

Speed

Let's Learn!



Distance And Speed

Mr Chen is driving from Town A to Town B. In 1 hour, he drove 65 km. Mr Gopal is also driving in the same direction. In 1 hour, he drove 95 km.



Mr Chen is driving at a speed of 65 km per hour.

Mr Gopal is driving at a speed of 95 km per hour.

The **speed** tells how fast Mr Chen and Mr Gopal are travelling.

We can write the speed of Mr Chen's car as 65 km/h. Similarly, we can write the speed of Mr Gopal's car as 95 km/h.

The symbol / means **per**. So we read 65 km/h as 65 km per hour.

We express speed as distance travelled per unit time.

Do these.

- 2
 - a Jalil can cycle 8 km in one hour. His speed is km/h.
 - b Lalita can run 300 m in one minute. Her speed is m/min.
 - c A marble rolls 9 cm in one second. Its speed is cm/s.
 - d Mingwei throws a stone and it falls 2 m in one second. Its speed is m/s.
- 3
 - a Bernard runs at a speed of 12.5 m/s. In 1 s, he runs m.
 - b A lorry travelled at a speed of 48 km/h. In 1 h, the lorry travelled km.

4 Mr Ahmad drives his lorry at a speed of 45 km/h. At this speed, how far does Mr Ahmad travel in:

- a 2 hours?
- b 5 hours?



In 1 hour, Mr Ahmad travels 45 km.



In 2 hours, Mr Ahmad travels $45 \times 2 = 90$ km.



In 5 hours, Mr Ahmad travels $45 \times 5 = 225$ km.

Speed Time Distance

Distance = Speed × Time

45 km/h means
45 km per hour.



Home Maths

Ask your child to calculate how long it takes you to travel from your office to your home. Tell your child the time at which you left the office and the time at which you reached home.

5 A racing car is travelling at a speed of 175 km/h. How far can it travel in 3 hours?

Method 1

$$\begin{aligned} 1 \text{ h} &\rightarrow 175 \text{ km} \\ 3 \text{ h} &\rightarrow 3 \times \text{ } \\ &= \text{ } \text{ km} \end{aligned}$$

The racing car can travel km in 3 hours.

Method 2

$$\begin{aligned} \text{Speed} &= \text{ } \text{ km/h} \\ \text{Time} &= \text{ } \text{ h} \\ \text{Distance} &= \text{Speed} \times \text{Time} \\ &= \text{ } \times \text{ } \\ &= \text{ } \text{ km} \end{aligned}$$

The racing car can travel km in 3 hours.

Speed = km/h



6 A bullet fired from a gun travels at a speed of 250 m/s. How far can the bullet travel in 2 seconds?

Method 1

$$\begin{aligned} 1 \text{ s} &\rightarrow \text{ } \text{ m} \\ 2 \text{ s} &\rightarrow \text{ } \text{ m} \end{aligned}$$

The bullet can travel m in 2 seconds.

Method 2

$$\begin{aligned} \text{Speed} &= \text{ } \text{ m/s} \\ \text{Time} &= \text{ } \text{ s} \\ \text{Distance} &= \text{ } \times \text{ } \\ &= \text{ } \text{ m} \end{aligned}$$

The bullet can travel m in 2 seconds.

Speed = m/s



Speed involves two quantities:

- a Distance covered
- b Time taken

Speed is the distance covered per unit time.

Example:

A snail crawls at a speed of 20 cm/min.

20 cm \longrightarrow 1 minute
(distance covered) (per unit time)

The snail covers 20 cm per minute.



- 7 Joyce swims 450 m in 5 minutes. Find her swimming speed in m/min.

Method 1

5 min \longrightarrow 450 m
1 min \longrightarrow $\frac{450}{5}$
= 90 m

Joyce's swimming speed is 90 m/min.

To find the speed in m/min means to find the distance she swims in 1 minute.



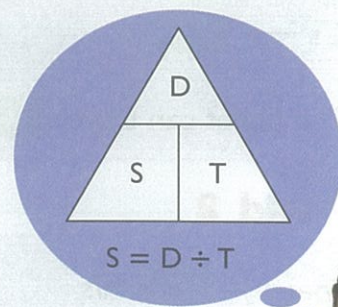
Method 2

Distance = 450 m
Time = 5 min

Speed = Distance \div Time

Speed = $450 \div 5$
= 90 m/min

Joyce's swimming speed is 90 m/min.



Ask your child to calculate his average speed for swimming 2 laps in a pool. Use a stopwatch to find his time taken for the swim.

- 8 The distance between Town A and Town B is 147 km. A van takes 3 hours to travel from Town A to Town B. What is the speed of the van?

