MEASUREMENT AND GEOMETRY
Length, time and mass

1 **Conversions involving length:**
1000 mm = 1 m 1000 m = 1 km
10 mm = 1 cm 100 cm = 1 m
Example: How many m in 6.805 km?
$6.805 \times 1000 = 6805$

2 The **perimeter** is the distance around the outside of a shape.
Example: What is the perimeter of an equilateral triangle with side length 2.8 cm?
All 3 sides of triangle of equal length:
Perimeter = $2.8 \times 3 = 8.4$ (8.4 cm)

3 A **scale** is used on maps relating length on the map to length on the ground.
Examples:
a A map uses a scale of 1 cm = 10 km. If two towns are 5.4 cm apart on the map, find their actual distance apart.
As $5.4 \times 10 = 54$, the towns are 54 km apart.
b A road map uses a scale of 1 cm = 5 km. The distance from Duck's Crossing to Lake's Lagoon is 95 km. How far apart on the map are the two towns?
Map distance $= 95 \div 5$
$= 19$ (19 cm)

4 **Speed** $= \frac{\text{Distance}}{\text{Time}}$ **Time** $= \frac{\text{Distance}}{\text{Speed}}$
Distance = Speed × Time
Examples:
a Find the speed if a car travels 400 km in 5 hours.
Speed $= \frac{400}{5} = 80$ (80 km/h)
b How long does it take Jenn to travel 250 km at an average speed of 50 km/h?
Time $= \frac{250}{50} = 5$ (5 hours)
c How far will a boy travel if he walks at 6 km/h for 30 minutes?
As 30 min $= \frac{1}{2}$ h, Distance $= 6 \times \frac{1}{2} = 3$
This means the boy travels 3 km.

5 Morning time is am and afternoon/evening time is pm. **24-hour time** eliminates the need for **am or pm notation**.
Examples:
a Write 8:32 pm in 24-hour time.
8:32 pm = 2032
b What is the time 7 hours after 2130?
21:30 + $2\frac{1}{2}$ h is midnight and then
another $4\frac{1}{2}$ hours gives 0430.

6 **Conversions involving time:**
60 s = 60 min 60 min = 1 h 24 h = 1 d
7 d = 1 week 52 weeks = 1 year
365 days = 1 year 366 days = 1 leap year
10 years = 1 decade 100 years = 1 century
1000 years = 1 millennium

7 **Time zones** exist across the world. *Examples:*
a Local time in Adelaide is thirty minutes behind local time in Sydney. If it is 2:20 pm in Sydney what is the local time in Adelaide?
2:20 minus 30 minutes
= 2:20 minus 20 min gives 2:00 then minus another 10 min is 1:50
The local time in Adelaide is 1:50 pm
b The local time in Perth is 8 hours ahead of local time in London. If it is 10 pm Tuesday in London, what time is it in Perth?
10 pm plus 8 hours = 10 pm plus 2 is midnight plus 6 is 6 am
The local time in Perth is 6 am Wednesday

8 **Conversions involving mass:**
1000 mg = 1 g 1000 g = 1 kg 1000 kg = 1 t
Examples:
a How many kilograms in 321 grams?
$321 \div 1000 = 0.321$ (0.321 kg)
[as decimal point is after the 1 digit (hidden) and moves 3 places to the left]
b Write in words the number of milligrams in a tonne.
Number $= 1000 \times 1000 \times 1000$
$= 1\,000\,000\,000$
There are one billion milligrams in a tonne

9 The mass of one litre of water is one kilogram.
Example: What is the mass of the 40 000 L of water in Tom's backyard swimming pool. Write your answer in tonnes.
40 000 L = 40 000 kg = 40 tonnes;
the water has a mass of 40 tonnes.

3 $\begin{array}{r} 9.97 \\ \times \quad 3 \\ \hline 29.91 \end{array}$ This means the books cost $29.91.

4 As 75% = $\frac{3}{4}$, we need $\frac{3}{4}$ of 120:
$\frac{3}{4} \times \frac{120}{1} = \frac{360}{4} = 90$
90 houses were damaged.

5 As 10% = $\frac{1}{10}$, we need $\frac{1}{10}$ of 125 000,
or 125 000 ÷ 10 = 12 500.
This means new profit is
$125 000 + $12 500 = $137 500

6 6.4 ÷ 0.4 = 64 ÷ 4 = 16

7 6 purple out of a total of 16 balls.
This means $\frac{6}{16} = \frac{3}{8}$

8 As there are 3 black, there must be 13 not black. This means the chance is $\frac{13}{16}$.

9 If two-thirds watched, then one-third did not watch. As $\frac{1}{3}$ of 21 = 7, this means 7 million did not watch the game.

