Day 224 **B Tier 10-a-day: Model Solutions**

1 Function notation

f(x) = 2x + 7
(a) Work out f(8)
(b) Solve f(x) = 9

(a) f(8) = 2 × 8 + 7 = 23
(b) 2x + 7 = 9
Subtract 7 from both sides: 2x = 2
Divide both sides by 2
Answer: (a) 23 (b) x = 1

2 Compound areas

Two rectangles are joined to make a shape.
The first is 4 cm by 8 cm.
The second is 11 cm by 5 cm.
Work out the total area of the shape.

First rectangle: 4 × 8 = 32
Second rectangle: 11 × 5 = 55
32 + 55 = 87
Answer: 87 cm^2

3 Speed

A cyclist travels 70 km in 3 hours 30 minutes.
Work out its average speed in km per hour.

Speed = distance ÷ time
Time = 3.5 hours
70 ÷ 3.5 = 20
Answer: 20 km per hour

4 Cost formulae

A taxi firm charges £7 plus £12 for each mile travelled.
(a) Work out the total cost for 5 miles.
(b) The total cost is £91. Work out the number of miles.

(a) 12 × 5 = 60, then 7 + 60 = 67
(b) Take off the fixed charge: 91 − 7 = 84
Divide by the cost for each: 84 ÷ 12 = 7
Answer: (a) £67 (b) 7

5 Standard form

Write each number in standard form.
(a) 5,200,000
(b) 0.0000086

(a) Move the decimal point 6 places: 5.2×10^6
(b) Move the decimal point 6 places the other way: 8.6×10^{-6}
Answer: (a) 5.2×10^6 (b) 8.6×10^{-6}

6 Volume of a cylinder

A drum has radius 6 m and height 16 m.
Work out its volume.
Give your answer in terms of π.

Volume = π × radius^2 × height
π × 6^2 × 16 = π × 36 × 16
= 576π
Answer: 576π m^3

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7 Midpoint of a line segment

M is the midpoint of AB.
A is the point (5, 8) and M is the point (4, 5).
Find the coordinates of B.

From A to M, x changes by −1 and y changes by −3
Do the same change again from M to get to B: x = 4 − 1 = 3, y = 5 − 3 = 2
Answer: (3, 2)

8 Capture-recapture

50 snails in a lake are caught, tagged and returned to the lake.
Later, a sample of 30 snails is caught and 2 of them are tagged.
Estimate the total number of snails in the lake.

Proportion tagged in the sample = 2 ÷ 30
This is the same proportion as 50 out of the whole population
Population ≈ 50 × 30 ÷ 2 = 750
Answer: 750

9 Bounds

The length of a rectangle is 8 cm and its width is 12 cm.
Both measurements are correct to the nearest cm.
Work out the upper bound for the perimeter of the rectangle.

Upper bound of each side = value + 0.5: 8.5 cm and 12.5 cm
Perimeter = 2 × (8.5 + 12.5) = 42 cm
Answer: 42 cm

10 Cumulative frequency

The cumulative frequency graph shows the times taken by 40 students to complete a puzzle.
(a) Use the graph to estimate the median.
(b) Work out an estimate for the interquartile range.

(a) Median is at 40 ÷ 2 = 20: read across from 20 on the vertical axis to the curve, then down: 25
(b) Lower quartile at 10: 15. Upper quartile at 30: 37
IQR = 37 − 15 = 22
Answer: (a) 25 minutes (b) 22 minutes