I know how to find the length of an edge of a cube given the area of one face.
(c) I know how to use the calculator to find the square root ($\sqrt{\ }$) and the cube root ($\sqrt[3]{\ }$) of numbers.

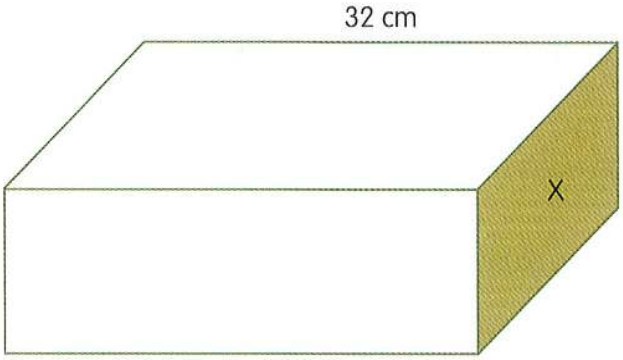
Finding the Area of One Face of a Cuboid or Cube

See and Learn

Find the area of one face given the volume and one edge

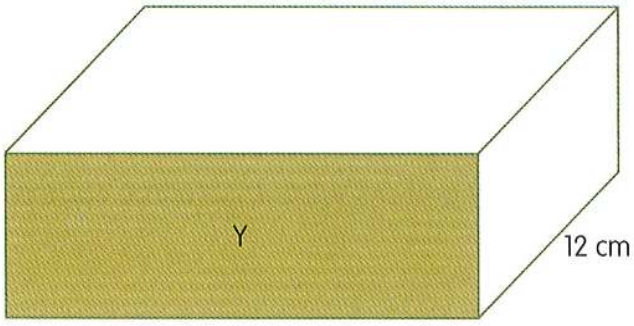
1 The volume of each cuboid is 3840 cm^3. Find the area of each shaded face.

(a)



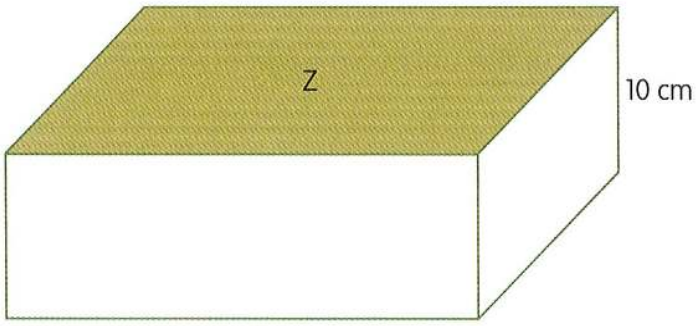
$$\text{Area X} = \frac{\text{Volume}}{\text{Length}}$$
$$= \frac{3840}{32}$$
$$= 120 \text{ cm}^2$$

(b)



$$\text{Area Y} = \frac{\text{Volume}}{\text{Breadth}}$$
$$= \frac{3840}{12}$$
$$= 320 \text{ cm}^2$$

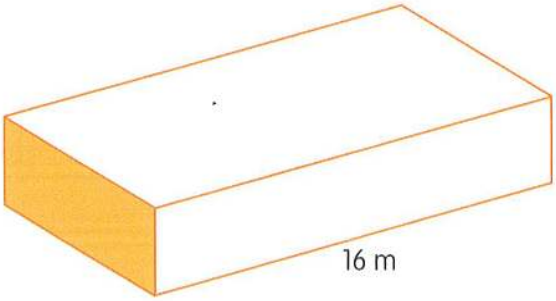
(c)



$$\text{Area Z} = \frac{\text{Volume}}{\text{Height}}$$
$$= \frac{3840}{10}$$
$$= 384 \text{ cm}^2$$

From the above examples, what do you notice about finding the area of a face?

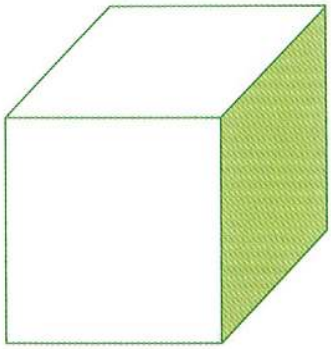
2 The volume of a cuboid is 256 m^3. One of its edges is 16 m.
Find the area of the shaded face.



$$\text{Area of shaded face} = \frac{\text{Volume}}{\text{Length}}$$
$$= \frac{256}{16}$$
$$= 16 \text{ m}^2$$

The area of the shaded face is 16 m^2.

3 The volume of a cube is 5832 cm^3. Find the area of a square face of the cube.



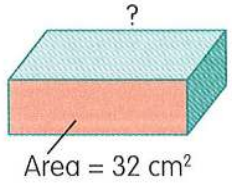
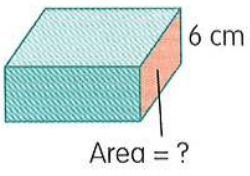
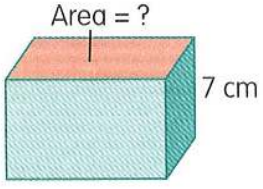
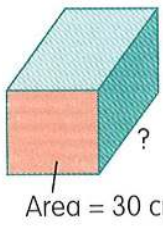
$$\text{Volume} = \text{Length} \times \text{Length} \times \text{Length}$$
$$\text{Length} = \sqrt[3]{5832}$$
$$= 18 \text{ cm}$$

$$\text{Area of a square face} = \text{Length} \times \text{Length}$$
$$= 18 \times 18$$
$$= 324 \text{ cm}^2$$

The area of a square face of the cube is 324 cm^2.

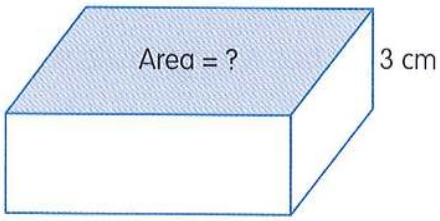
Pair and Share

Discuss with your partner.
In which of the following can you find the face area or the unknown edge of the cuboid?

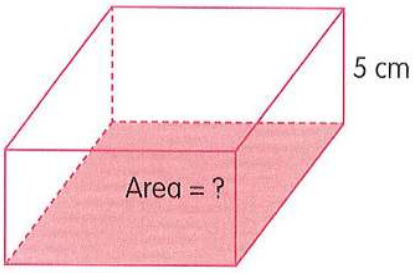
Volume of A = 320 cm^3	Volume of B = 1200 cm^3	Volume of C = 189 cm^3	Volume of D = 330 cm^3
			

Do and Learn

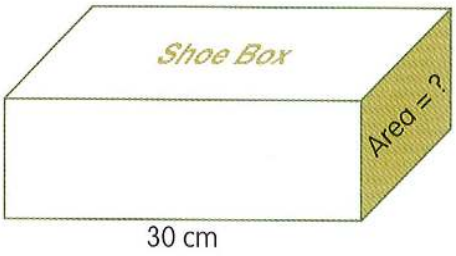
1. The height of a cuboid is 3 cm and its volume is 168 cm^3. Find the shaded area.



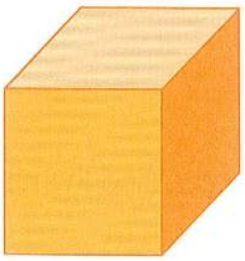
2. A cuboid has a volume of 840 cm^3 and a height of 5 cm. Find its base area.



3. The length of a shoe box is 30 cm and its volume is 2160 cm^3. Find the area of the shaded face.



4. A cube has a volume of 512 m^3. Find the area of each face of the cube.



Go to WB 6B 37–38

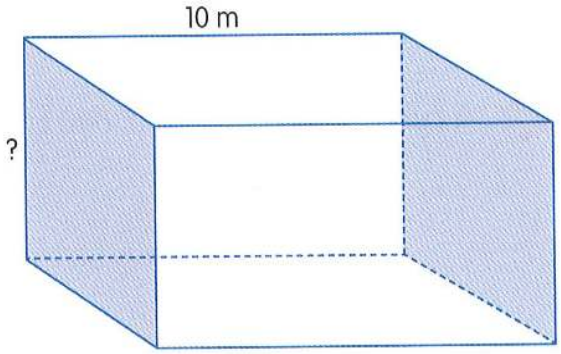
Self-Check

(a) I know how to find the area of a face of a cuboid given its volume and one edge.

(b) I know how to find the area of a square face of a cube given its volume.

See and Learn

1 The length of a cuboid is 10 m and its volume is 250 m^3. The cuboid has two opposite square faces. Find the length of each side of the square face.



$$\text{Area of square face} = \frac{\text{Volume}}{\text{Length}}$$
$$= \frac{250}{10}$$
$$= 25 \text{ m}^2$$

$$\text{Length of each side of the square face} = \sqrt{25}$$
$$= 5 \text{ m}$$

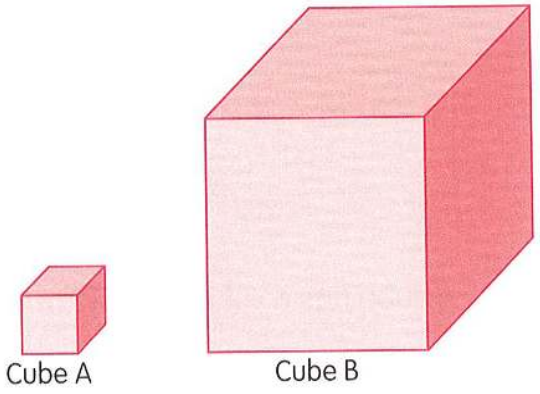
The length of each side of the square face is 5 m.

2 The volume of Cube A is 27 cm^3. The length of Cube B is 4 times the length of Cube A. Find the volume of Cube B.

$$\text{Length of each edge of Cube A} = \sqrt[3]{27}$$
$$= 3 \text{ cm}$$

$$\text{Length of each edge of Cube B} = 4 \times 3$$
$$= 12 \text{ cm}$$

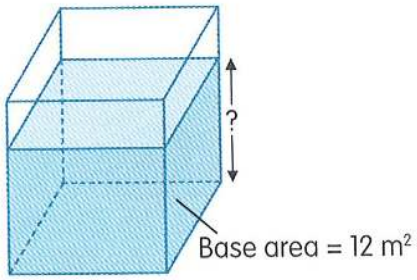
$$\text{Volume of Cube B} = 12 \times 12 \times 12$$
$$= 1728 \text{ cm}^3$$



The volume of Cube B is 1728 cm^3.

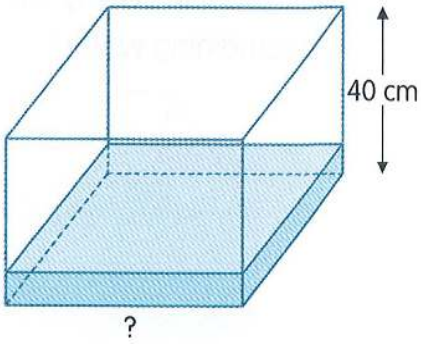
3 A rectangular tank has a base area of 12 m^2. The tank contains 36 m^3 of water. Find the height of the water level in the tank.

$$\text{Height of water level} = \frac{\text{Volume}}{\text{Base area}}$$
$$= \frac{36}{12}$$
$$= 3 \text{ m}$$



The height of the water level in the tank is 3 m.

4 A rectangular tank of height 40 cm has a square base. It is $\frac{1}{5}$ full with 28.8 ℓ of water.



(a) What is the area of the base of the tank?

(b) What is the length of the base?

(a) Height of water level when the tank is $\frac{1}{5}$ full $= \frac{1}{5} \times 40$

$= 8$ cm

Volume of water when the tank is $\frac{1}{5}$ full $= 28.8\ \ell$

$28.8\ \ell = 28.8 \times 1000$

$= 28\,800\ \text{cm}^3$

$$\text{Area of square base of tank} = \frac{\text{Volume}}{\text{Height}}$$

$$= \frac{28\,800}{8}$$

$= 3600\ \text{cm}^2$

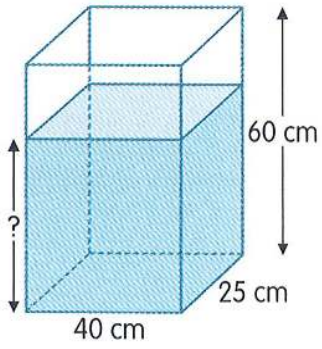
The area of the base of the tank is 3600 cm^2.

(b) Length of base $= \sqrt{3600}$

$= 60$ cm

The length of the base is 60 cm.

5 A rectangular tank measures 40 cm by 25 cm by 60 cm. It is filled with 45 ℓ of water.



(a) What is the height of the water level?

(b) How many more litres of water are needed to fill the tank completely?

(a) Base area of tank = Length × Breadth

$= 40 \times 25$

$= 1000\ \text{cm}^2$

Volume of water $= 45\ \ell$

$45\ \ell = 45\,000\ \text{cm}^3$

$$\text{Height of water level} = \frac{\text{Volume}}{\text{Base area}}$$

$$= \frac{45\,000}{1000}$$

$= 45$ cm

The height of the water level is 45 cm.

(b) Height of tank not filled with water $= 60 - 45$

$= 15$ cm

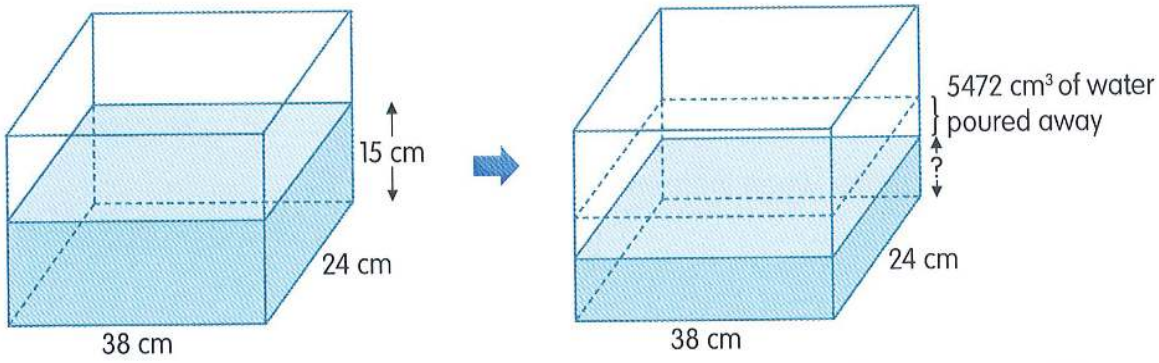
Volume of water needed to fill the tank completely $= 40 \times 25 \times 15$

$= 15\,000\ \text{cm}^3$

$15\,000\ \text{cm}^3 = 15\ \ell$

15 ℓ more water are needed to fill the tank completely.

6 A rectangular tank is 38 cm long and 24 cm wide. The height of the water level in the tank is 15 cm. Mrs Loh pours away 5472 cm^3 of water from the tank. What is the height of the water level of the remaining water?



Method 1

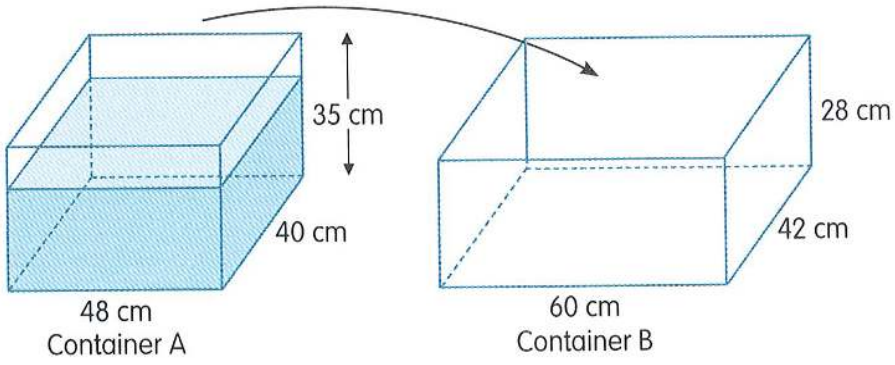
$$\text{Decrease in height} = \frac{5472}{38 \times 24}$$
$$= 6 \text{ cm}$$
$$\text{Height of water level} = 15 - 6$$
$$= 9 \text{ cm}$$

Method 2

$$\text{Volume of water at first} = 38 \times 24 \times 15$$
$$= 13\,680 \text{ cm}^3$$
$$\text{Volume of water left} = 13\,680 - 5472$$
$$= 8208 \text{ cm}^3$$
$$\text{Height of water level} = \frac{8208}{38 \times 24}$$
$$= 9 \text{ cm}$$

The height of the water level of the remaining water is 9 cm.

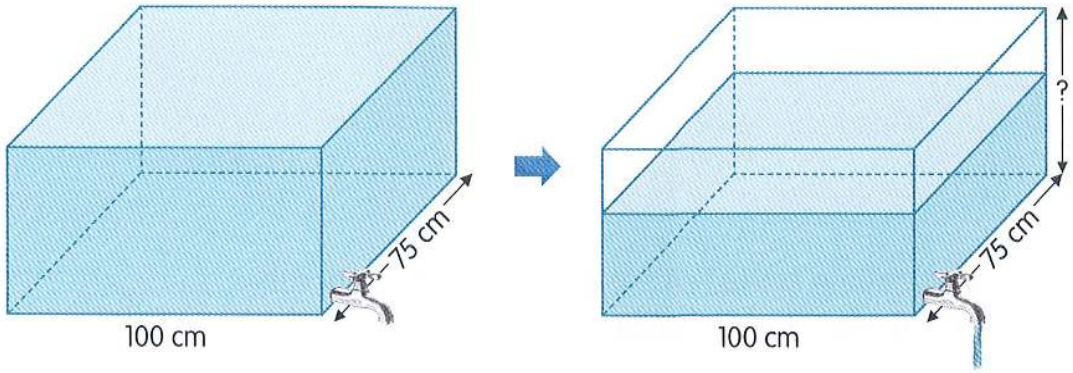
7 Containers A and B are rectangular containers. Container A measures 48 cm by 40 cm by 35 cm and is $\frac{3}{4}$ filled with water. Container B measures 60 cm by 42 cm by 28 cm and is empty. All the water in Container A is poured into Container B. Find the height of the water level in Container B.



$$\text{Volume of water in Container A} = \frac{3}{4} \times 48 \times 40 \times 35$$
$$= 50\,400 \text{ cm}^3$$
$$\text{Height of water level in Container B} = \frac{\text{Volume}}{\text{Length} \times \text{Breadth}}$$
$$= \frac{50\,400}{60 \times 42}$$
$$= 20 \text{ cm}$$

The height of the water level in Container B is 20 cm.

8 A rectangular tank is 100 cm long and 75 cm wide. It is completely filled with water at first. A tap is turned on and water is drained from the tank at a rate of 16 ℓ per minute. It takes 24 min to empty the tank. What is the height of the tank?



1 min → 16 ℓ

24 min → 16 × 24 = 384 ℓ

384 ℓ = 384 000 cm^3

$$\text{Height of tank} = \frac{\text{Volume}}{\text{Length} \times \text{Breadth}}$$

$$= \frac{384\,000}{100 \times 75}$$

$$= 51.2 \text{ cm}$$

The height of the tank is 51.2 cm.

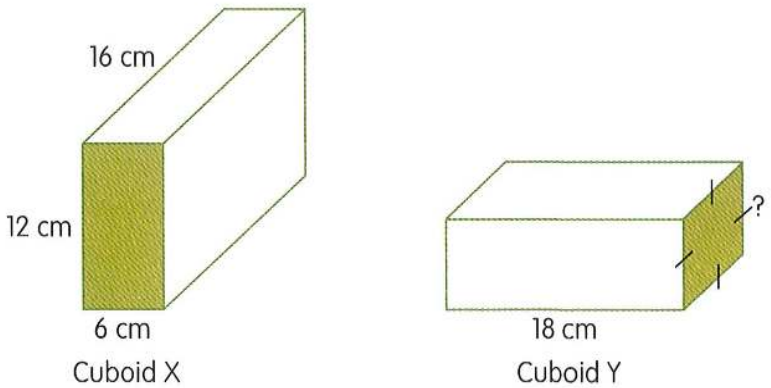
Do and Learn

Solve the word problems.

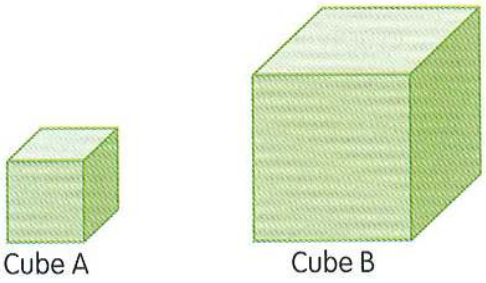
1 The volume of Cuboid X is the same as the volume of Cuboid Y.

(a) Find the area of the shaded face of Cuboid Y.

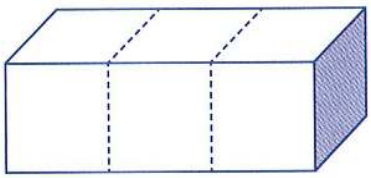
(b) Find the length of a side of the square face of Cuboid Y.



2 The volume of Cube A is 64 cm^3. The length of Cube B is twice the length of Cube A.
Find the volume of Cube B.



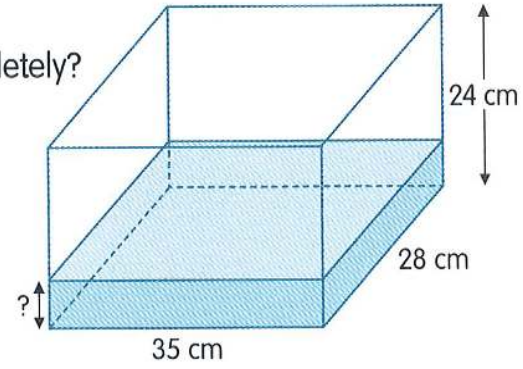
3 A cuboid has a volume of 2187 cm^3. It is cut into 3 identical cubes.
Find the length of one edge of a cube.



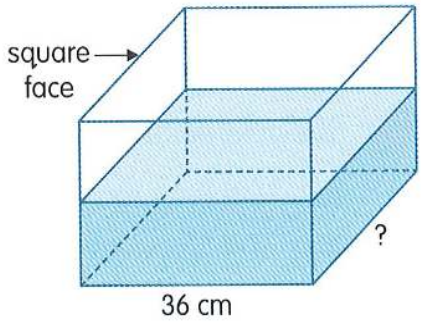
4 A rectangular tank measures 35 cm by 28 cm by 24 cm. The volume of water in the tank is 5.88 ℓ.

(a) What is the height of the water level?

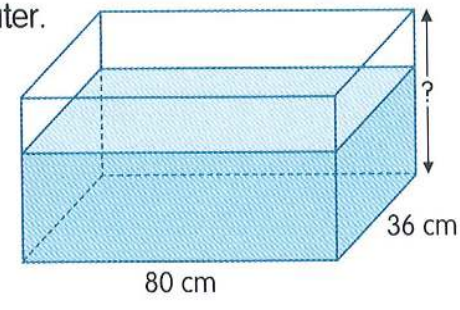
(b) How much more water is needed to fill the tank completely?
Give the answer in litres.



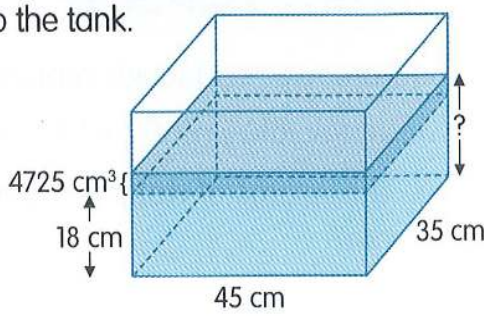
5 The length of a rectangular tank is 36 cm. It has square faces at opposite ends and is half-filled with water. The volume of the water in the tank is 10.368 ℓ. Find the breadth of the tank.