10 Decrease = 160 – 40 = 120; $\frac{120}{160} = \frac{3}{4}$
Decrease % = $\frac{3}{4} \times \frac{100}{1}$ = 75%

11 As 25% = $\frac{1}{4}$, this means $\frac{1}{4}$ of 12 are cracked, or 12 ÷ 4 = 3. 3 are cracked.

12 As $\frac{5}{10} = \frac{1}{2}$, then $4\frac{1}{2} = 4\frac{5}{10}$

13 2.3 × 100 = 230

14 As 18.4 is close to 20 and 16.30 is close to 15, then the estimate is 20 × 15 = 300.
The answer close to $300 is $299.92.

15 Firstly, add $\frac{1}{2}$ and $\frac{1}{3}$: $\frac{1}{2} + \frac{1}{3} = \frac{3}{6} + \frac{2}{6}$
$= \frac{5}{6}$
As $1 - \frac{5}{6} = \frac{1}{6}$, this means $\frac{1}{6}$ travelled by car.

16 Average = $\frac{4.5 + 9.3 + 1.7 + 6.1}{4}$
$= \frac{21.6}{4}$
= 5.4
The average is 5.4 m

MEASUREMENT AND GEOMETRY (Test Your Skills)
Length, time and mass Page 39

1 As 7390 ÷ 100 = 73.9, there are 73.9 m

2 First, change to cm: 410 cm and 392 cm
Difference = 410 – 392
= 18
Difference is 18 cm

$\begin{array}{r} {}^{3}\cancel{4}\,{}^{10}\cancel{1}\,{}^{1}0 \\ -\ 3\ 9\ 2 \\ \hline 1\ 8 \end{array}$

3 Count the lengths of each side:
Perimeter = 5 + 3 + 3 + 1 + 5 + 2 + 3 + 2
= 24
The perimeter is 24 units

4 Perimeter = 4.8 × 4
= 19.2
The perimeter is 19.2 cm

$\begin{array}{r} 4.8 \\ \times_{3}\ 4 \\ \hline 19.2 \end{array}$

5 Length = 10.8 ÷ 3
= 3.6
Length is 3.6 metres

$3\overline{)10.^{1}8}$ → 3.6

6 As 20 m = 1 cm, 60 m = 3 cm,
so that 70 m = $3\frac{1}{2}$ cm

7 As 5 cm = 120 km,
we divide 120 by 5: 120 ÷ 5 = 24
This means 1 cm = 24 km

$5\overline{)12^{2}0}$ → 24

8 Speed = Distance ÷ Time
= 450 ÷ 5
= 90
This means 90 km/h

9 Time = Distance ÷ Speed
= 240 ÷ 60
= 4
This means 4 hours

10 As 70 km was travelled in one hour,
then 35 km in $\frac{1}{2}$ h
As 70 + 35 = 105, then Ronaldo will travel 105 km.

11 20 to midnight = 23:40 (or 11:40 pm)

12 The clock is showing a time of 6:40.
The next screening is at 19:05 or 7:05 pm.
From 6:40 to 7:05 is 25 minutes.

13 As 52 weeks in a year, we need to multiply:
Amount = 52 × 2000
= 104 000
Mario is paid $104 000 per year

14 Hobart is 2 hours behind. This means it is 9:30 am in Hobart.

15 48.62 × 1000 = 48 620
This means 48 620 grams

16 Subtract 225 from 1000
The remaining flour has a mass of 775 g.

$$\begin{array}{r} {}^{1}\not{1}\,{}^{9}\not{0}\,{}^{9}\not{0}\,{}^{10}0 \\ -\quad 2\ 2\ 5 \\ \hline 7\ 7\ 5 \end{array}$$

17 As 1 L = 1000 mL has mass 1000 grams, then 600 mL has mass 600 grams

MEASUREMENT AND GEOMETRY (Real Test)
Length, time and mass Page 41

1 C **2** B **3** C **4** 1.21 **5** A **6** D **7** B **8** C **9** D
10 D **11** B **12** A **13** B **14** B **15** A **16** A

EXPLANATIONS

1 17:45 is in the afternoon: 5:45 pm

2 Using a ruler, length of rectangle is 3 cm.
As 3 cm = 120 m, then 1 cm = 40 m

3 Perimeter = 3 + 2 + 3 + 2
= 10
The perimeter is 10 cm.

4 Add 440 and 770
The total mass is 1210 grams = 1.21 kg.

$$\begin{array}{r} {}^{1}4\ 4\ 0 \\ +\ 7\ 7\ 0 \\ \hline 1\ 2\ 1\ 0 \end{array}$$

5 As 30 minutes = $\frac{1}{2}$ hour, and

Distance = Speed × Time
= $14 \times \frac{1}{2}$
= 7
Trudi ran 7 km.

