Day 307 **B Tier 10-a-day: Model Solutions**

1 Symmetry

How many lines of symmetry does a regular pentagon have?

A regular pentagon has 5 lines of symmetry

Answer: 5

2 Order of operations

Work out

(a) $9^2 - (9 - 5) \times 5$

(b) $(12 + 6) \times 7 - 12$

(a) Brackets: $9 - 5 = 4$

Powers: $9^2 = 81$

Multiply: $4 \times 5 = 20$

Subtract: $81 - 20 = 61$

(b) Brackets first: $12 + 6 = 18$

Multiply: $18 \times 7 = 126$

Subtract: $126 - 12 = 114$

Answer: (a) 61 (b) 114

3 Probability of not happening

The probability that a bus is late is 30%.

Work out the probability that a bus is not late.

Probabilities add up to 100%

$100\% - 30\% = 70\%$

Answer: 70%

4 Negative and zero indices

Work out

(a) 5^{-2}

(b) $5^0 + \sqrt{25}$

(a) A negative power means the reciprocal: $5^{-2} = \frac{1}{5^2} = \frac{1}{25}$

(b) Anything to the power 0 is 1, so $5^0 = 1$

$\sqrt{25} = 5$, so $1 + 5 = 6$

Answer: (a) $\frac{1}{25}$ (b) 6

5 Term-to-term rules

The first term of a sequence is 8.

The term-to-term rule is: multiply by 2 and then subtract 6.

Work out the 4th term.

2nd term: $8 \times 2 - 6 = 10$

3rd term: $10 \times 2 - 6 = 14$

4th term: $14 \times 2 - 6 = 22$

Answer: 22

6 Standard form calculations

Work out $(15 \times 10^9) \div (5 \times 10^2)$

Give your answer in standard form.

Divide the numbers: $15 \div 5 = 3$

Subtract the powers: $9 - 2 = 7$

3×10^7

Answer: 3×10^7

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7 Similar shapes

The two triangles are similar.
(a) Work out the scale factor of the enlargement from the smaller triangle to the larger triangle.
(b) Work out the value of t.
The diagram is not drawn accurately.

(a) Scale factor = 10 ÷ 5 = 2
(b) t = 4 × 2 = 8
Answer: (a) 2 (b) t = 8 cm

8 Quadratic graphs

The diagram shows the graph of
$y = -x^2 + 8x - 12$
(a) Write down the solutions of $-x^2 + 8x - 12 = 0$
(b) Write down the coordinates of the maximum point of the graph.

(a) The solutions are where the graph crosses the x-axis
(b) The highest point of the curve is halfway between the two solutions, at x = 4
Answer: (a) x = 2 and x = 6 (b) (4, 4)

9 Speed unit conversion

A cyclist travels at 81 km/h.
Work out its speed in metres per second.

81 km = 81,000 m
1 hour = 3600 seconds
81,000 ÷ 3600 = 22.5 m/s
Answer: 22.5 m/s

10 Tree diagrams

A bag contains 2 red counters and 7 blue counters.
Leo takes one at random and does not replace it, then takes a second.
Work out the probability that both are red.

P(first red) = $\frac{2}{9}$

P(second red) = $\frac{1}{8}$

P(both red) = $\frac{2}{9} \times \frac{1}{8} = \frac{1}{36}$

Answer: $\mathbf{\frac{1}{36}}$