Day 89 **B Tier 10-a-day: Model Solutions**

1 Symmetry

What is the order of rotational symmetry of an isosceles trapezium?

An isosceles trapezium only looks the same after a full turn, so the order is 1

Answer: 1

2 Continuing sequences

Here are the first four terms of a sequence.
3, 7, 15, 27
(a) Write down the next two terms.
(b) Describe the rule for continuing the sequence.

The differences are 4, 8, 12, going up by 4 each time
Next differences: 16 then 20
27 + 16 = 43 and 43 + 20 = 63

Answer: (a) 43, 63 (b) The differences go up by 4 each time

3 Map scales

The scale of a map is 1 : 50,000.
Two towns are 6.5 cm apart on the map.
Work out the real distance between the towns.
Give your answer in kilometres.

6.5 × 50,000 = 325,000 cm
100 000 cm = 1 km, so divide by 100 000
= 3.25 km

Answer: 3.25 km

4 Perimeter with algebra

A rectangle has length (4x + 1) m and width (3x) m.
The perimeter of the rectangle is 142 m.
(a) Work out the value of x.
(b) Work out the area of the rectangle.

(a) 2(4x + 1) + 2(3x) = 142
14x + 2 = 142
14x = 140
x = 10
(b) Length = 41, width = 30, area = 41 × 30 = 1230

Answer: (a) x = 10 (b) 1230 m^2

5 Decimal calculations

Work out
(a) 0.6 ÷ 0.4
(b) 15 ÷ 0.5

(a) Multiply both numbers by 10: 6 ÷ 4
6 ÷ 4 = 1.5
(b) Dividing by 0.5 is the same as multiplying by 2: 15 × 2 = 30

Answer: (a) 1.5 (b) 30

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6 Algebraic fractions

Write as a single fraction

$\frac{x}{3} + \frac{x}{2}$

Common denominator: 6

$\frac{2x}{6} + \frac{3x}{6}$

$\frac{5x}{6}$

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

7 Scatter graphs

The scatter graph shows information about age of car and value.
A line of best fit is drawn.
(a) Describe the correlation.
(b) Use the line of best fit to estimate the value when age of car is 5.

(a) As one variable goes up, the other goes down
This is negative correlation
(b) Go up from 5 on the horizontal axis to the line, then across to the vertical axis
The reading is about £13 000
Answer: (a) Negative correlation (b) about £13 000

8 Trial and improvement

The equation $x^3 - 2x = 9$ has a solution between 2 and 3. (Calculator)
Use trial and improvement to find this solution.
Give your answer correct to 1 decimal place.

x = 2.5: $2.5^3 - 2 \times 2.5 = 10.625$ (too big)
x = 2.2: $2.2^3 - 2 \times 2.2 = 6.248$ (too small)
x = 2.3: $2.3^3 - 2 \times 2.3 = 7.567$ (too small)
x = 2.4: $2.4^3 - 2 \times 2.4 = 9.024$ (too big)
x = 2.35: value = 8.278 (too small), so the solution is above 2.35
So x = 2.4 to 1 decimal place
Answer: x = 2.4

9 Trigonometry: finding a side

Work out the length of y. (Calculator)
Give your answer correct to 1 decimal place.
The diagram is not drawn accurately.

Label the sides: y is the hypotenuse and 7 m is the adjacent
We use cos (adjacent and hypotenuse)

$\cos 54° = \frac{7}{y}$

$y = \frac{7}{\cos 54°} = 11.909...$

y = 11.9 m (1 d.p.)
Answer: y = 11.9 m

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10 Fractions and decimals

(a) Write $\frac{1}{5}$ as a decimal.

(b) Write $\frac{6}{11}$ as a recurring decimal.

For part (b), write down the first 8 decimal places and say which digits repeat.

(a) 1 ÷ 5 = 0.2

(b) 6 ÷ 11: use short division, adding zeros

6 ÷ 11 = 0.54545454...

The digits 54 repeat

Answer: (a) 0.2 (b) 0.54545454... (54 repeats)