

1

Rates

Syllabus topic — M4 Rates

This topic focuses on the use of rates to solve problems in practical contexts.

Outcomes

- Use, simplify and convert between units of rates.
- Use rates to make comparisons such as best buys.
- Use rates to determine costs.
- Use rates to solve problems related to speed, distance and time.
- Calculate the fuel consumption rate.
- Solve problems involving heart rates and blood pressure.
- Describe heart rate as a rate expressed in beats per minute.
- Calculate target heart rate ranges.
- Express blood pressure using measures of systolic pressure and diastolic pressure.

Digital Resources for this chapter

In the Interactive Textbook:

- Videos
- Literacy worksheet
- Quick Quiz
- Solutions (enabled by teacher)
- Desmos widgets
- Spreadsheets
- Study guide

In the Online Teaching Suite:

- Teaching Program
- Tests
- Review Quiz
- Teaching Notes



Knowledge check

The Interactive Textbook provides a test of prior knowledge for this chapter, and may direct you to revision from the previous years' work.

1A Rates

Rates

A rate is a comparison of amounts with different units. For example, we may compare the distance travelled with the time taken. In a rate the units are different and must be specified.

The order of a rate is important. A rate is written as the first amount per one of the second amount. For example, \$2.99/kg represents \$2.99 per one kilogram or 80 km/h represents 80 kilometres per one hour.

We are constantly interested in rates of change and how things change over a period of time. There are many examples of rates such as:

- Growth rate: The average growth rate of a child from 0 to 15 years of age.
- Running rate: Your running pace in metres per second.
- Typing rate: Your typing speed in words per minute.
- Wage rate: The amount of money you are paid per hour.



CONVERTING A RATE

- 1 Write the rate as a fraction. First quantity is the numerator and 1 is the denominator.
- 2 Convert the first amount to the required unit.
- 3 Convert the second amount to the required unit.
- 4 Simplify the fraction.



Example 1: Converting a rate

1A

Convert each rate to the units shown.

a 55 200 m/h to m/min

b \$6.50/kg to c/g

SOLUTION:

- 1 Write the rate as a fraction.
- 2 The numerator is 55 200m and the denominator is 1 h.
- 3 No conversion required for the numerator.
- 4 Convert the 1 hour to minutes by multiplying by 60.
- 5 Simplify the fraction.
- 6 Write the rate as a fraction.
- 7 The numerator is \$6.50 and the denominator is 1 kg.
- 8 Convert the \$6.50 to cents by multiplying by 100.
- 9 Convert the 1 kg to g by multiplying by 1000.
- 10 Simplify the fraction.

$$\begin{aligned}
 \text{a } 55\,200 &= \frac{55\,200 \text{ m}}{1 \text{ h}} \\
 &= \frac{55\,200 \text{ m}}{1 \times 60 \text{ min}} \\
 &= 920 \text{ m/min} \\
 \text{b } 6.50 &= \frac{\$6.50}{1 \text{ kg}} \\
 &= \frac{6.50 \times 100 \text{ c}}{1 \times 1000 \text{ g}} \\
 &= 0.65 \text{ c/g}
 \end{aligned}$$

Exercise 1A

1 Which of the following are examples of rates?

- | | |
|----------|-----------------------|
| a \$7.50 | b 150 mL/min |
| c \$80/h | d 500 cm ² |
| e 7/22 | f \$1.54/L |

Example 1

2 Convert to the rate shown.

- | | |
|--|---|
| a \$100 in 4 h is a rate of \$□/h | b 240 m in 20 s is a rate of □ m/s |
| c 700 L in 10 h is a rate of L□/h | d \$39 in 12 h is a rate of \$□/h |
| e \$1.20 for 2 kg is a rate of □ c/kg | f 630 km in 60 L is a rate of □ km/L |
| g 1200 rev in 4 min is a rate of □ rev/min | h A rise of 20° in 4 h is a rate of □ °/h |
| i 275 m in 25 s is a rate of □ m/s | j 630 L in 9 h is a rate of □ L/h |

3 Express each rate in simplest form using the rates shown.

- | | |
|---|--------------------------------|
| a 300 km on 60 L [km per L] | b 15 m in 10 s [cm per s] |
| c \$640 for 5 m [\$ per m] | d 56 L in 0.5 min [L per min] |
| e 78 mg for 13 g [mg per g] | f 196 g for 14 L [g per L] |
| g 20 g for 8 m ² [g per m ²] | h 75 mL for 5 min [mL per min] |
| i \$1.80 for 9 phone calls [c/call] | j \$630 for 36 h work [\$ /h] |

4 Write each of the following as a simplified rate.

- | | |
|-----------------------------------|------------------------------------|
| a 18 goals in 3 games | b 12 days in 4 years |
| c \$1.50 for 5 kilograms | d \$180 in 6 hours |
| e 49 500 cans in 11 hours | f \$126 000 to purchase 9 hectares |
| g 80 mm rainfall in 5 days | h 19 000 revolutions in 10 minutes |
| i 15 kilometres run in 60 minutes | j 60 minutes to run 15 kilometres |

5 Convert each rate to the units shown.

- | | |
|----------------------|----------------------|
| a 39 240 m/min [m/s] | b 2 m/s [cm/s] |
| c 88 cm/h [mm/h] | d 55 200 m/h [m/min] |
| e 0.4 km/s [m/s] | f 57.5 m/s [km/s] |
| g 6.09 g/mL [mg/mL] | h 4800 L/kL [mL/kL] |
| i 300 m/s [cm/s] | j 36 km/h [km/min] |

6 A dripping tap filled a 9 litre bucket in 3 hours.

- a What was the dripping rate of the tap in litres/hour?
- b How long would it take the tap to fill a 21 litre bucket?

- 7** If 30 kebabs were bought to feed 20 people at a picnic, and the total cost was \$120, find the following rates.
- a** kebabs/person
 - b** cost/person

- 8** The number of hours of sunshine was recorded each day for one week in May. The results were:

Monday 6 hours

Tuesday 8 hours

Wednesday 3 hours

Thursday 5 hours

Friday 7 hours

Saturday 6 hours

Sunday 7 hours

Find the average number of hours of sunshine:

a per weekday

b per weekend day

c per week

d per day.



- 9** Sebastian finished a 10 kilometre race in 37 minutes and 30 seconds. Alexander finished a 15 kilometre race in 53 minutes and 15 seconds. Calculate the running rate of each runner expressed as minutes per kilometre.
- 10** A football club had 12000 members. After five successful years and two premierships, they now have 18000 members. What has been the average rate of membership growth per year for the past 5 years?

1B The unitary method

The unitary method involves finding one unit of an amount by division. This result is then multiplied to solve the problem. The unitary method is often used to make comparisons.

USING THE UNITARY METHOD

- 1 Find one unit of an amount by dividing by the amount.
- 2 Multiply the result in step 1 by a number to solve the problem.



Example 2: Using the unitary method

1B

A car travels 360km on 30L of petrol. How far does it travel on 7L?

SOLUTION:

- | | |
|---|--|
| 1 Write a statement using information from the question. | $30\text{ L} = 360\text{ km}$ |
| 2 Find 1 L of petrol by dividing 360km by the amount or 30. | $1\text{ L} = \frac{360}{30}\text{ km}$ |
| 3 Multiply both sides by 7. | $7\text{ L} = \frac{360}{30} \times 7\text{ km}$ |
| 4 Evaluate to an appropriate degree of accuracy. | $= 84\text{ km}$ |
| 5 Write the answer in words. | The car travels 84km. |



Example 3: Using the unitary method

1B

- a Bella can touch type at 70 words per minute. How many words can she type in 20 minutes?
- b A brand of 400mL soft drink cans sell singly for \$2.40, in a six-pack for \$11.95, or in a carton of 24 for \$39.95. Compare the cost of one can in each option, to the nearest cent.
- c What is the cost of 14 cans of the soft drink at the cheapest option?