6 As $\frac{6}{24} = \frac{1}{4}$, then Alma bought $\frac{1}{4}$ kg, or 250 grams.

7 From 10:15 am to 10:00 pm is only 15 minutes short of 12 hours.
This it is means 11 hours 45 minutes.

8 As 80 grams = 0.080 kg,
so 1 kg 80 g = 1.080 or 1.08 kg.

9 By counting the units, 8 units = 160 km
This means 1 unit = 20 km.
As the distance from Frypan Flat to Clifford Hill is 4 units, the distance is 80 km.

10 As 100 metres = 120 paces, then
25 metres = 30 paces, and
75 metres = 90 paces
Ali uses 90 paces to walk 75 metres.

11 Firstly, add 5 h 10 min on to 10:40 am:
This means 15:50 (in 24 h time)
Now as Sydney is 2 hours ahead of Perth, add another 2 h on to 15:50 gives 17:50
Graeme arrives at 17:50, 5:50 pm.

12 From 11 am to 3 pm is 4 hours.
Speed = Distance ÷ Time
= 240 ÷ 4
= 60
This means 60 km/h.

13 As 25 m 30 s + 8 m 30 s = 33 m 60 s
= 34 min
Walk = 45 min – 34 min
= 11 min
Bailey walked for 11 minutes.

14 As 150 km/h means 150 km in 60 minutes, or 25 km in 10 minutes
This means 100 km in 40 minutes

MEASUREMENT AND GEOMETRY

Length, time and mass

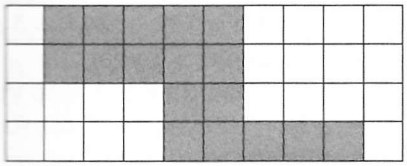
1 Change 7390 cm to metres.

A 0.739 m B 7.39 m
C 73.9 m D 739 m

2 In the long jump, Margot jumped 4.1 m while Caitlyn jumped 3.92 m. What is the difference in their jumps?

A 18 cm B 22 cm C 23 cm D 180 cm

3 What is the perimeter of this shaded shape?



A 17 units B 22 units
C 23 units D 24 units

4 A square has a side length of 4.8 cm. What is the perimeter of the square?

A 1.2 cm B 9.6 cm
C 14.2 cm D 19.2 cm

5 An equilateral triangle has each side the same length. If the perimeter is 10.8 cm, what is the length of each side?

A 2.7 cm B 3.6 cm
C 5.4 cm D 32.4 cm

6 A map of the school has been drawn using a scale of 1 cm = 20 m. The flagpole and the canteen are 70 metres apart. How far apart are they on the map?

A 3 cm B $3\frac{1}{2}$ cm C 9 cm D 11 cm

7 Abbotsfield to Buchanan is a distance of 120 km. A map is drawn and the distance between the towns is 5 cm. What scale has been used on the map?

A 1 cm = 4 km B 1 cm = 20 km
C 1 cm = 24 km D 1 cm = 25 km

8 Jack travels 450 km in 5 hours. What is his average speed?

A 85 km/h B 90 km/h
C 110 km/h D 120 km/h

9 How long will it take to travel 240 km at an average speed of 60 km/h?

A 180 min B 4 hours
C 6 hours D 6 h 25 min

10 Ronaldo travels at 70 km/h for 1 hour and 30 minutes. How far will he travel?

A 40 km B 70 km C 100 km D 105 km

11 The time on a clock is showing 20 minutes to midnight. This time is the same as

A 11:20 am B 11:40 am C 23:20 D 23:40

12 Erica wants to see a movie. The screening times for the movie are 1420, 1750, 1905 and 2110. The clock on the wall shows the present time. How long is there before the next screening?

A 25 minutes B 35 minutes
C 1 h 10 min D 3 h 30 min

13 Mario is paid $2000 per week. How much is he paid per year?

A $24 000 B $52 000
C $100 000 D $104 000

14 Local time in Auckland is 2 hours ahead of local time in Hobart. When it is 11:30 am in Auckland, what will be the time in Hobart?

