Day 197 **B Tier 10-a-day: Model Solutions**

1 Pie charts

In a pie chart showing the answers of 72 people, the angle for juice is 60°.
How many people chose juice?

60° out of 360° = $\frac{1}{6}$

$\frac{1}{6}$ of 72 = 12

Answer: 12

2 Area of 2D shapes

The diagram shows a triangle.
Calculate the area of this triangle.
The diagram is not drawn accurately.

Area of a triangle = ½ × base × height
½ × 8 × 13 = 52

Answer: 52 mm^2

3 Simplifying ratios

Write the ratio 9 : 45 in the form 1 : n

Divide both sides by 9
9 ÷ 9 = 1 and 45 ÷ 9 = 5

Answer: 1 : 5

4 Gradient of a line

Work out the gradient of the straight line that passes through the points (−4, 8) and (−5, 15).

Gradient = $\frac{\text{change in y}}{\text{change in x}}$
Change in y = 15 − 8 = 7
Change in x = −5 − (−4) = −1

Gradient = $\frac{7}{-1}$ = −7

Answer: −7

5 Surface area of cuboids

A cereal box measures 12 cm by 6 cm by 4 cm.
Work out the total surface area.

Top and bottom: 2 × 12 × 6 = 144
Front and back: 2 × 12 × 4 = 96
Two sides: 2 × 6 × 4 = 48
144 + 96 + 48 = 288

Answer: 288 cm^2

6 Percentage change

Priya bought a bike for £2000 and sold it for £1900.
Work out the percentage loss.

Loss = cost − selling price = £100

Percentage loss = $\frac{£100}{£2000}$ × 100 = 5%

Answer: 5% loss

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7 Expanding double brackets

Expand and simplify $(x - 1)(x + 5)$

Multiply every term in the first bracket by every term in the second:

$x^2 + 5x - x - 5$

Collect the x terms: $x^2 + 4x - 5$

Answer: $x^2 + 4x - 5$

8 Bounds

The length of a rectangle is 17 cm and its width is 8 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: 17.5 cm and 8.5 cm
Perimeter = 2 × (17.5 + 8.5) = 52 cm
Answer: 52 cm

9 Average speed

A cyclist travels at 30 km/h for 1 hour and then at 20 km/h for 1 hour.
Work out its average speed for the whole journey.

Distance: 30 × 1 = 30 km and 20 × 1 = 20 km
Total distance = 50 km and total time = 2 hours
Average speed = 50 ÷ 2 = 25
Answer: 25 km/h

10 Algebraic proof

Show that $(n + 9)(n + 8) - n(n + 17)$ has the same value for every whole number n.

Expand the first part: $n^2 + 8n + 9n + 72 = n^2 + 17n + 72$

Expand the second part: $n^2 + 17n$

Subtract: the n^2 terms and the n terms cancel, leaving 72
Answer: The value is always 72