SOLUTION:

- | | |
|--|--|
| 1 Typing rate is 70 words in one minute. | a Number of words = 70×20 |
| 2 Multiply 70 by 20 to determine the number of words typed in 20 minutes. | $= 1400$ |
| 3 Write your answer in words. | Bella types 1400 words in 20 minutes. |
| 4 Write down the price of a single can. | b \$2.40 |
| 5 Find the cost of one can in a six-pack by dividing its price by 6, and rounding to the nearest cent. | $\$11.95 \div 6 \approx \1.99 |
| 6 Find the cost of one can in a carton by dividing its price by 24, and rounding to the nearest cent. | $\$39.95 \div 24 \approx \1.66 |
| 7 Write the answer in words. | A can costs \$2.40 bought singly, \$1.99 each in a six-pack and \$1.66 each in a carton. |
| 8 Look for the cheapest can and multiply by 14. | c $\$1.66 \times 14 = \23.24 |
| 9 Write the answer in words. | 14 cans at the cheapest price option will cost \$23.24 |

Exercise 1B

Example 2, 3

- 1 Use the rate provided to answer the following questions.
 - a Cost of apples is \$2.50/kg. What is the cost of 5 kg?
 - b Tax charge is \$28/m². What is the tax for 7 m²?
 - c Cost savings are \$35/day. How much is saved in 5 days?
 - d Cost of a chemical is \$65/100 mL. What is the cost of 300 mL?
 - e Cost of mushrooms is \$5.80/kg. What is the cost of $\frac{1}{2}$ kg?
 - f Distance travelled is 1.2 km/min. What is the distance travelled in 30 minutes?
 - g Concentration of a chemical is 3 mL/L. How many mL of the chemical is needed for 4 L?
 - h Concentration of a drug is 2 mL/g. How many mL is needed for 10 g?
 - 2 A cricket team scores runs at a rate of 5 runs/over in a match. How many runs are scored in 18 overs?
- 
- 3 If one dozen tennis balls cost \$9.60, how much would 22 tennis balls cost?
 - 4 If Leo can march at 7 km/h, how far can he march in 2.5 hours?
 - 5 If 8 kg of chicken fillets cost \$72, how much would 3 kg of chicken fillets cost?
 - 6 If three pairs of socks cost \$12.99, how much would 10 pairs of socks cost?
 - 7 If 500 g of mincemeat costs \$4.50, how much would 4 kg of mincemeat cost?
 - 8 A courier delivers 1 parcel on average every 20 minutes. How many hours does it take to deliver 18 parcels?
 - 9 Water is dripping from a tap at a rate of 5 L/h. How much water will leak in one day?
 - 10 A bulldozer is moving soil at a rate of 22 t/h. How long will it take at this rate to move 55 tonnes?
 - 11 Edward saves \$40/week, how long should it take to save \$1000?
 - 12 A professional footballer scores an average of 3 goals every 6 games. How many goals is he likely to score in a full season of 22 games?
 - 13 A computer processor can process 500 000 kilobytes of information in 4 seconds. How much information can it process in 15 seconds?

1C Using rates to make comparisons

Rates are used to solve practical problems such as calculating wages, best buy and costs.



Example 4: Using rates to calculate the best buy

1C

Which is the best buy: Option 1: 12 rose plants for \$195, or Option 2: 10 rose plants for \$162?

SOLUTION:

- | | |
|--|-----------------------------------|
| 1 Find the unit cost for option 1. | Option 1: 12 plants = \$195 |
| 2 Divide the cost of 12 plants (\$195) by the 12. | 1 plant = \$16.25 |
| 3 Find the unit cost for option 2. | Option 2: 10 plants = \$162 |
| 4 Divide the cost of 120 plants (\$162) by the 10. | 1 plant = \$16.20 |
| 5 Option 2 has the lowest cost; write the answer. | $\therefore$ Best buy is option 2 |



Example 5: Using rates to determine costs

1C

Alice's mobile phone contract charges a flagfall of \$0.25 and a call rate of \$0.45 per 30 seconds.

- a** What is the charge if Alice makes a 2 minute call?
b What is the charge if Alice made 200 calls of duration less than 30 seconds?

SOLUTION:

- | | |
|---|--|
| 1 Start with the flagfall. 2 minutes is 120 seconds. Divide 120 by 30 to find number of 30 second blocks. Evaluate. | a Charge = $(0.25 + (120 \div 30) \times 0.45)$
= \$2.05 |
| 2 Write the answer in words. | $\therefore$ Alice is charged \$2.05. |
| 3 Add the flagfall to the rate charge for each call. | b Charge = $(0.25 + 0.45) \times 200$ |
| 4 Multiply calculation by 200. Evaluate. | = \$140 |
| 5 Write the answer in words. | $\therefore$ Alice is charged \$140 for the calls. |



Example 6: Using rates to calculate wages

1C

Hamish works for a building construction company. Find Hamish's wage for 35 hours at the normal rate of \$22 an hour, 3 hours at time-and-a-half rates and 1 hour at double time rates.

SOLUTION:

- | | |
|--|---|
| 1 Write the quantity to be found. | Wage = normal + $1.5 \times$ time + $2 \times$ time |
| 2 Normal wage is 35 multiplied by \$22. | Wage = (35×22) normal pay |
| 3 Payment for time-and-a-half is 3 multiplied by \$22 multiplied by 1.5. | + $(3 \times 22 \times 1.5)$ time-and-a-half pay |
| 4 Payment for double time is 1 multiplied by \$22 multiplied by 2. Evaluate. | + $(1 \times 22 \times 2)$ double time pay |
| 5 Write your answer in words. | = \$913.00 |
| | $\therefore$ Hamish's wage is \$913. |

Exercise 1C

Example 4

- 1** Calculate the best buy between option 1 and 2.

a Option 1: 6 calculators for \$126	Option 2: 24 calculators for \$552
b Option 1: 21 g for \$8.61	Option 2: 27 g for \$15.39
c Option 1: \$16.92 for 36L	Option 2: \$4.68 for 12L
d Option 1: 5 batteries for \$8.00	Option 2: 12 batteries for \$14.76
e Option 1: 22 pens for \$8.36	Option 2: 30 pens for \$10.80
f Option 1: \$598 for 23 pairs of shoes	Option 2: \$891 for 33 pairs of shoes
g Option 1: 36 chocolate bars for \$66.60	Option 2: 20 chocolate bars for \$35
h Option 1: 19kg for \$37.62	Option 2: 28kg for \$49.56
i Option 1: 10L of soft drink for \$6.20	Option 2: 3L of soft drink for \$1.89
j Option 1: 9 g for \$4.77	Option 2: 24 g for \$10.08

- 2** A breakfast cereal is sold in boxes of three different sizes:
small (400 g) for \$5.00, medium (600 g) for \$7.20, large (750 g) for \$8.25
- a** Find the value of each box in \$/100g.
- b** What is the cheapest way to buy a minimum of 3 kg of the cereal?

Example 5

- 3** Xavier has a mobile phone contract that charges a flagfall of \$0.30 and a call rate of \$0.43 per 30 seconds.
- a** What the charge if Xavier makes a 30 second call?
- b** What the charge if Xavier makes a 2 minute call?
- c** What the charge if Xavier makes a 5 minute call?
- d** What the charge if Xavier made 100 calls whose duration was less than 30 seconds?
- e** What the charge if Xavier made 50 calls whose duration was less than 60 seconds?
- 4** A mobile phone plan has a monthly charge of \$59 on a 24 month contract. In addition, the calls are charged at a rate of \$0.90 per 60 second block with a \$0.35 connection fee.
- a** What is the charge for a call lasting 1 minute?
- b** What is the charge for a call lasting 2 minutes?
- c** What is the charge for a call lasting 3 minutes and 30 seconds?
- d** What is the charge for a call lasting 4 minutes and 20 seconds?
- e** Determine the monthly charge for making 40 calls (60 seconds)
- f** Determine the monthly charge for making 90 calls (60 seconds)

- 5 Nails cost \$4.80/kg. How many kilograms can be bought for \$30?
- 6 Natural gas is charged at a rate of \$0.014 per MJ.
 - a Find the charge for 12 500 MJ of natural gas. Answer to the nearest dollar.
 - b Find the charge for 16 654 MJ of natural gas. Answer to the nearest dollar.
- 7 Olivia pays council rates of \$2915 p.a. for land valued at \$265 000. Lucy pays council rates of \$3186 on land worth \$295 000 from another council.
 - a What is Olivia's council charge as a rate \$/\$1000 valuation?
 - b What is Lucy's council charge as a rate \$/\$1000 valuation?

Example 6

- 8 Ryan works as a builder and charges \$45.50 an hour. How much does he earn for working the following hours?
 - a 35 hours
 - b 37 hours
 - c 40 hours
 - d 42 hours



- 9 Nathan is a plumber who earned \$477 for a days work. He is paid \$53 per hour. How many hours did Zachary work on this day?
- 10 Mia is an apprentice electrician who earns \$37.50 per hour.
 - a How much a does Mia earn for working a 9-hour day?
 - b How many hours does Mia work to earn \$1200?
 - c What is Mia's annual income if she works 40 hours a week? Assume she works 52 weeks in the year.
- 11 Elizabeth is a hairdresser who earns \$24.20 per hour. She works an 8-hour day.
 - a How much does Elizabeth earn per day?
 - b How much does Elizabeth earn per week? Assume she works 5 days a week.
 - c How much does Elizabeth earn per fortnight?
 - d How much does Elizabeth earn per year? Assume 52 weeks in the year.
- 12 Logan earns \$32.50 an hour as a driver. He works 38 hours a week at normal time and 5 hours a week at double time. Find his weekly wage. Answer correct to the nearest cent.
- 13 Grace is a casual who worked 8 hours at normal time and 2 hours at time-and-a-half. Her normal rate of pay is \$12.30 per hour. What is her pay for the above time?

