		$0.595km^2$ x 1 000 000 = 595 000 m^2
(c)	$26cm^2$ (m^2)	10 000 cm^2 = 1 m^2 means ÷ 10 000 $26cm^2$ ÷ 10 000 = 0.0026 m^2
(d)	31.8ha (km^2)	100 ha = $1km^2$ means ÷ 100 31.8 ha ÷ 100 = 0.318 km^2
(e)	450 $000m^2$ (ha and km^2)	10 000 m^2 = 1 ha means ÷ 10 000 450 $000m^2$ ÷ 10 000 = 45 ha
(f)	575 $212cm^2$ (m^2)	10 000 cm^2 = 1 m^2 means ÷ 10 000 575 $212cm^2$ ÷ 10 000 = 57.5212 m^2

6. Change the following volume measurements to the units shown in brackets

(a)	356 $000cm^3$ (m^3)	1 000 000 cm^3 = $1m^3$ means ÷ 1 000 000 356 $000cm^3$ = 0.356 m^3
(b)	2.575 m^3 (cm^3)	$1m^3$ =1 000 000 cm^3 means x 1 000 000 2.575 m^3 = 2 575 000 cm^3
(c)	0.000 4 km^3 (m^3)	$1km^3$ =1 000 000 000 m^3 means x 1 000 000 000 0.000 4 km^3 x 1 000 000 000 = 400 000 m^3
(d)	375 cm^3 (m^3)	1 000 000 cm^3 = $1m^3$ means ÷ 1 000 000 375 cm^3 = 0.000 375 m^3

7. Change the following volume units to the capacity units shown in brackets

(a)	345 cm^3 (mL)	1 cm^3 = 1 mL 345 cm^3 = 345 mL
(b)	0.072 m^3 (L)	1 m^3= 1 kL = 1000 L means x 1000 0.072 m^3 x 1000 = 72 L
(c)	$5.5m^3$ (L)	1 m^3= 1 kL = 1000 L means x 1000 $5.5m^3$ = 5500 L
(d)	67 500 cm^3 (kL)	1 cm^3 = 1 mL 1000 mL= 1 L means ÷ 1 000 1000 L = 1 kL means ÷ 1 000 67 500 cm^3 ÷ 1 000 000 = 0.0675 (kL)

Conversions – dimensional analysis

1. Change the following measurements using the dimensional analysis method to the units shown in brackets

(a) 3.55m (cm)

$$3.55\cancel{m}\times\frac{100cm}{1\cancel{m}}$$
$$=355cm$$

(b) 6510g (kg)

$$6510\cancel{g}\times\frac{1kg}{1000\cancel{g}}$$
$$=6.51kg$$

(c) 55cm (m)

$$55\cancel{cm}\times\frac{1m}{100\cancel{cm}}$$
$$=0.55m$$

(d) 1.36 kg (mg)

$$1.36\cancel{kg}\times\frac{1000\cancel{g}}{1\cancel{kg}}\times\frac{1000mg}{1\cancel{g}}$$
$$=1360\,000mg$$

(e) 4 550 mm^2 (cm^2)

$$4550\cancel{mm^2}\times\frac{1cm^2}{100\cancel{mm^2}}$$
$$=45.5cm^2$$

(f) 5.2 L (mL)

$$5.2L\times\frac{1000mL}{1L}$$
$$=5200mL$$

(g) 11.4 mg (g)

$$11.4\cancel{mg}\times\frac{1g}{1000\cancel{mg}}$$
$$=0.0114g$$

(h) 305 000cm^3 (m^3)

$$305000\cancel{cm^3}\times\frac{1m^3}{1000\,000\cancel{cm^3}}$$
$$=0.305m^3$$

(i) 8 550 g (t)

$$8550\cancel{g}\times\frac{1\cancel{kg}}{1000\cancel{g}}\times\frac{1t}{1000\cancel{kg}}$$
$$=0.00855t$$

(j) 240 000m^2 (ha)

$$240000m^2\times\frac{1ha}{10000m^2}$$
$$=24ha$$

(k) 9.352L (mL)

$$9.352\cancel{L}\times\frac{1000mL}{1\cancel{L}}$$
$$=9352mL$$

(l) 21.8ha (m^2)

$$21.8\cancel{ha}\times\frac{10000m^2}{1\cancel{ha}}$$
$$=218\,000m^2$$

(m) 2 905 µg (g)

$$2905\cancel{\mu g}\times\frac{1g}{1000\,000\cancel{\mu g}}$$
$$=0.002\,905g$$

(n) 15 305mg (kg)

$$15305\,\cancel{mg}\times\frac{1\,\cancel{g}}{1000\,\cancel{mg}}\times\frac{1kg}{1000\,\cancel{g}}$$
$$=0.015305kg$$