Method 1

3 h \longrightarrow [] km
1 h \longrightarrow [] \div 3
= [] km

The speed of the van is [] km/h.

Method 2

Distance = [] km
Time = [] h
Speed = Distance \div Time
= [] km/h

The speed of the van is [] km/h.

Distance = [] km



- 9 Lek Ming ran round a field at a speed of 8 m/s. How long did he take to run a distance of 96 m?

Method 1

8 m \longrightarrow 1 s
96 m \longrightarrow $\frac{96}{8}$
= 12 s

Lek Ming took 12 s to run 96 m.

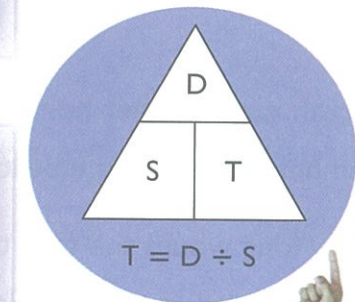
Method 2

Distance = 96 m
Speed = 8 m/s

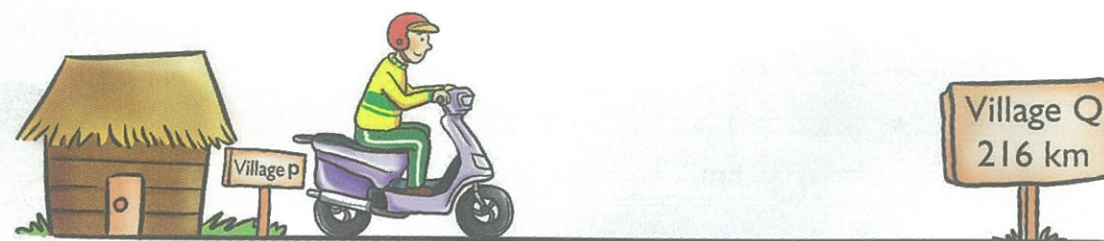
Time = Distance \div Speed

Time = $96 \div 8$
= 12 s

Lek Ming took 12 s to run 96 m.



- 10 The distance between Village P and Village Q is 216 km. Mr Thomas rides his scooter at a speed of 54 km/h. How long will Mr Thomas take to travel from Village P to Village Q?



Method 1

$$\begin{aligned} \text{[] km} &\rightarrow 1 \text{ h} \\ \text{[] km} &\rightarrow \text{[] h} \end{aligned}$$

Mr Thomas will take [] h to travel from Village P to Village Q.


Method 2

$$\begin{aligned} \text{Distance} &= \text{[] km} \\ \text{Speed} &= \text{[] km/h} \\ \text{Time} &= \text{Distance} \div \text{Speed} \\ &= \text{[] h} \end{aligned}$$

$$\text{Speed} = \text{[] km/h}$$

Mr Thomas will take [] h to travel from Village P to Village Q.



- 11  Farrah ran from her home to a beach at a speed of 18 m/s. The distance between her home and the beach was 1008 m.

- How long would she take to run from her home to the beach?
- If she wanted to take 14 s less to reach the beach, at what speed must she run?

$$\begin{aligned} \text{a Time} &= \text{Distance} \div \text{Speed} \\ &= \text{[]} \div \text{[]} \\ &= \text{[] s} \end{aligned}$$

Farrah took [] s to run from her home to the beach.

$$\begin{aligned} \text{b Time} &= \text{[]} - 14 \\ &= \text{[] s} \\ \text{Speed} &= \text{Distance} \div \text{Time} \\ &= \text{[]} \div \text{[]} \\ &= \text{[] m/s} \end{aligned}$$

Farrah must run at a speed of [] m/s if she wants to take 14 s less to reach the beach.

Let's Explore!




Work in groups of four.

Your teacher will provide each group with a stopwatch and some round objects of different sizes.

- On the floor, mark out two points, X and Y. The two points should be 100 cm apart.



- Roll each object from X to Y. Use the stopwatch to find the time taken for each object to roll from X to Y. Record the time correct to the nearest second in a table.

- 3  Calculate the speed of each object. What do you observe about the speed of the object and size of the object?

Example:


Object	Distance (cm)	Time taken (s)	Speed (cm/s) (Distance ÷ Time)
A	100	<input type="text"/>	<input type="text"/>
B	100	<input type="text"/>	<input type="text"/>
C	100	<input type="text"/>	<input type="text"/>
D	100	<input type="text"/>	<input type="text"/>
E	100	<input type="text"/>	<input type="text"/>


- 4 Which object rolled the fastest and which object rolled the slowest?
- 5 Explain the meaning of speed to your partner.

Let's Practise! 7a



Solve these word problems. Show your working clearly.