1D Speed as a rate

Speed is a rate that compares the distance travelled to the time taken. The speed of a car is measured in kilometres per hour (km/h). The speedometer in a car measures the instantaneous speed of the car. They are not totally accurate but have a tolerance of about 5%. GPS devices are capable of showing speed readings based on the distance travelled per one-hertz interval. Most cars also have an odometer to indicate the distance travelled by a vehicle.



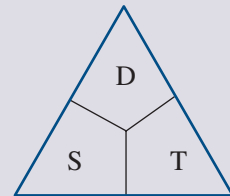
SPEED

$$S = \frac{D}{T} \quad \text{or} \quad T = \frac{D}{S} \quad \text{or} \quad D = S \times T$$

D – Distance

S – Speed

T – Time



Example 7: Solving problems involving speed

1D

- Find the average speed of a car that travels 341 km in 5 hours.
- How long will it take a vehicle to travel 294 km at a speed of 56 km/h?

SOLUTION:

1 Write the formula.

2 Substitute 341 for D and 5 for T into the formula.

3 Evaluate.

4 Write the formula.

5 Substitute 294 for D and 56 for S into the formula.

6 Evaluate and express the answer correct to the nearest hour.

$$\begin{aligned} \mathbf{a} \quad S &= \frac{D}{T} \\ &= \frac{341}{5} \\ &= 68.2 \text{ km/h} \end{aligned}$$

$$\begin{aligned} \mathbf{b} \quad T &= \frac{D}{S} \\ &= \frac{294}{56} \\ &= 5.25 \text{ h or } 5 \text{ h } 15 \text{ min} \end{aligned}$$

Exercise 1D

Example 7

- 1** Find the average speed (in km/h) of a vehicle which travels:

a 160 km in 2 hours c 280 km in 3.5 hours e 432 km in $4\frac{1}{2}$ hours	b 582 km in 6 hours d 22 km in $\frac{1}{4}$ hour f 18 km in 20 minutes
---	--

- 2** Find the distance travelled by a car whose average speed is 62 km/h if the journey lasts for the following time. (Answer correct to the nearest kilometre.)

a 4 hours c 2.6 hours e $3\frac{1}{2}$ hours	b 5 hours d $1\frac{1}{4}$ hour f $2\frac{3}{4}$ hour
---	--

- 3** How long will it take a vehicle to travel (correct to the nearest hour):

a 240 km at a speed of 80 km/h? c 160 km at a speed of 48 km/h? e 240 km at a speed of 40 km/h?	b 175 km at a speed of 70 km/h? d 225 km at a speed of 45 km/h? f 556 km at a speed of 69.5 km/h?
--	--

- 4** The Melbourne Formula 1 track is 5.303 km in length. The track record is 1 minute and 24 seconds.

a What is the track record in hours? b What is the average speed (km/h) for the lap record? Answer correct to two decimal places.	
--	--

- 5** Emily lives in Wollongong and travels to Sydney daily. The car trip requires her to travel at different speeds. Most often she travels 30 kilometres at 60 km/h and 40 kilometres at 100 km/h.

a What is the total distance of the trip? b How long (in hours) does the trip take? c What is her average speed (in km/h) when travelling to Sydney? (Answer correct to two decimal places.)	
---	--

- 6** Thomas drives his car to work 3 days a week. The distance of the trip is 48 km. The trip took 43 minutes on Monday, 50 minutes on Tuesday and 42 minutes on Wednesday.

a Calculate the average time taken to travel to work. b What is the average speed (in km/h) for the three trips?	
---	--

- 7** Use the information provided on speed to answer the following questions.
- a** Walking at 5 km/h. How far can I walk in 4 hours?
 - b** Car travelling at 80 km/h. How far will it travel in 2.5 hours?
 - c** Plane is travelling at 600 km/h. How far will it travel in 30 minutes?
 - d** A train took 7 hours to travel 665 km. What was its average speed?
 - e** Ryder runs a 42.4 km marathon in 2 hours 30 minutes. Calculate his average speed.
 - f** A spacecraft travels at 1700 km/h for a distance of 238 000 km. How many hours did it take?
- 8** Alexandra jogs 100 metres in 20 seconds. How many seconds would it take her to jog one kilometre?
- 9** A car travels at a rate of 50 metres each second. How many kilometres does it travel in:
- a** one minute?
 - b** one hour?
- 10** Convert the following speeds to metres per second. Answer to the nearest whole number.
- a** 60 km/h
 - b** 260 km/h
- 11** An athlete runs 100 metres in 10 seconds. If he could continue at this rate, what is his speed in kilometres per hour?
- 12** A snail travelling at a constant speed travels 400 mm in 8 minutes. How far does it travel in 7 minutes?
- 13** Find the average speed (in km/h to the nearest whole number) of a vehicle which travels:
- a** 350 km in 1 hour and 30 minutes
 - b** 600 km in 2 hours and 15 minutes
 - c** 500 km in 6 hours and 10 minutes
 - d** 64 km in 1 hour and 30 seconds
 - e** 36 000 m in 45 minutes
 - f** 320 m in 10 seconds.
- 14** Find the distances travelled by a car whose average speed is 68 km/h if the journeys last for the following times. (Answer correct to the nearest kilometre.)
- a** 3 hours 15 minutes
 - b** 5 hours and 30 minutes
 - c** 30 minutes
 - d** 2 minutes
 - e** 1 hour and 20 minutes
 - f** 4 hours and 10 seconds
- 15** Find how long will it take a vehicle to travel (correct to the nearest minute):
- a** 450 km at a speed of 82 km/h
 - b** 50 km at a speed of 60 km/h
 - c** 250 km at a speed of 49 km/h
 - d** 580 000 m at a speed of 62 km/h
 - e** 24 000 m at a speed of 72 km/h
 - f** 100 km at a speed of 1 km/min.

1E Distance–time graphs

A distance–time graph describes a journey involving different events. Each event is a line segment on the distance–time graph and represents travelling at a constant speed. The steeper the line segment the faster the object is travelling. If the distance–time graph has a horizontal line then the object is not moving or is at rest.

DISTANCE–TIME GRAPHS

Line graph with time on the horizontal axis and distance on the vertical axis.

- 1 Gradient of the line = $\frac{\text{Vertical rise}}{\text{Horizontal run}} = \frac{\text{Distance}}{\text{Time}} = \text{Speed}$
- 2 The steepness of a line (or gradient) indicates the speed of the object.
- 3 A horizontal line indicates that the object is stationary or not moving.



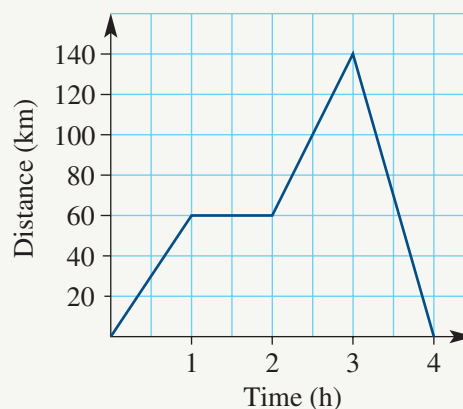
Example 8: Reading a distance–time graph

1E

The distance–time graph describes a car trip taken last Sunday.

- a How long was the rest stop?
- b How far did the car travel from its starting point?
- c What was the total distance travelled?
- d Determine the average speed during the first hour of the trip.

