Day 291 **B Tier 10-a-day: Model Solutions**

1 Distance, speed and time

A scooter travels 75 km at an average speed of 30 km/h.
How long does the journey take?
Give your answer in hours and minutes.

Time = distance ÷ speed
75 ÷ 30 = 2.5 hours
2.5 hours = 2 hours 30 minutes
Answer: 2 hours 30 minutes

2 Prime factors

Write 189 as a product of its prime factors.
Give your answer in index form.

Divide by prime numbers, smallest first:
189 ÷ 3 = 63, 63 ÷ 3 = 21, 21 ÷ 3 = 7, 7 is prime
189 = 3 × 3 × 3 × 7
In index form: 189 = $3^3 \times 7$
Answer: $3^3 \times 7$

3 Perimeter and area of compound shapes

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

(a) Missing lengths: 17 − 14 = 3 and 15 − 9 = 6
Perimeter = 17 + 9 + 3 + 6 + 14 + 15 = 64
(b) Split into two rectangles: 17 × 9 = 153 and 14 × 6 = 84
153 + 84 = 237
Answer: (a) 64 m (b) 237 m^2

4 Sharing in a ratio

Dev and Ben share 126 sweets in the ratio 5 : 4.
Work out how many Dev gets.

5 + 4 = 9 parts
1 part = 126 ÷ 9 = 14
Dev gets 5 × 14 = 70
Answer: 70

5 Real-life graphs

A printing company charges a set-up fee plus a cost for each box of leaflets.
The graph shows the total cost.
(a) Write down the fixed charge.
(b) Work out the cost for each box.

(a) The fixed charge is the cost when nothing has been used, where the line meets the vertical axis
(b) Take two points on the line, for example (0, 7) and (4, 15)
Cost for each box = (15 − 7) ÷ 4 = 2
Answer: (a) £7 (b) £2

6 Ratio, one part known

The ratio of cats to dogs among the pets at a rescue centre is 7 : 5.
There are 35 cats.
How many dogs are there?

7 parts = 35 cats
1 part = 35 ÷ 7 = 5
dogs: 5 × 5 = 25
Answer: 25

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7 Congruent triangles

Triangle ABC has angles of 45°, 80° and 55°.
Triangle DEF has angles of 45°, 80° and 55°. Its sides are twice as long as those of triangle ABC.
Are the two triangles congruent?
Give a reason for your answer.

The angles are equal but the sides are different lengths
So they are similar, not congruent
Answer: No, they are similar but not the same size

8 Quadratic graphs

The diagram shows the graph of
$y = x^2 + 2x - 3$
(a) Write down the solutions of $x^2 + 2x - 3 = 0$
(b) Write down the coordinates of the minimum point of the graph.

(a) The solutions are where the graph crosses the x-axis
(b) The lowest point of the curve is halfway between the two solutions, at $x = -1$
Answer: (a) $x = -3$ and $x = 1$ (b) $(-1, -4)$

9 Chords and the centre of a circle

A circle has centre O and radius 13 m.
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.

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

10 Bounds

The length of a rectangle is 22 cm and its width is 13 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: 22.5 cm and 13.5 cm
Perimeter = 2 × (22.5 + 13.5) = 72 cm
Answer: 72 cm