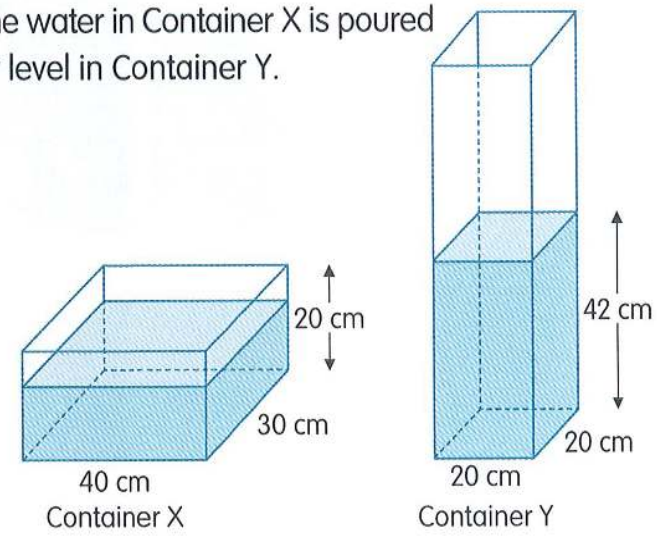
6 A rectangular tank 80 cm long and 36 cm wide is $\frac{2}{3}$ filled with water.
The tank contains 80.64 ℓ of water.
Find the height of the tank.



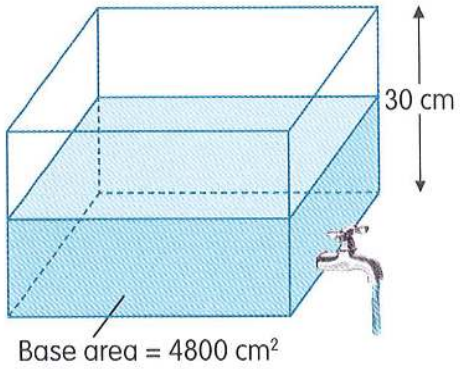
7 The base of a rectangular tank measures 45 cm by 35 cm. The height of the water level in the tank was 18 cm at first. Peter added 4725 cm^3 of water into the tank. What is the new height of the water level?



8 A rectangular Container X is $\frac{5}{8}$ full of water. A rectangular Container Y with a square base is filled with some water to a height of 42 cm. All the water in Container X is poured into Container Y. Find the new height of the water level in Container Y.



9 A rectangular tank with a base area of 4800 cm^2 and a height of 30 cm is half-filled with water. A tap is turned on and water is drained from the tank at a rate of 18 ℓ per minute. How long does it take to empty the tank?



Go to WB 6B 39–52

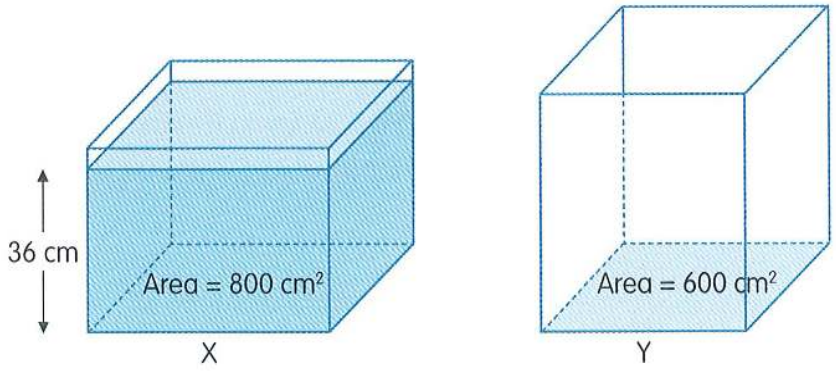
Self-Check

(a) I know how to solve word problems involving finding one edge of a cuboid given the volume and area or lengths of two other sides.

(b) I know how to solve word problems involving finding the area of a face or edge of a cube given the volume.

Let's Think Along...

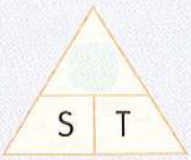
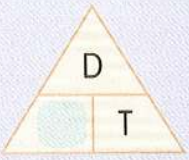
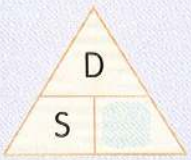
X and Y are two rectangular containers as shown below. The base area of X is 800 cm^2. The base area of Y is 600 cm^2. The height of X is $\frac{5}{6}$ the height of Y. X contains water to a height of 36 cm. The volume of water in X will fill Y completely. How much more water is needed to fill X to the brim?



Go to WB 6B 53–56

Review 4 Speed and Volume

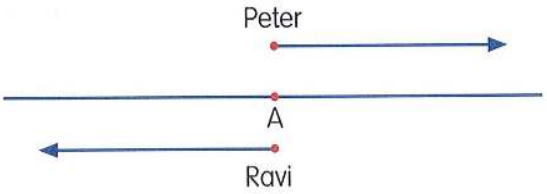
1. Find the speed, distance or time.

(a)	(b)	(c)
		
Speed = 70 km/h	**Distance = 30 m**	**Speed = 25 km/h**
Time = 2 h	**Time = 6 s**	**Distance = 90 km**
Distance = _____	**Speed = _____**	**Time = _____**

2. Mr Teo ran 9 km in $\frac{3}{4}$ h. What was his running speed?

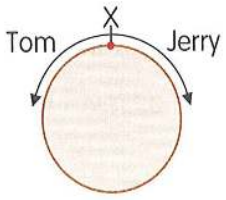
3. Muthu's house is 480 m from the supermarket. He took 15 min to walk from his house to the supermarket. He took 17 min to walk back. What was his average walking speed in metres per minute?

4. Peter and Ravi started jogging from Point A in opposite directions along a straight path. At the end of 54 minutes, they were 9 km apart. Ravi jogged at a constant speed of 6 km/h. What was Peter's speed?



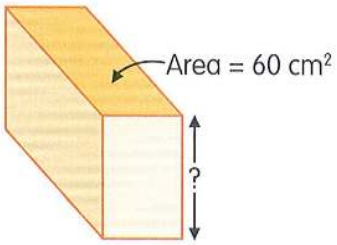
5. Janice and Huiling cycled from Point A to Point B which were 5.6 km apart at different constant speeds. Janice cycled at a speed of 400 m/min. When she reached Point B, Huiling was 350 m behind her. Find Huiling's speed in metres per minute.

6. Tom and Jerry started jogging from Point X at the same time in different directions along a circular 6-km track as shown. They both jogged at their own constant speeds. When Tom jogged 4 km, Jerry just jogged past him. Tom took 48 min to complete one round. Find Jerry's speed in m/min.

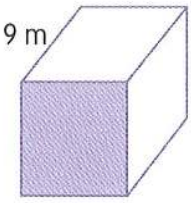


7. The volume of a cube is 4096 cm^3. Find the area of each face.

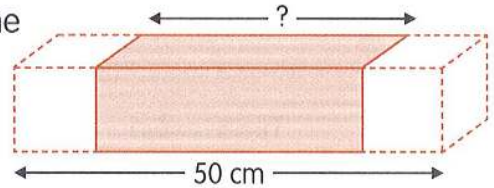
8 **(a)** Find the height of the cuboid.
Volume = 504 cm³



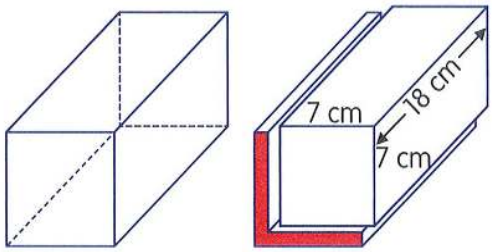
(b) Find the shaded area of the cuboid.
Volume = 441 m³



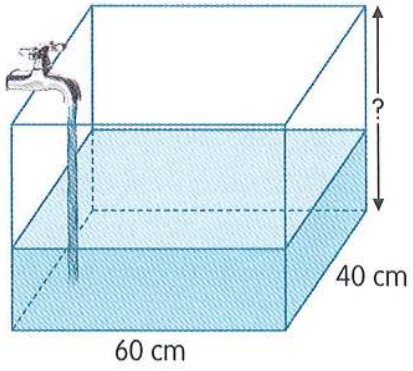
9 A rectangular block is 50 cm long. Two cubes, each of volume 343 cm³ are cut from the ends of the rectangular block. What is the length of the remaining block?



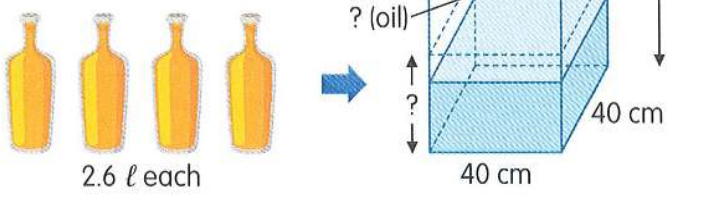
10 A rectangular wooden block with opposite square faces has a volume of 1458 cm³. A smaller rectangular wooden block measuring 7 cm by 7 cm by 18 cm is cut out from the original wooden block. What is the area of the shaded part of the original wooden block as shown?

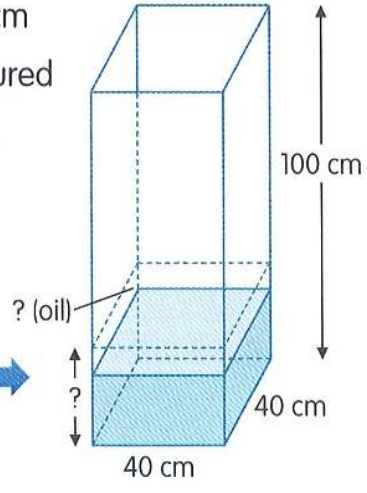


11 An empty rectangular tank is 60 cm long and 40 cm wide. A tap is turned on and water flows at a rate of 12 ℓ per minute. After 9 minutes, the tank is filled to the brim with water. Find the height of the tank.



12 A rectangular tank with a square base of side 40 cm and height 100 cm was $\frac{1}{5}$ filled with water. 4 bottles containing 2.6 ℓ of oil each were poured into the tank. The oil floated on the water. What was the height of the oil level from the base of the tank?





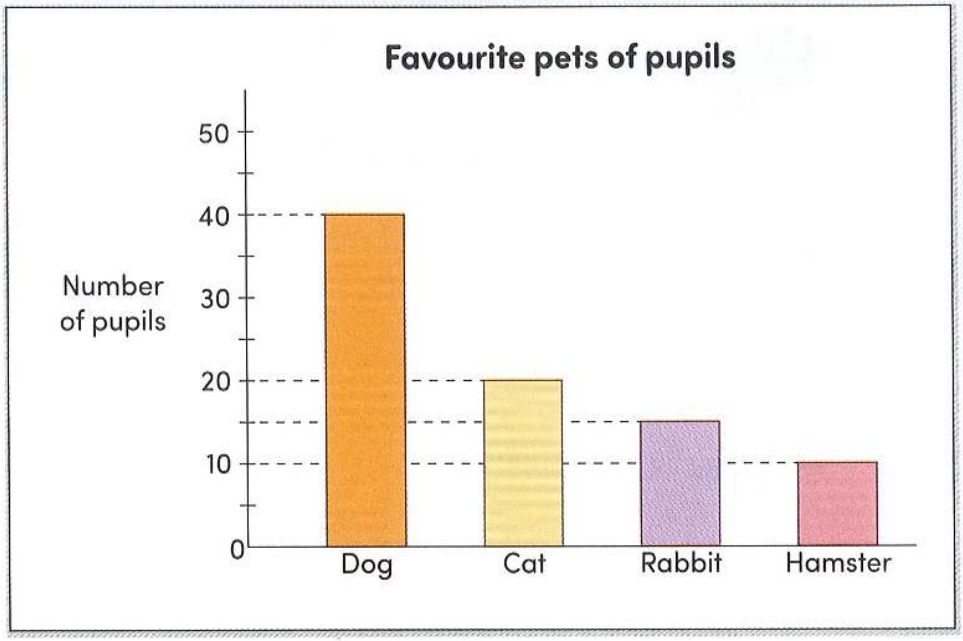
Go to WB 6B 57–62

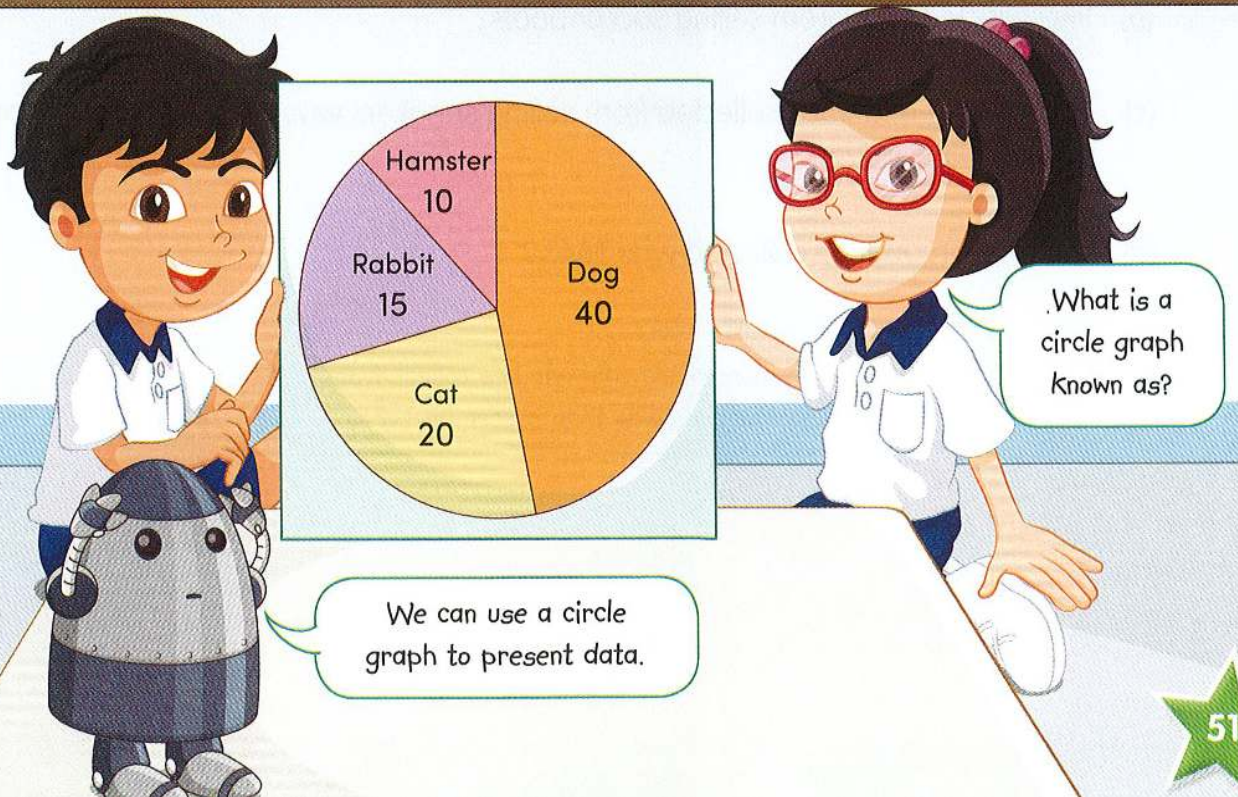
9 Pie Charts

Let's Talk About...

There are different ways to present data.

Favourite pet	Number of pupils
Dog	40
Cat	20
Rabbit	15
Hamster	10





Let's Recall

Tables, bar graphs and line graphs

1 The table shows the amount of money Mr Lee collected from selling different types of footwear in a month.

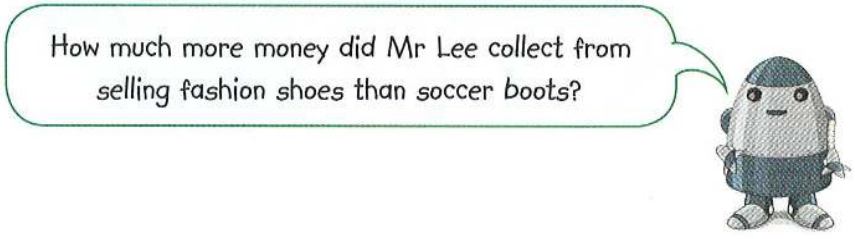
Types of footwear	Amount of money collected
 Flip-flops	$710
 Sneakers	$1420
 Soccer boots	$450
 Fashion shoes	$3870

(a) Mr Lee collected the greatest amount of money from selling fashion shoes.

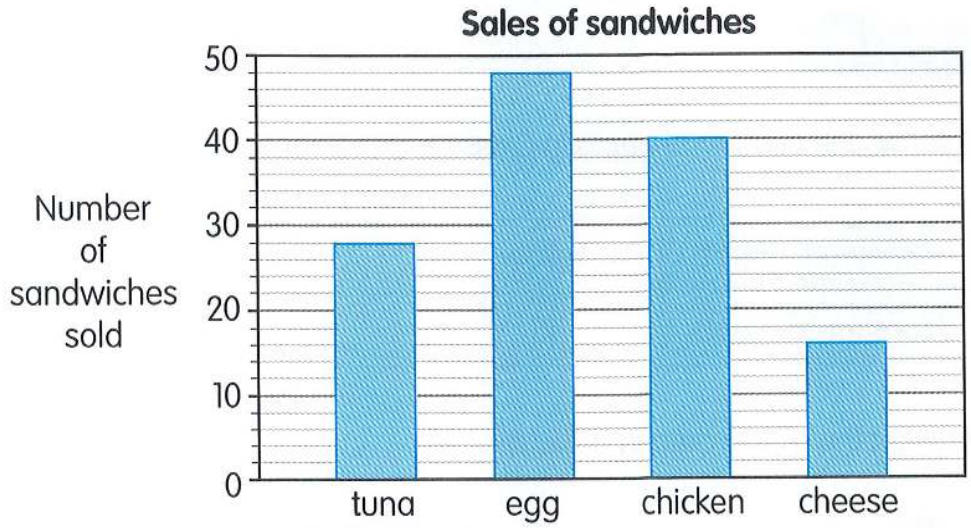
(b) He collected $450 from selling soccer boots.

(c) The amount of money collected from selling sneakers was twice the amount collected from selling flip-flops.

(d) The total amount he collected was $6450.



2 The bar graph shows the number of each type of sandwiches sold by Mrs Toh.



(a) How many sandwiches did Mrs Toh sell in all? **132**

(b) Which type of sandwich sold was $\frac{1}{3}$ that of egg sandwich sold? **Cheese**

(c) How much money was collected if each sandwich was sold for $1.50? **$198**

3 The line graph shows the number of shops that remained open on Friday from 7 p.m. to 10 p.m.

(a) How many shops remained open at 9 p.m.? **60**

(b) What was the decrease in the number of shops that remained open between 7 p.m. and 9 p.m.? **80**

Go to WB 6B 63–66

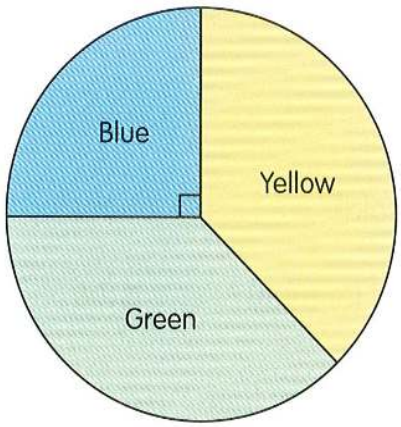
Presenting Data in Pie Charts

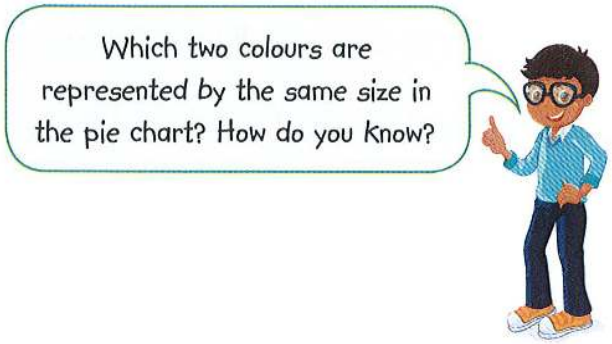
See and Learn

1 The table shows the number of pupils in Class 6F who bought the school T-shirts of each colour.

Colour of T-shirt	Yellow	Green	Blue
Number of pupils	15	15	10

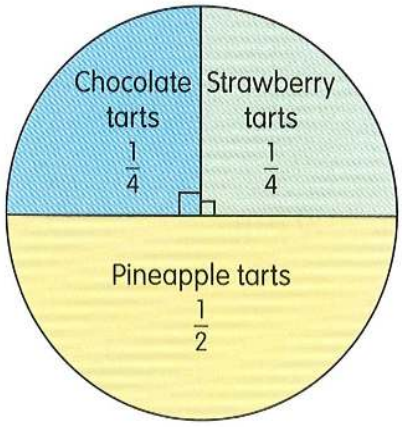
We can present the above data in a **pie chart**.

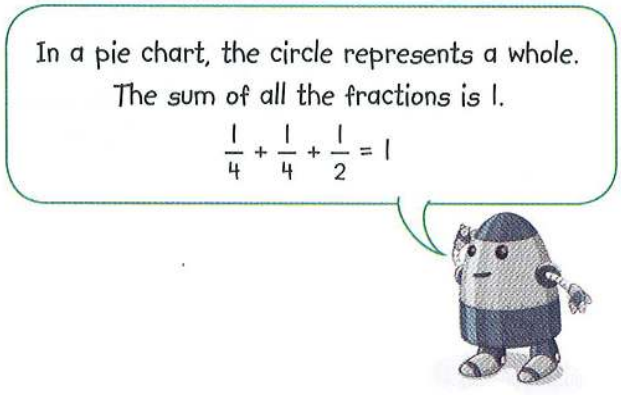




2 At a bakery, $\frac{1}{4}$ of the tarts are strawberry tarts, $\frac{1}{4}$ of them are chocolate tarts and $\frac{1}{2}$ of them are pineapple tarts.

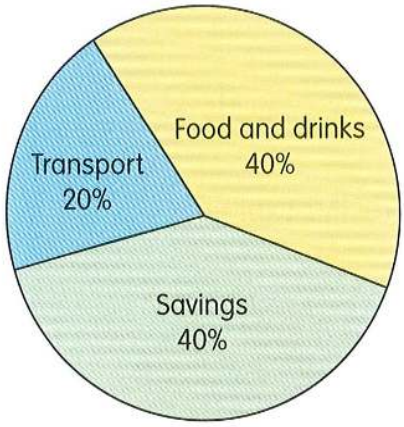
We can show the above information in a pie chart using fractions.



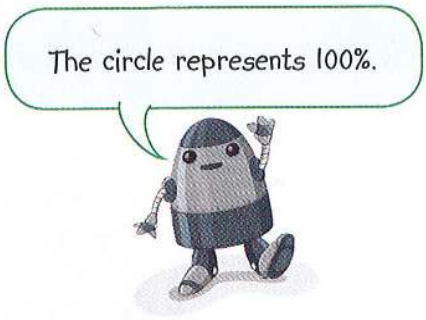


3 On Monday, Janice spent 40% of her pocket money on food and drinks, 20% of it on transport and saved the rest.

We can show the above information in a pie chart using percentages.



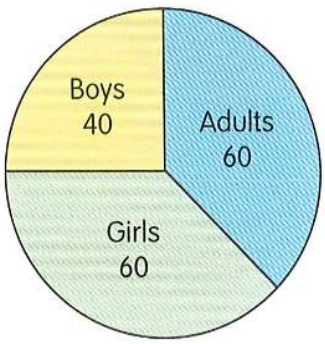
$100\% - 40\% - 20\% = 40\%$

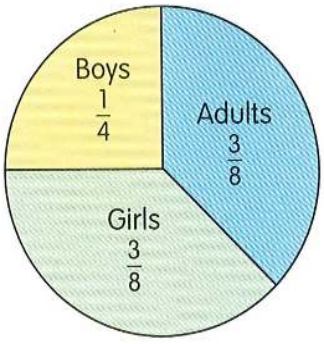


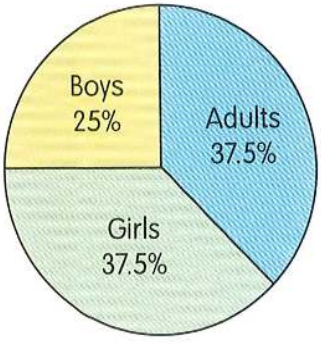
4 The table shows the number of adults, boys and girls at a concert. It also shows the fractions and percentages of the audience who are adults, boys and girls.