Distance–time graph of a car trip

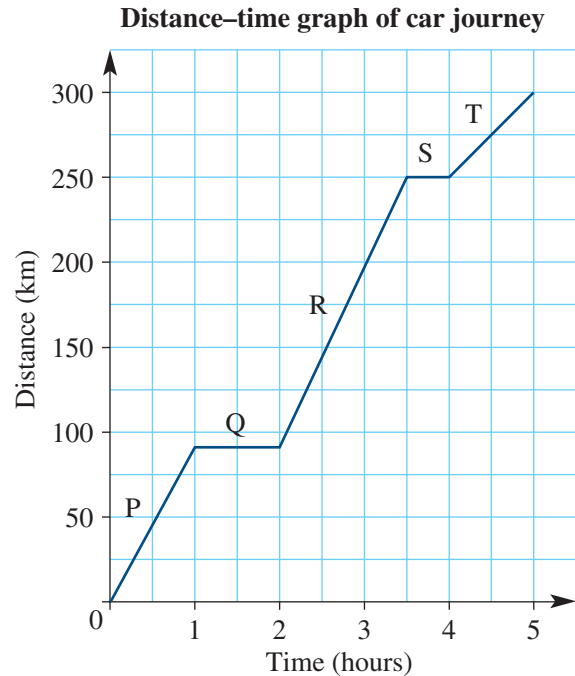


SOLUTION:

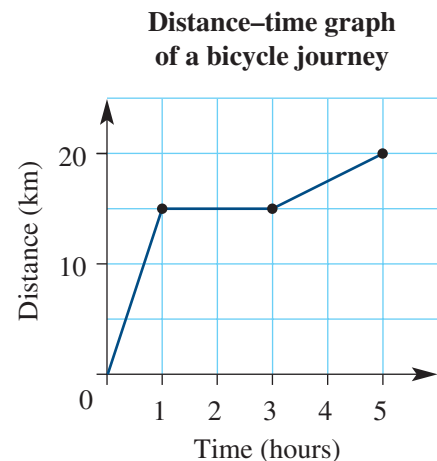
- | | |
|---|--|
| <ol style="list-style-type: none"> 1 Car is at rest when it is not travelling (horizontal line). 2 Largest value for distance. (140 km) 3 The car has travelled on a trip of 140 km and returned. 4 Average speed is distanced travelled divided by the time taken. | <ol style="list-style-type: none"> a Time for rest stop is 1 hour. b Distance is 140 km. c Total distance = 140×2
= 280 km d $S = \frac{D}{T}$
= $\frac{60}{1}$
= 60 km/h
∴ Average speed is 60 km/h |
|---|--|

Exercise 1E

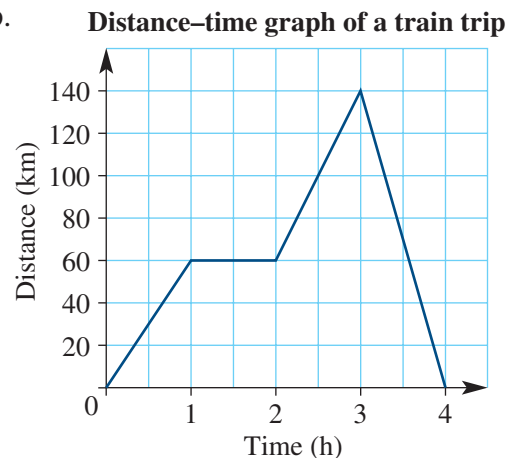
- 1 A car journey of 300km takes 5 hours. The distance–time graph for this journey is shown opposite. For each description below, choose the letter on the graph that matches it.
- a A half-hour rest break is taken after travelling 250km.
 - b In the first hour the car travels 90km.
 - c The car is at rest for 1 hour, 90km from the start.
 - d The car takes 1.5 hours to travel 90km to 250km.
 - e The distance from 250km to 350km takes 1 hour.



- 2 A bicycle journey is shown on distance–time graph opposite.
- a What is the total distance travelled?
 - b What is the time taken for the journey?
 - c How long was the cyclist at rest?
 - d How far had the cyclist travelled after 1 hour?
 - e How far had the cyclist travelled after 4 hours?
 - f Determine the average speed during the last two hours of the trip.

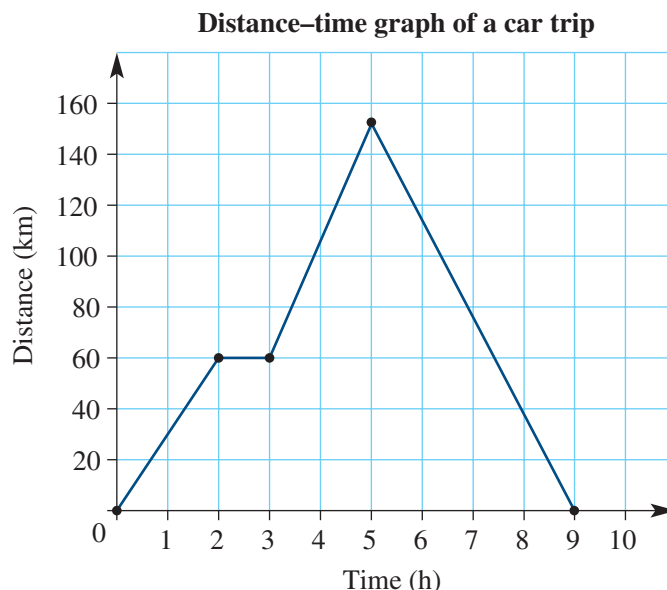


- Example 8** 3 The distance–time graph describes Alexander’s train trip.
- a How long was the rest stop?
 - b How far did the train travel from its starting point?
 - c What was the total distance travelled?
 - d Determine the average speed during the third hour of the trip.
 - e Determine the average speed during the last hour of the trip.

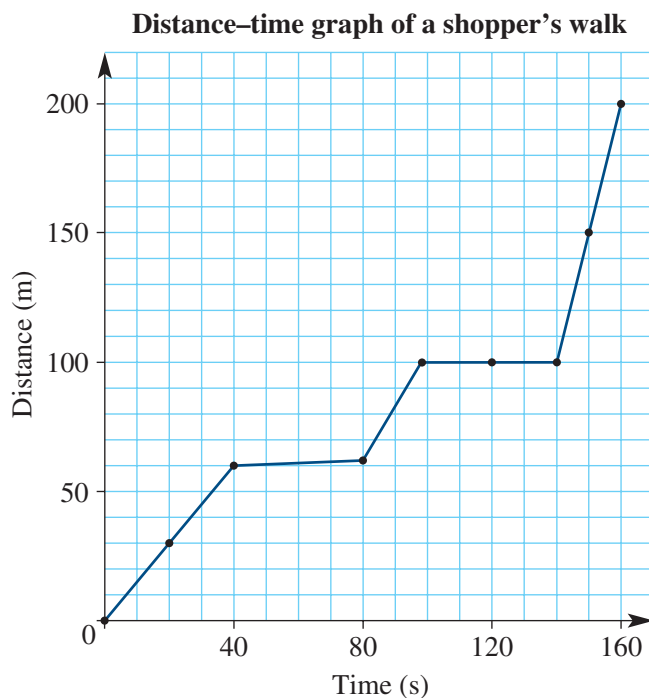


- 4 The distance–time graph describes Ella’s car trip.

- a How long was the rest stop?
- b How far did the car travel from its starting point?
- c How long did the trip take?
- d Determine the average speed during the first five hours of the trip.
- e Determine the average speed during the last four hours of the trip.
- f Determine the average speed for the entire trip, correct to two decimal places.



- 5 The distance–time graph below shows a shopper’s walk in a shopping mall.



- a What is the total distance the shopper travelled?
- b What was the total time the shopper was not walking?
- c What was the total distance the shopper had travelled by the following times?
 - i 20 seconds
 - ii 80 seconds
 - iii 150 seconds

1F Fuel consumption rate

A motor vehicle's fuel consumption is the number of litres of fuel it uses to travel 100 kilometres. The fuel consumption is calculated by filling the motor vehicle with fuel and recording the kilometres travelled from the odometer. When the motor vehicle is again filled with fuel then record the reading from the odometer and how many litres of fuel it takes to refill the tank. The distance travelled is the difference between the odometer readings.

FUEL CONSUMPTION

$$\text{Fuel consumption} = \frac{\text{Amount of fuel(L)} \times 100\text{km}}{\text{Distance travelled (km)}}$$



Example 9: Calculating the fuel consumption rate

1F

- a** A medium-sized car travelled 850km using 78.2L of petrol. What was the fuel consumption?
b A small-sized car travelled 260km using 16.9L of petrol. What was the fuel consumption?

SOLUTION:

- 1 Write the fuel consumption formula.
- 2 Substitute 78.2 for the amount of fuel and 850 for the distance travelled.
- 3 Evaluate.
- 4 Write the answer in words.
- 5 Write the fuel consumption formula.
- 6 Substitute 16.9 for the amount of fuel and 260 for the distance travelled.
- 7 Evaluate.
- 8 Write the answer in words.

$$\begin{aligned} \text{a Fuel consumption} &= \frac{\text{Amount of fuel} \times 100}{\text{Distance travelled}} \\ &= \frac{78.2 \times 100}{850} \\ &= 9.2\text{L}/100\text{km} \end{aligned}$$

∴ Fuel consumption is 9.2L per 100km.

$$\begin{aligned} \text{b Fuel consumption} &= \frac{\text{Amount of fuel(L)} \times 100}{\text{Distance travelled (km)}} \\ &= \frac{16.9 \times 100}{260} \\ &= 6.5\text{L}/100\text{km} \end{aligned}$$

∴ Fuel consumption is 6.5L per 100km.

