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GCSE MATHEMATICS • RATIO & PROPORTION

Converting Units

Worked Solutions

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

Full worked solutions for the free Converting Units worksheet, GCSE and iGCSE Maths



Tap a section to jump straight to it

Full worked solutions for every question on the Converting Units worksheet, in the same order and with the same question numbers.

How to mark your work. Tick each step you got right, not just the final answer. In the exam, method marks are given for correct working even when the final answer is wrong. If you lost marks, find the *first* line where your working is different from ours. That is the thing to fix.

In Section E: **M** = method mark, **P** = process mark, **A** = accuracy mark, **B** = independent mark, **C** = communication mark.

Question sheet

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A**Your turn answers**

Compare each line of your working with the solution.

FOUNDATION

A1 $1.3 \text{ m} = 130 \text{ cm}$ $130 - 45 = \boxed{85 \text{ cm}}$

A2 $1 \text{ m}^2 = 10\,000 \text{ cm}^2$, so divide: $72\,000 \div 10\,000 = \boxed{7.2 \text{ m}^2}$

A3 $3 \text{ km} = 300\,000 \text{ cm}$ $300\,000 \div 20\,000 = \boxed{15 \text{ cm}}$

HIGHER

A4 $200 \times 50 \times 30 = 300\,000 \text{ cm}^3$ $300\,000 \div 1000 = \boxed{300 \text{ litres}}$

A5 $1 \text{ day} = 24 \text{ hours}$: $60 \times 24 = 1440 \text{ cm}^3$ per day $1440 \div 1000 = \boxed{1.44 \text{ litres per day}}$

A6 $1 \text{ cm} = 10\,000 \text{ cm} = 100 \text{ m}$, so $1 \text{ cm}^2 = 100^2 = 10\,000 \text{ m}^2$ $15 \times 10\,000 = \boxed{150\,000 \text{ m}^2}$

A7 $x \text{ m} = 100x \text{ cm}$ $100x - x = 792$ $99x = 792$ $\boxed{x = 8}$

B**Fluency solutions**One mark for each correct part. The notes in *italics* explain why each sequence was chosen.**FOUNDATION**

B1 (a) $\boxed{340 \text{ cm}}$ (b) $\boxed{3400 \text{ mm}}$ (c) $\boxed{3.4 \text{ cm}}$ (d) $3400 \div 100\,000 = \boxed{0.034 \text{ km}}$

Small unit to big unit: divide. Big unit to small unit: multiply.

B2 (a) $\boxed{2750 \text{ g}}$ (b) $\boxed{0.45 \text{ kg}}$ (c) $\boxed{1200 \text{ ml}}$ (d) $100 \text{ cl} = 1 \text{ litre}$: $\boxed{0.85 \text{ litres}}$

B3 (a) $3 \times 100^2 = \boxed{30\,000 \text{ cm}^2}$ (b) $45\,000 \div 10\,000 = \boxed{4.5 \text{ m}^2}$ (c) $6 \times 10^2 = \boxed{600 \text{ mm}^2}$ (d) $2.5 \times 1000^2 = \boxed{2\,500\,000 \text{ m}^2}$

For area, square the length factor: 1 m^2 is not 100 cm^2 . It is $100 \times 100 = 10\,000 \text{ cm}^2$ 

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B4 (a) $2 \times 100^3 = 2\,000\,000\text{ cm}^3$ (b) $5400 \div 1000 = 5.4\text{ litres}$ (c) $0.35 \times 1000 = 350\text{ litres}$ (d) $10^3 = 1000\text{ mm}^3$

For volume, cube the length factor. $1\text{ m}^3 = 1000\text{ litres}$ and $1\text{ litre} = 1000\text{ cm}^3$

B5 (a) $40 \div 5 \times 8 = 64\text{ km}$ (b) $100 \div 8 \times 5 = 62.5\text{ miles}$ (c) $11 \div 2.2 = 5\text{ kg}$ (d) $18 \div 4.5 = 4\text{ gallons}$