	Adults	Boys	Girls	Total
Number	60	40	60	160
Fraction	$\frac{60}{160} = \frac{3}{8}$	$\frac{40}{160} = \frac{1}{4}$	$\frac{60}{160} = \frac{3}{8}$	1
Percentage	$\frac{60}{160} \times 100\% = 37.5\%$	$\frac{40}{160} \times 100\% = 25\%$	$\frac{60}{160} \times 100\% = 37.5\%$	100%

The same set of data can be presented using numbers, fractions or percentages in pie charts.





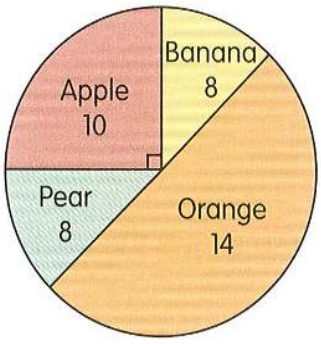


Do and Learn

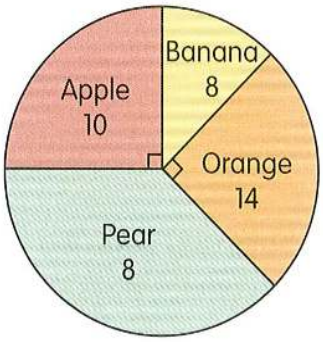
1. The table shows the favourite fruits of pupils in Class 6B. There are 40 pupils in the class.

Fruit	Apple	Banana	Orange	Pear
Number of pupils	10	8	14	8

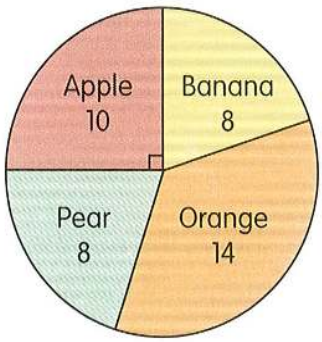
Which of the following pie charts show the data in the table correctly? Explain.



A



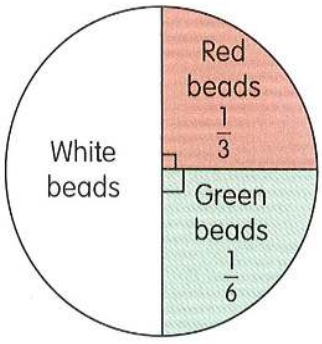
B



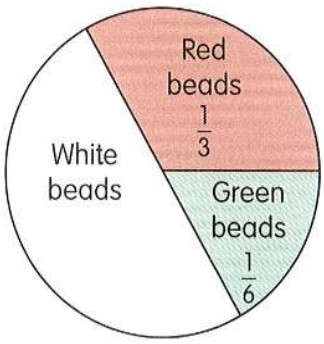
C

2. Joyce has beads in 3 different colours. $\frac{1}{3}$ of her beads are red, $\frac{1}{6}$ of them are green and the rest are white.

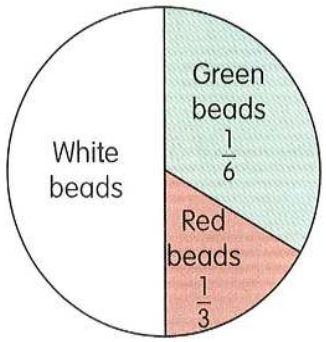
Which one of the following pie charts shows the above information correctly? Explain.



X



Y



Z

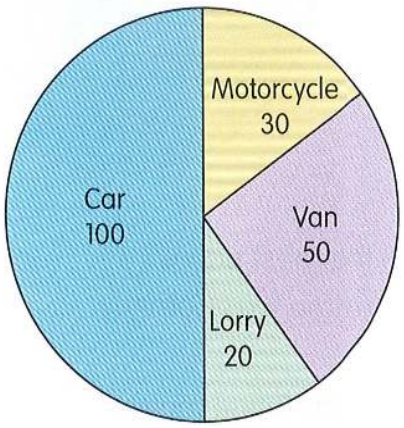
Go to WB 6B 67–70

Reading and Interpreting Data in Pie Charts

See and Learn

1 In a car park, there were 100 cars, 30 motorcycles, 50 vans and 20 lorries.

The pie chart shows the above information.



(a) How many more cars than vans were there at the car park?

$100 - 50 = 50$

There were 50 more cars than vans at the car park.

(b) How many vehicles were there altogether?

$100 + 30 + 50 + 20 = 200$

There were 200 vehicles altogether.

(c) What fraction of the vehicles were cars?

$\frac{100}{200} = \frac{1}{2}$

$\frac{1}{2}$ of the vehicles were cars.

(d) What fraction of the vehicles were lorries?

$\frac{20}{200} = \frac{1}{10}$

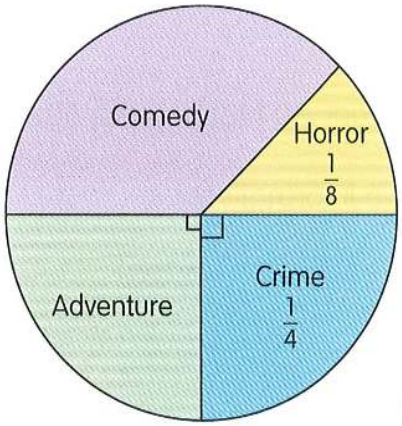
$\frac{1}{10}$ of the vehicles were lorries.

(e) What percentage of the vehicles were motorcycles?

$\frac{30}{200} \times 100\% = 15\%$

15% of the vehicles were motorcycles.

2 80 pupils were asked to choose their favourite type of movies. The pie chart represents their choices.



(a) Which type of movie was the most popular?
The most popular type of movie was Comedy.

(b) How many pupils like to watch Crime movies?

$\frac{1}{4} \times 80 = 20$

20 pupils like to watch Crime movies.

(c) What fraction of the pupils like to watch Comedy movies?

$$1 - \frac{1}{4} - \frac{1}{4} - \frac{1}{8} = 1 - \frac{2}{8} - \frac{2}{8} - \frac{1}{8}$$
$$= \frac{3}{8}$$

$\frac{3}{8}$ of the pupils like to watch Comedy movies.

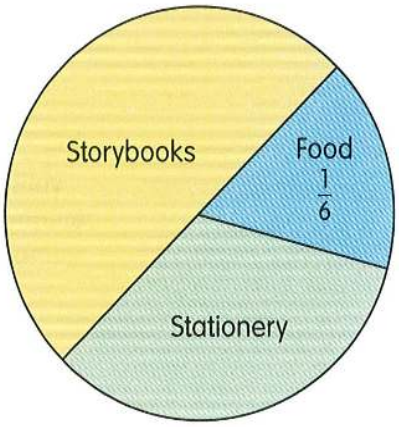
(d) How many more pupils prefer to watch Comedy than Adventure movies?

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

$\frac{1}{8} \times 80 = 10$

10 more pupils prefer to watch Comedy than Adventure movies.

3 The pie chart shows how Siti spent a sum of $24.



(a) What fraction of Siti's money was spent on storybooks?

$\frac{1}{2}$ of Siti's money was spent on storybooks.

(b) What fraction of her pocket money was spent on stationery?

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

$\frac{1}{3}$ of her money was spent on stationery.

(c) How much money did she spend on food?

$\frac{1}{6} \times \$24 = \$4$

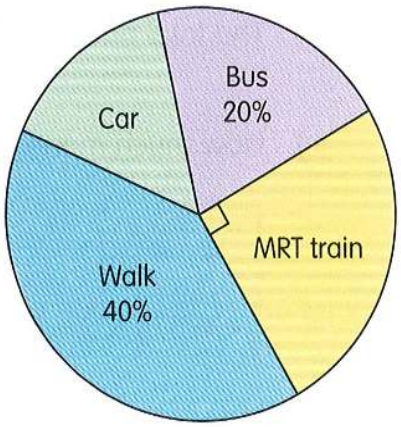
She spent $4 on food.

(d) How much money did she spend on storybooks and stationery altogether?

$\$24 - \$4 = \$20$

She spent $20 on storybooks and stationery altogether.

4 The pie chart shows how 400 pupils go to school.



(a) What percentage of the pupils go to school by MRT train.

$\frac{1}{4} \times 100\% = 25\%$

25% of the pupils go to school by MRT train.

(b) What percentage of the pupils go to school by car?

$100\% - 40\% - 25\% - 20\% = 15\%$

15% of the pupils go to school by car.

(c) How many pupils walk to school?

$\frac{40}{100} \times 400 = 160$

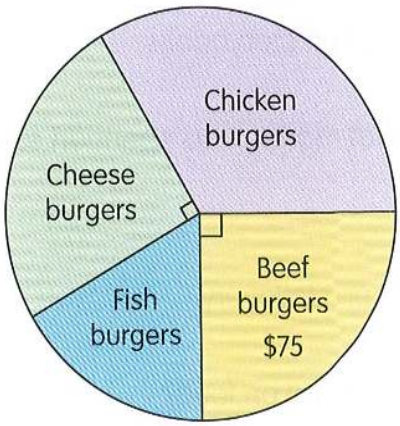
160 pupils walk to school.

(d) How many times as many pupils walk to school compared to those who take the bus to school?

$40\% \div 20\% = 2$

2 times as many pupils walk to school compared to those who take the bus to school.

5 The pie chart shows the amount of money a fast-food outlet collected from the sales of each type of burger.



(a) How much money was collected from the sales of cheese burgers?

$75 was collected from the sales of cheese burgers.

(b) What was the total amount of money collected from the sales of all the burgers?

$\frac{1}{4} \rightarrow \$75$

$\frac{4}{4} \rightarrow \$75 \times 4 = \$300$

The total amount of money collected from the sales of all the burgers was $300.

(c) How much money was collected from the sales of chicken burgers and fish burgers in all?

$1 - \frac{1}{4} - \frac{1}{4} = \frac{1}{2}$

$\frac{1}{2} \rightarrow \$75 \times 2 = \$150$

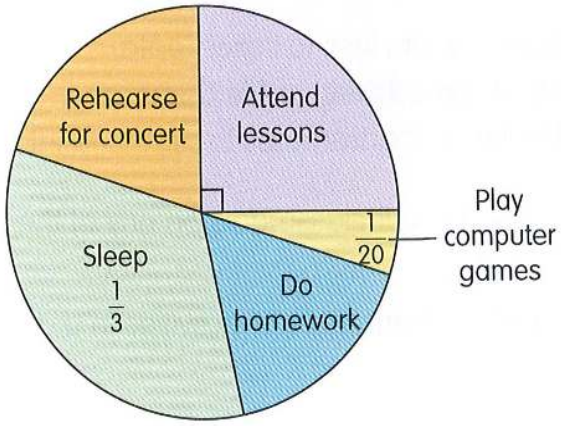
$150 was collected from the sales of chicken and fish burgers in all.

(d) The amount of money collected from the sales of chicken burgers was twice that collected for fish burgers.
How much was collected from the sales of fish burgers?

$\$150 \div 3 = \$50$

$50 was collected from the sales of fish burgers.

6 The pie chart shows how Joe spent 24 h of his time on a Monday.



(a) How many hours did Joe sleep?

$\frac{1}{3} \times 24 \text{ h} = 8 \text{ h}$

Joe slept for 8 h.

(b) Joe spent half a day playing computer games, attending lessons and rehearsing for a concert. What fraction of the time did he spend rehearsing for a concert?

$$\frac{1}{2} - \frac{1}{4} - \frac{1}{20} = \frac{10}{20} - \frac{5}{20} - \frac{1}{20}$$
$$= \frac{4}{20}$$
$$= \frac{1}{5}$$

He spent $\frac{1}{5}$ of the time rehearsing for a concert.

(c) What was the ratio of the number of hours Joe spent doing homework to the total number of hours for the day?

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

The ratio of the number of hours Joe spent doing homework to the total number of hours for the day was 1 : 6.

Hands-On Activity

Work in groups.
Discuss and conduct a survey in your class to collect data.
Then create a pie chart using a **spreadsheet** or **Pie Chart** programme based on the data collected.
Print out the pie chart and invite your classmates to read and interpret the data.

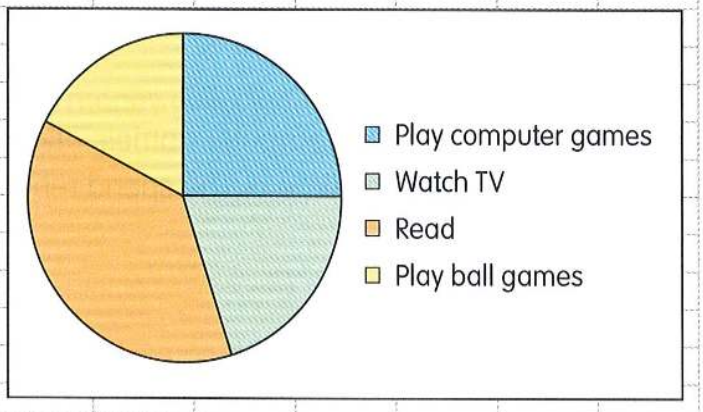
You may conduct a survey among your classmates on any of the following:

(a) Favourite hobby, fruit or colour
(b) Number of hours spent on different types of activities in a day (24 h)

Example

Conduct a survey among your classmates on their hobbies.

A	B	C	D	E	F	G	H	I
Favourite Pastime	Number							
Play computer games	10							
Watch TV	8							
Read	15							
Play ball games	7							



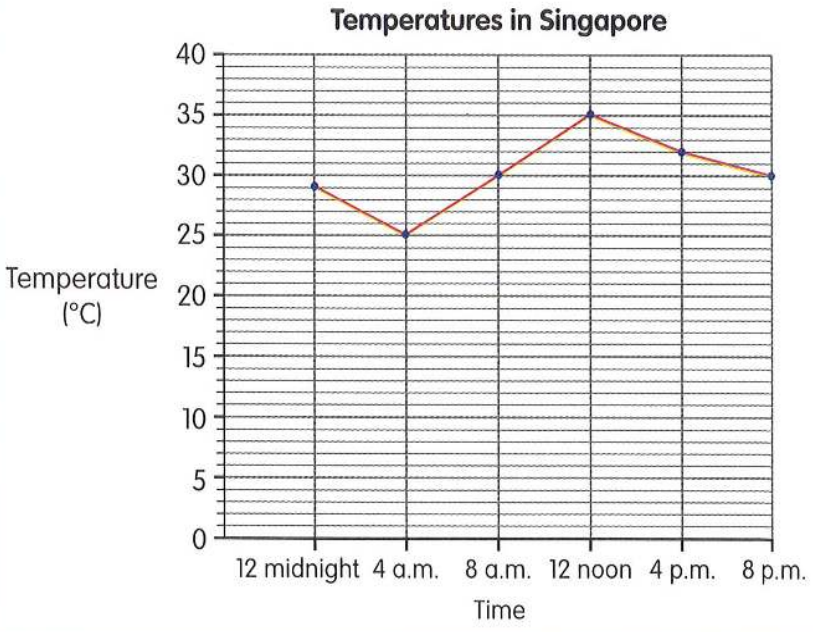
Let's Have FUN

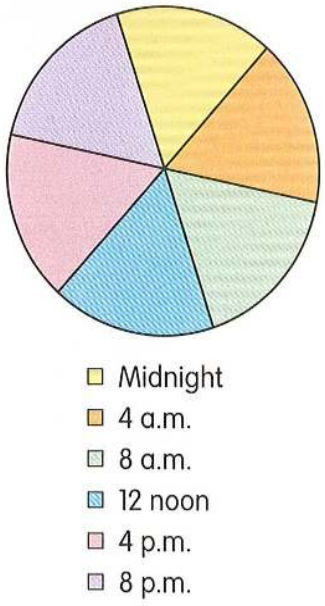
Show and Say

Work in groups.
The table shows the temperatures recorded in Singapore from 12 midnight to 8 p.m.

Time	Temperature (°C)
12 midnight	29
4 a.m.	25
8 a.m.	30
12 noon	35
4 p.m.	32
8 p.m.	30

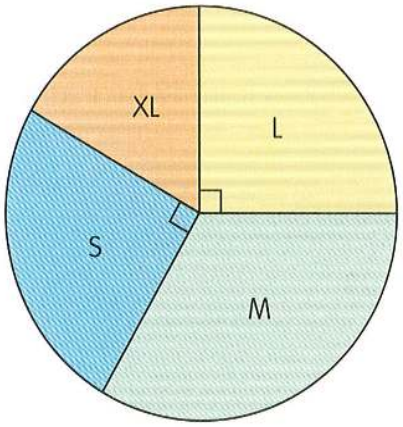
(a) A line graph and a pie chart are used to present the data in the above table.
Which graph would you use to present the data? Why?
Share the reasons with the class.





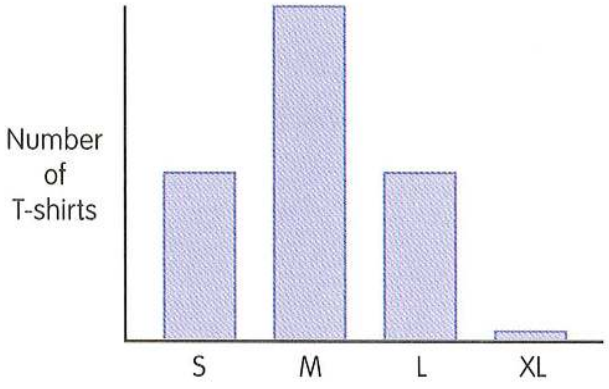
(b) Discuss examples of data that may be presented in pie charts.
Can they be represented in other forms of graphs?

(c) The pie chart represents the different sizes of T-shirts that are available at a shop.

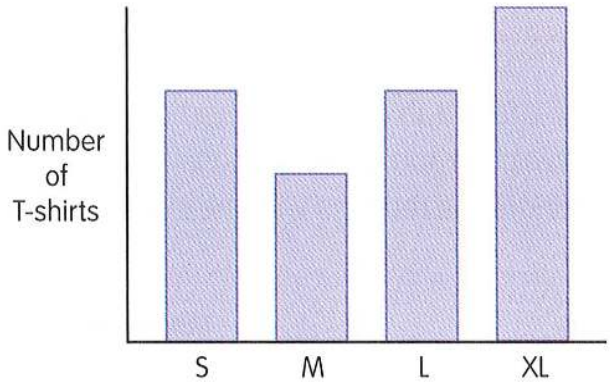


XL – Extra large
L – Large
M – Medium
S – Small

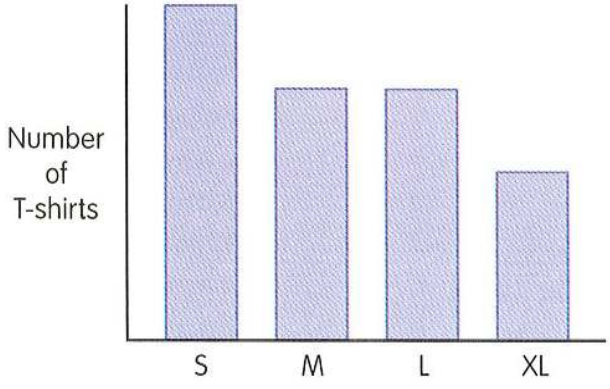
Discuss and explain which bar graph represents the information in the pie chart.



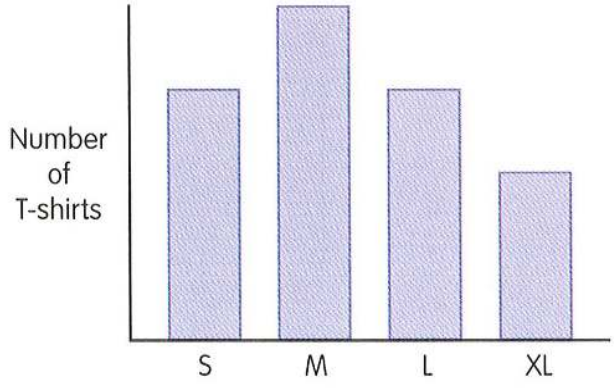
A



B

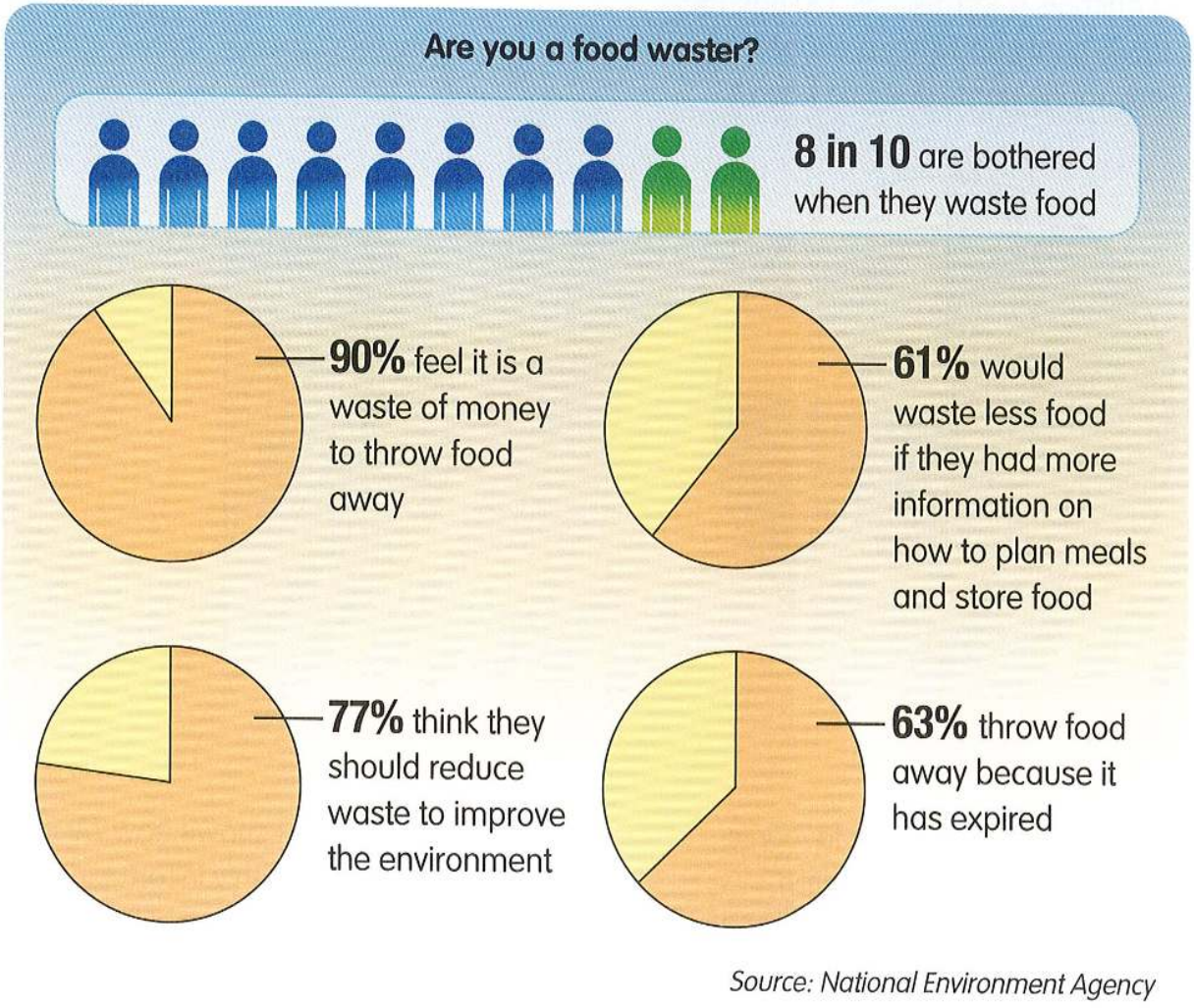


C



D

Do you usually finish your food or throw them away?
The pie charts below show the responses of 1016 people on what they think regarding food wastage.



