Day 179 **B Tier 10-a-day: Model Solutions**

1 Arc length and sector area

The diagram shows a sector of a circle with radius 6 m and angle 60°.
Work out the length of the arc of the sector.
Give your answer in terms of π.
The diagram is not drawn accurately.

Arc length = $\frac{60}{360} \times 2 \times \pi \times 6$

$= \frac{60}{360} \times 12\pi = 2\pi$

Answer: 2π m

2 Substitution into formulae

Here is a formula.
v = u + at
Work out the value of v when u = 8, a = 2 and t = 5

v = 8 + 2 × 5
v = 18
Answer: v = 18

3 Perimeter and area of compound shapes

The diagram shows the shape of a garden.
All the corners are right angles. All lengths are in cm.
(a) Calculate the perimeter.
(b) Calculate the area.

(a) Missing lengths: 17 − 14 = 3 and 13 − 9 = 4
Perimeter = 17 + 9 + 3 + 4 + 14 + 13 = 60
(b) Split into two rectangles: 17 × 9 = 153 and 14 × 4 = 56
153 + 56 = 209
Answer: (a) 60 cm (b) 209 cm^2

4 Expanding double brackets

Expand and simplify (2x − 3)(x + 7)

Multiply every term in the first bracket by every term in the second:
$2x^2 + 14x - 3x - 21$
Collect the x terms: $2x^2 + 11x - 21$
Answer: $2x^2 + 11x - 21$

5 Mean

Here are the number of goals scored by a team in each match.
5, 0, 2, 3
Work out the mean.

Add the values: 5 + 0 + 2 + 3 = 10
Divide by the number of values: 10 ÷ 4 = 2.5
Answer: 2.5 goals

6 Percentage change

Nina bought a bike for £800 and sold it for £320.
Work out the percentage loss.

Loss = cost − selling price = £480
Percentage loss = $\frac{£480}{£800} \times 100 = 60\%$
Answer: 60% loss

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7 Surface area of a cylinder

A tin has radius 9 cm and height 8 cm. (Calculator)
It is closed.
Work out the total outside surface area.
Give your answer correct to 1 decimal place.

Two circles: $2 \times \pi \times 9^2 = 162\pi$
Curved surface: $2 \times \pi \times 9 \times 8 = 144\pi$
Total = $162\pi + 144\pi = 306\pi$
= 961.3 cm^2 (1 d.p.)
Answer: 961.3 cm^2

8 Combined mean

In a test, the mean mark of 9 boys is 41.
The mean mark of 6 girls is 71.
Work out the mean mark of all 15 students.

Total for boys = 9 × 41 = 369
Total for girls = 6 × 71 = 426
Overall mean = (369 + 426) ÷ 15 = 795 ÷ 15 = 53
Answer: 53

9 Bounds

The length of a rectangle is 32 cm and its width is 30 cm.
Both measurements are correct to the nearest cm.
Work out the lower bound for the area of the rectangle.

Lower bound of each side = value − 0.5: 31.5 cm and 29.5 cm
Area = 31.5 × 29.5 = 929.25 cm^2
Answer: 929.25 cm^2

10 Reverse percentages

Hannah's rent goes up by 30%. (Calculator)
The new rent is £26 a month.
Work out the rent before the increase.

The new rent is 100% + 30% = 130% of the old rent.
130% = £26, so 1% = £26 ÷ 130 = 20p
100% = 20p × 100 = £20
Answer: £20