Exercise 1F

Example 9

1 Find the fuel consumption (litres per 100km) for each of the following:

- a Ryan's car uses 75 litres of petrol to travel 750km.
- b Grace's car uses 60 litres of petrol to travel 300km.
- c A new car uses 120 litres of petrol to travel 2400km.
- d Matthew's car uses 100 litres of petrol to travel 800km.
- e Lincoln's car uses 45.5 litres of petrol to travel 520km.
- f A small car uses 36.9 litres of petrol to travel 600km.
- g Gemma's sedan uses 55.1 litres of LPG to travel 950km.
- h A sports car travelled 250km using 28.5 litres of petrol.
- i Anthony's motor bike uses 167.5 litres of LPG to travel 2500km.
- j Tahlia's car uses 121.6 litres of petrol to travel 3200km.

2 Stephanie has bought a used car whose fuel consumption is 7.8 litres petrol per 100 kilometres. She is planning to travel around Australia. Calculate the number litres of petrol Stephanie's car will use on the following distances. Answer correct to the nearest whole number.

- a A trip of 4049km from Darwin to Perth
- b A trip of 982km from Sydney to Brisbane
- c A trip of 2716km from Perth to Adelaide
- d A trip of 658km from Melbourne to Canberra
- e A trip of 732km from Adelaide to Melbourne
- f A trip of 309km from Canberra to Sydney
- g A trip of 3429km from Brisbane to Darwin



3 Charlie travels 45 km to work and 45 km from work each day.

- a How many kilometres does she travel to and from work in a 5-day working week?
- b Charlie drives a four-wheel drive with a fuel consumption of 8L/100km to and from work. How many litres of petrol does Charlie use travelling to and from work? Answer correct to one decimal place.
- c What is Charlie's petrol bill for her travel for the week if petrol costs \$1.20 per litre?

4 A family car uses LPG at a rate of 15 L/100km and the gas tank holds 72 litres. How far can it travel on a tank of LPG?

- 5 Evie drives a car with a petrol consumption of 9 litres of petrol per 100km. Petrol costs \$1.50 per litre.
- How many litres of fuel does the car use for 300km?
 - How many litres of fuel does the car use for 50km?
 - What is the cost of travelling 100km?
 - What is the cost of travelling 200km?
 - How far can she drive using \$10 worth of petrol? Answer to the nearest km.
 - How far can she drive using \$50 worth of petrol? Answer to the nearest km
- 6 Max drives a truck whose petrol consumption is 16L/100km and the petrol tank holds 90 litres. He is planning a trip from Moorebank to Melbourne. The distance from Moorebank to Melbourne is 840km. Max filled up the petrol tank at Moorebank.
- What is the distance travelled on one tank of petrol?
 - How many litres of petrol are needed on this trip?
 - How many times will he need to fill his tank before arriving at Melbourne? Give reasons for your answer.
- 7 Natalie is planning a trip from Parramatta to Canberra using a car with a fuel consumption of 9.6L/100km. The distance from Parramatta to Canberra via the highway is 278km and avoiding the highway is 363km. The cost of LPG is 68.5 cents per litre.
- What is the amount of fuel used on the trip via the highway?
 - How much will the trip cost via the highway?
 - What is the amount of fuel used on the trip avoiding the highway?
 - How much will the trip cost avoiding the highway?
 - How much money is saved by travelling via the highway?
- 8 Austin owns an SUV with a fuel consumption of 10.9L/100km in the city and 8.4L/100km in the country. Austin travels 12000km per year in the city and 20000km per year in the country. The average cost of petrol is \$1.48 per litre in the city and 12 cents higher in the country.
- What is the amount of fuel needed to drive in the city for the year?
 - Find the cost of petrol to drive in the city for the year.
 - What is the amount of fuel needed to drive in the country for the year?
 - Find the cost of petrol to drive in the country for the year.
 - What is the total cost of petrol for Austin in one year?
 - What is the total cost of petrol for Austin in one year if the average cost of petrol increased to \$2.00 in the city and 12 cents higher in the country?
- 9 Investigate the costs for two common cars on a family trip in your local area. Calculate the cost for the return trip in each case. You will need to determine the distance of the trip, fuel consumption for each car and the average price of fuel in the local area.

1G Heart rate

Heart rate is the number of heartbeats per minute (bpm). It is measured by finding the pulse of the body. This pulse rate is measured where the pulsation of an artery can be felt on the skin by pressing with the index and middle fingers, such as on the wrist and neck. A heart rate monitor consists of a chest strap with electrodes that transmit to a wrist receiver for display. It is used during exercise when manual measurements are difficult. An electrocardiograph is used by medical professionals to obtain a more accurate measurement of heart rate to assist in the diagnosis and tracking of medical conditions. The resting heart rate is measured while a person is at rest but awake and is typically between 60 and 80 beats per minute.



There are many different formulas used to estimate maximum heart rate (MHR). The most widely used formula is $MHR = 220 - \text{Age}$ where age is in years.

HEART RATE

Heart rate is the number of heartbeats per minute (bpm).

$$MHR = 220 - \text{Age}(\text{years})$$



Example 10: Estimating maximum heart rate

1G

Estimate the maximum heart rate for an 18 year old.

SOLUTION:

- 1 Write the formula.
- 2 Substitute 18 for age.
- 3 Evaluate.
- 4 Write the answer in words.

$$\begin{aligned} MHR &= 220 - \text{Age} \\ &= 220 - 18 \\ &= 202 \end{aligned}$$

Maximum heart rate for an 18 year old is estimated to be 202bpm.



Example 11: Interpreting trends in heart rate

1G

The table below shows the average resting heart rate for men.

Health	18–25 years	26–35 years	36–45 years	46–55 years	56–65 years	65+ years
Athlete	49–55	49–54	50–56	50–57	51–56	50–55
Excellent	56–61	55–61	57–62	58–63	57–61	56–61
Good	62–65	62–65	63–66	64–67	62–67	62–65
Above average	66–69	66–70	67–70	68–71	68–71	66–69
Average	70–73	71–74	71–75	72–76	72–75	70–73
Below average	74–81	75–81	76–82	77–83	76–81	74–79
Poor	82+	82+	83+	84+	82+	80+

- a What is the average resting heart rate for a man aged 47 years in good health?
- b What is the average resting heart rate for a man aged 25 years in below-average health?
- c What is the health of a man aged 57 years with a resting heart rate of 60?
- d What is the health of a man aged 30 years with a resting heart rate of 84?

SOLUTION:

- 1 Locate the column for the age.
 - 2 Locate row for good health, read value at row/column intersection.
 - 3 Locate the column for the age.
 - 4 Locate row for below-average health, read value at row/column intersection.
 - 5 Locate the column for the age.
 - 6 In that column, locate the heart rate.
 - 7 Read the row header.
 - 8 Locate the column for the age.
 - 9 In that column, locate the heart rate.
 - 10 Read the row header.
- a Age of 47 is in the range 46–55 years.
Average rest heart rate is 64–67.
 - b Age of 25 is in the range 18–25 years.
Average rest heart rate is 74–81.
 - c Age of 57 is in the range 56–65 years.
Heart rate of 60 is in the range 57–61.
Health is excellent.
 - d Age of 30 is in the range 26–35 years.
Heart rate of 84 is in the range 82+.
Health is poor.

Target heart rate

The target heart rate (THR) is the desired range of heart rate during exercise that enables the heart and lungs to receive the most benefit from a workout. This range depends on the person's age, physical condition, gender and previous training. The THR is calculated as a range between 65% and 85% of the MHR. For example, for an 18-year-old with a MHR of 202 the THR is between $131.3(0.65 \times 202)$ and $171.7(0.85 \times 202)$.