A 9:30 am B 10 am
C 1 pm D 1:30 pm

15 How many grams are there in 48.62 kg?

A 0.04862 g B 4.862 g
C 4862 g D 48 620 g

16 From a one kilogram bag of flour, 225 grams is poured out. What is the mass of the remaining flour?

A 675 g B 685 g C 775 g D 785 g

17 If 1 litre of water has a mass of 1 kilogram, what is the mass of water in a 600 mL bottle?

A 6 grams B 60 grams
C 600 grams D 600 000 grams

☞ Explanations on pages 200-201

Answers: 1 C 2 A 3 D 4 D 5 B 6 B 7 C 8 B 9 B 10 D 11 D 12 A 13 D 14 A 15 D 16 C 17 C

MEASUREMENT AND GEOMETRY

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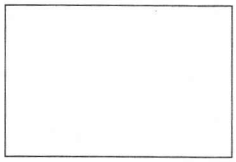
1 What time is the same time as the time shown on the digital clock? *Hint 1*

A 5:45 am B 7:45 am
C 5:45 pm D 7:45 pm

2 A paddock has dimensions 120 m by 80 m. A scale drawing is shown. What scale is used in the diagram?



A 1 cm = 10 m B 1 cm = 40 m
C 10 cm = 1 m D 20 cm = 1 m

3 Find the perimeter of the shape in question 2.

A 5 cm B 6 cm
C 10 cm D 12 cm

4 Into his shopping bag Michael puts a 440 g tin of tomatoes and a 770 g box of muesli. What is the total mass in kg of the objects?

Write your answer in the box: 1.210 kg

5 Trudi used her treadmill for fitness. She ran at a speed of 14 km/h for 30 minutes. What distance did she run? *Hint 2*

A 7 km B 11 km C 12 km D 42 km

6 Prawns are $24 per kilogram. Alma bought $6 worth of the prawns. What mass of prawns did she buy?

A 25 grams B 40 grams
C 200 grams D 250 grams

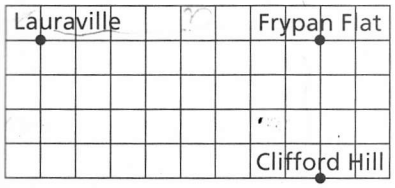
7 Richie left home at 10:15 am and returned home at 10:00 pm on the same day? How long was he away from home?

A 11 h 15 min B 11 h 45 min
C 12 h 15 min D 12 h 45 min

8 1 kilogram and 80 grams is the same as

A 180 g B 1008 g C 1.08 kg D 1.8 kg

9



The map shows the location of three towns. The distance from Lauraville to Frypan Flat is 160 km. How far from Frypan Flat to Clifford Hill? *Hint 3*

A 4 km B 40 km C 60 km D 80 km

10 Ali walks at an average of 120 paces for every 100 metres. How many paces would he take for 75 metres?

A 60 B 70 C 80 D 90

11 The local time in Sydney is 2 hours ahead of Perth. Graeme leaves Perth at 10:40 am and his flight to Sydney takes 5 hours and 10 minutes. What time was it in Sydney when he arrived?

A 3:50 pm B 5:50 pm
C 6:10 pm D 6:50 pm

12 Isabella leaves home at 11 am and travels 240 km arriving at her destination at 3 pm. What was her average speed?

A 60 km/h B 65 km/h
C 70 km/h D 80 km/h

13 Bailey planned to exercise for three quarters of an hour. She jogged for 25 minutes 30 seconds, ran for 8 minutes 30 seconds and walked the remainder of the time. How long did Bailey walk for?

A 10 minutes B 11 minutes
C 12 minutes D 27 minutes

14 A train is travelling at an average speed of 150 km/h. How long would it take the train to travel 100 km?

A 30 min B 40 min
C 45 min D 1 h 30 min

15 How many decades in a millennium?

A 100 B 1000
C 10 000 D 100 000

16 6 millimetres is the same as *Hint 4*

A 0.006 m B 0.06 m C 0.6 m D 60 m

Hint 1: am is before midday, pm is after midday—in 24 hour time, 9:00 pm is 21:00.
Hint 2: Distance = Speed x Time.
Hint 3: Determine the scale used on the map from known distances and then apply to new lengths.
Hint 4: Changing millimetres to metres we divide by 1000.

☞ Answers and explanations on pages 201-202