Source: National Environment Agency

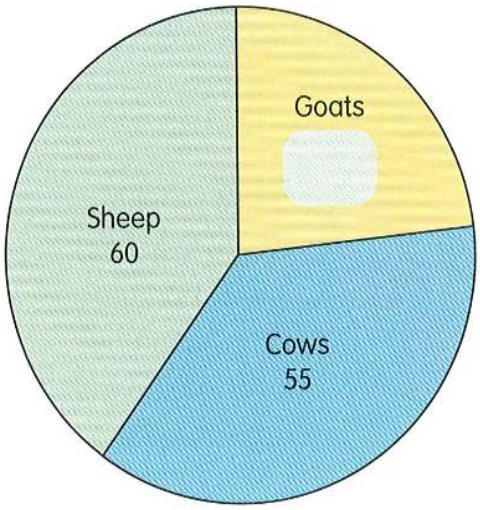
Work in groups.
Collect data based on any of the following.
Construct a pie chart to show the results of the survey.

(a) How can food wastage be reduced?
(b) Why do you throw food away?

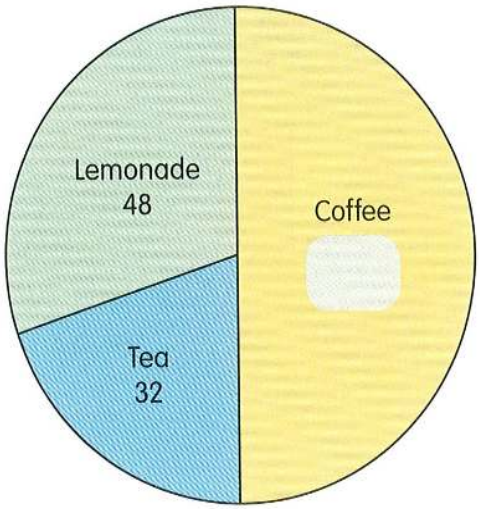
Do and Learn

1 Study the pie charts.
What are the missing numbers?

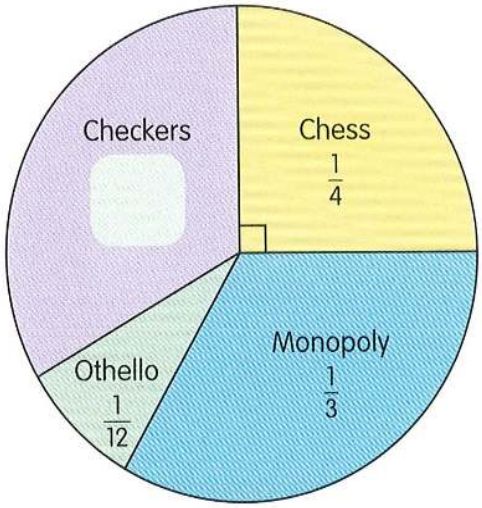
(a) The pie chart shows the different types of animals a farmer has. He has 150 cows, goats and sheep altogether.
How many goats does he have?



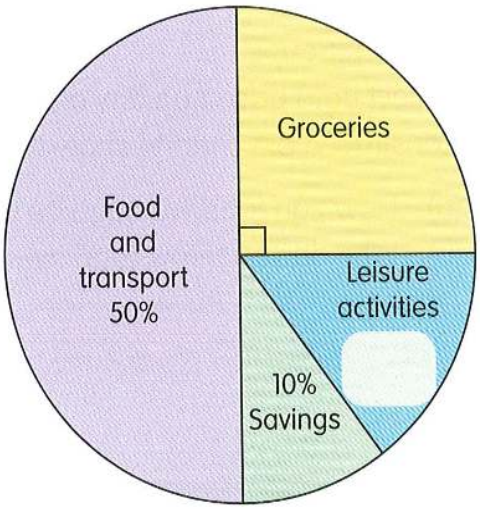
(b) The pie chart shows the favourite drinks of a group of people.
How many people prefer coffee?



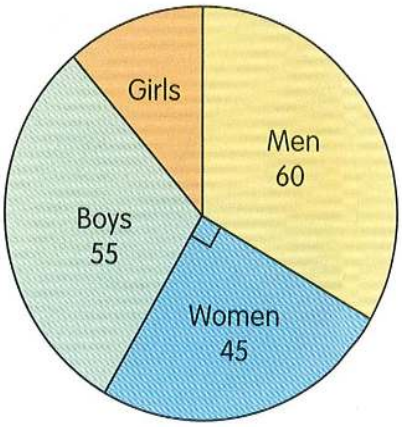
(c) The pie chart shows the favourite games of a group of children.
What fraction of the children like to play checkers?



(d) The pie chart shows how Mr Tay spent his monthly income in June.
What percentage of his income was spent on leisure activities?



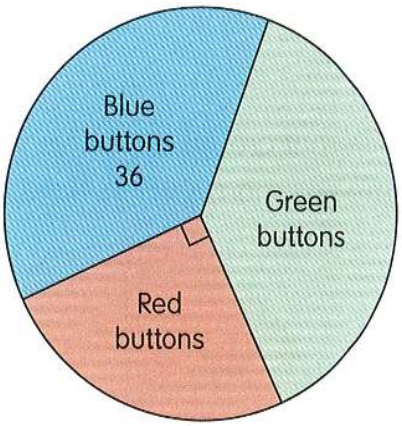
2 The pie chart shows the number of people in a cinema on a weekend.



(a) How many people were in the cinema?

(b) How many girls were there?

3 The pie chart shows the different colours of buttons that Haslindah has. She has an equal number of blue and green buttons.



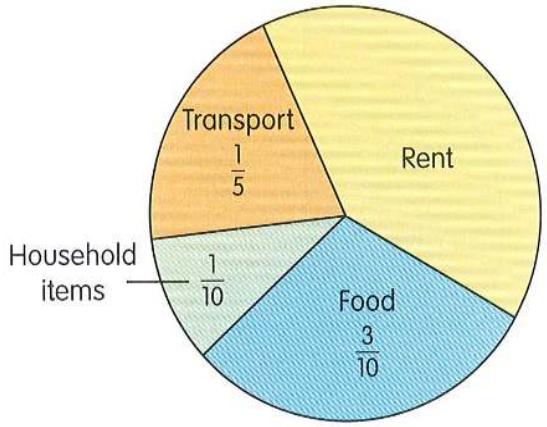
(a) What fraction of the buttons are blue buttons and green buttons?

(b) What fraction of the buttons are blue?

(c) What percentage of the buttons are green?

(d) How many red buttons does she have?

4 The pie chart shows how Mrs Tay spent a sum of money in July.



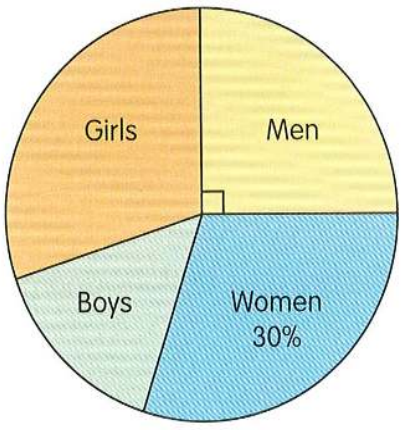
(a) What fraction of Mrs Tay's money was spent on rent?

(b) Mrs Tay spent \$120 on transport. What was the sum of money?

(c) How much was her rent?

(d) The amount spent on household items was 3 times as much as the amount spent on food. Is this true or false? Explain.

5 The pie chart represents the different groups of people who went to the funfair last weekend. There were 275 men and 2 times as many girls as boys.



(a) What percentage of the people at the funfair were children?

(b) How many children were there?

(c) How many people were there altogether?

(d) A child ticket for admission to the funfair cost \$5. What was the total amount collected from the sales of child tickets?

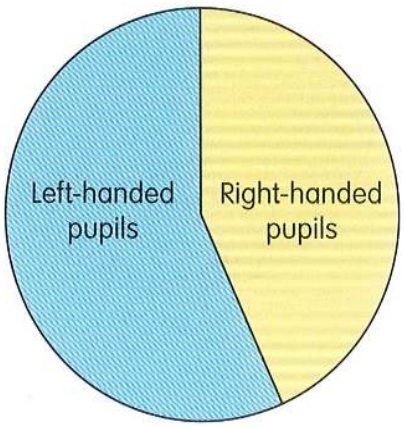
6 The table shows the number of boys and girls who are left-handed and right-handed.

(a) What are the missing numbers?

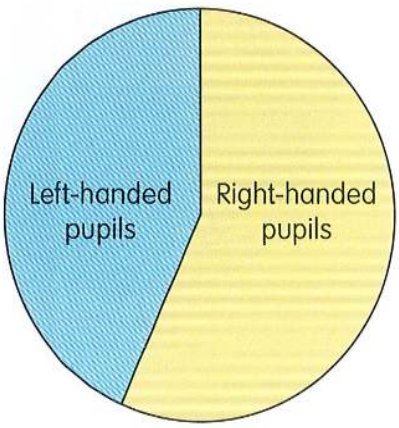
	Left-handed	Right-handed	Total
Number of boys	28	_____	_____
Number of girls	_____	30	54
Total	_____	_____	120

(b) Which pie chart represents the information in the table? Explain your choice.

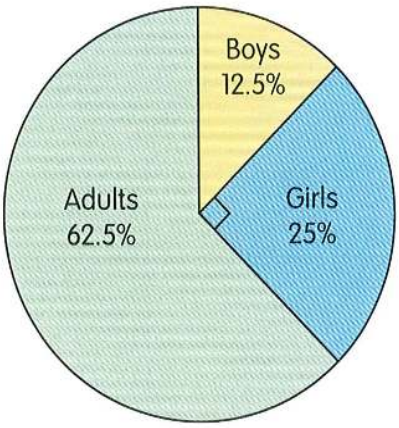
A



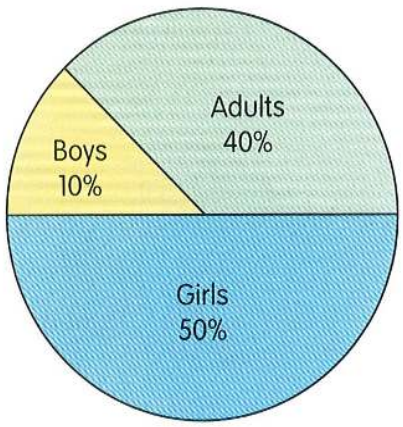
B



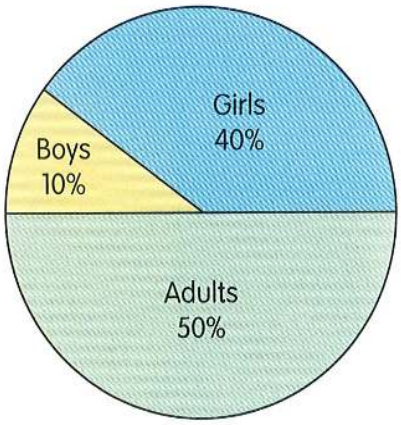
7 There were 30 boys, 60 girls and 150 adults in a hall. 60 more girls joined them. The pie chart shows the percentages of adults, boys and girls who were in the hall **at first**.



Which of the following is a correct representation of the pie chart after the 60 girls joined in? Explain.



A



B

Go to WB 6B 71–78

Self-Check

(a) I know how to present data in a pie chart.

(b) I know how to read and interpret data in pie charts.

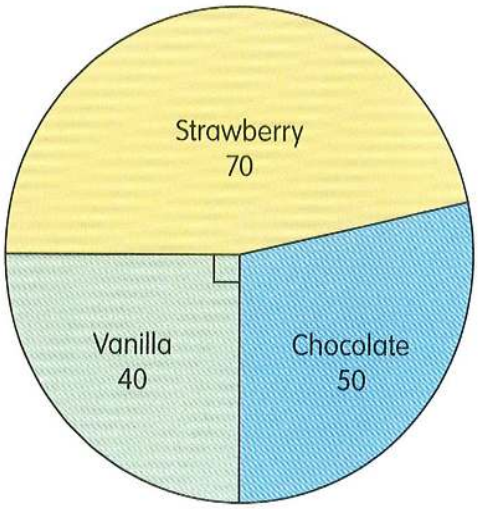
Show and Say

Work in pairs.

1. The pie chart shows the number of ice creams of different flavours sold by Mr Teo on a Friday. He wants to sell a total of 640 ice creams on Saturday.

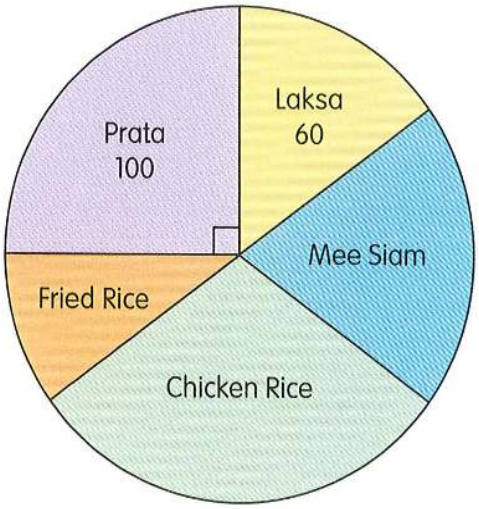
   (a) If all the 3 parts in the pie chart were to remain the same, how many ice creams of each flavour should he sell? Explain.

   (b) Does the percentage of ice creams of each flavour increase if he sells a total of 640 ice creams on Saturday?



2. The pie chart shows the favourite types of food of 400 people.
   3 times as many people like chicken rice as fried rice.
   Find the number of people who like each of the following:

   (a) fried rice **(b)** chicken rice **(c)** mee siam



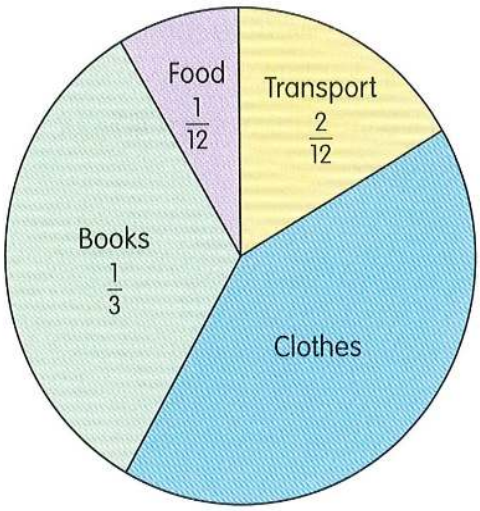
Let's Think Along...

The pie chart shows how Mary spent her pocket money last week. She spent $16 on food.

(a) What fraction of her pocket money was spent on clothes?

(b) How much money did she spend on clothes?

(c) Was the total amount she spent on books and food the same as the amount spent on clothes? Explain.

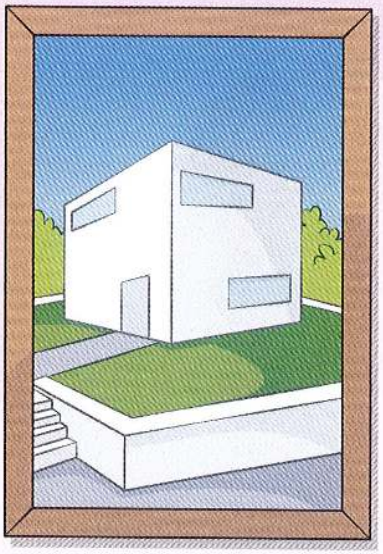


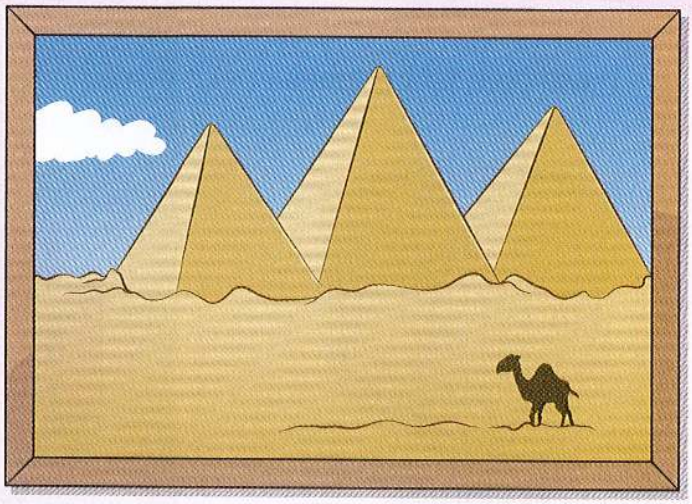
Go to WB 6B 79–80

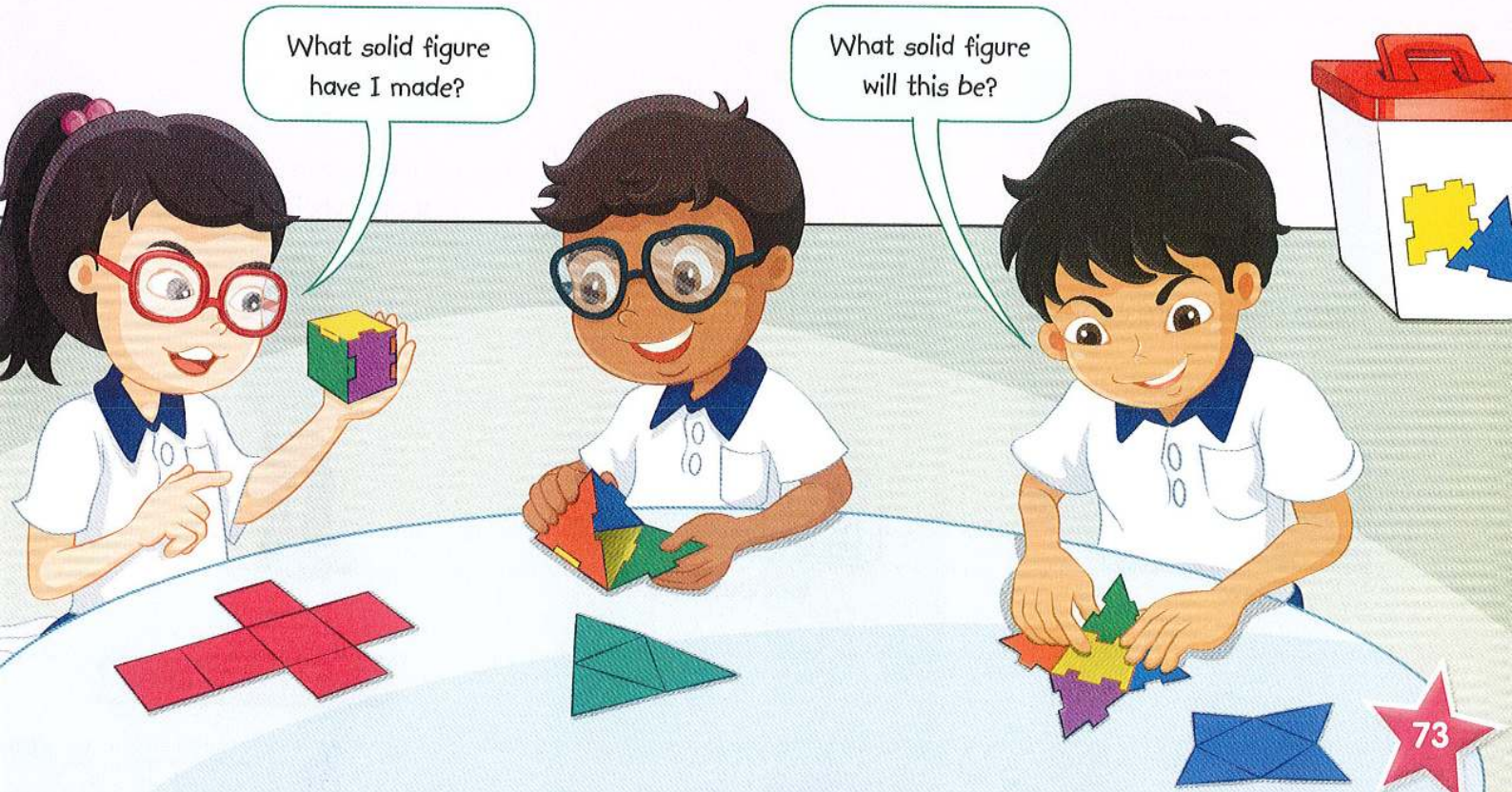
10 Solid Figures And Nets

Let's Talk About...

The children are making solid figures.



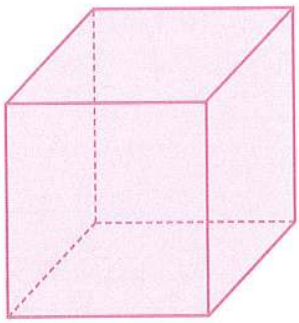




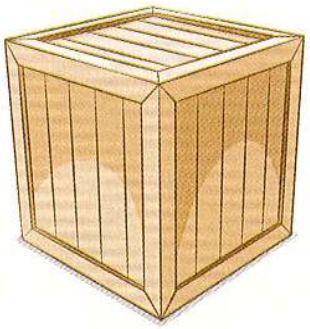
Let's Recall

Cubes and cuboids

1 A **cube** has 6 square faces.

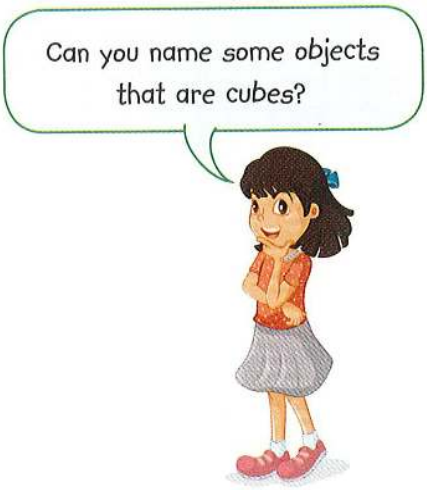


These objects are cubes.

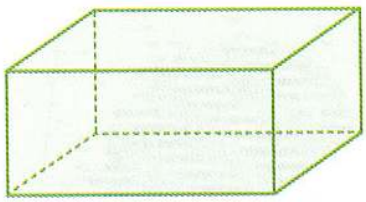


wooden crate

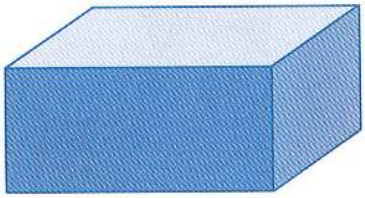
box



2 A **cuboid** can have 6 rectangular faces. It can also have 4 rectangular faces and 2 square faces.

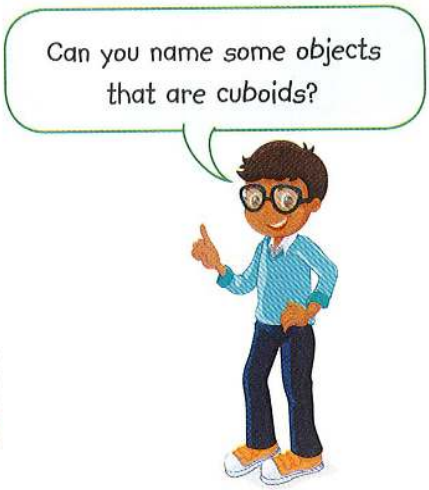


These objects are cuboids.



box

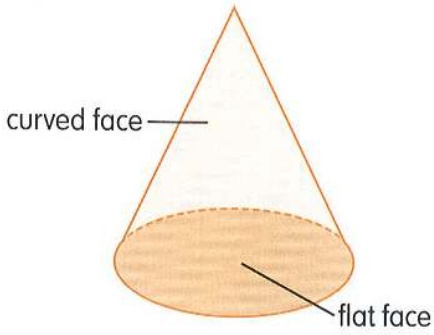
toothpaste box



Go to WB 6B 81–82

See and Learn

1. A solid **cone** has 1 flat face and 1 curved face.

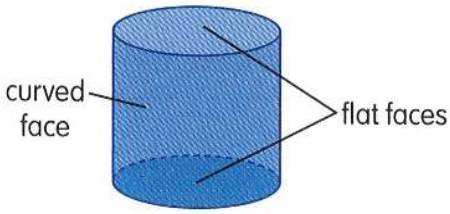


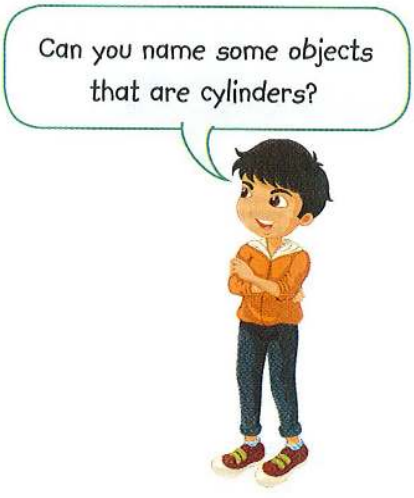
These objects are cones.

ice cream cone

party hat

2. A solid **cylinder** has 2 flat faces and 1 curved face.



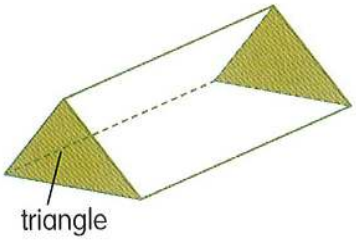


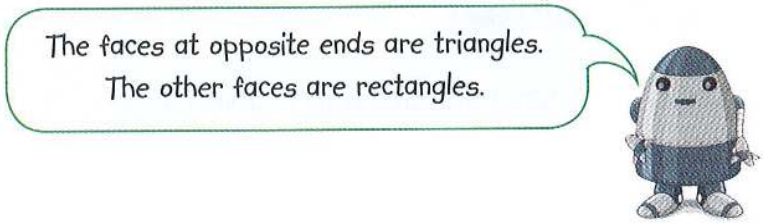
These objects are cylinders.

tin

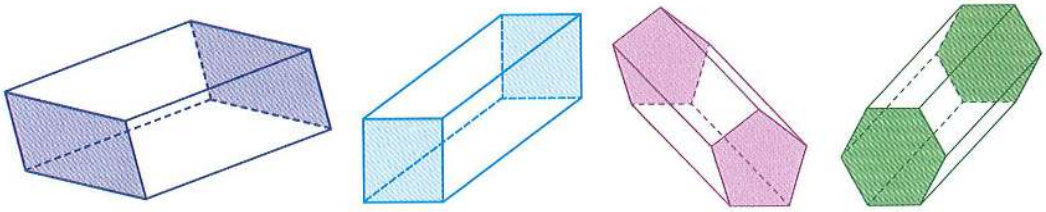
potato chips container

3 A **prism** has **faces** of the same shape and size at opposite ends. These identical opposite faces can be any shape. All the edges of a prism are **straight**.