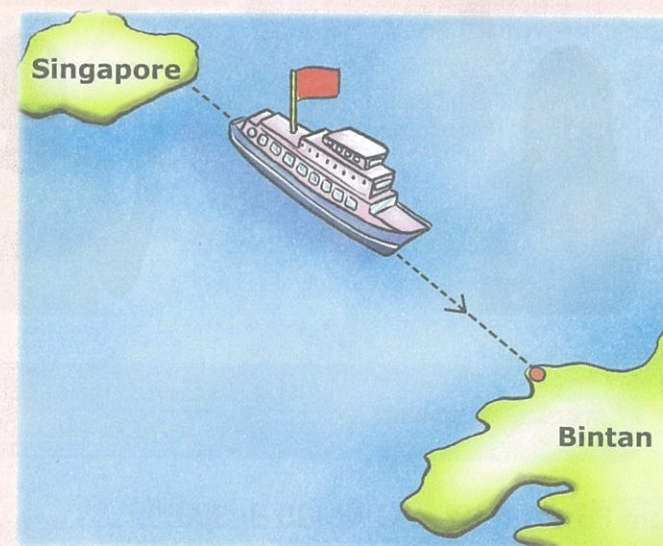
- 1 A motorist takes 80 minutes to travel 120 km. Find his speed.
- 2 Aishah accidentally releases the balloon she is holding. It rises 42 m in 8 seconds. What is the speed at which the balloon rises?
- 3 A parachutist falls at a speed of 3200 m/min. What is the distance the parachutist falls in 4 minutes?
- 4  A bat can fly at a speed of 48 km/h. How many minutes will it take to fly a distance of 8 km?

- 5  Da Ming walks from his school to his house at a speed of 5 km/h. He takes 20 minutes to reach home. What is the distance between his school and his house? Give your answer correct to 2 decimal places. (Hint: Convert the time from minutes to hour.)

- 6  A car travelled at a speed of 54 km/h for $3\frac{1}{4}$ h. Find the distance travelled.

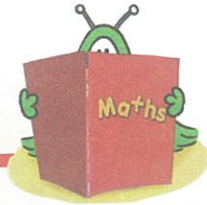
- 7  The distance between Singapore and Bintan is 45 km.

- a If a ferry travels at a speed of 60 km/h, how long will it take to travel from Singapore to Bintan?
- b If the ferry takes 40 min to travel from Singapore to Bintan, what is the speed of the ferry? Leave your answer in km/min. Give your answer correct to 1 decimal place.



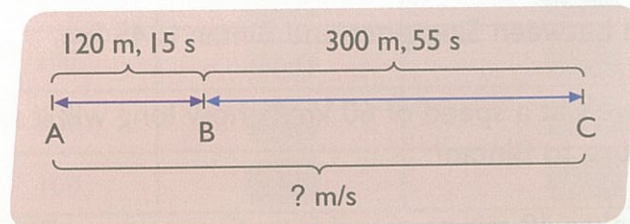
WB 6B, p 1
Practice 1

Let's Learn!



Average Speed

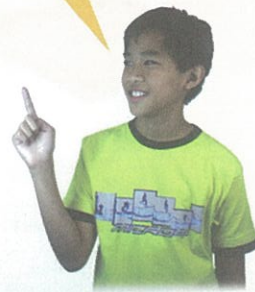
- 1 Post A and Post B are 120 m apart. Post B and Post C are 300 m apart. Budin runs from Post A to Post B in 15 seconds. Then he runs from Post B to Post C in 55 seconds. Find Budin's average speed for the distance from Post A to Post C.



Speed between Post A and Post B is different from speed between Post B and Post C.



Average speed is the average distance travelled per unit time.



$$\text{Average speed} = \frac{\text{Total distance travelled}}{\text{Total time taken}}$$

$$\begin{aligned} \text{Total distance from Post A to Post C} &= 120 + 300 \\ &= 420 \text{ m} \end{aligned}$$

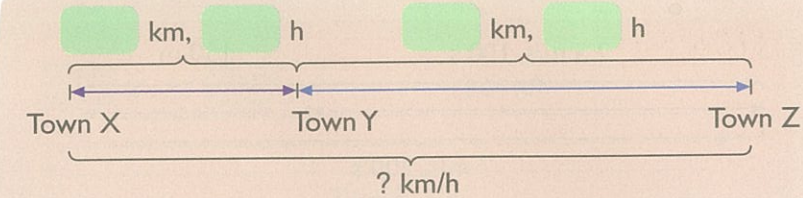
$$\begin{aligned} \text{Total time taken to run from Post A to Post C} &= 15 + 55 \\ &= 70 \text{ s} \end{aligned}$$

$$\begin{aligned} \text{Average speed} &= \frac{\text{Total distance travelled}}{\text{Total time taken}} \\ &= \frac{420}{70} \\ &= 6 \text{ m/s} \end{aligned}$$

Budin's average speed is 6 m/s.