Exercise 1G

- Example 10** 1 Estimate the maximum heart rate using the formula $MHR = 220 - \text{Age}$ for a person who is:
- | | | |
|-----------------------|-----------------------|-------------------------|
| a 20 years old | b 30 years old | c 40 years old |
| d 50 years old | e 60 years old | f 70 years old |
| g 80 years old | h 90 years old | i 100 years old. |
- 2 Identify the trends in the maximum heart rate (MHR) with age.
- Draw a number plane with 'Age' as the horizontal axis and 'MHR' as the vertical axis.
 - Plot the answers from question 1 on the number plane.
 - Join the points to make a straight line.
 - Use the graph to estimate the MHR for a person who is 25 years old.
 - Use the graph to estimate the MHR for a person who is 38 years old.
 - Use the graph to estimate the age of a person with a MHR of 155 bpm.
 - Use the graph to estimate the age of a person with a MHR of 175 bpm.
- 3 Calculate the target heart rate (65% to 85% of the MHR) for questions 1a to i.

- Example 11** 4 The table below shows the average resting heart rate for women.

Health	18–25 years	26–35 years	36–45 years	46–55 years	56–65 years	65+ years
Athlete	54–60	54–59	54–59	54–60	54–59	54–59
Excellent	61–65	60–64	60–64	61–65	60–64	60–64
Good	66–69	65–68	65–69	66–69	65–68	65–68
Above average	70–73	69–72	70–73	70–73	69–73	69–72
Average	74–78	73–76	74–78	74–77	74–77	73–76
Below average	79–84	77–82	79–84	78–83	78–83	77–84
Poor	85+	83+	85+	84+	84+	85+

- What is the average resting heart rate for a woman aged 35 years in below-average health?
- What is the average resting heart rate for a woman aged 56 years in excellent health?
- What is the health of a woman aged 68 years with a resting heart rate of 78?
- What is the health of a woman aged 37 years with a resting heart rate of 59?

- 5 Perform an experiment to measure your heart rate.

Activity	Heart rate
Rest before walk	
End of a 15 minute walk	
3 minutes after the walk	
5 minutes after the walk	

- a Copy the table. Measure your resting heart rate and write the result in the table.
 - b Walk quickly for 15 minutes. Measure your heart rate and write the result in the table.
 - c Measure your heart rate for 3 and 5 minutes after the walk. Write the results in the table.
 - d Draw a number plane with 'Time' as the horizontal axis and 'Heart rate' as the vertical axis.
 - e Plot the results from the table on the number plane.
 - f Do you think the first 15 minutes of the graph is a straight line?
 - g Did your heart rate return to the resting heart rate after 5 minutes?
 - h Calculate your maximum heart rate using the formula $MHR = 220 - \text{Age}$.
 - i Calculate your target heart rate. How does it compare to the results in the table?
 - j Complete the same experiment by jogging for 15 minutes instead of walking.
 - k What was the change in your heart rate at the end of the activity?
- 6 Use your resting heart rate measured in question 5.
- a How many times does your heart beat in 1 hour?
 - b How many times does your heart beat in 1 day?
 - c How many times does your heart beat in 1 year?
 - d How many times has your heart been beating since you were born?
 - e How many times would your heart beat if you lived to 100 years?
- 7 Twenty people measured their heart rate using a heart rate monitor. The results were:
- | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|
| 64 | 68 | 64 | 72 | 75 | 67 | 91 | 80 | 77 | 73 |
| 68 | 81 | 73 | 72 | 60 | 62 | 74 | 68 | 55 | 62 |
- a What is the maximum heart rate?
 - b What is the minimum heart rate?
 - c What is the sum of these heart rates?
 - d Find the mean heart rate. Answer correct to one decimal place.
 - e Find the interquartile range of these heart rates. Answer correct to one decimal place.
 - f Find the population standard deviation of these heart rates. Answer correct to one decimal place.

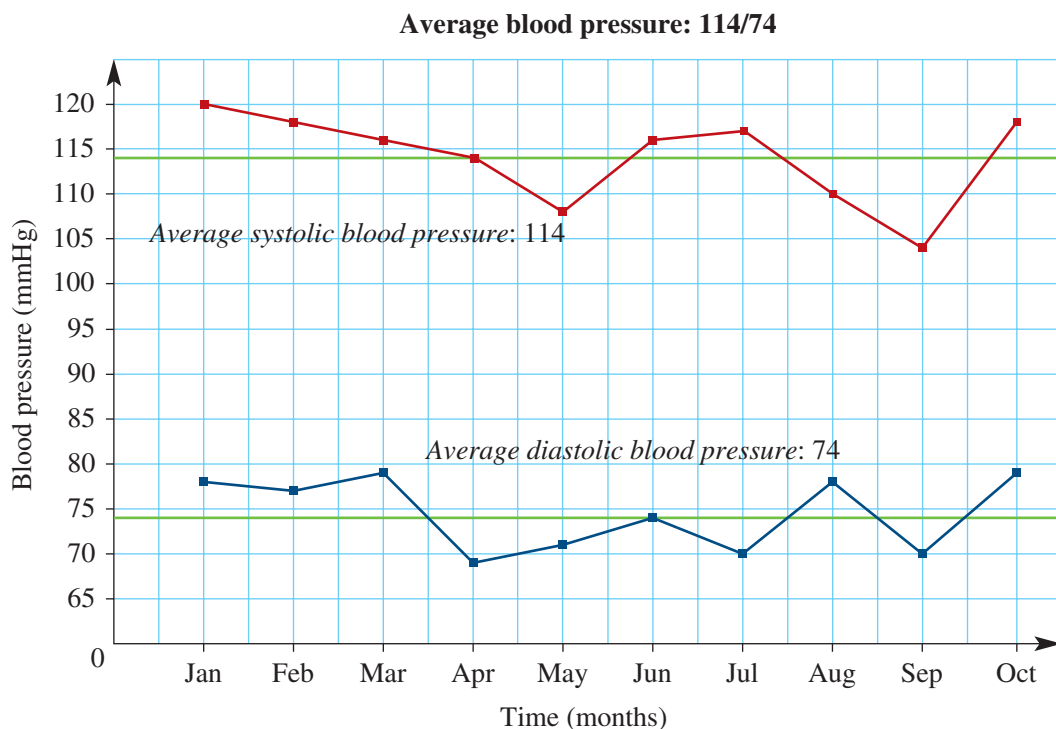
1H Blood pressure

Blood pressure is the pressure of the blood in the arteries as it is pumped around the body by the heart. During each heart beat, blood pressure varies between a maximum (systolic) and a minimum (diastolic) pressure.

Blood pressure is measured by wrapping an inflatable pressure cuff around the upper arm. This cuff is part of a machine called a sphygmomanometer. Blood pressure is expressed in millimetres of mercury (mmHg).

A normal healthy adult has a blood pressure of 120mmHg systolic and 80mmHg diastolic, which is expressed as 120/80mmHg. Many factors affect blood pressure, such as stress, disease, exercise and drugs.

Blood pressure changes to meet your body's needs. A doctor may request a patient's blood pressure be measured on a regular basis. The chart below shows the changes in blood pressure over time for a patient.



BLOOD PRESSURE

- Blood pressure is the pressure of the blood in the arteries as it is pumped around the body.
- Blood pressure varies between a maximum (systolic) and a minimum (diastolic) pressure.
- Blood pressure is measured in mmHg.



Example 12: Reading a blood pressure table

1H

The table below shows the classification of blood pressure.

Category	Systolic (mmHg)	Diastolic (mmHg)
Normal	<120	<80
Normal to high	120–139	80–89
High	140–179	90–109
Very high	≥ 180	≥ 110

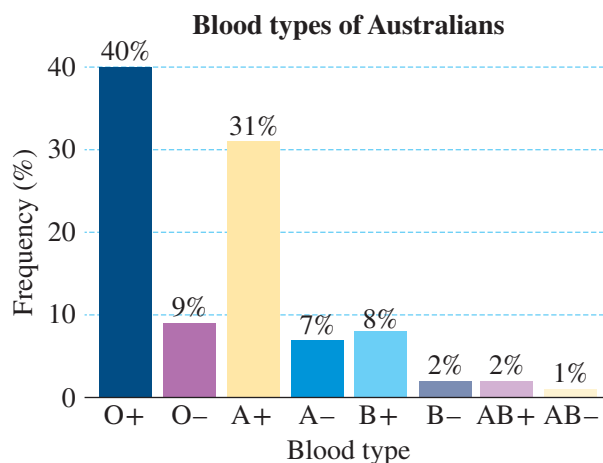
- a** What is the systolic blood pressure for very high blood pressure?
b What is the diastolic blood pressure for normal to high blood pressure?
c Stephanie has blood pressure of 117/74 mmHg. In what category is she classified?

SOLUTION:

- 1** Read the value in the table. **a** Systolic blood pressure is ≥ 180 .
2 Read the value in the table. **b** Diastolic blood pressure is 80–89.
3 Read the value in the table. **c** Blood pressure category is normal.