B6 (a) $3 \times 50\,000 = 150\,000\text{ cm}$ 1.5 km (b) $720\,000 \div 50\,000 = 14.4\text{ cm}$ (c) $4.5 \times 200 = 900\text{ cm}$ 9 m

HIGHER

B7 (a) $90 \times 1000 \div 3600 = 25\text{ m/s}$ (b) $3000 \div 60 = 50\text{ cm}^3\text{ per second}$

(c) 2400 kg/m^3 (d) $120\text{p per } 1000\text{ g: } 0.12\text{p per gram}$

B8 (a) $1\text{ cm} = 1\text{ m}$, so $1\text{ cm}^2 = 1\text{ m}^2$: 12 m^2 (b) $1\text{ cm}^2 = 0.25^2 = 0.0625\text{ km}^2$: 0.25 km^2
 (c) $1\text{ cm}^2 = 0.5^2 = 0.25\text{ km}^2$: $3 \div 0.25 = 12\text{ cm}^2$ (d) $1\text{ cm}^2 = 0.5^2 = 0.25\text{ m}^2$: $45 \div 0.25 = 180\text{ cm}^2$

B9 (a) $100x\text{ cm}$ (b) $\frac{y}{10\,000}\text{ m}^2$ (c) $\frac{t}{60}\text{ hours}$ (d) $3.6v\text{ km/h}$

B10 (a) 1000 cm^3 : 1 litre (b) 1 m^3 : 1000 litres (c) $\pi \times 10^2 \times 30 = 9424.7\dots\text{ cm}^3$: 9.42 litres
 (d) $200 \times 25 \times 4 = 20\,000\text{ cm}^3$: 20 litres Put every length in cm before you multiply.

C

Reasoning solutions

Your wording can be different. Check that your reason makes the same point.

FOUNDATION

C1 (a) Ella multiplied by 100, the factor for length. For area it is $100 \times 100 = 10\,000$

(b) $4 \times 10\,000 = 40\,000\text{ cm}^2$

C2 5 miles 5 miles is about 8 km, which is more than 7.5 km

C3 (a) $4 \times 25\,000 = 100\,000\text{ centimetres}$, not kilometres. (b) $100\,000\text{ cm} = 1000\text{ m} = 1\text{ km}$



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C4 $1 \text{ m}^3 = 100 \times 100 \times 100 = 1\,000\,000 \text{ cm}^3$ $1\,000\,000 \div 1000 = \boxed{1000}$ litres, as required

HIGHER

C5 **No.** On map B each length is half as long, so each area is $\left(\frac{1}{2}\right)^2 = \frac{1}{4}$ as big. The field looks a quarter of the size.

C6 1 g/cm^3 : $1 \text{ m}^3 = 1\,000\,000 \text{ cm}^3$ has mass $1\,000\,000 \text{ g} = 1000 \text{ kg}$ so $\boxed{1000 \text{ kg/m}^3}$, as required

C7 $1 \text{ m} = 1000 \text{ mm}$, so $1 \text{ m}^3 = 1000^3 = 10^9 \text{ mm}^3$ $1 \text{ mm}^3 = \boxed{1 \times 10^{-9} \text{ m}^3}$, not 0.001 m^3

C8 (a) 1 cm on the map is $n \text{ cm} = \frac{n}{100\,000} \text{ km}$. So 1 cm^2 is $\frac{n^2}{10^{10}} \text{ km}^2$, and $A \text{ cm}^2$ is $\frac{An^2}{10^{10}} \text{ km}^2$ **as required**

(b) $\frac{6n^2}{10^{10}} = 13.5$ $n^2 = 2.25 \times 10^{10}$ $\boxed{n = 150\,000}$

D**Problem solving solutions**

There is often more than one correct method. Any complete, correct method scores full marks.