2

- Chee Kean takes 2 hours to drive from Town X to Town Y. He takes another 3 hours to drive from Town Y to Town Z. The distance between Town X and Town Y is 90 km while the distance between Town Y and Town Z is 180 km. What is Chee Kean's average speed for the whole journey?



First, find the total distance.

Then, find the total time.



$$\begin{aligned} \text{Total distance from Town X to Town Z} &= \text{ } + \text{ } \\ &= \text{ } \text{ km} \end{aligned}$$

$$\begin{aligned} \text{Total time to travel from Town X to Town Z} &= \text{ } + \text{ } \\ &= \text{ } \text{ h} \end{aligned}$$

$$\begin{aligned} \text{Average speed} &= \frac{\text{Total distance travelled}}{\text{Total time taken}} \\ &= \frac{\text{ } }{\text{ } } \\ &= \text{ } \text{ km/h} \end{aligned}$$

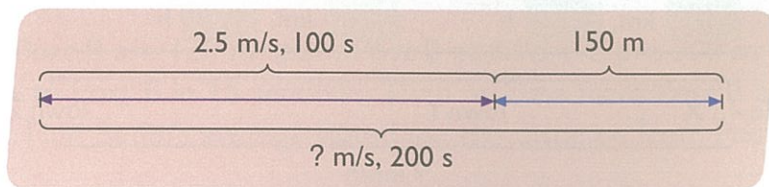
$$\begin{aligned} \text{Average speed} \\ &= \frac{\text{Total distance travelled}}{\text{Total time taken}} \end{aligned}$$

Chee Kean's average speed for the whole journey is $\text{ } \text{ km/h}$.



3 Pushpa swam for 100 seconds at a speed of 2.5 m/s. Then she swam for another 150 m. In total, she took 200 seconds to complete the swim.

- a Find the total distance Pushpa had swum.
- b Find Pushpa's average speed.

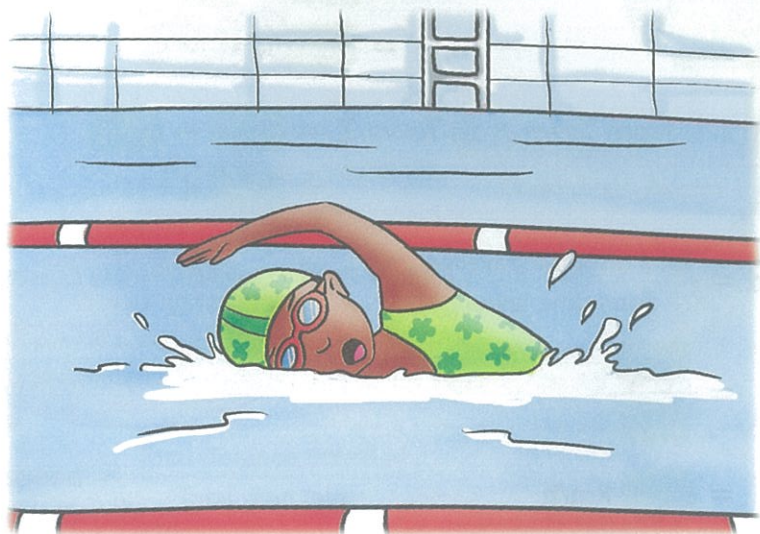


- a For the first part,
Distance swum = 2.5×100
= 250 m
- Total distance swum = $250 + 150$
= 400 m

Distance = Speed \times Time

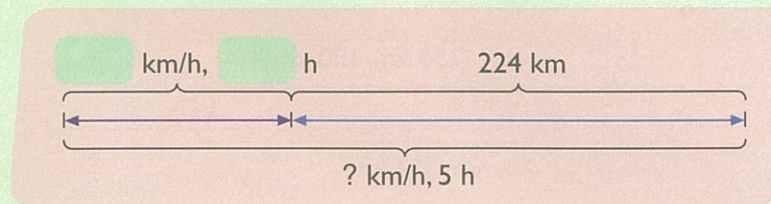
- b Average speed = $\frac{400}{200}$
= 2 m/s

Pushpa's average speed was 2 m/s.



4 Mr Abu drove for $2\frac{1}{5}$ h at a speed of 70 km/h. He then drove another 224 km. He took 5 hours for the whole journey.

- a Find the total distance Mr Abu had driven.
- b What was Mr Abu's average speed for the whole journey?