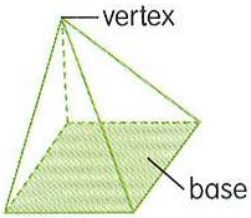




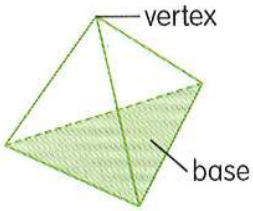
These are other examples of prisms.



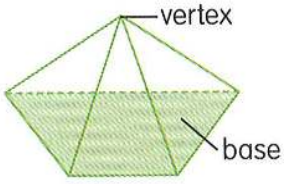
4 A **pyramid** has a base that is a **flat face** and sloping faces that are triangles. All the triangles meet at a **common point** called the **vertex**.



base is a square,
4 faces are triangles



base is a triangle,
3 other faces are triangles

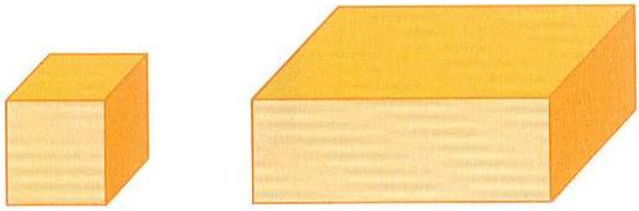


base is a trapezium,
4 faces are triangles

The base of a pyramid can be any shape with **straight edges**.

Pair and Share

Discuss with your partner.
Cubes and cuboids are prisms. Why?



Let's Have FUN

Show and Say

Work in groups.
Look around you or surf the Internet to find examples of **prisms** and **pyramids**.
What are the similarities and differences between these two solid figures?

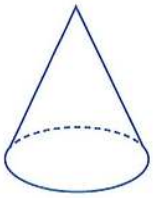
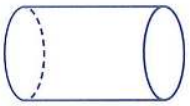
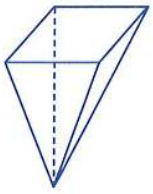
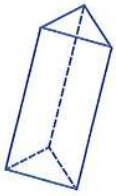
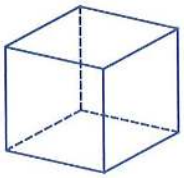
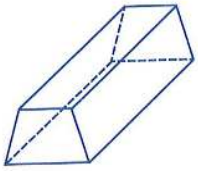
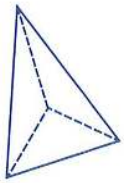
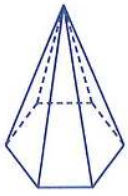
Example

prism


pyramid

Do and Learn

Name the solid figures.

(a) 	(b) 	(c) 
(d) 	(e) 	(f) 
(g) 	(h) 	(i) 

Go to WB 6B 83–84

Self-Check

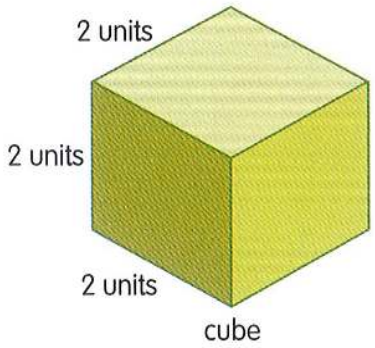
I know how to identify cones, cylinders, prisms and pyramids.

Drawing Solid Figures on Isometric Grids

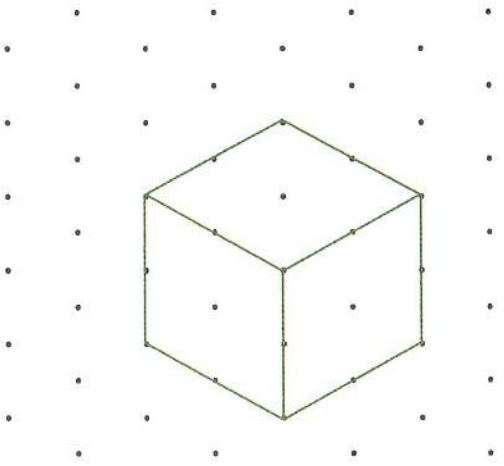
See and Learn

Draw each solid figure on an isometric grid.

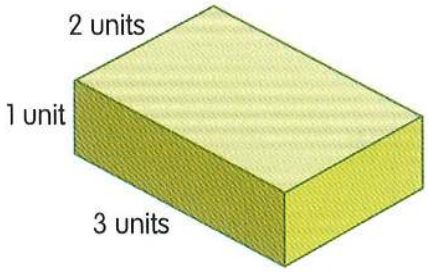
(a)



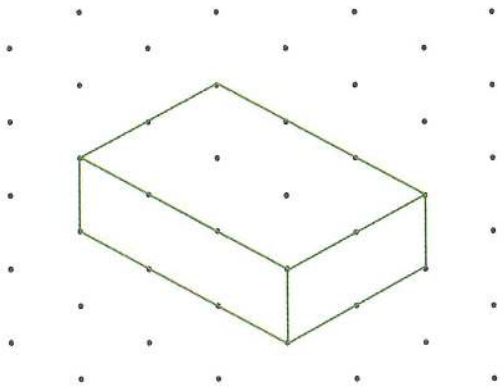
cube



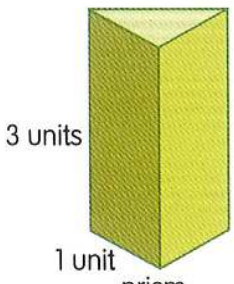
(b)



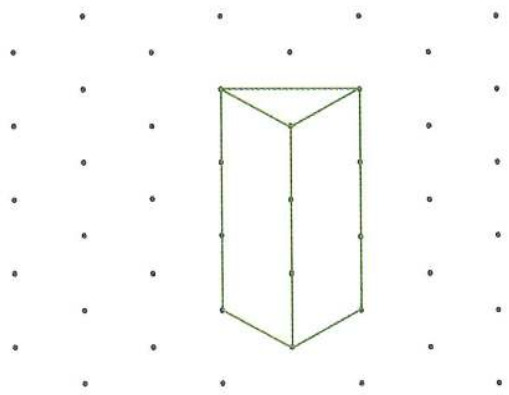
cuboid



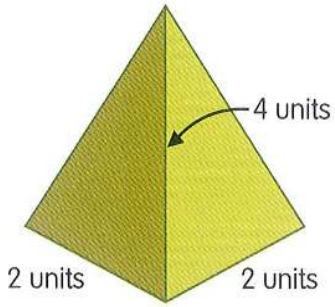
(c)



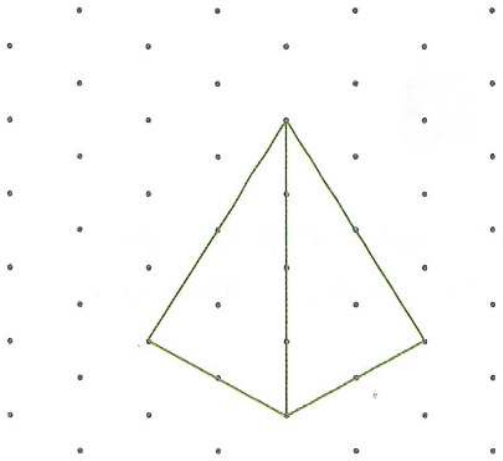
prism



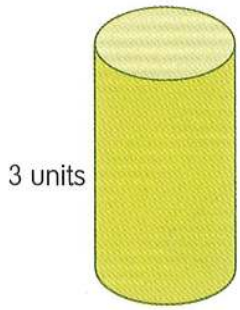
(d)



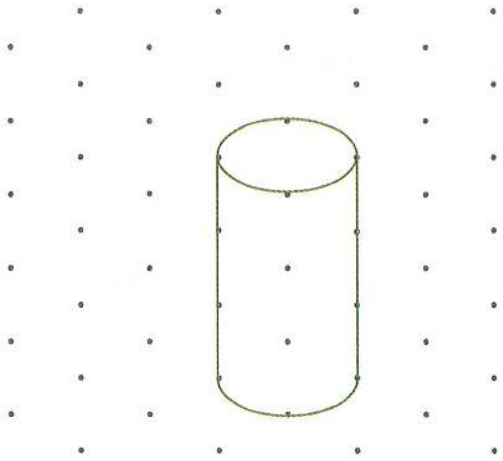
pyramid



(e)

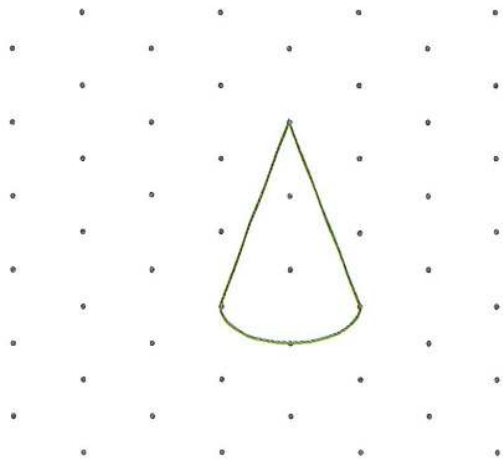


cylinder



(f)

cone



Let's Have FUN

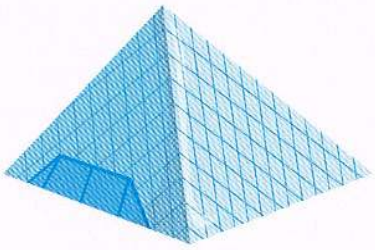
Show and Say

Work in groups.
Bring real objects (or photos) of prisms or pyramids.
Draw the objects. You may draw them on isometric grids.

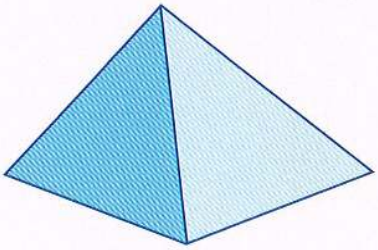
Example

cheese shaped like a prism

drawing of a prism



Louvre Museum (France)



drawing of a pyramid

Show the class what your group has drawn. Invite them to identify the solid figures.
Does each drawing look like the shape of the real object?

MATHS in Real Life

Some families make rice dumplings and share them with other families or friends during a certain festival.

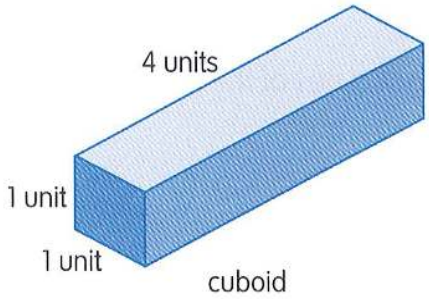
(a) What is the name of this festival?

(b) Does the rice dumpling in the photo look like a prism or a pyramid? Why?

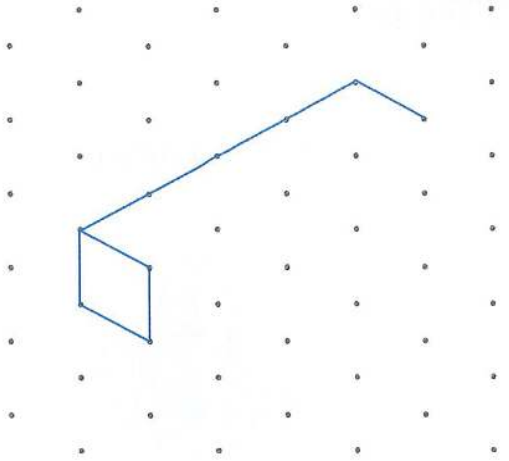
Do and Learn

Complete the drawing of each solid figure on an isometric grid.

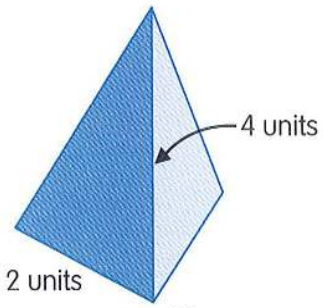
(a)



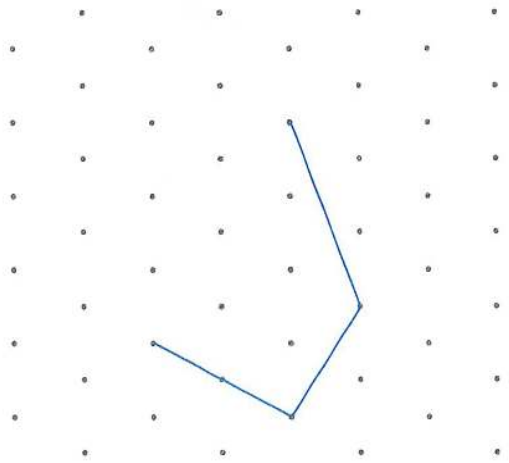
cuboid



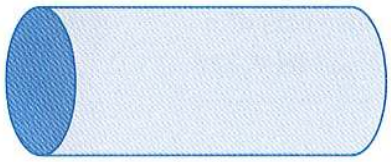
(b)



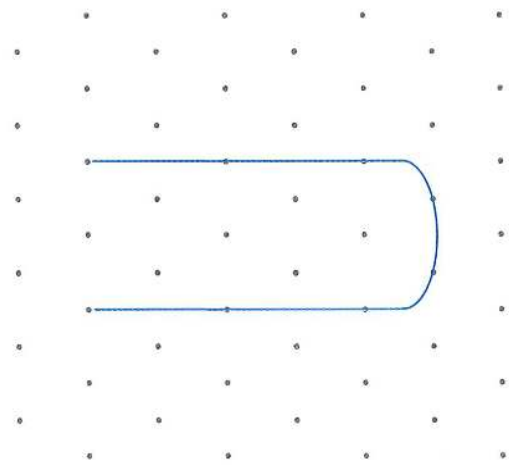
pyramid



(c)



cylinder



Go to WB 6B 85–88

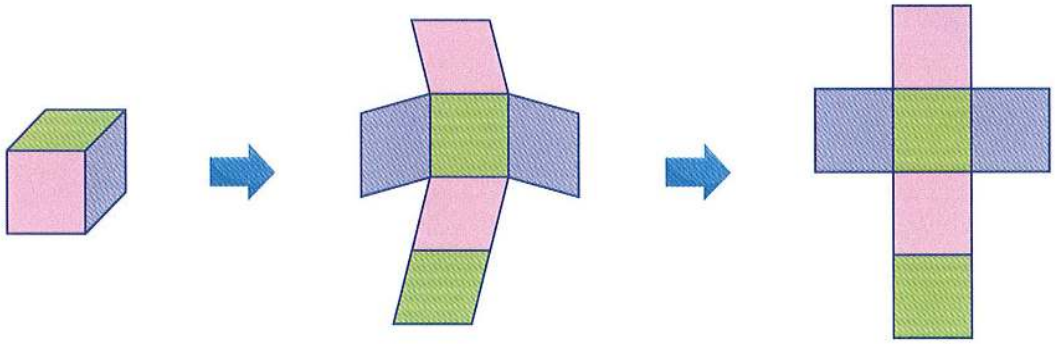
Self-Check

I know how to draw cubes, cuboids, cones, cylinders, prisms and pyramids on isometric grids.

See and Learn

Nets of cubes and cuboids

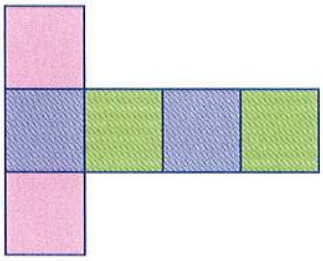
1 Cut along some of the edges of a cube and open it up to get a **net** of the cube.



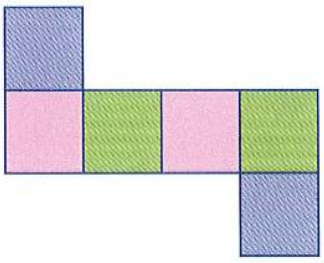
net

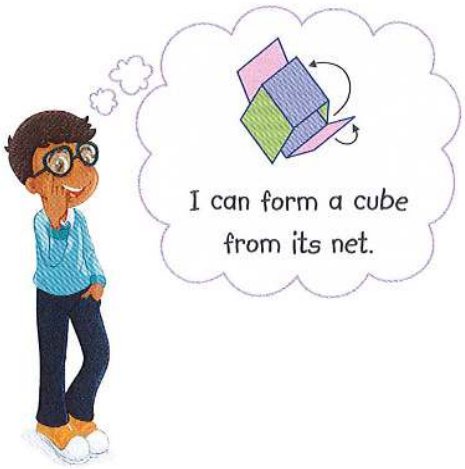
A **cube** has more than one net as shown below.

(a)



(b)

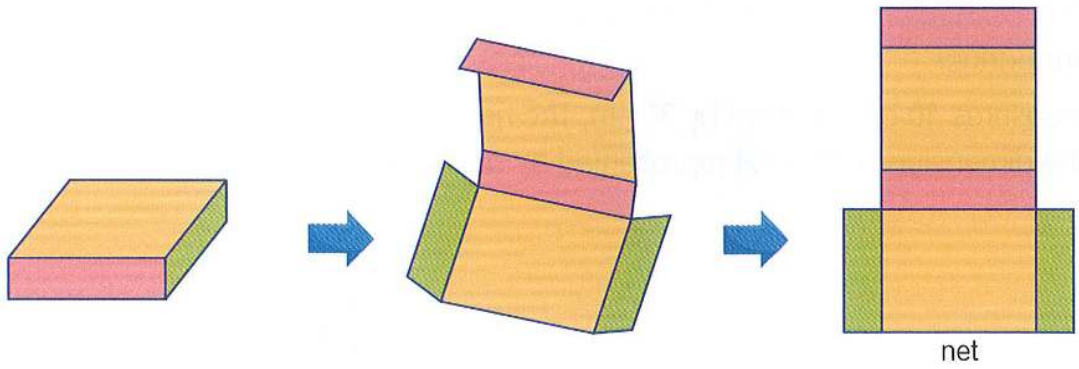




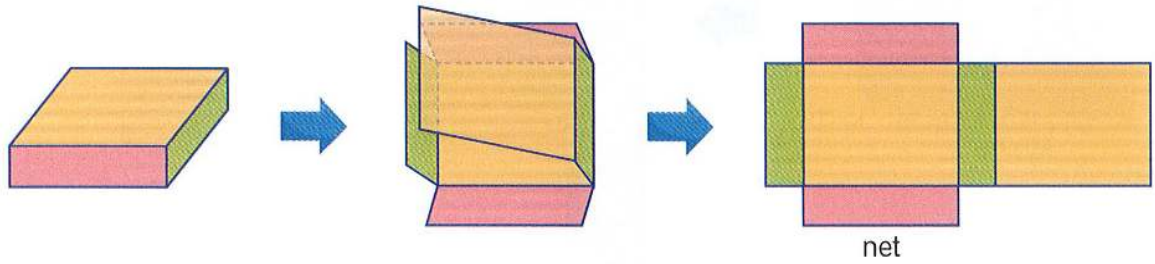
A net of a solid is a figure that can be folded to form the solid.

2 A **cuboid** also has more than one net.

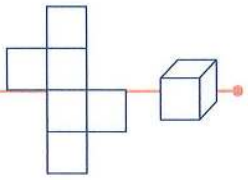
(a)



(b) Here is another example of a net of the same cuboid.

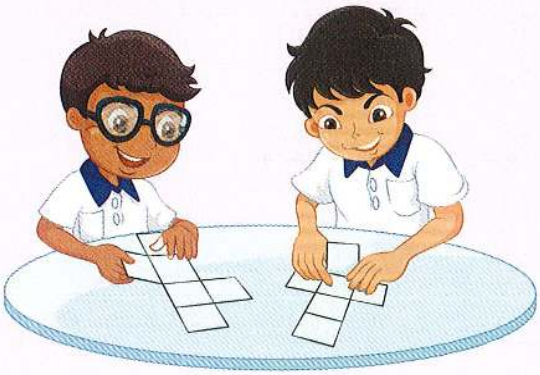


Hands-On Activity



Work in pairs.
Draw different nets of a cube. Cut out the nets and fold them.
Does each net form a cube when folded?

