Day 152 **B Tier 10-a-day: Model Solutions**

1 Number machines

Here is a number machine.
Input → + 10 → − 8 → Output
(a) The input is 12. Work out the output.
(b) The output is 12. Work out the input.

(a) 12 + 10 = 22, then 22 − 8 = 14
(b) Work backwards: undo − 8 to get 20, then undo + 10 to get 10
Answer: (a) 14 (b) 10

2 Metric conversions

(a) Convert 3500 ml to litres.
(b) Convert 2.5 m^3 to cm^3.

(a) ml → litres: divide by 1000: 3500 ÷ 1000 = 3.5
(b) 1 m = 100 cm, so 1 m^3 = 100 × 100 × 100 = 1 000 000 cm^3. 2.5 × 1 000 000 = 2 500 000
Answer: (a) 3.5 litres (b) 2 500 000 cm^3

3 Median and range

Here are the temperatures at noon in a town.
31, 25, 27, 21, 9, 16, 11, 14
(a) Find the median.
(b) Work out the range.

(a) Put in order: 9, 11, 14, 16, 21, 25, 27, 31
The middle two values are 16 and 21, so the median is 37 ÷ 2 = 18.5
(b) Range = largest − smallest = 31 − 9 = 22
Answer: (a) 18.5 (b) 22

4 Metric units

A jug holds 1.75 litres of juice.
Each glass holds 250 ml.
How many glasses can be filled from the jug?

1.75 litres = 1.75 × 1000 = 1750 ml
1750 ÷ 250 = 7
Answer: 7 glasses

5 Reflection

The diagram shows triangle ABC on a grid.
(a) Write down the coordinates of the image of B after a reflection in the line y = 1.
(b) Write down the coordinates of the image of C after a reflection in the y-axis.

(a) B is at (1, 4). Reflect in the line y = 1: (1, −2)
(b) C is at (3, 4). Reflect in the y-axis: (−3, 4)
Answer: (a) (1, −2) (b) (−3, 4)

6 Average speed

A lorry travels at 60 km/h for 1.5 hours and then at 48 km/h for 1.5 hours.
Work out its average speed for the whole journey.

Distance: 60 × 1.5 = 90 km and 48 × 1.5 = 72 km
Total distance = 162 km and total time = 3 hours
Average speed = 162 ÷ 3 = 54
Answer: 54 km/h

Day 152 **B Tier 10-a-day: Model Solutions**

7 Equations with fractional answers

Solve $4x - 5 = 12$

Give your answer as a fraction in its simplest form.

Add 5 to both sides: $4x = 17$

Divide both sides by 4: $x = \frac{17}{4}$

Answer: $x = \frac{17}{4}$

8 Venn diagram problems

25 students were asked.

12 of them play football and 11 of them play tennis.

8 of them did both.

(a) How many did neither?

(b) One is chosen at random. Find the probability that they play football but do not play tennis.

(a) Union = $12 + 11 - 8 = 15$

Neither = $25 - 15 = 10$

(b) Only play football = $12 - 8 = 4$

P = 4 out of 25

Answer: (a) 10 (b) $\frac{4}{25}$

9 Reverse repeated percentages

In a sale, the price of a sofa is reduced by 10%. (Calculator)

Two weeks later it is reduced by a further 20% of the new price.

The final price is £36.

Work out the original price of the sofa.

Multipliers: 0.9 and 0.8

Overall multiplier = $0.9 \times 0.8 = 0.72$

Original price = £36 ÷ 0.72 = £50

Answer: £50

10 Fraction problems

A paddling pool is $\frac{2}{5}$ full.

21 litres of water are added.

The paddling pool is now $\frac{1}{2}$ full.

Work out the capacity of the paddling pool.

Fraction added = $\frac{1}{2} - \frac{2}{5} = \frac{1}{10}$

$\frac{1}{10}$ of the capacity = 21 litres

Whole capacity = $21 \times 10 = 210$ litres

Answer: 210 litres