Day 214 **B Tier 10-a-day: Model Solutions**

1 Faces, edges and vertices

Write down the number of faces and vertices of a pentagonal prism.

Faces: two 5-sided ends and 5 rectangles = 7
Vertices: 5 on each end = 10
Answer: faces: 7 vertices: 10

2 Percentages of amounts

Work out
(a) 85% of £140
(b) 25% of 640

(a) 10% of £140 = £14
5% of £140 = £7
85% = 8 × £14 + £7 = £119
(b) 10% of 640 = 64
5% of 640 = 32
25% = 2 × 64 + 32 = 160
Answer: (a) £119 (b) 160

3 Laws of indices

Simplify fully
(a) $(y^2)^4$
(b) $(4a^2)^3$

(a) Multiply the powers: 2 × 4 = 8
(b) $4^3 = 64$ and the powers multiply: 2 × 3 = 6
Answer: (a) y^8 (b) $64a^6$

4 Prisms and density

A block of ice is a cuboid measuring 12 cm by 3 cm by 2 cm.
The density of ice is 0.9 g/cm^3.
Work out the mass of the block.

Volume = 12 × 3 × 2 = 72 cm^3
Mass = density × volume
0.9 × 72 = 64.8 g
Answer: 64.8 g

5 Two-way tables

The table shows some information about 42 people at a meeting.
A person is chosen at random.
Find the probability that the person chose "Coffee".

Male who chose Coffee = 28 − 13 = 15
Female who chose Coffee = 10
Total who chose Coffee = 15 + 10 = 25
P = 25 out of 42
Answer: $\frac{25}{42}$

6 Difference of two squares

Factorise $9x^2 - 64$

$9x^2 = (3x)^2$ and $64 = 8^2$
$(3x)^2 - 8^2 = (3x - 8)(3x + 8)$
Answer: (3x − 8)(3x + 8)

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7 Bearings

The bearing of Q from P is 175°.
Work out the bearing of P from Q.

175 is less than 180, so add 180°
175 + 180 = 355
Answer: 355°

8 Combined mean

In a test, the mean mark of 9 Year 10 is 50.
The mean mark of 6 Year 11 is 80.
Work out the mean mark of all 15 students.

Total for Year 10 = 9 × 50 = 450
Total for Year 11 = 6 × 80 = 480
Overall mean = (450 + 480) ÷ 15 = 930 ÷ 15 = 62
Answer: 62

9 Fraction problems

A storage tank is $\frac{1}{2}$ full.

12 litres of oil are added.

The storage tank is now $\frac{3}{5}$ full.

Work out the capacity of the storage tank.

Fraction added = $\frac{3}{5} - \frac{1}{2} = \frac{1}{10}$

$\frac{1}{10}$ of the capacity = 12 litres
Whole capacity = 12 × 10 = 120 litres
Answer: 120 litres

10 Average speed

A coach travels at 30 km/h for 1.5 hours and then at 90 km/h for 1 hour.
Work out its average speed for the whole journey.

Distance: 30 × 1.5 = 45 km and 90 × 1 = 90 km
Total distance = 135 km and total time = 2.5 hours
Average speed = 135 ÷ 2.5 = 54
Answer: 54 km/h