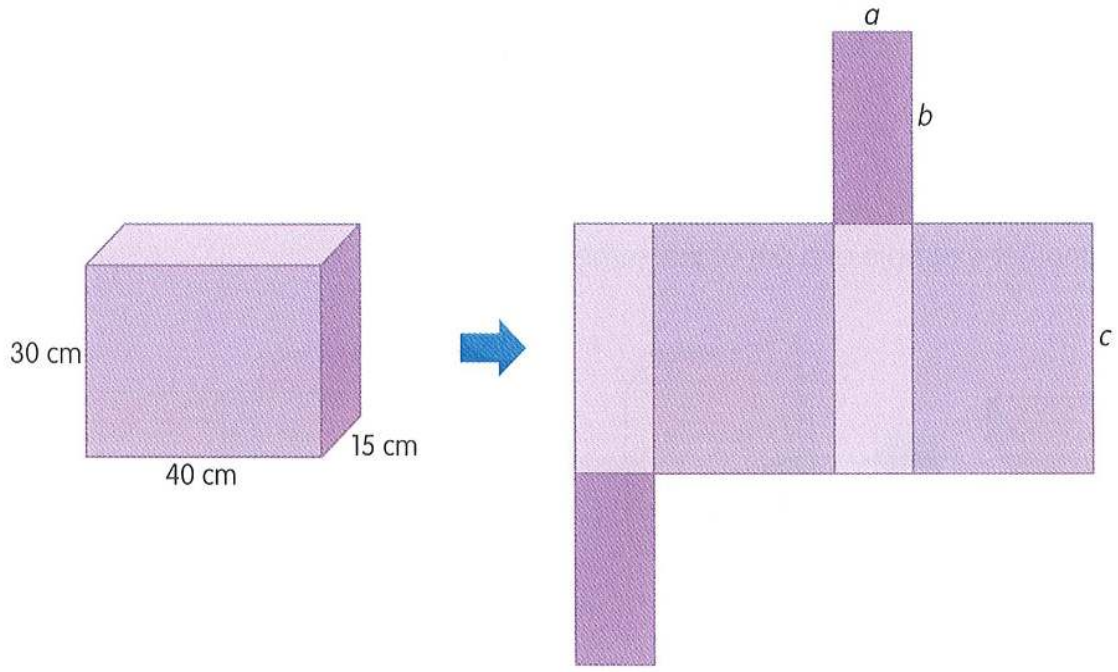
Example



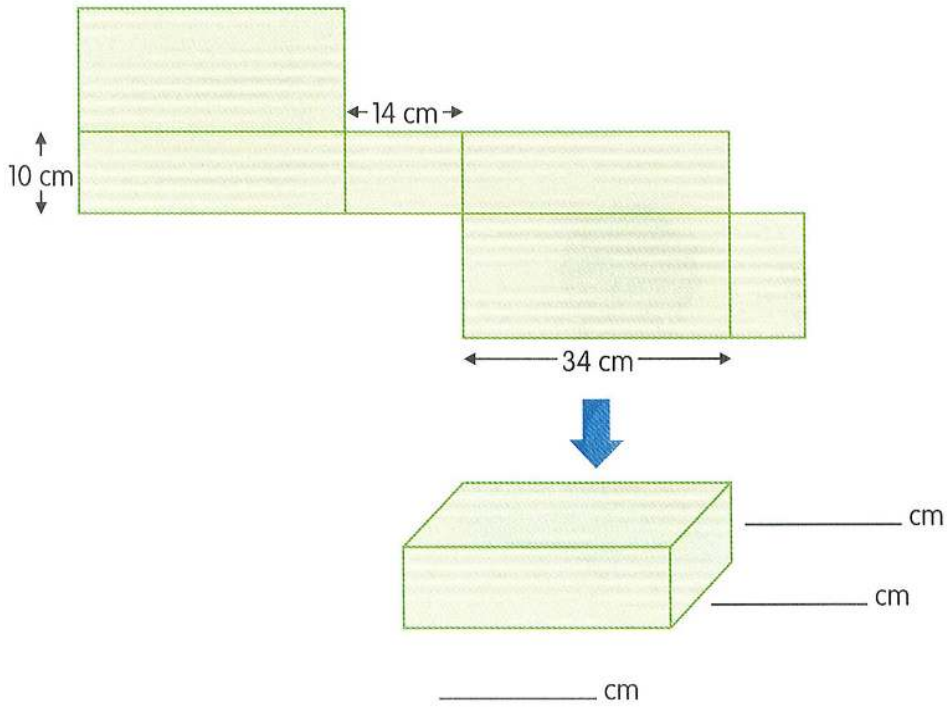
Pair and Share

Discuss with your partner.

(a) A cuboid measures 40 cm by 15 cm by 30 cm. The net of the cuboid is shown below. What are the dimensions of the net represented by *a*, *b* and *c*.



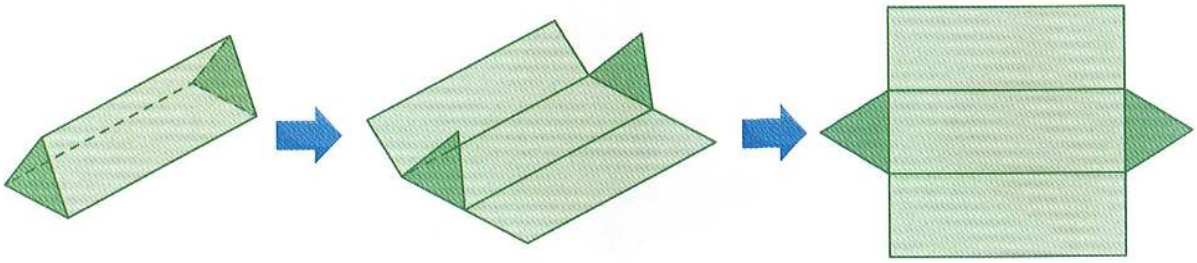
(b) The figure shows the net of a cuboid. Find the length, breadth and height of the cuboid.



Nets of prisms and pyramids

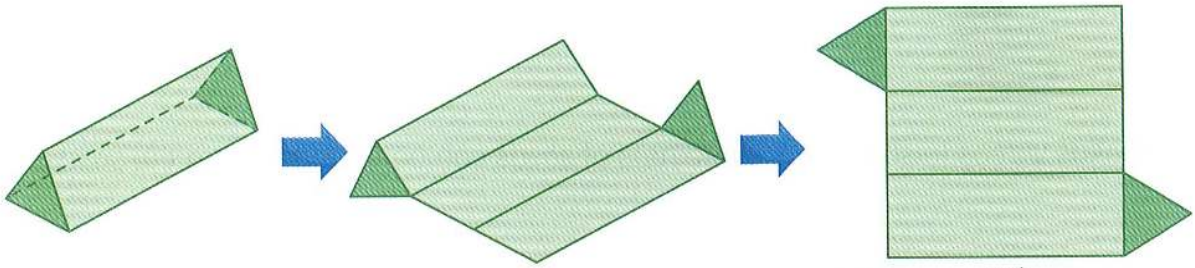
3 A prism can have more than one net.

(a)



net

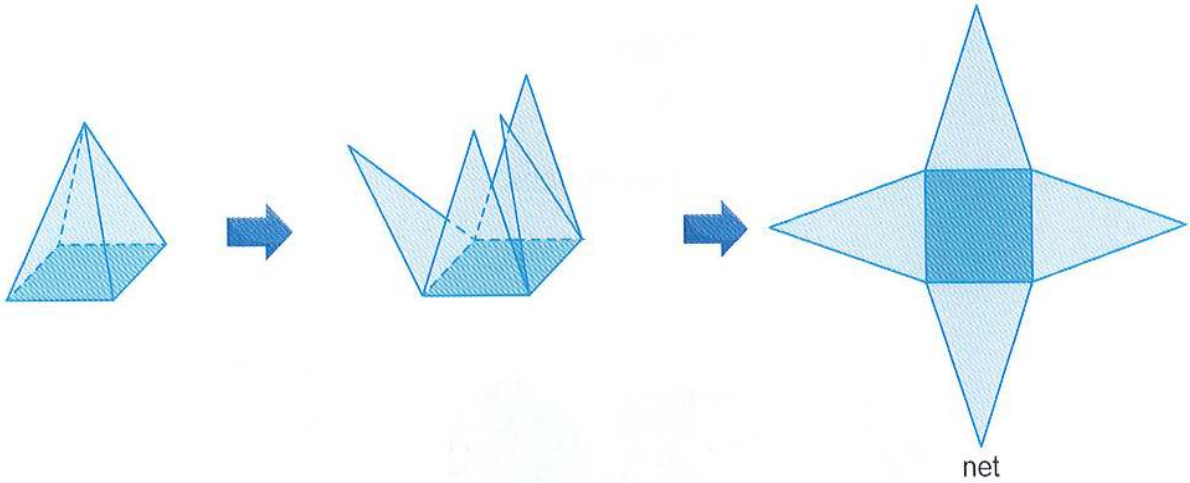
(b) Here is another example of a net of the same prism.



net

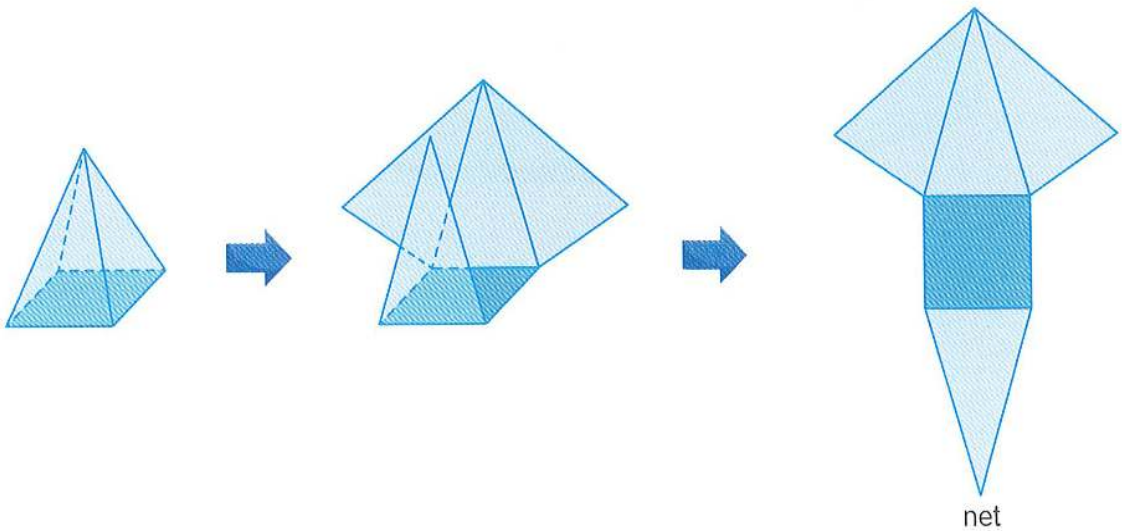
4 A pyramid can have more than one net.

(a)



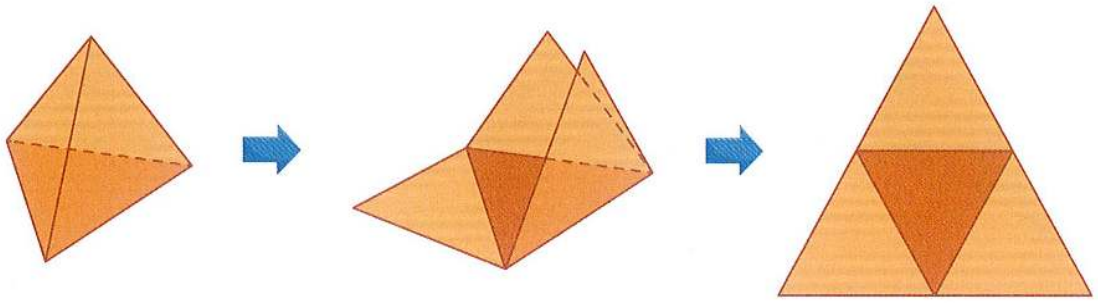
net

(b) Here is another example of a net of the same pyramid.



net

5 Here is an example of a net of another pyramid.



net

IT Activity

Use **Nets-Solids** videos to show how some nets of solids can be folded to form the solids.

Hands-On Activity

Work in groups.

1 Make solid figures using geoshapes.

(a) cube **(b)** cuboid **(c)** prism **(d)** pyramid

2 Make nets of solid figures using geoshapes.

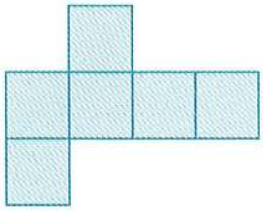
Example

Do and Learn

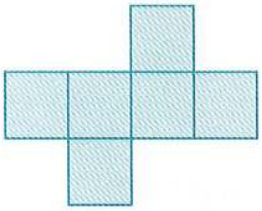
1 **(a)** Which of the following are the nets of a cube?

(b) Explain why the others are **not** the nets of a cube.

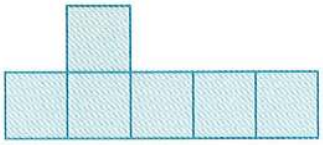
cube



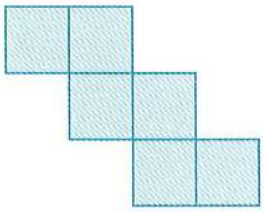
A



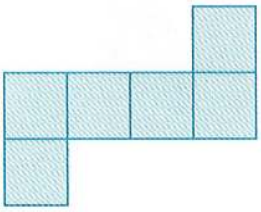
B



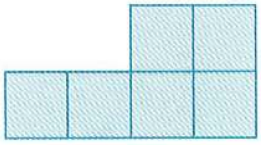
C



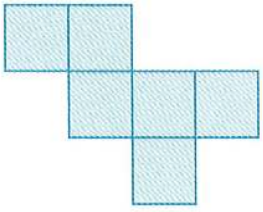
D



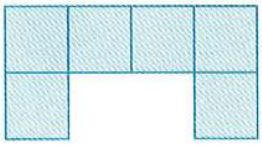
E



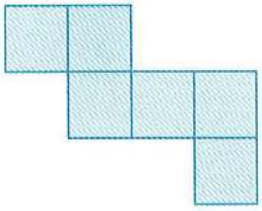
F



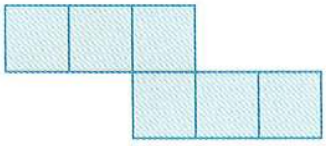
G



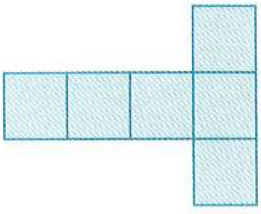
H



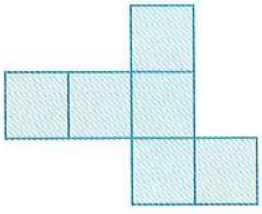
I



J



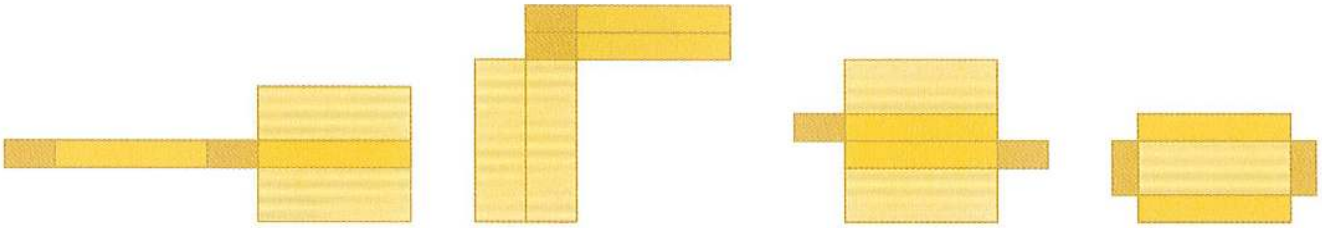
K



L

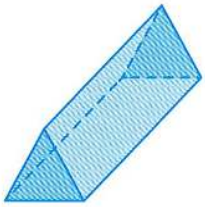
2 Which of the following are the nets of a cuboid?

cuboid

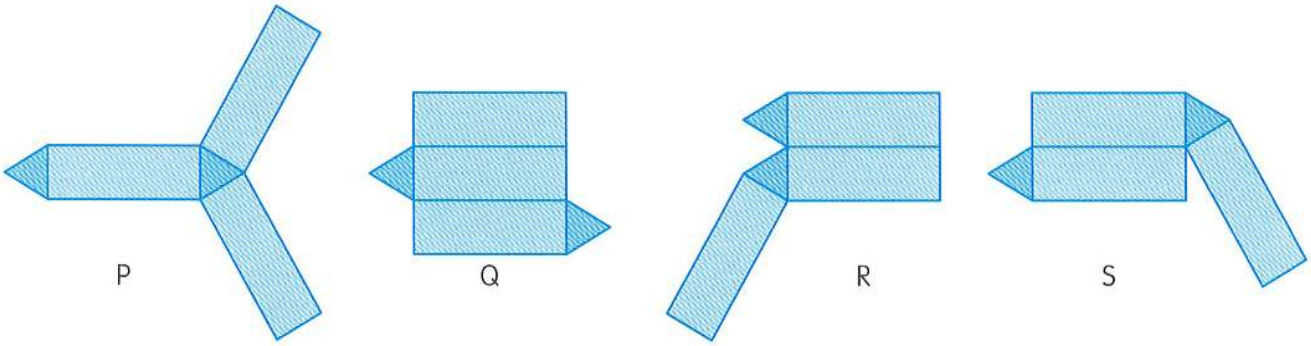


E F G H

3 Which of the following are the nets of a prism?

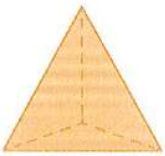


prism

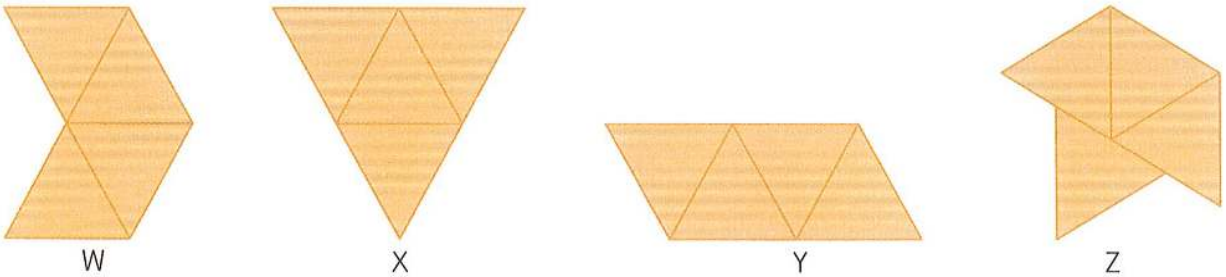


P Q R S

4 Which of the following are the nets of a pyramid?



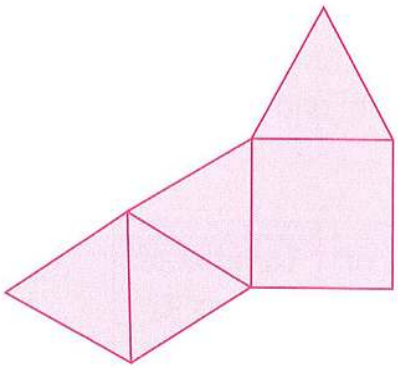
pyramid



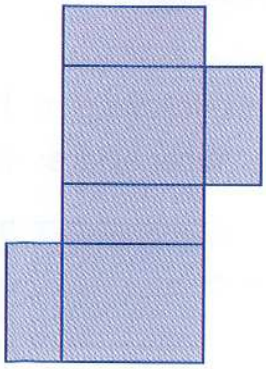
W X Y Z

5 Identify the solid based on the given net.

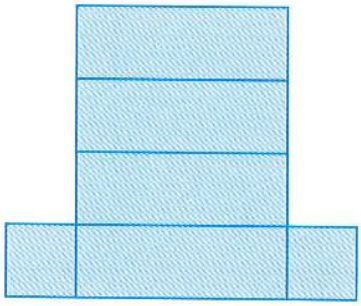
(a)



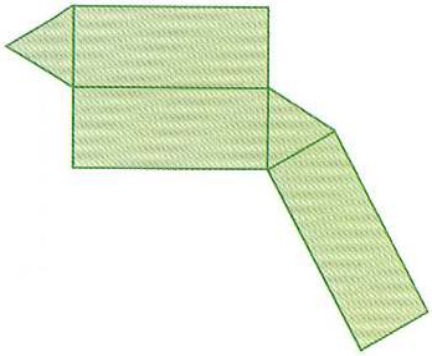
(b)



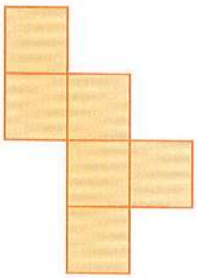
(c)



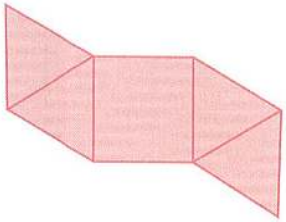
(d)



(e)



(f)



Go to WB 6B 89–98

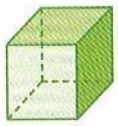
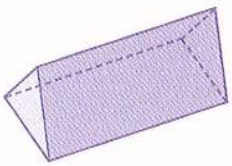
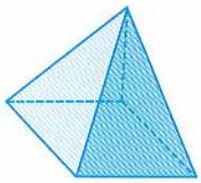
Self-Check

(a) I know how to identify the nets of cubes, cuboids, prisms and pyramids.

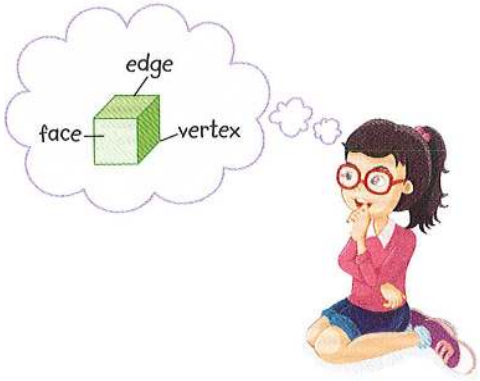
(b) I know how to identify the solids from their nets.

Let's Think Along...

Work in groups.
Each group will have the following solid figures: cube, cuboid, prism and pyramid.
Use them to find the number of faces, vertices and edges.

3D-figure	Number of faces (F)	Number of vertices (V)	Number of edges (E)	F + V – E
(a) cube 				
(b) cuboid 				
(c) prism 				
(d) pyramid 				

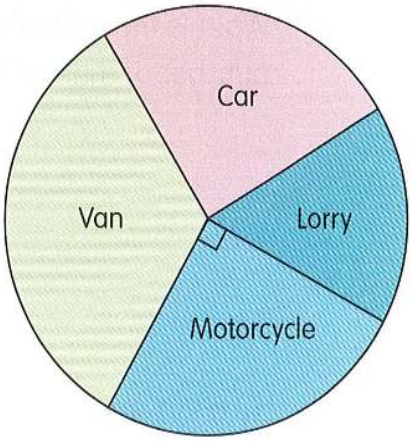
In the last column, find the sum of 'the number of faces' and 'the number of vertices'.
Then subtract 'the number of edges' from the sum. What do you notice?



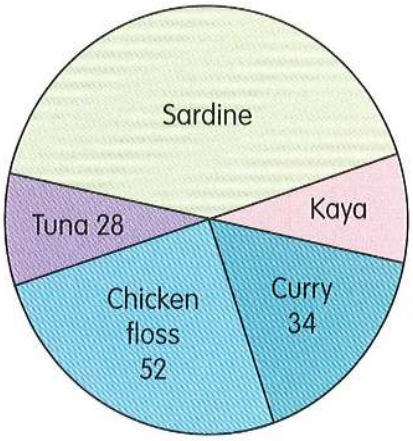
Go to WB 6B 99–100

Review 5 Pie Charts and Solid Figures and Nets

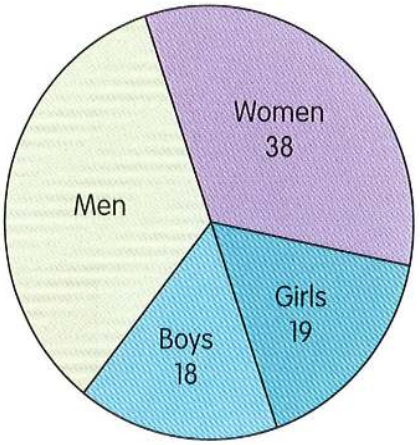
1. The pie chart shows the different types of vehicles at a car park. Which type of vehicle occupies a quarter of the space at the car park?



2. The pie chart shows the different types of buns sold at a bakery. There were as many tuna buns sold as kaya buns. How many sardine buns were sold?



3. The pie chart shows half of the number of people in a cinema are girls and women. How many men are there?

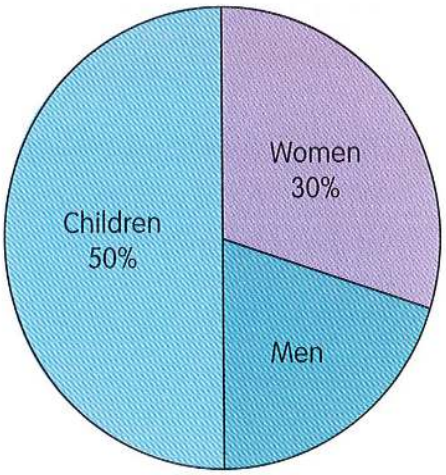


4 The pie chart shows the percentages of men, women and children who attended a concert. 400 people were at the concert.

(a) How many women were there?

(b) How many children were there?

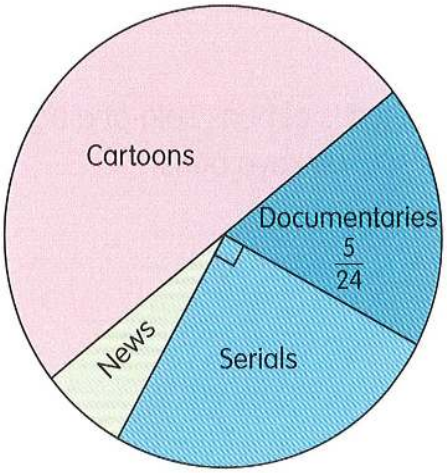
(c) What is the ratio of the number of children to the number of men at the concert?



