



eClassroom

GCSE MATHEMATICS • RATIO & PROPORTION

Converting Units

Worksheet

Pearson Edexcel GCSE (1MA1) & International GCSE (4MA1) • Calculator allowed

Free Converting Units worksheet for GCSE and iGCSE Maths, with full worked solutions



Tap a section to jump straight to it

By the end of this worksheet you can: convert metric units of length, mass and capacity • convert units of area and volume, and volume to litres • use map scales and approximate imperial conversions • *Higher:* convert rates, find real areas from maps, and write conversions with algebra.

Which questions are for me?

FOUNDATION Everyone starts here. These skills appear on both tiers.

HIGHER The same skills where Higher papers use them: capacity from dimensions, converting rates, areas on maps and conversions with algebra. Grades 6 to 9.

Every section has both, clearly labelled. Questions get harder as you go, and every skill in Sections A to D is needed in Section E.

Track your progress

Section	B	C	D	E
Foundation marks	23	10	14	17
Higher marks	16	14	16	15
My score				

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A**Worked examples & Your turn**

Read each example carefully. Cover it up, then answer the question beside it using the same method.

FOUNDATION*Everyone starts here***Worked example A1**

Work out $2.4 \text{ kg} + 650 \text{ g}$. Give your answer in kilograms.

Change to the same units first: $650 \text{ g} = 0.65 \text{ kg}$

$$2.4 + 0.65 = 3.05$$

3.05 kg

Your turn A1

Work out $1.3 \text{ m} - 45 \text{ cm}$. Give your answer in centimetres.

Worked example A2

Change 2.6 m^2 into cm^2

$1 \text{ m} = 100 \text{ cm}$, so $1 \text{ m}^2 = 100 \times 100 = 10\,000 \text{ cm}^2$

$$2.6 \times 10\,000 = 26\,000$$

26 000 cm^2

Your turn A2

Change $72\,000 \text{ cm}^2$ into m^2

Worked example A3

A map has a scale of $1:50\,000$. Two towns are 4.6 cm apart on the map. Work out the real distance in km.

1 cm on the map is $50\,000 \text{ cm}$ in real life.

$$4.6 \times 50\,000 = 230\,000 \text{ cm} = 2300 \text{ m}$$

2.3 km

Your turn A3

A map has a scale of $1:20\,000$. Two points are 3 km apart. How far apart are they on the map, in cm?



HIGHER*Higher strategies: these are new ways of thinking, not longer sums***Worked example A4: capacity from dimensions**

A tank is a cuboid 1.5 m by 60 cm by 40 cm. Work out its capacity in litres.

Work in cm, then use 1 litre = 1000 cm³

$$150 \times 60 \times 40 = 360\,000 \quad 360\,000 \div 1000 = 360$$

360 litres

Your turn A4

A tank is a cuboid 2 m by 50 cm by 30 cm. Work out its capacity in litres.

Worked example A5: converting a rate

Water flows at 18 litres per minute. Write this in cm³ per second.

Convert litres to cm³, then minutes to seconds.

$$18 \times 1000 = 18\,000 \text{ cm}^3 \text{ per minute}$$

$$18\,000 \div 60 = 300$$

300 cm³ per second

Your turn A5

A tap drips at 60 cm³ per hour. Write this in litres per day.

Worked example A6: areas on a map

A map has a scale of 1 : 25 000. A wood covers 8 cm² on the map. Work out its real area in km²

$$1 \text{ cm} = 25\,000 \text{ cm} = 0.25 \text{ km}$$

$$\text{so } 1 \text{ cm}^2 = 0.25^2 = 0.0625 \text{ km}^2$$

$$8 \times 0.0625 = 0.5$$

0.5 km²

Your turn A6

A plan has a scale of 1 : 10 000. A park covers 15 cm² on the plan. Work out its real area in m²

Worked example A7: conversions with algebra

A speed is v m/s. In km/h the number is 52 more. Find v

$$v \text{ m/s} = v \times 3600 \div 1000 = 3.6v \text{ km/h}$$

$$3.6v - v = 52 \quad \text{so} \quad 2.6v = 52$$

$$v = 20$$

Your turn A7

A length is x m. In centimetres the number is 792 more. Find x



B**Fluency**

Each question is a designed sequence. From one part to the next, ask yourself: what changed, and what did it do to the answer?

