Day 48 **A Tier 10-a-day: Model Solutions**

1 Equations with brackets

Solve $5(x + 5) = 4(x + 6) + 10$

Expand the brackets: $5x + 25 = 4x + 24 + 10$
Simplify: $5x + 25 = 4x + 34$
Collect x terms on one side and numbers on the other: $x = 9$
$x = 9$
Answer: x = 9

2 Ratio and a difference

The ratio of adults to children in a swimming pool is 1 : 5.
There are 56 more children than adults.
Work out the number of adults.

Difference in parts = 5 − 1 = 4
4 parts = 56, so 1 part = 56 ÷ 4 = 14
adults: 1 × 14 = 14
Answer: 14

3 Mixed number multiplication and division

Work out $5\frac{2}{3} \times 3\frac{1}{2}$

Give your answer as a mixed number in its simplest form.

Improper fractions: $\frac{17}{3}$ and $\frac{7}{2}$

Multiply: $\frac{17}{3} \times \frac{7}{2} = \frac{119}{6}$

Simplify: $19\frac{5}{6}$

Answer: $19\frac{5}{6}$

4 Converting area and volume units

Change 250000 cm^2 to m^2.

1 m^2 = 10 000 cm^2
250000 ÷ 10 000 = 25
Answer: 25 m^2

5 Estimation

By rounding each number to 1 significant figure, estimate the value of

$$\frac{29.3 + 3.2}{0.51}$$

Round each number to 1 significant figure: 30, 3, 0.5

$$\frac{30 + 3}{0.5} = 66$$

Answer: 66

6 Average speed

A van travels for 1 hour at 75 km/h,
then for 1 hour 30 minutes at 70 km/h.
Work out the average speed for the whole journey.

Distance 1 = 75 × 1 = 75 km
Distance 2 = 70 × 1.5 = 105 km
Total distance = 180 km and total time = 2.5 hours
Average speed = 180 ÷ 2.5 = 72 km/h
Answer: 72 km/h

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7 Area of a triangle using sine

Work out the area of triangle ABC. (Calculator)
Give your answer to 3 significant figures.
The diagram is not drawn accurately.

Area = $\frac{1}{2} \times a \times b \times \sin C$

$= \frac{1}{2} \times 11 \times 15 \times \sin 69°$

$= 77.0$

Answer: 77.0 cm^2

8 Quadratic graph from its roots

The diagram shows the graph of $y = x^2 + bx + c$.
Find the value of b and the value of c.

The curve crosses the x-axis at $x = -3$ and $x = 1$
So $y = (x + 3)(x - 1)$
Expand: $y = x^2 + 2x - 3$
$b = 2$ and $c = -3$
Answer: b = 2, c = −3

9 Primes

(a) Write down all the prime numbers between 50 and 68.
(b) Write 187 as the product of two prime numbers.

(a) A prime number has exactly two factors. Checking each number between 50 and 68 gives: 53, 59, 61, 67
(b) $187 \div 11 = 17$, and both 11 and 17 are prime.
Answer: (a) 53, 59, 61, 67 (b) 11 × 17

10 Bearings with the cosine rule

Boat P sails 13 miles from a harbour on a bearing of 250°.
Boat Q sails 22 miles from the same harbour on a bearing of 285°. (Calculator)
Work out the distance between the two boats.
Give your answer to 3 significant figures.

The angle between the two paths = $|250° - 285°| = 35°$
$d^2 = 13^2 + 22^2 - 2 \times 13 \times 22 \times \cos 35°$
$d^2 = 184.45$
$d = 13.6$
Answer: 13.6 miles