- a For the first part of the journey,
Distance travelled = $\square \times \square$
= \square km

Total distance travelled = $\square + \square$
= \square km

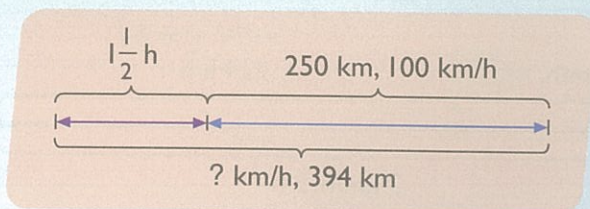
- b Average speed = $\frac{\text{Total distance}}{\text{Total time}}$
= $\frac{\square}{\square}$
= \square km/h

Mr Abu's average speed for the whole journey was \square km/h.

Handwritten calculations:
 $2\frac{1}{5}$
 $70 \times \frac{11}{5} = 154$
 $154 + 224 = 378$

5  A train travelled the first part of a journey in $1\frac{1}{2}$ h. It travelled the remaining 250 km at an average speed of 100 km/h. The total distance travelled was 394 km.

- a Find the total time taken for the journey.
- b Find the average speed of the train for the whole journey.



a For the second part of the journey,

$$\begin{aligned} \text{Time taken} &= \frac{250}{100} \\ &= 2\frac{1}{2} \text{ h} \end{aligned}$$


$$\begin{aligned} \text{Total time taken} &= 1\frac{1}{2} + 2\frac{1}{2} \\ &= 4 \text{ h} \end{aligned}$$

b Average speed = $\frac{\text{Total distance}}{\text{Total time}}$

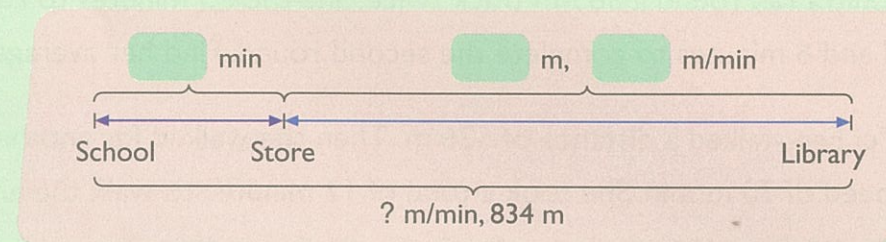
$$\begin{aligned} &= \frac{394}{4} \\ &= 98\frac{1}{2} \text{ km/h} \end{aligned}$$

The average speed of the train for the whole journey was $98\frac{1}{2}$ km/h.



6  Renee took 3 minutes to walk from the school to the store. She walked another 675 m at a speed of 75 m/min from the store to the library. Renee walked a total distance of 834 m.

- a Find the total time taken for the journey.
- b Find Renee's average speed for the whole distance.



a For the second part,

$$\begin{aligned} \text{Time taken} &= \square \div \square \\ &= \square \text{ min} \end{aligned}$$

$$\begin{aligned} \text{Total time taken} &= \square + \square \\ &= \square \text{ min} \end{aligned}$$

b Average speed = $\frac{\text{Total distance}}{\text{Total time}}$



$$\begin{aligned} &= \frac{\square}{\square} \\ &= \square \text{ m/min} \end{aligned}$$

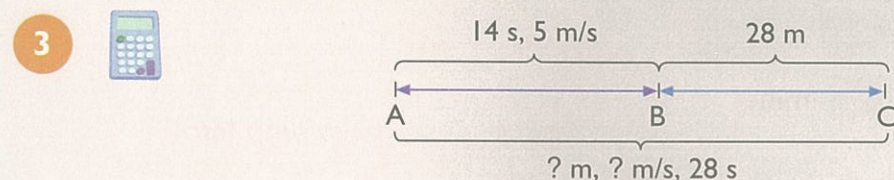
Renee's average speed for the whole distance was \square m/min.

Let's Practise! 7b




Solve these word problems. Show your working clearly.

- 1  Chitra ran round a 385-m track twice. She took 5 minutes to run the first round and 6 minutes to complete the second round. Find her average speed.
- 2  Pei Fen walked a distance of 526 m. Then she walked for another 5 minutes at a speed of 70 m/min. She took a total of 12 minutes to walk the entire distance.
 - a Find the total distance that Pei Fen walked.
 - b What was Pei Fen's average speed for the whole journey?



A ball rolled from Point A to Point B in 14 seconds at a speed of 5 m/s. Then, it rolled a distance of 28 m from Point B to Point C. The ball took 28 seconds altogether to roll from Point A to C.