FOUNDATION*Everyone starts here***B1** Convert**(a)** 3.4 m to cm**(b)** 3.4 m to mm**(c)** 34 mm to cm**(d)** 3400 cm to km**[4 marks]****B2** Convert**(a)** 2.75 kg to g**(b)** 450 g to kg**(c)** 1.2 litres to ml**(d)** 85 cl to litres**[4 marks]****B3** Convert**(a)** 3 m^2 to cm^2 **(b)** $45\,000 \text{ cm}^2$ to m^2 **(c)** 6 cm^2 to mm^2 **(d)** 2.5 km^2 to m^2 **[4 marks]****B4** Convert**(a)** 2 m^3 to cm^3 **(b)** 5400 cm^3 to litres**(c)** 0.35 m^3 to litres**(d)** 1 cm^3 to mm^3 **[4 marks]****B5** Use 5 miles $\approx$ 8 km, 1 kg $\approx$ 2.2 pounds (lb) and 1 gallon $\approx$ 4.5 litres to convert**(a)** 40 miles to km**(b)** 100 km to miles**(c)** 11 lb to kg**(d)** 18 litres to gallons**[4 marks]****B6** **(a)** A map has a scale of 1 : 50 000. Change 3 cm on the map to a real distance in km.**(b)** On the same map, how many cm represent 7.2 km?**(c)** A house plan has a scale of 1 : 200. A wall is 4.5 cm long on the plan. How long is the real wall, in metres?**[3 marks]**

HIGHER*Higher tier only***B7** Convert

- (a) 90 km/h to m/s
(b) 3 litres per minute to cm^3 per second
(c) 2.4 g/cm^3 to kg/m^3
(d) £1.20 per kg to pence per gram

[4 marks]

- B8** (a) A plan has a scale of 1 : 100. A room is 12 cm^2 on the plan. Work out its real area in m^2
(b) A map has a scale of 1 : 25 000. A lake is 4 cm^2 on the map. Work out its real area in km^2
(c) A map has a scale of 1 : 50 000. A forest has a real area of 3 km^2 . What is its area on the map?
(d) A plan has a scale of 1 : 50. A hall has a real area of 45 m^2 . What is its area on the plan? **[4 marks]**

B9 Write an expression for

- (a) x m in cm (b) $y \text{ cm}^2$ in m^2 (c) t minutes in hours (d) v m/s in km/h

[4 marks]**B10** Work out the capacity in litres of

- (a) a cube with sides of 10 cm (b) a cube with sides of 1 m
(c) a cylinder with radius 10 cm and height 30 cm (d) a cuboid 2 m by 25 cm by 40 mm

[4 marks]

C**Reasoning**

Show your working and explain your thinking. A correct answer without a reason does not score full marks.

FOUNDATION

Everyone starts here

C1 Ella writes $4 \text{ m}^2 = 400 \text{ cm}^2$

(a) Explain Ella's mistake. (b) Write 4 m^2 in cm^2

[2 marks]

C2 5 miles $\approx$ 8 km. Which is longer, 5 miles or 7.5 km? Give a reason for your answer.

[2 marks]

C3 A map has a scale of 1 : 25 000

Tom says, "4 cm on the map is 100 km in real life, because $4 \times 25\,000 = 100\,000$."

(a) Explain Tom's mistake. (b) Work out the correct distance.

[3 marks]

C4 1 litre = 1000 cm^3

Show that a tank with a volume of 1 m^3 holds 1000 litres.

[3 marks]



HIGHER*Higher tier only*

- C5** Map A has a scale of 1 : 25 000. Map B has a scale of 1 : 50 000
Kai says, "A field on map B looks half as big as it does on map A."
Is Kai correct? Give a reason for your answer. [3 marks]
- C6** Show that a density of 1 g/cm^3 is the same as 1000 kg/m^3 [3 marks]
- C7** Sam says, " $1 \text{ mm}^3 = 0.001 \text{ m}^3$ "
Show that Sam is wrong, and write 1 mm^3 in m^3 in standard form. [3 marks]
- C8** A map has a scale of 1 : n
(a) Show that an area of $A \text{ cm}^2$ on the map represents a real area of $\frac{An^2}{10^{10}} \text{ km}^2$
(b) On the map, a lake has an area of 6 cm^2 . Its real area is 13.5 km^2 . Find n [5 marks]



D**Problem solving**

You decide the method. Read the whole question first, and show every step.