FOUNDATION

D1 $1.2 \text{ kg} = 1200 \text{ g}$. Two bags give only 1000 g , so she needs 3 bags. $3 \times 85 = 255\text{p} = \boxed{\text{£}2.55}$

D2 Perimeter $= 2 \times (12.5 + 8.4) = 41.8 \text{ m} = 4180 \text{ cm}$ $4180 \div 180 = 23.2\ldots$ $\boxed{24}$ panels (round up)

D3 $45 \text{ miles} \approx 45 \div 5 \times 8 = 72 \text{ km}$ on 4.5 litres $72 \div 4.5 = \boxed{16 \text{ km}}$ per litre

D4 Dose $= 7.5 \times 18 = 135 \text{ mg}$ 1 ml contains $120 \div 5 = 24 \text{ mg}$ $135 \div 24 = \boxed{5.625 \text{ ml}}$

HIGHER

D5 Area $= 4.5 \times 2.6 = 11.7 \text{ m}^2$, two coats $= 23.4 \text{ m}^2$ Paint $= 23.4 \div 12 = 1.95 \text{ litres}$
 $1.95 \div 0.75 = 2.6$, so 3 tins $3 \times 7.99 = \boxed{\text{£}23.97}$



D6 $12 \text{ mm} = 0.012 \text{ m}$ $\text{Volume} = 8 \times 6 \times 0.012 = 0.576 \text{ m}^3$ $0.576 \times 1000 = \boxed{576} \text{ litres}$

D7 $23 \times 40\,000 = 920\,000 \text{ cm} = 9.2 \text{ km}$ $\text{Time} = 9.2 \div 4 = 2.3 \text{ hours}$ $0.3 \times 60 = 18$ 2 hours 18 minutes

D8 $\text{Volume} = 1 \div 19.3 = 0.05181... \text{ cm}^3 = 51.81... \text{ mm}^3$
 $\text{Area} = \text{volume} \div \text{thickness} = 51.81... \div 0.0001 = 518\,134... \text{ mm}^2$
 $1 \text{ m}^2 = 1000^2 = 10^6 \text{ mm}^2$, so the area is $0.518... \text{ m}^2$ 0.518 m²

E**Exam practice solutions**

Marks are shown on the right of each line.

FOUNDATION

Foundation and Higher crossover

E1 (a) 3500 m B1
 (b) 0.75 kg B1
 (c) 2400 ml B1

E2 In grams: 800, 750, 85, 820 M1
0.085 kg, 750 g, 0.8 kg, 820 000 mg A1

E3 (a) $360 \div 8 \times 5$ M1
225 miles A1
 (b) 144 km B1

E4 $7.2 \times 25\,000 = 180\,000 \text{ cm}$ M1
 $180\,000 \div 100\,000$ M1
1.8 km A1

E5 $2.25 \text{ kg} = 2250 \text{ g}$, and $2250 \div 500 = 4.5$ P1
 $4.5 \times 20 + 20 = 110 \text{ minutes}$ P1
 $110 \text{ minutes} = 1 \text{ hour } 50 \text{ minutes before } 18\,30$ P1
16 40 A1



- E6 (a) $35\,000\text{ cm}^2$ B1
 (b) 48 litres B1

HIGHER

- E7 $1\text{ day} = 24 \times 60 = 1440\text{ minutes}$ M1
 $45 \times 1440 = 64\,800\text{ cm}^3$ M1
 64.8 litres A1
-
- E8 $1\text{ cm} = 50\,000\text{ cm} = 0.5\text{ km}$ M1
 $1\text{ cm}^2 = 0.5^2 = 0.25\text{ km}^2$ M1
 $6 \times 0.25 = 1.5\text{ km}^2$ A1
-
- E9 Volume = $12 \times 4.5 \times 0.08 = 4.32\text{ m}^3$ P1
 $= 4320\text{ litres}$ P1
 $4320 \div 40 = 108\text{ bags}$ P1
 $108 \times 4.50 = \text{£}486$ A1
-
- E10 (a) Height $h\text{ m} = 100h\text{ cm}$ M1
 Volume = $\pi r^2 \times 100h\text{ cm}^3$ M1
 $\div 1000: \frac{100\pi r^2 h}{1000} = \frac{\pi r^2 h}{10}\text{ litres}$ as required A1
 (b) $\frac{\pi r^2 \times 1.5}{10} = 750$, so $r^2 = \frac{7500}{1.5\pi} = 1591.5\dots$ M1
 $r = 39.89\dots$ 39.9 cm A1