- a Find the total distance that the ball travelled.
 - b Find the average speed of the ball.
- 4 A boat travelled for 4 hours from Pole A to Pole B. Then it travelled for 3 hours from Pole B back to Pole A. The distance between the two poles was 40 km.
 - a Find the total time taken for the whole journey.
 - b Find the average speed for the whole journey.
- 5  Jerry took $1\frac{1}{3}$ h to cycle from his school to the library. He took another $1\frac{2}{3}$ h to cycle from the library back to his school. The distance between the school and the library was 24 km.
 - a Find the total time taken for the whole journey.
 - b Find the average speed for the whole journey.

WB 6B, p 7
Practice 2



Maths Journal

A car travels from A to B and then to C. The car takes 3 hours to travel from A to B at an average speed of 42 km/h. It travels 128 km from B to C at an average speed of 68 km/h. If the car takes a total of 5 hours, find the average speed of the car travelling from A to C.

Majeed's answer:

$$\begin{aligned} \text{Distance} &= 42 + 68 = 110 \text{ km} \\ \text{Speed} &= 110 \div 2 = 55 \text{ km/h} \end{aligned}$$

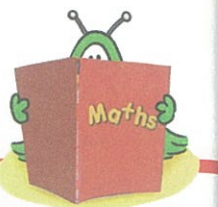
The average speed of the car travelling from A to C is 55 km/h.

Norlan's answer:

$$\begin{aligned} \text{Distance} &= 42 + 68 = 110 \text{ km} \\ \text{Speed} &= 110 \div 5 = 22 \text{ km/h} \end{aligned}$$

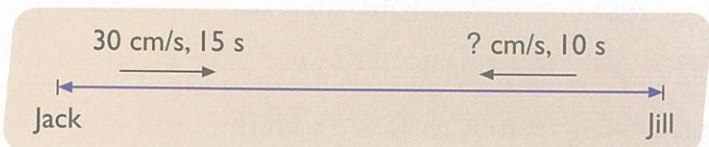
The average speed of the car travelling from A to C is 22 km/h.

Majeed and Norlan made some mistakes in their answers. Find the mistakes and explain where they have gone wrong.



Word Problems

1 Jack and Jill were standing some distance apart. Jack rolled a ball to Jill. It travelled at a speed of 30 cm/s to reach Jill in 15 seconds. Jill then rolled the ball back to Jack. It reached Jack in 10 seconds. Find the speed of the ball as it travelled from Jill to Jack.



First, find the distance between Jack and Jill.

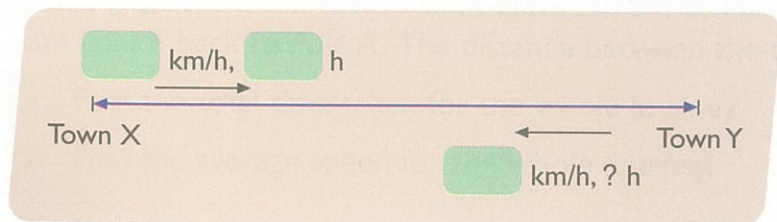


$$\begin{aligned} \text{Distance between Jack and Jill} &= \text{Speed} \times \text{Time} \\ &= 30 \times 15 \\ &= 450 \text{ cm} \end{aligned}$$

$$\begin{aligned} \text{Speed of ball as it rolled from Jill to Jack} &= \text{Distance} \div \text{Time} \\ &= 450 \div 10 \\ &= 45 \text{ cm/s} \end{aligned}$$

The speed of the ball as it travelled from Jill to Jack was 45 cm/s.

2 A man took 4 hours to drive his van from Town X to Town Y at a speed of 50 km/h. On his return journey from Town Y to Town X, he increased the speed to 80 km/h. How long did the man take to reach Town X?



First, find the distance between Town X and Town Y.



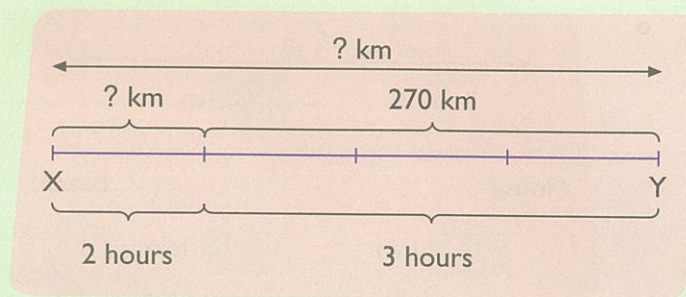
$$\begin{aligned} \text{Distance between Town X and Town Y} &= 50 \times 4 \\ &= 200 \text{ km} \end{aligned}$$

$$\begin{aligned} \text{Time taken to reach Town X from Town Y} &= 200 \div 80 \\ &= 2.5 \text{ h} \end{aligned}$$

The man took 2.5 h to reach Town X.

