Day 93 **B Tier 10-a-day: Model Solutions**

1 Angles on a line and round a point

The diagram shows 2 angles on a straight line.
Work out the value of a.
The diagram is not drawn accurately.

Angles on a straight line add up to 180°
100 + (a + 49) = 180
a + 149 = 180
a = 31
Answer: a = 31°

2 Factors and multiples

Write down all the common factors of 35 and 70.

Factors of 35: 1, 5, 7, 35
Factors of 70: 1, 2, 5, 7, 10, 14, 35, 70
The common factors are the numbers in both lists
Answer: 1, 5, 7, 35

3 Stratified sampling

A stratified sample of 50 students is taken from the 300 students in the table.
Work out how many students should be sampled from Group B.

Sample fraction = 50 ÷ 300
Group B: 60 ÷ 300 × 50 = 10
Answer: 10

4 Factorising quadratics

Factorise $x^2 + 12x + 35$

Find two numbers that multiply to give 35 and add to give 12
The numbers are 5 and 7
Answer: (x + 5)(x + 7)

5 HCF and LCM

Find the (a) highest common factor (HCF), (b) lowest common multiple (LCM) of 16 and 12.

$16 = 2^4$ and $12 = 2^2 \times 3$
(a) HCF: multiply the primes in both lists, using the smaller power: $2^2 = 4$
(b) LCM: use the larger power of every prime: $2^4 \times 3 = 48$
Answer: (a) 4 (b) 48

6 Circle theorems

A, B and C are points on a circle.
AB is a diameter of the circle.
Angle CAB = 65°.
Work out the size of angle x.
Give a reason for each step of your working.
The diagram is not drawn accurately.

Angle ACB = 90° (the angle in a semicircle is a right angle)
x = 180 − 90 − 65 = 25°
(angles in a triangle add up to 180°)
Answer: x = 25°

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7 Reverse percentages

The price of a meal including VAT at 20% is £120. (Calculator)
Work out the price of the meal before VAT was added.

The price including VAT is 100% + 20% = 120% of the price before VAT.
120% = £120, so 1% = £120 ÷ 120 = £1
100% = £1 × 100 = £100
Answer: £100

8 Term-to-term rules

The first term of a sequence is 5.
The term-to-term rule is: double the term, then add 4.
Work out the 5th term.

2nd term: 2 × 5 + 4 = 14
3rd term: 2 × 14 + 4 = 32
4th term: 2 × 32 + 4 = 68
5th term: 2 × 68 + 4 = 140
Answer: 140

9 Volume of cones and pyramids

A cone has base radius 9 m and vertical height 3 m. (Calculator)

Volume of a cone = $\frac{1}{3}\pi r^2 h$

Work out the volume of the cone.
Give your answer correct to 1 decimal place.

Volume = $\frac{1}{3} \times \pi \times 9^2 \times 3$
= 254.469...
= 254.5 m^3 (1 d.p.)
Answer: 254.5 m^3

10 Capture-recapture

20 fish in a lake are caught, tagged and returned to the lake.
Later, a sample of 40 fish is caught and 2 of them are tagged.
Estimate the total number of fish in the lake.

Proportion tagged in the sample = 2 ÷ 40
This is the same proportion as 20 out of the whole population
Population ≈ 20 × 40 ÷ 2 = 400
Answer: 400