Day 199 **B Tier 10-a-day: Model Solutions**

1 Solving equations

Solve $n + 3 = 11$

Subtract 3 from both sides

Answer: n = 8

2 Symmetry

How many lines of symmetry does a regular nonagon have?

A regular nonagon has 9 lines of symmetry

Answer: 9

3 HCF and LCM

Find the (a) highest common factor (HCF), (b) lowest common multiple (LCM) of 35 and 20.

$35 = 5 \times 7$ and $20 = 2^2 \times 5$

(a) HCF: multiply the primes in both lists, using the smaller power: 5

(b) LCM: use the larger power of every prime: $2^2 \times 5 \times 7 = 140$

Answer: (a) 5 (b) 140

4 Bearings

The bearing of M from L is 139°.

Work out the bearing of L from M.

139 is less than 180, so add 180°

139 + 180 = 319

Answer: 319°

5 Mean from a frequency table

The table shows the numbers of brothers and sisters of some students.

Work out the mean.

Multiply each value by its frequency and add: $2 \times 1 + 3 \times 4 + 4 \times 2 + 5 \times 6 = 52$

Total frequency = 1 + 4 + 2 + 6 = 13

Mean = 52 ÷ 13 = 4

Answer: 4

6 Substitution into formulae

$y = 3x^2 - 4x - 4$

Work out the value of y when x = 3

$y = 3 \times 3^2 + (-4) \times 3 + (-4)$

$y = 27 + (-12) + (-4) = 11$

Answer: y = 11

7 Percentages of amounts

Work out

(a) 45% of £500

(b) 65% of 260

(a) 10% of £500 = £50

5% of £500 = £25

45% = 4 × £50 + £25 = £225

(b) 10% of 260 = 26

5% of 260 = 13

65% = 6 × 26 + 13 = 169

Answer: (a) £225 (b) 169

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8 Algebraic proof

Show that 6(2n + 3) + 6(2n + 9) is always a multiple of 24, where n is a whole number.

Expand: 12n + 18 + 12n + 54
Collect like terms: 24n + 72
Factorise: 24(n + 3), which is a multiple of 24
Answer: 24(n + 3) is a multiple of 24

9 Enlargement

A rectangle is 4 m long and 6 m wide.
It is enlarged by scale factor 2.
(a) Write down the length and width of the enlarged rectangle.
(b) Work out the perimeter of the enlarged rectangle.

(a) 4 × 2 = 8 and 6 × 2 = 12
(b) Perimeter = 2 × (8 + 12) = 40
Answer: (a) 8 m by 12 m (b) 40 m

10 Speed

A cyclist travels 9 km in 45 minutes.
Work out its average speed in km per hour.

Speed = distance ÷ time
Time = 0.75 hours
9 ÷ 0.75 = 12
Answer: 12 km per hour