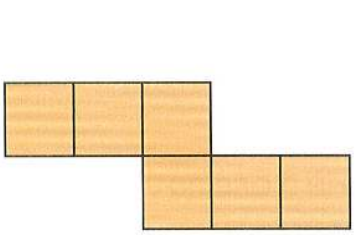
5 The pie chart shows the different types of TV programmes some children like to watch.

(a) What fraction of the children like to watch news?

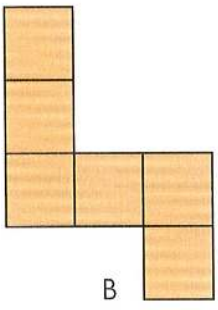
(b) If 30 children like to watch documentaries, how many children like to watch cartoons?



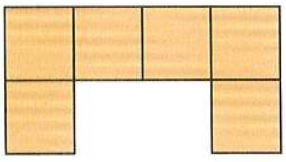
6 Which of the following are the nets of a cube?



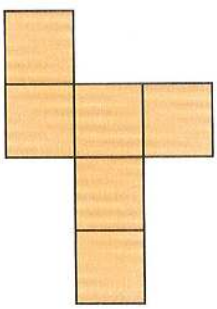
A



B

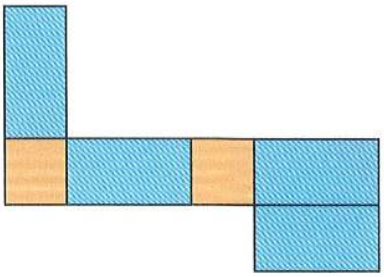


C

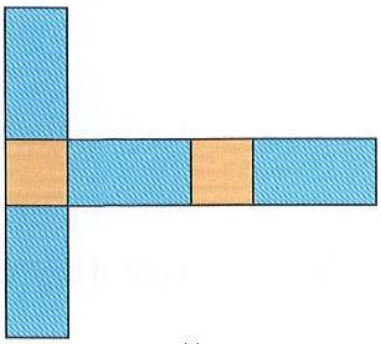


D

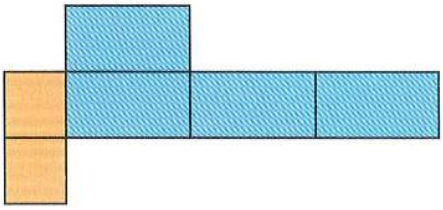
7 Which of the following are the nets of a cuboid?



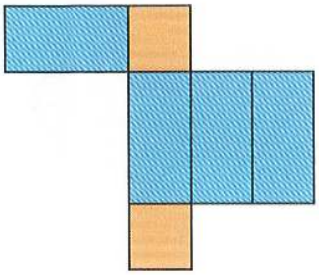
W



X

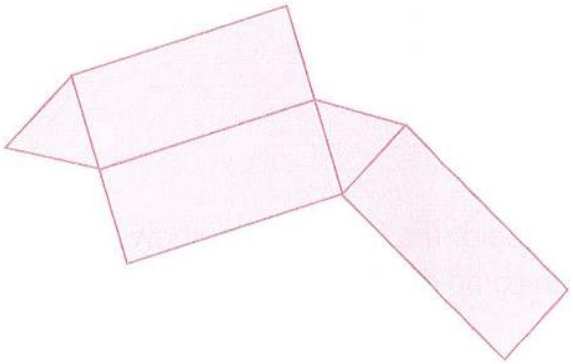


Y

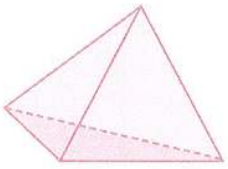


Z

8 The net of a solid is shown below.

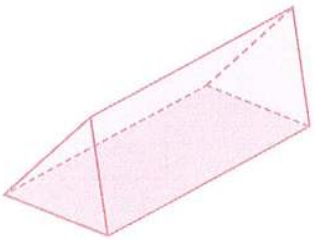


Which of the following solids has the net above?

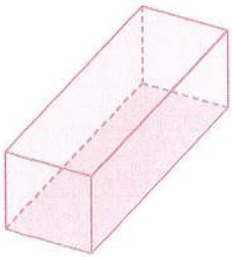


A

B

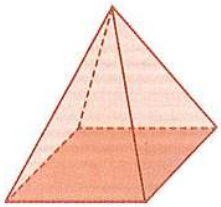


C

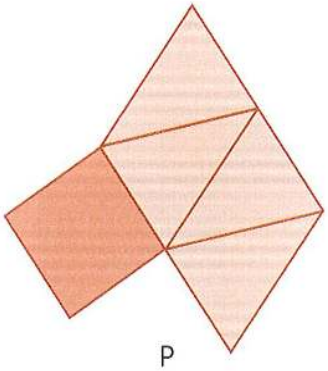


D

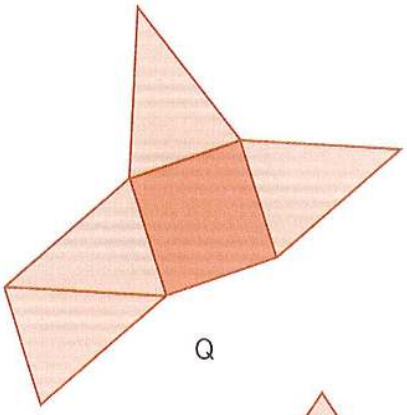
9 The figure shows a solid.



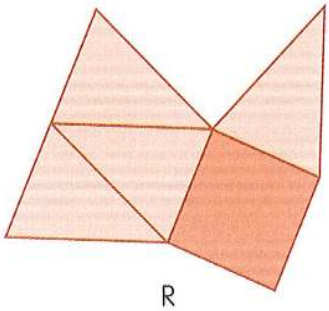
Which of the following is a net of the solid?



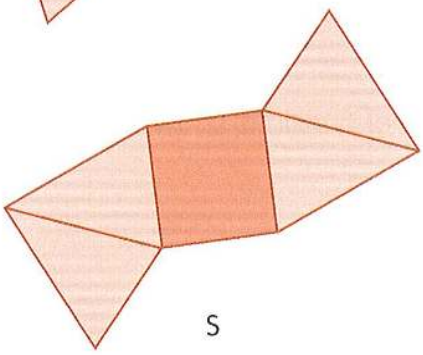
P



Q

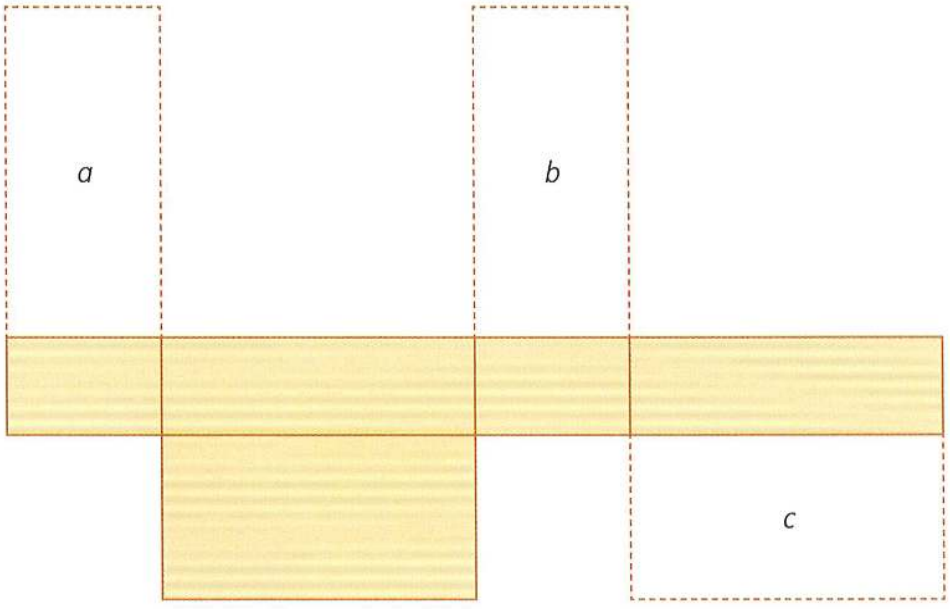


R



S

10 Peter wants to make a cuboid. The figure below shows an incomplete net of the cuboid. Choose the part that can complete the net correctly.



Go to WB 6B 101–130

Mastery Checklist

Do you know how to …

Whole Numbers

- **find the place value of each digit in a given number?**

  In 1 **82**6 4**5**9, the digit **8** stands for 800 000,
  the value of the digit **5** is 50,
  the digit **2** is in the ten thousands place.

- **find the multiples of given numbers?**

  The first 5 multiples of 7 is 7, 14, 21, 28 and 35.
  The 3rd multiple of 8 is 24.

- **find the first two common multiples of 2 numbers?**

  The first two common multiples of 3 and 4 are 12 and 24.

- **find the factors of a given number?**

  The factors of 8 are 1, 2, 4 and 8.
  All numbers have 1 and the number itself as factors.
  E.g. The factors of 5 are 1 and 5.

  A product divides by any of its factors exactly (leaving no remainder).

- **round a whole number to the nearest 10, 100 and 1000?**

  5834 rounded to the **nearest 10** is 5830. $5834 \approx 5830$
  5834 rounded to the **nearest 100** is 5800. $5834 \approx 5800$
  5834 rounded to the **nearest 1000** is 6000. $5834 \approx 6000$

- **work out the order of operations?**

  (a) Mixed operations involving multiplication, division, addition and subtraction:

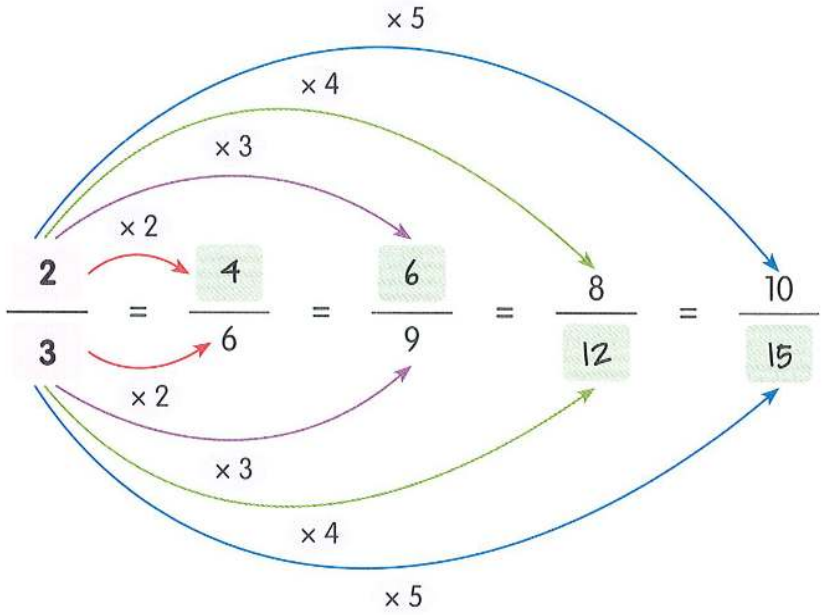
  $16 + \underline{4 \times 2} - \underline{6 \div 3} = 16 + 8 - 2$ (Multiply or Divide from left to right first)
  $= 24 - 2$ (Add or Subtract from left to right)
  $= 22$

  (b) Mixed operations with brackets

  $4 \times \underline{(8 - 6)} \div 2 = 4 \times 2 \div 2$ (Do the operation in brackets first)
  $= 8 \div 2$ (Multiply or Divide from left to right)
  $= 4$

Fractions

- **find equivalent fractions of a given fraction?**



- **simplify fractions?**

$$\frac{6}{12} \overset{\div 2}{=} \frac{3}{6} \overset{\div 3}{=} \frac{1}{2}$$

$$\frac{6}{12} \overset{\div 6}{=} \frac{1}{2}$$

- **add and subtract unlike fractions?**

$$\frac{2}{3}+\frac{1}{2}=\frac{4}{6}+\frac{3}{6}$$
$$=\frac{7}{6}$$
$$=1\frac{1}{6}$$

$$\frac{1}{2}-\frac{2}{5}=\frac{5}{10}-\frac{4}{10}$$
$$=\frac{1}{10}$$

Change the fractions to like fractions first before adding or subtracting.

- **convert mixed numbers to improper fractions and vice versa?**

$$1\frac{7}{8}=1+\frac{7}{8}$$
$$=\frac{8}{8}+\frac{7}{8}$$
$$=\frac{15}{8}$$

$$\frac{8}{5}=\frac{5}{5}+\frac{3}{5}$$
$$=1+\frac{3}{5}$$
$$=1\frac{3}{5}$$

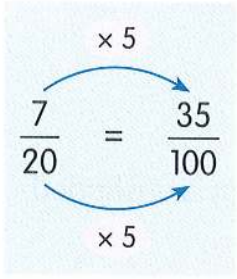
- **express the division of whole numbers as fractions?**

$2 \div 3 = \frac{2}{3}$ This is the same as $\frac{1}{3}$ of 2 or $\frac{1}{3} \times 2$.

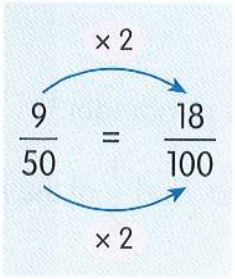
- **convert fractions to decimals?**

Check if the denominator can be expressed as multiples of 10.

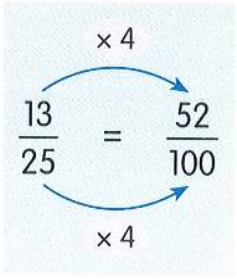
(a) $\frac{7}{20} = \frac{35}{100}$
$= 0.35$



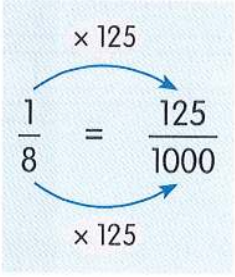
(b) $\frac{9}{50} = \frac{18}{100}$
$= 0.18$



(c) $\frac{13}{25} = \frac{52}{100}$
$= 0.52$



(d) $\frac{1}{8} = \frac{125}{1000}$
$= 0.125$



Divide using the long division method if the denominators cannot be expressed as multiples of 10.

$\frac{6}{11} \approx 0.55$

$\frac{6}{11} = 0.55$ (to 2 decimal places)

```
   0.545
11)6.000
   0
   60
   55
    50
    44
     60
     55
      5
```

- **multiply a fraction by a whole number?**

$\frac{3}{\cancel{4}_{1}} \times \cancel{8}^{2} = 3 \times 2 = 6$ (This may be interpreted as finding $\frac{3}{4}$ of a set of 8 items.)

$\frac{3}{4} \times 8 = \frac{3 \times 8}{4} = \frac{24}{4} = 6$ (This may be interpreted as 8 groups of 3 quarters.)

$4 \times \frac{7}{3} = \frac{28}{3} = 9\frac{1}{3}$

- **multiply fractions or multiply a mixed number by a whole number?**

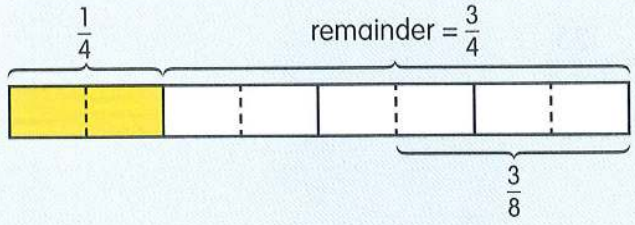
$$\frac{1}{2} \times \frac{4}{5} = \frac{1 \times 4}{2 \times 5} = \frac{4}{10} = \frac{2}{5}$$

$$\frac{6}{4} \times \frac{8}{3} = \frac{\cancel{6}^{2}}{\cancel{4}_{1}} \times \frac{\cancel{8}^{2}}{\cancel{3}_{1}} = 4$$

$$1\frac{1}{2} \times 3 = \frac{3}{2} \times 3 = \frac{9}{2} = 4\frac{1}{2}$$

- **find the fraction of a remainder?**

$\frac{1}{4}$ of the bar is shaded. Find $\frac{1}{2}$ of the remainder of the bar that is unshaded.



From the model, $\frac{1}{2}$ of the remainder $= \frac{3}{8}$.

$$\frac{1}{2} \text{ of the remainder} = \frac{1}{2} \times \frac{3}{4} = \frac{3}{8}$$

- **divide a fraction by a whole number?**

$\frac{3}{4} \div 3 = \frac{3}{4} \times \frac{1}{3} = \frac{1}{4}$ (This may be interpreted as finding $\frac{1}{3}$ of $\frac{3}{4}$.)

- **divide a whole number by a fraction?**

$3 \div \frac{3}{4} = 3 \times \frac{4}{3} = 4$ (This may be interpreted as finding the number of three quarters in 3 wholes.)

- **divide a fraction by a fraction?**

$\frac{1}{2} \div \frac{1}{8} = \frac{1}{2} \times \frac{8}{1} = 4$ (This may be interpreted as finding the number of eighths in $\frac{1}{2}$.)

Another method is to change the fractions to like fractions.

$\frac{1}{2} \div \frac{1}{8} = \frac{4}{8} \div \frac{1}{8} = 4$ (This may be interpreted as finding the number of eighths in $\frac{4}{8}$.)

Decimals

- **round a decimal to the nearest whole number, 1 or 2 decimal places?**

  5.864 rounded to the **nearest whole number** is 6. $5.864 \approx 6$

  5.864 rounded to **1 decimal place** (or the **nearest tenth**) is 5.9. $5.864 \approx 5.9$

  5.864 rounded to **2 decimal places** (or the **nearest hundredth**) is 5.86. $5.864 \approx 5.86$

- **convert a decimal to a fraction and express it in the simplest form?**

$$\begin{aligned} 8.25 &= 8 + 0.25 \\ &= 8 + \frac{25}{100} \\ &= 8\frac{1}{4} \end{aligned}$$

Algebra

- **write algebraic expressions?**

Statement	Algebraic expression
Add 10 to a	$a + 10$ or $10 + a$
12 more than b	$b + 12$ or $12 + b$
Subtract c from 20	$20 - c$
15 less than d	$d - 15$
3 groups of x	$3x$
Divide y by 6	$\frac{y}{6}$

- **simplify algebraic expressions?**

$$\begin{aligned} 8h + 4 + 2h - 1 &= 8h + 2h + 4 - 1 \\ &= 10h + 3 \end{aligned}$$

- **evaluate algebraic expressions?**

There are different numbers of bags. Each bag has k oranges.

Number of bags	Total number of oranges in terms of k	Total number of oranges if $k = 5$
2	$2k$	$2 \times 5 = 10$
5	$5k$	$5 \times 5 = 25$
10	$10k$	$10 \times 5 = 50$

- **solve simple equations?**

$$\begin{aligned} p + 4p &= 50 \\ 5p &= 50 \\ p &= 50 \div 5 \\ &= 10 \end{aligned}$$

Rate

- **find the rate?**

  A rate is a comparison of two quantities and is expressed as one quantity per unit of another quantity.

  A photocopier takes 5 min to print 400 pages. How many pages does it print per minute?

  5 min → 400 pages

  1 min → 400 ÷ 5 = 80 pages

  The photocopier prints 80 pages per minute.

- **find the total amount given the rate?**

  A waitress is paid $5 per hour. How much will she be paid if she works 8 h?

  1 h → $5

  8 h → $5 × 8 = $40

  The waitress will be paid $40 if she works 8 h.

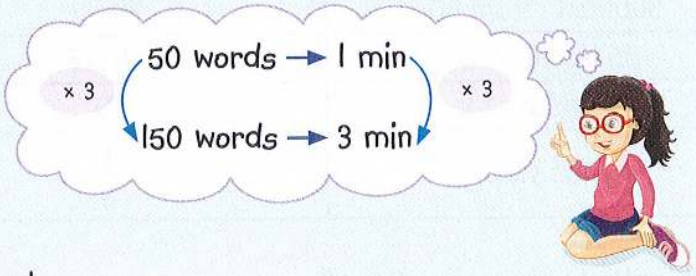
- **find the number of units given the rate and the total quantity?**

  50 words → 1 min

  1 word → $\frac{1}{50}$ min

  150 words → $\frac{1}{50} \times 150 = 3$ min

  Peter takes 3 minutes to type 150 words.



- **solve problems involving step rates?**

  The table shows the rental rates of bicycles at a park.

Bicycle rental rates	
For the first hour	$4
For every additional hour	$2

  Peter paid $10 to rent a bicycle.
  How many hours did he rent the bicycle for?

  1st hour → $4

  Next 3 hours → $6

  He rented the bicycle for 4 hours.

Ratio

- **find equivalent ratios and unknown quantities?**

$5 : 20$ ($\div 5$, $\div 5$) $= 1 : 4$

$2 : 3$ ($\times 6$, $\times 6$) $= 12 : 18$

$2 : 4 : 5$ ($\times 4$, $\times 4$, $\times 4$) $= 8 : 16 : 20$

X : Y = 2 : 3 and Y : Z = 2 : 5. Find X : Y : Z.

First common multiple of 2 and 3 = 6

	X	:	Y
=	2	:	3
=	4	:	6

(×2 on X, ×2 on Y)

	Y	:	Z
=	2	:	5
=	6	:	15

(×3 on Y, ×3 on Z)

X : Y : Z = 4 : 6 : 15

- **express fractions as ratios and vice versa?**

(a) There are $\frac{1}{2}$ as many boys as girls.

Number of boys		Number of girls
= 1	:	2

(b) The ratio of the number of boys to the number of girls is 1 : 3.

$\frac{\text{Number of boys}}{\text{Number of girls}} = \frac{1}{3}$

There are $\frac{1}{3}$ as many boys as girls.

Percentage

- **express a fraction as a percentage?**

Method 1

$\frac{16}{200} \overset{\div 2}{=} \frac{8}{100} = 8\%$ ($\div 2$)

Find the equivalent fraction with denominator = 100

Note: The whole is 100%.

Method 2

$\frac{16}{200_{2}} \times \frac{1}{100\%} = 8\%$

Multiply the fraction by 100%

- **express each percentage as a fraction or a decimal?**

(a) $80\% = \frac{80}{100}$

$= \frac{4}{5}$

(b) $65\% = \frac{65}{100}$

$= 0.65$

- **find percentage of a quantity?**

A class has 40 pupils. 45% of them are boys. How many boys are there?

Method 1

$$45\% = \frac{45}{100}$$

$$\frac{45}{100} \times 40 = 18$$

Method 2

$$100\% \rightarrow 40$$

$$1\% \rightarrow \frac{40}{100} = \frac{2}{5}$$

$$45\% \rightarrow \frac{2}{5} \times 45 = 18$$

There are 18 boys.

- **find percentage increase or decrease?**

There were 8 children in a room. After some children went home, there were 3 children left in the room. Find the percentage decrease in the number of children.

$8 - 3 = 5$

$$\text{Percentage decrease} = \frac{5}{8} \times 100\%$$

$$= 62.5\%$$

$$\text{Percentage increase or decrease} = \frac{\text{difference in amount}}{\text{original amount}} \times 100\%$$

The percentage decrease in the number of children was 62.5%.

- **find GST, discount and interest?**

(a) Price of iron = \$40, GST rate = 7%

$$\text{GST} = \frac{7}{100} \times \$40$$

$$= \$2.80$$

(b) Price of fan = \$60, discount = 20%

$$\text{Discount} = \frac{20}{100} \times \$60$$

$$= \$12$$

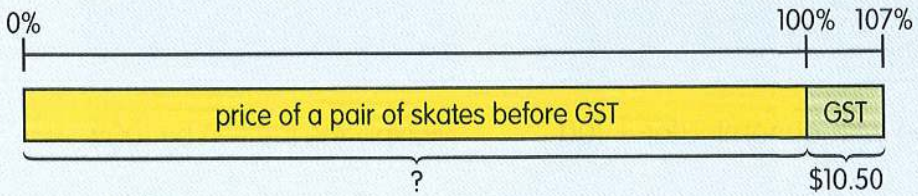
(c) Amount deposited = \$2000, interest rate = 2%

$$\text{Interest} = \frac{2}{100} \times \$2000$$

$$= \$40$$

- **find the total amount given the GST rate, percentage discount or interest rate?**

Ravi paid 7% GST for a pair of skates he bought. The GST was \$10.50. How much did the pair of skates cost before GST?