FOUNDATION

Everyone starts here

- D1** A recipe needs 1.2 kg of flour. Flour is sold in 500 g bags costing 85p each.
Work out the cost of the flour needed. [3 marks]
- D2** A garden is a rectangle 12.5 m by 8.4 m. It is fenced all the way round with panels 180 cm wide.
How many panels are needed? [4 marks]
- D3** A car travels 45 miles on 1 gallon of fuel.
5 miles $\approx$ 8 km and 1 gallon $\approx$ 4.5 litres. About how many kilometres does the car travel on 1 litre?
[3 marks]
- D4** A child needs 7.5 mg of a medicine for each kg of body mass, in each dose. The child's mass is 18 kg.
The medicine contains 120 mg in every 5 ml. How many ml should be given in each dose? [4 marks]



HIGHER*Higher tier only*

- D5** A wall is 4.5 m wide and 2.6 m high. It needs two coats of paint. 1 litre of paint covers 12 m^2 . Paint is sold in 750 ml tins costing £7.99 each. Work out the cost of the paint needed. [4 marks]
- D6** 12 mm of rain falls on a flat roof measuring 8 m by 6 m. How many litres of rain fall on the roof? [3 marks]
- D7** On a map with a scale of 1 : 40 000, a footpath is 23 cm long. Jo walks along the footpath at 4 km/h. How long does it take her? Give your answer in hours and minutes. [4 marks]
- D8** 1 g of gold is beaten into a very thin square sheet 0.0001 mm thick. The density of gold is 19.3 g/cm^3 . Work out the area of the sheet in m^2 . Give your answer to 3 significant figures. [5 marks]



**Exam practice**

Exam-style questions. Write your answers in the spaces. Aim for about one minute per mark.

FOUNDATION*Foundation and Higher crossover***E1** (a) Change 3.5 km into metres...... m
(1)

(b) Change 750 g into kilograms.

..... kg
(1)

(c) Change 2.4 litres into millilitres.

..... ml
(1)**(Total for Question E1 is 3 marks)****E2** Write these masses in order of size. Start with the smallest.

0.8 kg 750 g 0.085 kg 820 000 mg

.....

(Total for Question E2 is 2 marks)**E3** 5 miles $\approx$ 8 km

(a) A road sign shows that Paris is 360 km away. About how many miles is this?

..... miles
(2)

(b) Tim drives 90 miles. About how many kilometres is this?

..... km
(1)**(Total for Question E3 is 3 marks)**

- E4** A map has a scale of 1 : 25 000. Two villages are 7.2 cm apart on the map.
Work out the real distance between the villages in km.

..... km

(Total for Question E4 is 3 marks)

- E5** A chicken is cooked for 20 minutes for every 500 g, plus an extra 20 minutes.
The chicken has a mass of 2.25 kg. It must be ready at 18 30. At what time should it go into the oven?

.....

(Total for Question E5 is 4 marks)

- E6** (a) Change 3.5 m^2 into cm^2

..... cm^2

(1)

- (b) Change $48\,000 \text{ cm}^3$ into litres.

..... litres

(1)

(Total for Question E6 is 2 marks)

HIGHER

Higher tier only

- E7** Water leaks from a pipe at 45 cm^3 per minute.
How many litres of water leak from the pipe in one day?

..... litres

(Total for Question E7 is 3 marks)



- E8** A map has a scale of 1 : 50 000. A lake has an area of 6 cm^2 on the map.
Work out the real area of the lake in km^2

..... km^2

(Total for Question E8 is 3 marks)

- E9** Topsoil is spread 8 cm deep over a rectangular garden 12 m by 4.5 m.
Topsoil is sold in 40 litre bags costing £4.50 each. Work out the cost of the topsoil.

£

(Total for Question E9 is 4 marks)

- E10** A cylinder has radius r cm and height h m.

(a) Show that the capacity of the cylinder is $\frac{\pi r^2 h}{10}$ litres.

(3)

(b) A cylinder of height 1.5 m holds 750 litres. Work out its radius. Give your answer to 1 decimal place.

..... cm

(2)

(Total for Question E10 is 5 marks)

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