2. Change the following metric rates to the rate shown in brackets

(a) 850mL/hr (L/hr)

$$\frac{850\,\cancel{mL}}{1hr}\times\frac{1L}{1000\,\cancel{mL}}$$
$$=0.85L/hr$$

(b) 4.51L/min (L/hr)

$$\frac{4.51L}{1\,\cancel{\min}}\times\frac{60\,\cancel{\min}}{1hr}$$
$$=270.6L/hr$$

(c) 85.9km/hr (m/min)

$$\frac{85.9\,\cancel{km}}{1\,\cancel{hr}}\times\frac{1000m}{1\,\cancel{km}}\times\frac{1\,\cancel{hr}}{60\min}$$
$$=1431m/\min$$

(d) 1.6 m^2/hr (cm^2/sec)

$$\frac{1.6\,\cancel{m^2}}{1\,\cancel{hr}}\times\frac{10\,000cm^2}{1\,\cancel{m^2}}\times\frac{1\,\cancel{hr}}{60\,\cancel{\min}}\times\frac{1\,\cancel{\min}}{60\sec}$$
$$=4.4\overline{4}cm^2/\sec$$

(e) 75 mg/min (g/hr)

$$\frac{75\,\cancel{mg}}{1\,\cancel{\min}}\times\frac{1g}{1000\,\cancel{mg}}\times\frac{60\,\cancel{\min}}{1hr}$$
$$=4.5g/hr$$

(f) 0.000 6 cm^3/sec (L/hr)

$$\frac{0.0006\,\cancel{cm^3}}{1\,\cancel{\sec}}\times\frac{1L}{1000\,\cancel{cm^3}}\times\frac{60\,\cancel{\sec}}{1\,\cancel{\min}}\times\frac{60\,\cancel{\min}}{1hr}$$
$$=0.00216L/hr$$

3. Change the following metric and imperial units to the units shown, given the conversion.

(a) Change 25 ha to acres given that 1 hectare is 2.48 acres

$$25\,\cancel{ha}\times\frac{2.48acres}{1\,\cancel{ha}}$$
$$=62acres$$

(b) Change 100 cm to inches given that 1 inch is 2.54 cm

$$100\,\cancel{cm}\times\frac{1in}{2.54\,\cancel{cm}}$$
$$=39.37in$$

(c) Change 50 lbs (pounds weight) to kg given that 1 kg is 2.2 lbs

$$50\,\cancel{lbs}\times\frac{1kg}{2.2\,\cancel{lbs}}$$
$$=22.73kg$$

(d) Change 100 miles to km given that 1 mile is 1.61 km

$$100\,\cancel{miles}\times\frac{1.61km}{1\,\cancel{mile}}$$
$$=161km$$

(e) Change 36.5 oz (ounces weight) to g given that 1 oz is 28.35g

$$36.5\,\cancel{oz}\times\frac{28.35g}{1\,\cancel{oz}}$$
$$=1034.775g$$

(f) Change 100 metres to yards (yd) given that 1 m is 1.09yd

$$100\,\cancel{m}\times\frac{1.09yd}{1\cancel{m}}$$
$$=109yd$$

(g) Change 308cubic inches (in^3) to cm^3 given that 1 in is 2.54 cm

$$308in^3\times\left(\frac{2.54cm}{1in}\right)^3$$
$$=3.08\times16.387$$
$$=5047cm^3$$

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4. Change the following rates to the new rate using both imperial and metric units, given the conversion.

(a) Change 3.45 mi/hr to km/hr given that 1 mile is 1.61 km

$$\frac{3.45\,\cancel{mi}}{1hr}\times\frac{1.61km}{1\,\cancel{mi}}$$
$$=5.5545km/hr$$

(b) Change 50.9 m^2/hr to yd^2/hr given that 1 m is 1.09yd

$$\frac{50.9m^2}{1hr}\times\left(\frac{1.09yd}{1m}\right)^2$$
$$=\frac{50.9\,\cancel{m^2}}{1hr}\times\frac{1.1881yd^2}{1\,\cancel{m^2}}$$
$$=60.5yd^2/hr$$

(c) Change 6.45 gal/hr to L/min given that 1 imp. gallon is 4.55 litres

$$\frac{6.45\,\cancel{gal}}{1hr}\times\frac{4.55L}{1\,\cancel{gal}}\times\frac{1hr}{60\min}$$
$$=0.489L/\min$$

(d) Change 3.45 ft^2/hr to cm^2/sec given that 1 ft (foot) is 30.48 cm

$$\frac{3.45\,ft^2}{1hr}\times\left(\frac{30.48cm}{1\,ft}\right)^2\times\frac{1hr}{60\min}\times\frac{1\min}{60\sec}$$
$$=\frac{3.45\,\cancel{ft^2}}{1\,\cancel{hr}}\times\frac{929.03cm^2}{1\,\cancel{ft^2}}\times\frac{1\,\cancel{hr}}{60\,\cancel{\min}}\times\frac{1\,\cancel{\min}}{60\sec}$$
$$=0.89cm^2/\sec$$

