Day 232 **B Tier 10-a-day: Model Solutions**

1 Percentage as a fraction of

(a) Priya scores 19 out of 40 in a test. Write this as a percentage.
(b) Write 90p as a percentage of £4.

(a) $\frac{19}{40} \times 100 = 47.5\%$

(b) Change both to pence: 90p and 400p

$\frac{90}{400} \times 100 = 22.5\%$

Answer: (a) 47.5% (b) 22.5%

2 Metric conversions

(a) Convert 12.5 litres to ml.
(b) Convert 15 000 cm^2 to m^2.

(a) litres → ml: multiply by 1000: $12.5 \times 1000 = 12\,500$

(b) 1 m = 100 cm, so 1 m^2 = $100 \times 100 = 10\,000$ cm^2. $15\,000 \div 10\,000 = 1.5$

Answer: (a) 12 500 ml (b) 1.5 m^2

3 Metric units

A jug holds 2.8 litres of juice.
Each glass holds 200 ml.
How many glasses can be filled from the jug?

2.8 litres = $2.8 \times 1000 = 2800$ ml

$2800 \div 200 = 14$

Answer: 14 glasses

4 Perimeter expressions

A triangle has sides of length (3x + 7) cm, (4x − 3) cm and (4x + 3) cm.
Write down an expression, in terms of x, for the perimeter of the triangle.
Give your answer in its simplest form.

Add the three sides: (3x + 7) + (4x − 3) + (4x + 3)

x terms: 3x + 4x + 4x = 11x. Numbers: 7 − 3 + 3 = 7

Answer: 11x + 7 cm

5 Stratified sampling

A stratified sample of 40 students is taken from the 600 students in the table.
Work out how many students should be sampled from Year 9.

Sample fraction = 40 ÷ 600

Year 9: $120 \div 600 \times 40 = 8$

Answer: 8

6 Solving double inequalities

(a) Solve $-4 \leq 3x - 4 \leq 2$
(b) Write down the integer values of x that satisfy this inequality.

(a) Add 4 in all three parts: $0 \leq 3x \leq 6$

Divide all three parts by 3: $0 \leq x \leq 2$

(b) The whole numbers in this range are 0, 1, 2

Answer: (a) $0 \leq x \leq 2$ (b) 0, 1, 2

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7 Prisms and density

A triangular prism has a right-angled triangle as its cross-section.
The two shorter sides of the triangle are 10 cm and 5 cm.
The length of the prism is 6 cm.
Work out the volume of the prism.

Area of triangle = ½ × 10 × 5 = 25
Volume = 25 × 6 = 150
Answer: 150 cm^3

8 Percentage change

George bought a laptop for £200 and sold it for £270.
Work out the percentage profit.

Profit = selling price − cost = £70
Percentage profit = $\frac{£70}{£200}$ × 100 = 35%
Answer: 35% profit

9 Sharing in a ratio

Omar and Priya share 28 marbles in the ratio 1 : 3.
Work out how many Omar gets.

1 + 3 = 4 parts
1 part = 28 ÷ 4 = 7
Omar gets 1 × 7 = 7
Answer: 7

10 Chords and the centre of a circle

A circle has centre O and radius 13 cm.
AB is a chord and M is the midpoint of AB. OM is perpendicular to AB.
Work out the value of x.
The diagram is not drawn accurately.

Triangle OMA has a right angle at M, and OA is the hypotenuse
$AM^2 = 13^2 - 12^2 = 169 - 144 = 25$
AM = $\sqrt{25}$ = 5
x = 2 × AM = 10
Answer: x = 10 cm