Blood types

A person's blood type is described by the appropriate letter (A, B, AB or O) and whether or not their blood is Rh positive or Rh negative. The column graph opposite shows the percentage of blood type frequency in Australia (Source: Australian Red Cross Blood Service). Blood is vital to life and for many people blood donors are their lifeline. Most of the blood donated is used to treat people with cancer and other serious illnesses.



Example 13: Calculating the number of people of a particular blood type

1H

The table opposite shows the number of males and females living in NSW. Use the above column graph and this table to answer how many males in NSW have blood type B+.

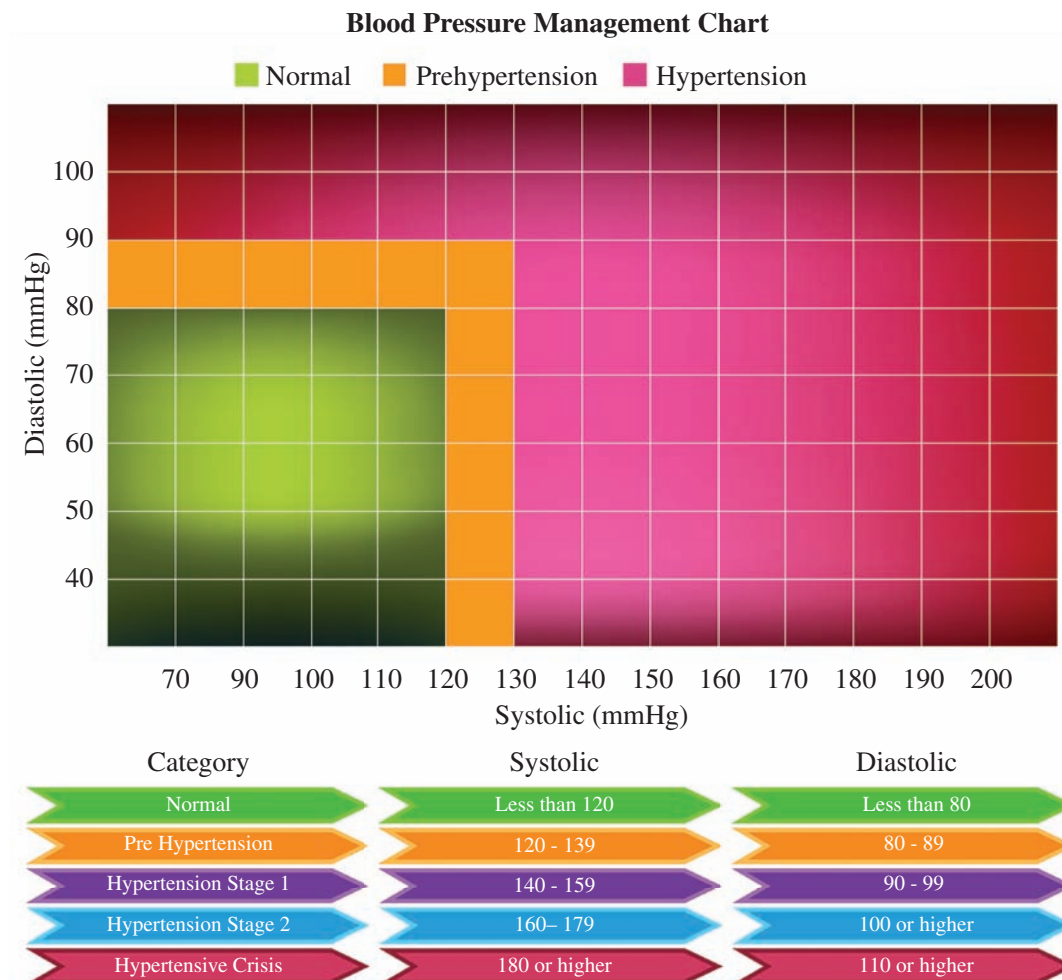
SOLUTION:

- 1** Read the percentage of blood type B+ in the column graph (8%). **a** 8% of the Australian population are B+.
2 Read the male population of NSW in the table. 8% of 3.72 million = $0.08 \times 3\,720\,000$
3 Multiply the percentage by the population. = 297 600

NSW population	
Males	3.72% million
Females	3.83% million
Total	7.55% million

Exercise 1H

Example 12 1 The blood pressure for normal, prehypertension and hypertension is shown below.



- a What is the systolic blood pressure for normal?
- b What is the diastolic blood pressure for hypertension stage 1?
- c What is the systolic blood pressure for hypertension crisis?
- d What is the diastolic blood pressure for prehypertension?
- e Caitlin has blood pressure of 125/82 mmHg. In what category is she classified?
- f Andrew has blood pressure of 146/96 mmHg. In what category is he classified?
- g Heidi has blood pressure of 181/112 mmHg. In what category is she classified?
- h Joseph has blood pressure of 165/104 mmHg. In what category is he classified?

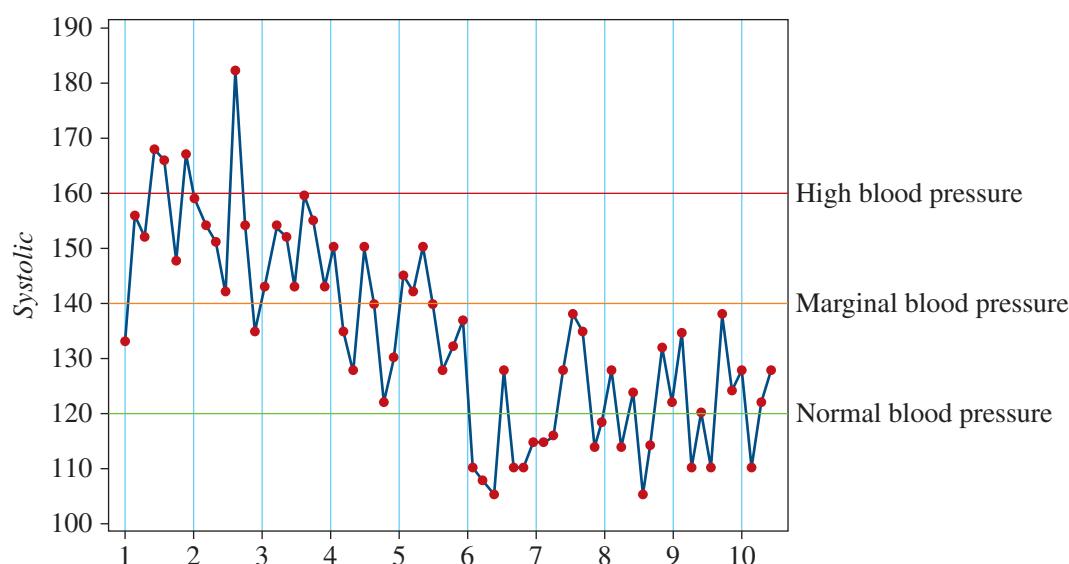
2 Owen has a very high blood pressure of 180/110.

- a A drug is expected to reduce blood pressure by 20%. What will be his blood pressure?
- b A drug is expected to reduce blood pressure by 25%. What will be his blood pressure?

3 Calculate the percentage change in the following blood pressures.

- a Gabriel's systolic blood pressure decreases from 144 to 126.
- b Lilly's diastolic blood pressure decreases from 96 to 72.

- 4 Twenty people measured their systolic blood pressure. The results were:
- | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| 118 | 123 | 132 | 127 | 140 | 115 | 165 | 133 | 122 | 171 |
| 128 | 136 | 121 | 117 | 141 | 126 | 139 | 134 | 125 | 130. |
- What is the maximum systolic blood pressure?
 - What is the minimum systolic blood pressure?
 - Find the mean systolic blood pressure. Answer correct to two decimal places.
 - Find the population standard deviation systolic blood pressure. Answer correct to two decimal places.
- 5 Eliza's systolic blood pressure for the past 10 days is shown below.



- What was the highest blood pressure?
- What was the lowest blood pressure?
- What was Eliza's first blood pressure reading on day 2?
- What was Eliza's first blood pressure reading on day 5?
- When did Eliza's blood pressure first reach a normal level?
- How many blood pressure measurements were high (≥ 160)?
- How many blood pressure measurements were normal (< 120)?

Example 13

- 6 The tables below show the percentage blood type of Australians and the number of males and females living in NSW.

Blood type percentage			
O+	40%	B+	8%
O-	9%	B-	2%
A+	31%	AB+	2%
A-	7%	AB-	1%

NSW population	
Males	3.72 million
Females	3.83 million
Total	7.55 million

- How many females in NSW have blood type O-?
- How many people in NSW have blood type A+?



