Day 45 **B Tier 10-a-day: Model Solutions**

1 HCF and LCM

Find the (a) highest common factor (HCF), (b) lowest common multiple (LCM) of 49 and 28.

$49 = 7^2$ and $28 = 2^2 \times 7$
(a) HCF: multiply the primes in both lists, using the smaller power: 7
(b) LCM: use the larger power of every prime: $2^2 \times 7^2 = 196$
Answer: (a) 7 (b) 196

2 Perimeter and area of compound shapes

The diagram shows the shape of a garden.
All the corners are right angles. All lengths are in m.
(a) Find the perimeter.
(b) Find the area.

(a) Missing lengths: $9 - 3 = 6$ and $12 - 5 = 7$
Perimeter = 9 + 5 + 6 + 7 + 3 + 12 = 42
(b) Split into two rectangles: $9 \times 5 = 45$ and $3 \times 7 = 21$
45 + 21 = 66
Answer: (a) 42 m (b) 66 m^2

3 Term-to-term rules

The first term of a sequence is 3.
The term-to-term rule is: double the term, then add 2.
Work out the 5th term.

2nd term: $2 \times 3 + 2 = 8$
3rd term: $2 \times 8 + 2 = 18$
4th term: $2 \times 18 + 2 = 38$
5th term: $2 \times 38 + 2 = 78$
Answer: 78

4 Exchange rates

The exchange rate is £1 = $1.25. (Calculator)
(a) Change £300 to dollars.
(b) Change $250 to pounds (£).

(a) Multiply by 1.25: $300 \times 1.25 = \$375$
(b) Divide by 1.25: $250 \div 1.25 = £200$
Answer: (a) $375 (b) £200

5 Map scales

The scale of a map is 1 : 20,000.
Two villages are 5 km apart.
How far apart are they on the map?
Give your answer in centimetres.

5 km = 500,000 cm
Divide by 20,000: $500{,}000 \div 20{,}000 = 25$
Answer: 25 cm

6 Angles and algebra

The angles of a triangle are x°, 3x° and (3x + 26)°.
Work out the size of the largest angle.

Angles in a triangle add up to 180°
$7x + 26 = 180$
$7x = 154$, so $x = 22$
The angles are 22°, 66°, 92°
Answer: 92°

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7 Repeated percentage change

The price of a laptop is £160.
The price is first increased by 5%, then the new price is increased by 30%.
(a) Work out the final price.
(b) Work out the overall percentage increase in the price.

(a) Multipliers: 1.05 and 1.3
160 × 1.05 × 1.3 = £218.40
(b) Overall multiplier = 1.365
Overall increase = 36.5%
Answer: (a) £218.40 (b) 36.5% increase

8 Algebraic proof

Show that the sum of two consecutive odd numbers is always a multiple of 4.

Let the smaller odd number be 2n + 1. The next odd number is 2n + 3
Sum = (2n + 1) + (2n + 3) = 4n + 4
4n + 4 = 4(n + 1), which is a multiple of 4
Answer: 4(n + 1) is a multiple of 4

9 Trigonometry in isosceles triangles

Triangle PQR is isosceles with PQ = PR = 11 cm. (Calculator)
The base QR = 10 cm.
Work out the size of angle PQR.
Give your answer correct to 1 decimal place.

Split the triangle into two right-angled triangles. Half the base = 10 ÷ 2 = 5

$\cos Q = \frac{5}{11}$

Angle PQR = $\cos^{-1}(\frac{5}{11})$ = 62.964...

= 63.0° (1 d.p.)
Answer: 63.0°

10 Tree diagrams

A bag contains 7 mint sweets and 2 toffee sweets.
Callum takes one at random and does not replace it, then takes a second.
Work out the probability that both are mint.

P(first mint) = $\frac{7}{9}$

P(second mint) = $\frac{3}{4}$

P(both mint) = $\frac{7}{9} \times \frac{3}{4} = \frac{7}{12}$

Answer: $\frac{7}{12}$