Day 84 **B Tier 10-a-day: Model Solutions**

1 Angles in triangles

A right-angled triangle has one angle of 65°.
Work out the size of the other acute angle.

Angles in a triangle add up to 180°
180 − 90 − 65 = 25
Answer: 25°

2 Powers and roots

Work out
(a) $12^2 + 5^3$
(b) $\sqrt{169} - 3^2$

(a) $12^2 = 144$ and $5^3 = 125$, so 144 + 125 = 269
(b) $\sqrt{169} = 13$ and $3^2 = 9$, so 13 − 9 = 4
Answer: (a) 269 (b) 4

3 Compound areas

A rectangular pond is 8 m by 12 m.
There is a path of width 2 m all the way round the outside of the pond.
Work out the area of the path.

Outer rectangle: (8 + 4) × (12 + 4) = 12 × 16 = 192
Pond: 8 × 12 = 96
192 − 96 = 96
Answer: 96 m^2

4 Equations with fractions

Solve $\frac{2x + 16}{2} = 5$

Multiply both sides by 2: 2x + 16 = 10
Subtract 16 from both sides: 2x = −6
Divide both sides by 2
Answer: x = −3

5 Mixed numbers

Work out $1\frac{1}{3} + 3\frac{5}{6}$
Give your answer as a mixed number.

Whole numbers: 1 + 3 = 4
Fractions: $\frac{1}{3} + \frac{5}{6} = \frac{7}{6} = 1\frac{1}{6}$

Total = $5\frac{1}{6}$

Answer: $5\frac{1}{6}$

6 Inverse proportion

3 gardeners take 24 days to clear a field.
All the gardeners work at the same rate.
How long would it take 9 gardeners?

The total work stays the same: 3 × 24 = 72 gardeners-days
With 9 gardeners: 72 ÷ 9 = 8 days
Answer: 8 days

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7 Arc length and sector area

The diagram shows a sector of a circle with radius 8 cm and angle 120°. (Calculator)
Work out the length of the arc of the sector.
Give your answer correct to 1 decimal place.
The diagram is not drawn accurately.

Arc length = $\frac{120}{360} \times 2 \times \pi \times 8$

= 16.755... = 16.8 cm (1 d.p.)

Answer: 16.8 cm

8 Algebraic proof

Show that $(n + 9)^2 - (n - 9)^2$ is a multiple of 36 for any whole number n.

Expand: $(n + 9)^2 = n^2 + 18n + 81$ and $(n - 9)^2 = n^2 - 18n + 81$

Subtract: the n^2 terms and the 81s cancel, leaving 36n

36n is a multiple of 36

Answer: 36n is a multiple of 36

9 Multiplying and dividing

A coach holds 16 passengers.
How many coaches are needed for 368 people?

368 ÷ 16 = 23

16 × 23 = 368, so there are no people left over

Answer: 23 coaches

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: 112

(b) Lower quartile at 10: 90. Upper quartile at 30: 127.5

IQR = 127.5 − 90 = 37.5

Answer: (a) 112 minutes (b) 37.5 minutes