Key ideas and chapter summary

Rate

- 1 Write the rate as a fraction. First quantity is the numerator and 1 is the denominator.
- 2 Convert the first amount to the required unit.
- 3 Convert the second amount to the required unit.
- 4 Simplify the fraction.

Unitary method

- 1 Find one unit of an amount by dividing by the amount.
- 2 Multiply the result in step 1 by the number.

Using rates to make comparisons

Rates are used to solve practical problems such as calculating the best buy, determining costs and calculating wages.

Speed as a rate

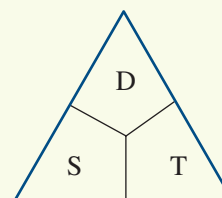
Speed is a rate that compares the distance travelled to the time taken.

$$S = \frac{D}{T} \quad \text{or} \quad T = \frac{D}{S} \quad \text{or} \quad D = S \times T$$

D – Distance

S – Speed

T – Time



Distance–time graphs

Line graph with time on the horizontal axis and distance on the vertical axis.

- Gradient of the line = $\frac{\text{Vertical rise}}{\text{Horizontal run}} = \frac{\text{Distance}}{\text{Time}} = \text{Speed}$
- The steepness of a line (or gradient) indicates the speed of the object.
- The horizontal line indicates that the object is stationary or not moving.

Fuel consumption rate

The number of litres of fuel used to travel 100km.

$$\text{Fuel consumption} = \frac{\text{Amount of fuel (L)} \times 100}{\text{Distance travelled (km)}}$$

Heart rate

Heart rate is the number of heartbeats per minute (bpm).

$$\text{MHR} = 220 - \text{Age (years)}$$

Blood pressure

- Blood pressure is the pressure of the blood in the arteries as it is pumped around the body.
- Blood pressure varies between a maximum (systolic) and a minimum (diastolic) pressure.

Multiple-choice

- 1 What is \$160 in 5 h converted to a rate of \$/h?
A \$32/h **B** \$155/h **C** \$165/h **D** \$800/h
- 2 Christian is a delivery driver who delivers one parcel, on average, every 25 minutes. How many hours does it take to deliver 24 parcels?
A 10 **B** 11 **C** 12 **D** 13
- 3 A hose fills a 10 L bucket in 20 seconds. What is the rate of flow in litres per hour?
A 0.0001 **B** 30 **C** 1800 **D** 7200
- 4 Which of the following is the slowest speed?
A 60 km/h **B** 100 m/s **C** 10000 m/min **D** 6000 m/h
- 5 How long will it take a vehicle to travel 342 km at a speed of 70 km/h?
A 0.20 h **B** 2.394 h **C** 4.89 h **D** 272 h

Questions 6 and 7 refer to the distance–time graph of the movement of a snail.

- 6 The total number of hours the snail was at rest is:

A 2 **B** 3
C 5 **D** 10

- 7 The speed of the snail in the last 5 hours was:

A 2 m/h **C** 10 m/h
B 5 m/h **D** 15 m/h

- 8 What is the fuel consumption for a vehicle that travelled 340 km using 51 litres of petrol?

A 7 L/100 km **C** 15 L/100 km
B 9 L/100 km **D** 17 L/100 km

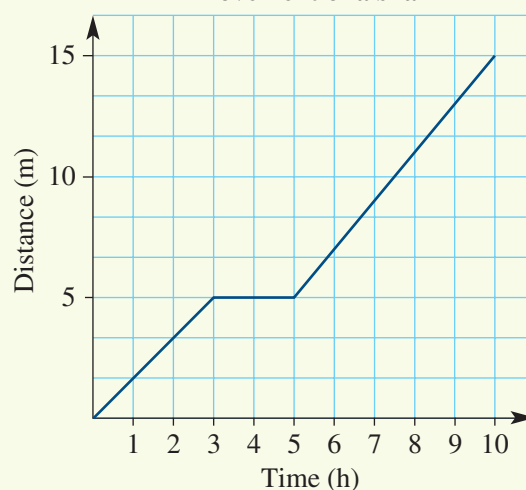
- 9 Eden's maximum heart rate (MHR) is 175. Which of the following heart rates is within her target heart rate (65–85%)?

A 75 **B** 100 **C** 125 **D** 150

- 10 A systolic blood pressure decreased from 150 to 120. What is the percentage decrease?

A 10% **B** 20% **C** 30% **D** 40%

Distance–time graph of the movement of a snail



Short-answer

- Convert each rate to the units shown.

a \$15/kg to \$/g	b 14400m/h to m/min
c 120cm/s to mm/min	d 4800kg/g to kg/mg
e 14L/g to mL/kg	f \$3600/g to c/mg
- If 20 metres of curtain material costs \$580, what would be the cost of 35 metres of the same material?
- A 5 kg bag of rice costs \$9.20. What is the cost of the following amounts?

a 10kg	b 40kg
c 3kg	d 7kg
e 500kg	f 250kg



- Calculate the best buy between option 1 and 2.

a Option 1: 5 books for \$110	Option 2: 7 books for \$161
b Option 1: \$175 for 50L	Option 2: \$54 for 15L
c Option 1: 35 g for \$357	Option 2: 27 g for \$270
d Option 1: 4 picture frames for \$50	Option 2: 6 picture frames for \$74.70
- Find the average speed (in km/h) of a vehicle which travels:

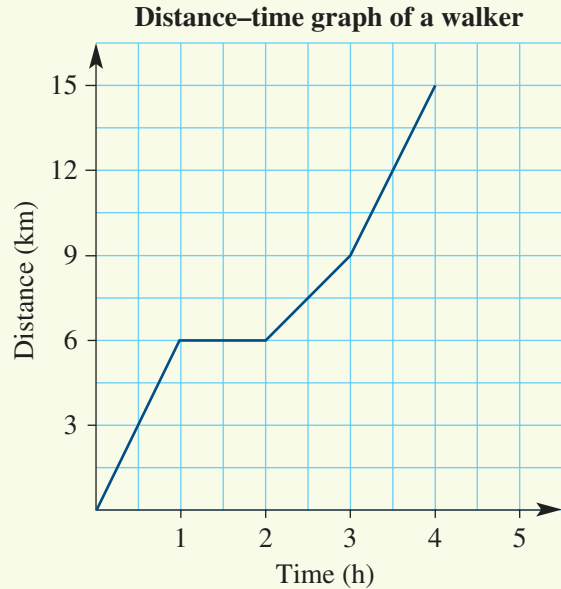
a 784km in 8 hours	b 315km in 4.5 hours
c 48km in $\frac{1}{4}$ hour	d 64km in 40 minutes.
- Find the distance travelled by a car (correct to the nearest kilometre) whose average speed is 76km/h if the journey lasts:

a 10 hours	b 4.1 hours
c $3\frac{1}{4}$ hour	d $8\frac{1}{2}$ hours.
- Maddison runs 200 metres in 45 seconds. How many seconds would it take her to run one kilometre at the same rate?
- Daniel drives to his mother's house. It takes 45 minutes. Calculate Daniel's average speed if his mother lives 48km away. Answer correct to the nearest km/h.

- 9** How long does it take Stella to drive 180km along the freeway to work if she manages to average 100km/h for the trip?

- 10** The distance–time graph describes the journey of a walker.

- a** What is the total distance travelled?
- b** How long was the person actually walking?
- c** How far had the person walked after:
 - i** 1 hour?
 - ii** 2 hours?
 - iii** 4 hours?
- d** How long did it take to walk a distance of 12km?



- 11** A car travels 960km on 75 litres of petrol. How far does it travel on 50 litres?
- 12** Thomas travels 51 km to work and 51 km from work each day.
- a** How many kilometres does he travel to and from work in a 5-day working week?
 - b** Thomas drives a car with a fuel consumption of 7.5L/100km to and from work. How many litres of petrol does Thomas use travelling to and from work per week?
 - c** What is Thomas's petrol bill for work per week if petrol costs are \$1.52 per litre?
- 13** Estimate the maximum heart rate using the formula $MHR = 220 - \text{Age}$ for these ages:
- | | |
|-----------------------|-----------------------|
| a 18 years old | b 28 years old |
| c 38 years old | d 48 years old |
- 14** The systolic blood pressure for a sample of 20 people is listed below.
- | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 203 | 124 | 180 | 210 | 105 | 148 | 161 | 131 | 192 | 125 |
| 159 | 106 | 170 | 138 | 100 | 120 | 109 | 144 | 190 | 193 |
- a** What is the minimum?
 - b** What is the maximum?
 - c** What is the range?
 - d** What is the mean?