Day 24 **B Tier 10-a-day: Model Solutions**

1 Metric conversions

(a) Convert 2 litres to ml.
(b) Convert 250 mm^2 to cm^2.

(a) litres → ml: multiply by 1000: 2 × 1000 = 2000
(b) 1 cm = 10 mm, so 1 cm^2 = 10 × 10 = 100 mm^2. 250 ÷ 100 = 2.5
Answer: (a) 2000 ml (b) 2.5 cm^2

2 Time

A train leaves at 11:07.
It arrives at 14:12.
How long does the journey take?

From 11:07 to 14:07 is 3 hours.
From 14:07 to 14:12 is 5 minutes.
Total time: 3 hours 5 minutes
Answer: 3 hours 5 minutes

3 Perimeter and area of compound shapes

The diagram shows the shape of a patio.
All the corners are right angles. All lengths are in m.
(a) Work out the perimeter.
(b) Work out the area.

(a) Missing lengths: 11 − 5 = 6 and 16 − 6 = 10
Perimeter = 11 + 6 + 6 + 10 + 5 + 16 = 54
(b) Split into two rectangles: 11 × 6 = 66 and 5 × 10 = 50
66 + 50 = 116
Answer: (a) 54 m (b) 116 m^2

4 Fractions of amounts

Work out
(a) $\frac{1}{5}$ of 50
(b) $\frac{1}{12}$ of £96

(a) 50 ÷ 5 = 10, then 10 × 1 = 10
(b) 96 ÷ 12 = 8, then 8 × 1 = 8
Answer: (a) 10 (b) £8

5 Relative frequency

Sam tests a biased spinner landing on red.
In 250 trials it happens 125 times.
Estimate how many times it will happen in 200 trials.

Relative frequency = 125 ÷ 250 = 0.5
0.5 × 200 = 100
Answer: 100

6 Area of a triangle using sine

In triangle PQR, PQ = 16 m, QR = 11 m and angle PQR = 140°. (Calculator)
Work out the area of the triangle.
Give your answer correct to 1 decimal place.

Area = ½ab sin C
Area = ½ × 16 × 11 × sin 140°
= 56.565...
= 56.6 m^2 (1 d.p.)
Answer: 56.6 m^2

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7 Equations with fractional answers

Solve $5x - 2 = 16$

Give your answer as a fraction in its simplest form.

Add 2 to both sides: $5x = 18$

Divide both sides by 5: $x = \frac{18}{5}$

Answer: $x = \frac{18}{5}$

8 Combining ratios

In a bag of counters, the ratio of red to blue is 3 : 5.

The ratio of blue to white is 2 : 1.

Write down the ratio red : blue : white.

Make the blue part the same in both ratios: lowest common multiple of 5 and 2 is 10

red : blue = 6 : 10

blue : white = 10 : 5

red : blue : white = 6 : 10 : 5

Answer: 6 : 10 : 5

9 Iteration

Here is an iteration formula.

$x_{n+1} = \sqrt{2x_n + 12}$

$x_0 = 2$

(a) Work out x_1

(b) Work out x_2. Give your answer correct to 3 decimal places. (Calculator)

(a) $x_1 = \sqrt{2 \times 2 + 12} = \sqrt{16} = 4$

(b) $x_2 = \sqrt{2 \times 4 + 12} = \sqrt{20} = 4.47214...$

$= 4.472$

Answer: (a) 4 (b) 4.472

10 Stratified sampling

A stratified sample of 30 students is taken from the 400 students in the table.

Work out how many students should be sampled from Group B.

Sample fraction = 30 ÷ 400

Group B: 160 ÷ 400 × 30 = 12

Answer: 12