3 Mr Quek was travelling from Village X to Village Y. He took 2 hours to drive $\frac{1}{4}$ of the journey. He drove the remaining 270 km in 3 hours.

- a Find the total distance that Mr Quek drove.
- b Find the average speed for the whole journey.



- a $3 \text{ units} \rightarrow 270 \text{ km}$
 $1 \text{ unit} \rightarrow \frac{270}{3}$
 $= 90 \text{ km}$
 $4 \text{ units} \rightarrow 4 \times 90$
 $= 360 \text{ km}$

The total distance that Mr Quek drove was 360 km.

- b $\text{Total time taken for the whole journey} = 2 + 3$
 $= 5 \text{ h}$

$$\begin{aligned} \text{Average speed for the whole journey} &= \frac{\text{Total distance}}{\text{Total time}} \\ &= \frac{360}{5} \\ &= 72 \text{ km/h} \end{aligned}$$

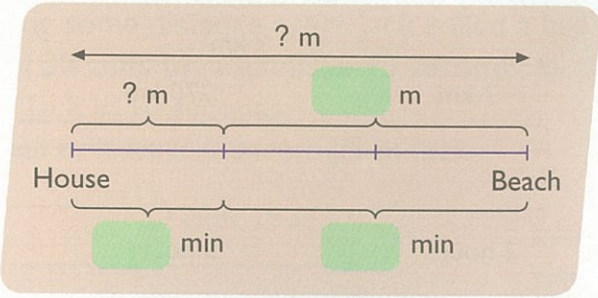
The average speed for the whole journey was 72 km/h.

4



Ramlah cycled from her house to the beach. She took 4 minutes to cycle $\frac{1}{3}$ of the distance and took another 12 minutes to cycle the remaining 1584 m.

- a Find the distance between Ramlah's house and the beach.
- b Find her average speed for the whole journey.



a 2 units \rightarrow m
 1 unit \rightarrow \div 2
 = m
 3 units \rightarrow 3 \times
 = m

The distance between Ramlah's house and the beach was m.

b Total time taken for the whole distance = +
 = min

Average speed for the whole journey = $\frac{\text{Total distance}}{\text{Total time}}$
 = $\frac{\text{input}}{\text{input}}$
 = m/min

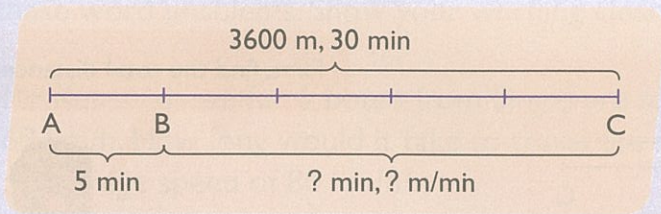
Her average speed for the whole journey was m/min.

5



Choon Ming took 30 minutes to run a distance of 3600 m from A to C. He took 5 minutes to run from A to B, which is $\frac{1}{5}$ of the total distance.

What was his average speed for the remaining distance?



5 units \rightarrow 3600 m
 1 unit \rightarrow $\frac{3600}{5}$
 = 720 m
 4 units \rightarrow 4 \times 720
 = 2880 m

Distance between B and C = 2880 m

Time taken to run from B to C = 30 - 5
 = 25 min

Average speed for the remaining distance = $\frac{\text{Distance}}{\text{Time}}$
 = $\frac{2880}{25}$
 = $115\frac{1}{5}$ m/min

His average speed for the remaining distance was $115\frac{1}{5}$ m/min.



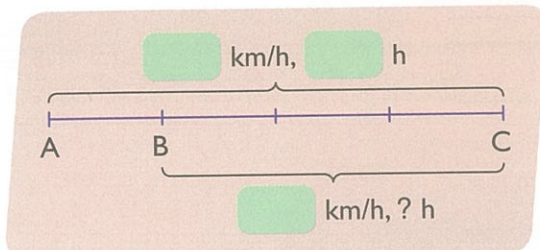
Get your child to find his average speed for his 1.6 km run.



Let's Practise! 7c

6

A lorry travelled for 5 hours from Factory A to Factory C at an average speed of 64 km/h. It travelled from Factory B to Factory C at an average speed of 80 km/h. If the distance between Factory A and Factory B is $\frac{1}{4}$ of the total distance between Factory A and Factory C, how long did the lorry take to travel from Factory B to Factory C?