$7\% \rightarrow \$10.50$

$1\% \rightarrow \$10.50 \div 7 = \$1.50$

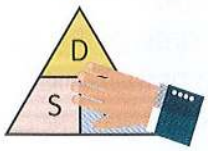
$100\% \rightarrow \$1.50 \times 100 = \$150$

The pair of skates cost \$150 before GST.

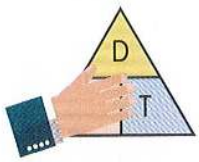
Speed

- **find distance, time or speed, and average speed?**

Distance = Speed × Time



$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$



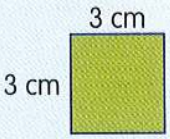
$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$

Average speed = Total distance ÷ Total time

Measurement

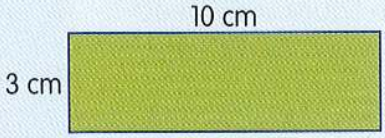
Area and Perimeter

- **find the perimeter and area of squares and rectangles?**



Perimeter of square = 4 × Length
= 4 × 3
= 12 cm

Area of square = Length × Length
= 3 × 3
= 9 cm²

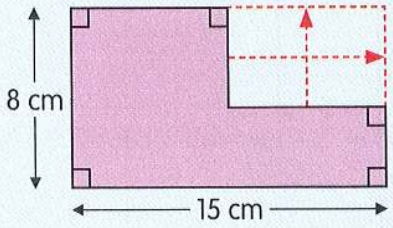


Perimeter of rectangle
= Length + Length + Breadth + Breadth
= 10 + 10 + 3 + 3
= 26 cm

Area of rectangle = Length × Breadth
= 10 × 3
= 30 cm²

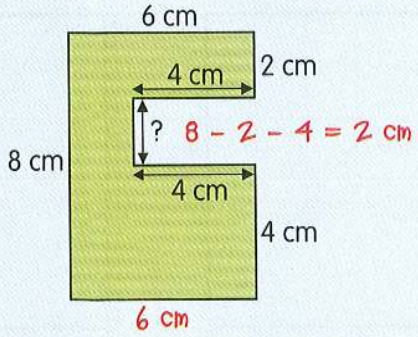
- **find the perimeter of composite figures?**

The perimeter of the L-shaped figure is the same as the perimeter of its related rectangle.



Perimeter = 15 + 15 + 8 + 8
= 46 cm

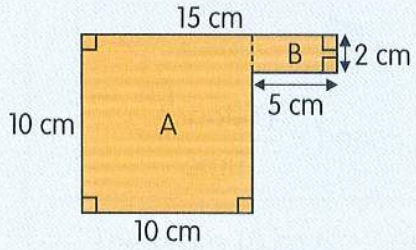
Find the unknown sides first and then add all the sides to find the perimeter.



Perimeter = 8 + 6 + 2 + 4 + 2 + 4 + 4 + 6
= 36 cm

- **find the area of composite figures?**

Method 1



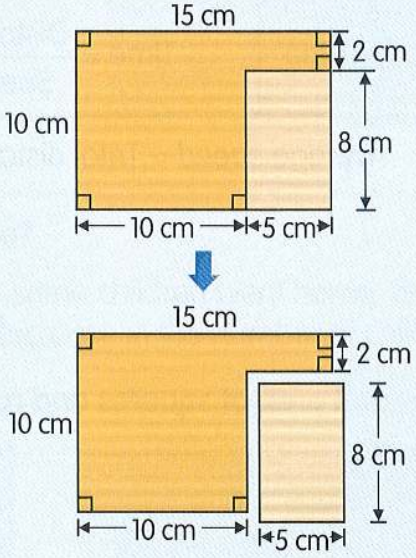
Area of Square A = 10 × 10
= 100 cm²

Area of Rectangle B = 5 × 2
= 10 cm²

Area of the figure = 100 + 10
= 110 cm²

Method 2

Find the area of the big rectangle first. Then subtract the area of the smaller rectangle from the big rectangle to get the area of the composite figure.



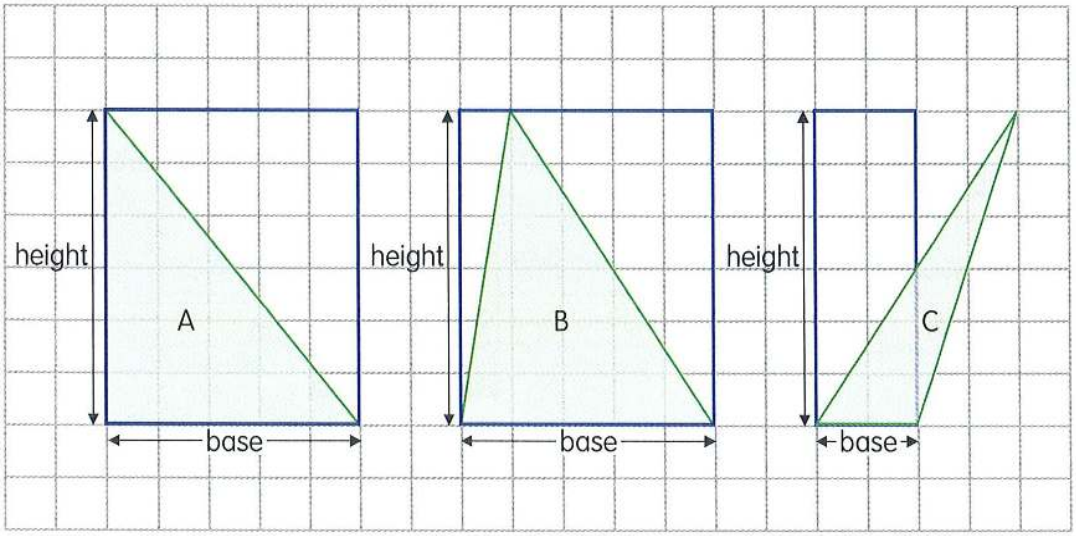
Area of big rectangle = 15 × 10
= 150 cm²

Area of small rectangle = 8 × 5
= 40 cm²

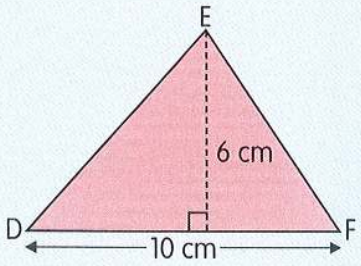
Area of the figure = 150 – 40
= 110 cm²

- **identify the base and height of triangles?**

The height of a triangle is perpendicular to its base.

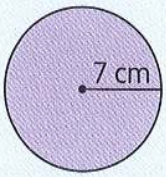


- **find the area of a triangle?**



$$\text{Area of triangle DEF} = \frac{1}{2} \times \text{base} \times \text{height}$$
$$= \frac{1}{2} \times 10 \times 6$$
$$= 30 \text{ cm}^2$$

- **find the circumference and area of a circle?**



$$\text{Circumference of circle} = 2\pi r$$
$$= 2 \times \frac{22}{7} \times 7$$
$$= 44 \text{ cm}$$

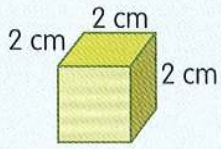
$$\text{Area of circle} = \pi r^2$$
$$= \frac{22}{7} \times 7 \times 7$$
$$= 154 \text{ cm}^2$$

Note: The value of π may be given as 3.14.

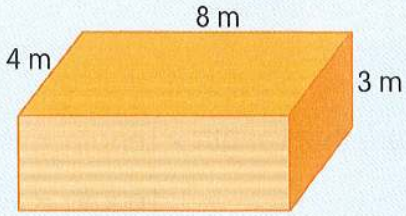
$$\text{Diameter} = 2 \times \text{Radius}$$
$$= 2r$$

$$\text{Circumference} = 2\pi r$$
$$= \pi d$$

- **find the volume of a cube or cuboid?**

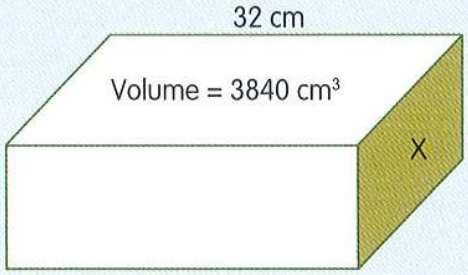


Volume of cube
= Length × Length × Length
= 2 × 2 × 2
= 8 cm^3



Volume of cuboid
= Length × Breadth × Height
= 8 × 4 × 3
= 96 m^3

- **find the area of a face of a cube or cuboid?**

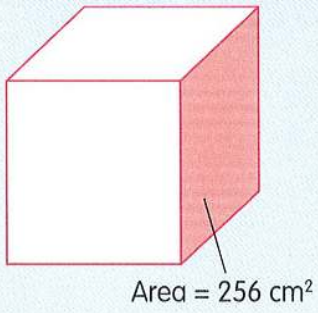


$$\text{Area X} = \frac{\text{Volume}}{\text{Length}}$$
$$= \frac{3840}{32}$$
$$= 120 \text{ cm}^2$$

Volume = Area × Edge (perpendicular to the face area)

Area = Volume ÷ Edge

- **find the length of a side of a square?**



$$\text{Length} \times \text{Length} = \text{Area}$$
$$\text{Length} = \sqrt{\text{Area}}$$
$$= \sqrt{256}$$
$$= 16 \text{ cm}$$

The **square root** of a square area gives the length of one side of the square.

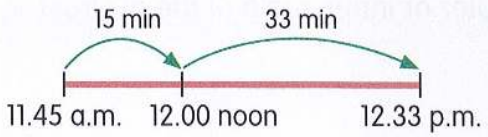
- **find the length of an edge of a cube?**

$$\text{Length} \times \text{Length} \times \text{Length} = \text{Volume}$$
$$\text{Length} = \sqrt[3]{\text{Volume}}$$
$$= \sqrt[3]{343}$$
$$= 7 \text{ cm}$$

The **cube root** of a cube gives the length of one edge of the cube.

- **find duration?**

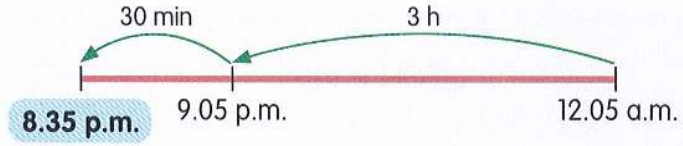
  Janice started reading a book at 11.45 a.m. She finished reading the book at 12.33 p.m. How long did she take to finish reading the book?

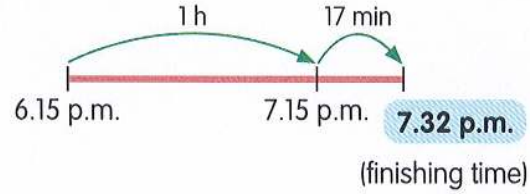


  15 min + 33 min = 48 min

  She took 48 min to finish reading the book.

- **find starting and finishing time?**





  A time line is used to work out duration, starting time and finishing time.

  Note: The above examples on time may be expressed in 24-hour clock.

- **add and subtract time?**

  1 h 15 min + 1 h 35 min = ?

  Add the hours.

  1 h 15 min $\xrightarrow{+1\text{ h}}$ 2 h 15 min

  Add the minutes.

  2 h 15 min $\xrightarrow{+35\text{ min}}$ 2 h 50 min

  4 h 50 min – 2 h 35 min = ?

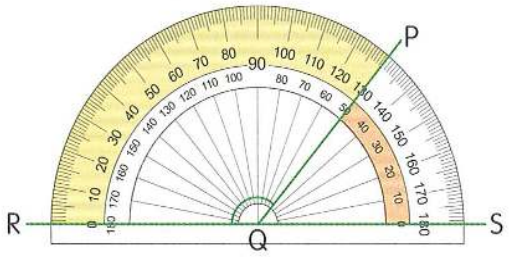
  Subtract the hours.

  4 h 50 min $\xrightarrow{-2\text{ h}}$ 2 h 50 min

  Subtract the minutes.

  2 h 50 min $\xrightarrow{-35\text{ min}}$ 2 h 15 min

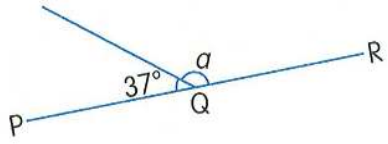
- **measure angles?**



$\angle PQR = 130°$ $\angle PQS = 50°$

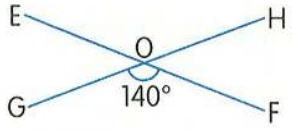
Angles are measured in degrees based on the outer or inner scale of the protractor.

- **find unknown angles?**



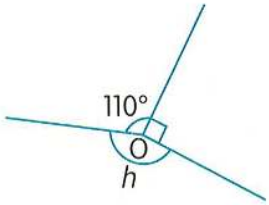
$\angle a = 180° - 37°$
$= 143°$

Sum of angles on a straight line = 180°



$\angle EOH = 140°$

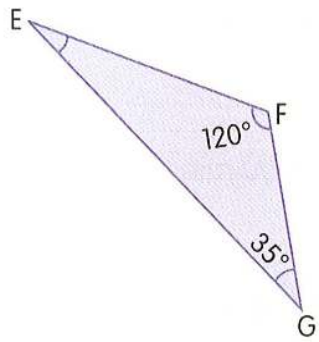
Vertically opposite angles are equal



$\angle h = 360° - 110° - 90°$
$= 160°$

Sum of angles at a point = 360°

- **find unknown angles in triangles?**

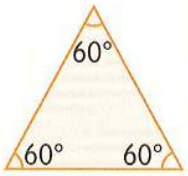


$\angle GEF = 180° - 120° - 35°$
$= 25°$

Sum of angles in a triangle = 180°

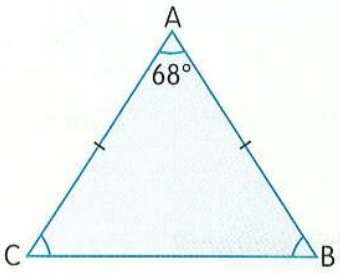
Note: There are different types of triangles.

Equilateral triangle



Each angle is 60°.

Isosceles triangle

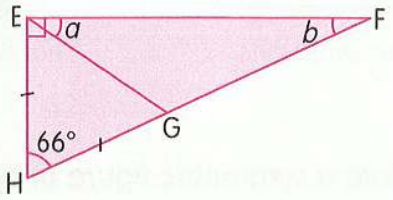


$\angle ACB = \angle ABC$

$\angle ACB + \angle ABC = 180° - 68°$
$= 112°$

$\angle ACB = 112° \div 2$
$= 56°$

Right-angled triangle



$\angle b = 180° - 90° - 66°$
$= 24°$

or

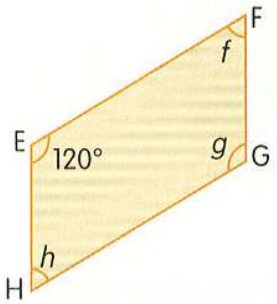
$\angle b = 90° - 66°$
$= 24°$

$\angle GEH = (180° - 66°) \div 2$
$= 57°$

$\angle a = 90° - 57°$
$= 33°$

- **find unknown angles in quadrilaterals?**

Parallelogram

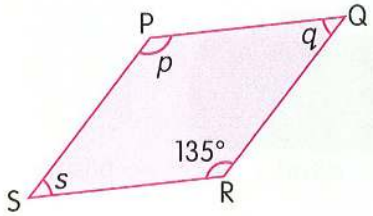


$\angle g = 120°$

$\angle h = 180° - 120°$
$= 60°$

$\angle f = \angle h$
$= 60°$

Rhombus

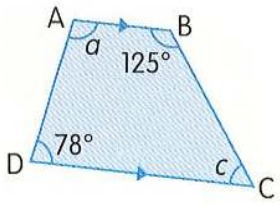


$\angle p = 135°$

$\angle q = 180° - 135°$
$= 45°$

$\angle s = \angle q$
$= 45°$

Trapezium



$\angle a = 180° - 78°$
$= 102°$

$\angle c = 180° - 125°$
$= 55°$

Note:
- The opposite angles of a parallelogram or a rhombus are equal.
- The sum of angles between a pair of parallel sides is 180°.

Symmetry

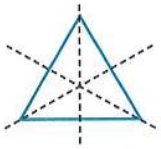
- **identify if a figure is symmetric and the line(s) of symmetry?**

(a) 

not symmetric

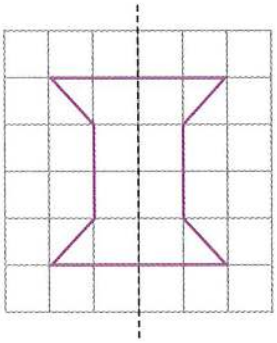
(b) 

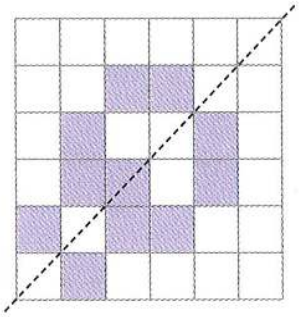
not symmetric

(c) 

symmetric

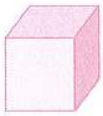
- **complete a symmetric figure or symmetric pattern?**





Solid Figures and Nets

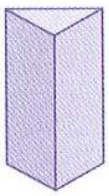
- **identify the solid figures and draw them?**



cube

cuboid

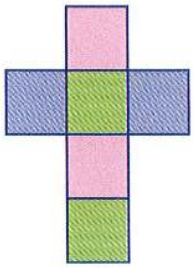
cylinder



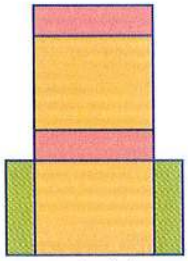
prism

pyramid

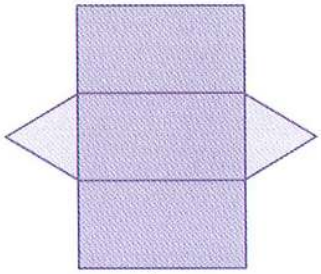
- **identify the nets of solid figures and the solids that can be formed from given nets?**



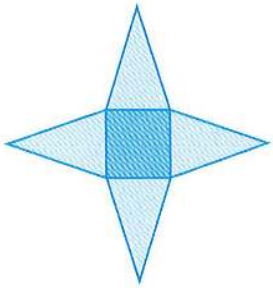
cube



cuboid



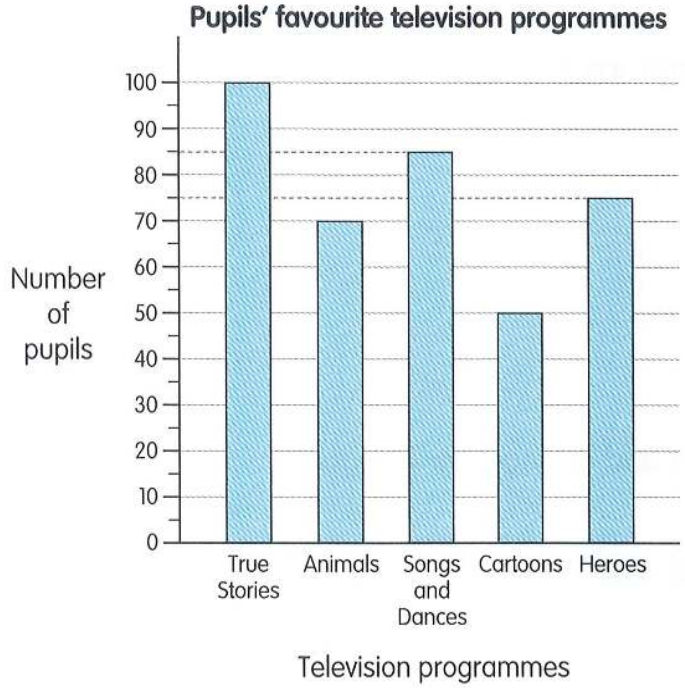
prism



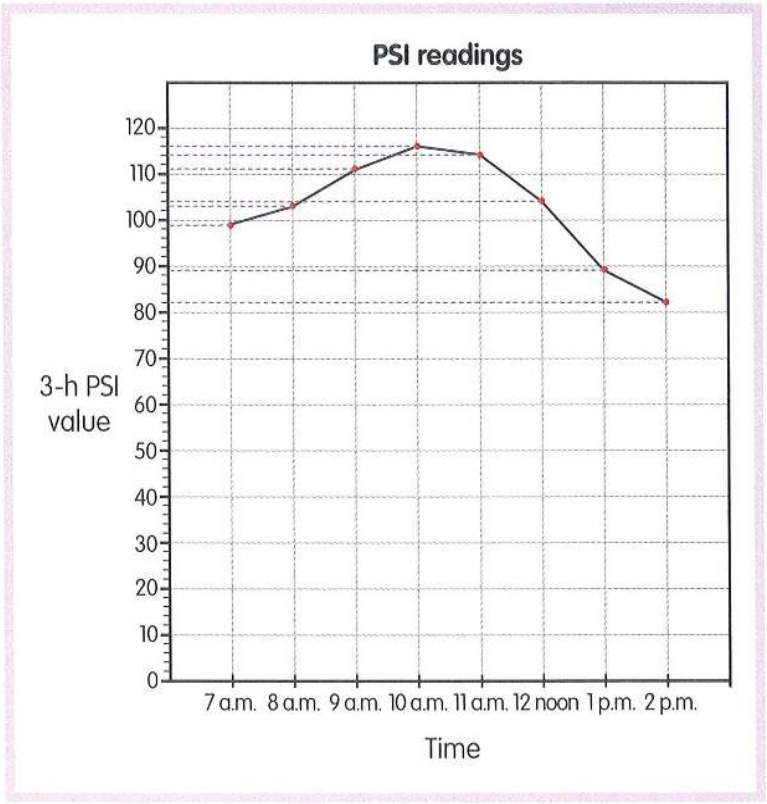
pyramid

- **read and interpret graphs?**

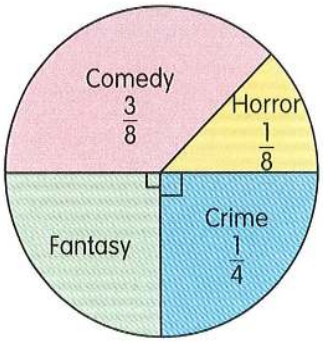
(a) bar graph



(b) line graph



(c) pie chart



- **find the average of a set of data?**

	Marks
Math Test 1	83
Math Test 2	76
Math Test 3	78
Math Test 4	80

Total score = 83 + 76 + 78 + 80
= 317 marks

Average score = 317 ÷ 4
= 79.25 marks

$$\text{Average} = \frac{\text{Total amount}}{\text{Number of data}}$$

- **find the total amount given the average and the number of data?**

Total amount = Average × Number of data

- **find the number of data given the average and the total amount?**

Number of data = Total amount ÷ Average

Targeting Mathematics

The Targeting Mathematics textbooks are part of a comprehensive learning package that meets the new syllabus requirements of the Ministry of Education, Singapore.

The book utilises the CPA (Concrete-Pictorial-Abstract) approach and learning experiences in the teaching of mathematics – making maths fun and relevant for children.

The main features of the book include:

- **Let's Talk About...**
  Colourful real-life scenarios allow pupils to relate mathematics to everyday life experiences
- **See and Learn**
  Concepts are presented clearly and colourfully
- **Hands-On Activity**
  Manipulatives are used to encourage pupils to 'learn by doing'
- **Let's Have Fun!**
  Activities are designed to make learning mathematics fun and relevant
- **Pair and Share**
  Pair work encourages peer learning and communication
- **Do and Learn**
  Exercises are given to test pupils' understanding of mathematical concepts
- **Self-Check**
  Opportunity for pupils to reflect on their own learning
- **Let's Think Along...**
  Activities are designed to encourage pupils to think and reason
- **Review**
  Exercises for pupils to revise and consolidate mathematical concepts learnt

STAR PUBLISHING PTE LTD

ISBN 978-981-4658-65-2

9 789814 658652