Time

1.	(a)	Change 420 minutes to hours 60mins =1 hr means ÷ 60 420 min ÷ 60 = 7 hrs
	(b)	Change 330 minutes to hours and minutes. 60mins =1 hr means ÷ 60 330 min ÷ 60 = 5.5hrs = 5hrs 30 mins
	(c)	Change 215 minutes to hours and minutes. 60mins =1 hr means ÷ 60 215 min ÷ 60 = 3.583333 hrs = 3hrs 35 min (0.58333 x 60 = 35)
	(d)	Change 191 seconds to minutes (as a decimal). 60 secs =1 min means ÷ 60 191 secs ÷ 60 = 3.18333 min
	(e)	Change 54 hours to days and hours. 24 hrs = 1 day means ÷ 24 54 hours = 2.25 days = 2days 6 hours (0.25 x 24 = 6)
	(f)	Change 324 mins to hrs (as a decimal) 60mins =1 hr means ÷ 60 324 min ÷ 60 = 5.4 hrs = 5hrs 24 min (0.4 x 60 = 24)

2.	(a)	Change 2 hours 12 minutes to minutes. 1 hr = 60 mins means x 60 2 hours 12 minutes = 2 x 60 + 12 mins = 132 mins
	(b)	Change 4.3 hours to hours and minutes. 4 hours 0.3 x 60 mins = 4 hours 18 mins
	(c)	Change 4.3 hours to minutes. 1 hr = 60 mins means x 60 4.3 hours = 4.3 x 60 mins = 258 mins
	(d)	Change 5 hours 38 minutes to hours. 5 + 38 ÷ 60 hrs = 5.633333 hours
	(e)	Change 3 hours 47 minutes to minutes. 3 x 60 + 47 mins = 227 mins
	(f)	Change 2.68 hours to hours and minutes. 2.68 hrs = 2 hrs 0.68 x 60 mins

	2.68 hrs = 2 hrs 41 mins	

3.		Change these am/pm times to 24 hour times	
	(a)	Midnight	0000
	(b)	7:31am	0731
	(c)	Midday	1200
	(d)	7.31pm	1931

4.		Change these 24 hour times to am/pm times	
	(a)	0047	12:47am
	(b)	0931	9:31am
	(c)	1550	3:50pm
	(d)	2300	11pm

5. A train leaves at 1227 and arrives at its destination at 2309. How long did the journey take?

	Hours	Minutes	
	23	09	
-	12	27	
Becomes	22	69	Change 1 hr into 60 mins.
-	12	27	
	10	42	The journey took 10hrs 42 mins.

6. Three drivers recorded their times to travel to the same holiday destination. The times were 5 hrs 11 mins, 5 hrs 52 mins and 6 hrs 9 mins. What was the average driving time?

Total of the times is: 17 hours 12 mins or 1032 mins

Average time = 1032 mins ÷ 3 = 344 mins or 5 hrs 44 mins

7. A car travelling at an average speed of 85 km/hr takes how long to cover 400km?

$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

$$85\text{km/hr} = \frac{400\text{km}}{t \text{ hrs}}$$

$$85\text{km/hr} \times t \text{ hrs} = 400\text{km}$$

$$t = \frac{400\text{km}}{85\text{km/hr}}$$

$$t = 4.706\text{hr}$$

Time taken is 4 hrs 42 minutes.

8. Students at a local school attend six, fifty minute lessons each day. How long have they spent in class over a 5 day school week.

Time spent over a week = 6 x 50 x 5 = 1500 min = 25 hours

9.	A family needs to travel 575 km to reach their holiday destination. If they leave at 6.45am and travel at an average speed of 85 km/hr, what time will they arrive at their destination? $$\text{speed}=\frac{\text{distance}}{\text{time}}$$ $$85\text{km/hr}=\frac{575\text{km}}{t\ \text{hrs}}$$ $$85\text{km/hr}\times t\ \text{hrs}=575\text{km}$$ $$t=\frac{575\text{km}}{85\text{km/hr}}$$ $$t=6.765\text{hr}$$ The journey takes 6 hrs 46mins, the family arrive at 1331 or 1:31pm	
10.	A cyclist left home at 5.45 am and arrived at her destination 42 km away at 7:12 am. What was her average speed? Time taken is 1 hr 27 min, or 1.45 hr (as a decimal) Average speed is $$s=\frac{d}{t}$$ $$s=\frac{42km}{1.45hr}$$ $$s\approx 29km/hr$$	