First, find the total distance.



$$\begin{aligned} \text{Distance from Factory A to Factory C} &= \text{[]} \times \text{[]} \\ &= \text{[] km} \end{aligned}$$

$$\text{[] units} \rightarrow \text{[] km}$$

$$1 \text{ unit} \rightarrow \frac{\text{[]}}{\text{[]}} = \text{[] km}$$

$$3 \text{ units} \rightarrow \text{[]} \times \text{[]} = \text{[] km}$$

$$\text{Distance between Factory B and Factory C} = \text{[] km}$$

$$\text{Time taken to travel from Factory B to Factory C} = \text{[]} \div \text{[]} = \text{[] h}$$

The lorry took [] h to travel from Factory B to Factory C.

7 Carry out this activity.



Draw diagrams to show the following.

- Samad walked from his home to the zoo at an average speed of $4\frac{1}{2}$ km/h for $\frac{1}{2}$ h. Then he walked back home with an average speed of $3\frac{4}{5}$ km/h.
- Chin Fong took 20 minutes to run from Post A to Post B over a distance of 760 m. He took 4 minutes to run $\frac{1}{5}$ of the journey.

Solve these word problems. Show your working clearly.

- Mr Kumar drove for 5 hours from Singapore to Malacca at an average speed of 60 km/h. How long would it take to travel the same distance if Mr Kumar drove at an average speed of 80 km/h?
- Selena took 20 seconds to swim from Point A to Point B at a speed of 4.5 m/s. She took 18 seconds to swim back from Point B to Point A. Find Selena's average speed when she swam from Point B to Point A.
- Mrs Leong took 1 hour to drive $\frac{1}{5}$ of a journey from Village R to Village S. She drove the remaining 180 km in 4 hours.
 - What was Mrs Leong's speed for the first part of the journey?
 - How long did she take to travel the whole journey?
 - Find Mrs Leong's average speed for the whole journey.
- Fauziah took 30 minutes to cycle from her house to the cinema. If she cycled the first 3 km of the journey at a speed of 150 m/min, find her average speed for the remaining 3 km of the journey.
- A motorist took a total of 4 hours to drive from Town A to Town C. He took 1 hour to travel from Town A to Town B, which is between Town A and Town C. The distance between Town B and Town C is $\frac{11}{15}$ of the distance between Town A and Town C. If the total distance travelled is 360 km, find the motorist's speed for the journey from Town B to Town C.
- Mr Roberts drove a distance of 118 km from City X to City Y. At first, he drove at a speed of 60 km/h. Then he drove for $1\frac{1}{4}$ h to City Y, covering a distance of 70 km. If Mr Roberts left City X at 14 00, at what time did he arrive at City Y?

Let's Wrap It Up!



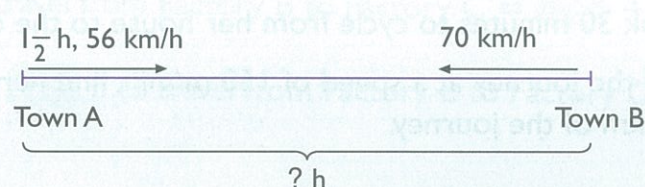
You have learnt to:

- calculate speed, distance and time given the other 2 quantities
- use the formula:
 - **Speed = Distance ÷ Time**
 - **Distance = Speed × Time**
 - **Time = Distance ÷ Speed**
- find average speed
- read, interpret and write speed in different units: km/h, m/min, m/s and cm/s
- draw diagrams to solve word problems in speed

Let's revise!



Jane took $1\frac{1}{2}$ h to travel from Town A to Town B at an average speed of 56 km/h. She rested for $\frac{3}{10}$ h at Town B. On her return journey, she increased her speed to 70 km/h.



- a Find the distance between Town A and B.

$$\begin{aligned} \text{Distance between Town A and Town B} &= 1\frac{1}{2} \times 56 \\ &= 84 \text{ km} \end{aligned}$$

- b Find the time taken on the return journey.

$$\begin{aligned} \text{Time taken from Town B to Town A} &= 84 \div 70 \\ &= 1\frac{1}{5} \text{ h} \end{aligned}$$

- c Find her total time taken for the whole journey.

$$\begin{aligned} \text{Total time taken for the whole journey} &= 1\frac{1}{2} + 1\frac{1}{5} + \frac{3}{10} \\ &= 3 \text{ h} \end{aligned}$$



Put On Your Thinking Caps!



Jessie and Kamal cycled 3.5 km from the school to the library along the same route. When she arrived at the library at 11 15, Kamal was 1.5 km away from the library. If Kamal cycled at an average speed of 15 km/h, at what time did he leave the school?

WB 6B, p 16
Challenging Practice

WB 6B, p 18
Problem Solving