Day 193 **B Tier 10-a-day: Model Solutions**

1 Angles on a line and round a point

The diagram shows 3 angles round a point.
Work out the value of a.
The diagram is not drawn accurately.

Angles round a point add up to 360°
(a + 60) + (3a + 10) + (4a + 2) = 360
8a + 72 = 360
8a = 288
a = 288 ÷ 8 = 36
Answer: a = 36°

2 Map scales

On a map, 1 cm represents 1 km.
A lake is 1.5 cm long on the map.
Work out the real length of the lake.

1.5 × 1 = 1.5
Answer: 1.5 km

3 Faces, edges and vertices

Write down the number of edges and vertices of a triangular-based pyramid.

Edges: 3 on the base plus 3 up to the point = 6
Vertices: 3 on the base plus the top point = 4
Answer: edges: 6 vertices: 4

4 Substitution into formulae

$E = \frac{1}{2}mv^2$

Work out the value of E when m = 2 and v = 8

$E = \frac{1}{2} \times 2 \times 8^2$

$E = \frac{1}{2} \times 2 \times 64 = 64$

Answer: E = 64

5 Laws of indices

Write each answer as a single power of 3.
(a) $(3^2)^2$
(b) $3^7 \times 3^2 \div 3^4$

(a) Multiply the powers: 2 × 2 = 4
(b) Add then subtract: 7 + 2 − 4 = 5
Answer: (a) 3^4 (b) 3^5

6 Stratified sampling

A stratified sample of 30 students is taken from the 200 students in the table.
Work out how many students should be sampled from Year 8.

Sample fraction = 30 ÷ 200
Year 8: 80 ÷ 200 × 30 = 12
Answer: 12

7 Solving quadratic equations

Solve $x^2 - 81 = 0$

Factorise as a difference of two squares: (x − 9)(x + 9) = 0
Either x − 9 = 0 or x + 9 = 0
Answer: x = −9 or x = 9

Day 193 **B Tier 10-a-day: Model Solutions**

8 Trigonometry in context

A ladder 4 m long leans against a vertical wall. (Calculator)
The ladder makes an angle of 72° with the horizontal ground.
Work out how high up the wall the ladder reaches.
Give your answer correct to 1 decimal place.

The ladder is the hypotenuse and the height is the opposite side

$\sin 72° = \frac{h}{4}$

$h = 4 \times \sin 72° = 3.804...$
h = 3.8 m (1 d.p.)
Answer: 3.8 m

9 Prime factors

Write 490 as a product of its prime factors.
Give your answer in index form.

Divide by prime numbers, smallest first:
490 ÷ 2 = 245, 245 ÷ 5 = 49, 49 ÷ 7 = 7, 7 is prime
490 = 2 × 5 × 7 × 7
In index form: $490 = 2 \times 5 \times 7^2$
Answer: $2 \times 5 \times 7^2$

10 Significant figures

Work out the value of this expression. (Calculator)

$$\frac{9.4^3}{1.8}$$

Give your answer correct to 3 significant figures.

Use a calculator: the full display is 461.435556...
Round to 3 significant figures: 461
Answer: 461