Day 202 **B Tier 10-a-day: Model Solutions**

1 Powers and roots

Work out

(a) $\sqrt[3]{125} \times 8$

(b) the square root of 64

(a) $\sqrt[3]{125} = 5$ because $5 \times 5 \times 5 = 125$, so $5 \times 8 = 40$

(b) $8 \times 8 = 64$, so the square root is 8

Answer: (a) 40 (b) 8

2 Integer inequalities

n is an integer.

Write down all the values of n for which

$-2 \leq n \leq 3$

Both end values are included because of the $\leq$ signs

Answer: $-2, -1, 0, 1, 2, 3$

3 Metric conversions

(a) Convert 750 g to kg.

(b) Convert 1500 cm^3 to litres.

(a) g → kg: divide by 1000: $750 \div 1000 = 0.75$

(b) 1 litre = 1000 cm^3. $1500 \div 1000 = 1.5$

Answer: (a) 0.75 kg (b) 1.5 litres

4 Factorising

Factorise $y^2 - 8y$

Both terms have y as a factor

$y^2 \div y = y$ and $-8y \div y = -8$

Answer: $y(y - 8)$

5 Percentage change

The number of members of a club goes from 120 to 162.

Work out the percentage increase.

Increase = $162 - 120 = 42$

Percentage increase = $\frac{42}{120} \times 100 = 35\%$

Answer: 35% increase

6 Expanding squared brackets

Expand and simplify $(3x - 6)^2$

Write as a product of two brackets: $(3x - 6)(3x - 6)$

$9x^2 - 18x - 18x + 36$

$9x^2 - 36x + 36$

Answer: $9x^2 - 36x + 36$

7 Capture-recapture

20 birds in a lake are caught, tagged and returned to the lake.

Later, a sample of 40 birds is caught and 8 of them are tagged.

Estimate the total number of birds in the lake.

Proportion tagged in the sample = $8 \div 40$

This is the same proportion as 20 out of the whole population

Population $\approx 20 \times 40 \div 8 = 100$

Answer: 100

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8 LCM problems

Two lights flash at 07:15.
One light flashes every 18 minutes.
The other light flashes every 12 minutes.
At what time do both lights next flash together?

Multiples of 18: 18, 36
Multiples of 12: 12, 24, 36
The first common multiple is 36, so the LCM is 36 minutes
07:15 + 36 minutes = 07:51
Answer: 07:51

9 Area of an isosceles trapezium

An isosceles trapezium has parallel sides of length 14 m and 4 m.
Each sloping side is 13 m long.
(a) Work out the perpendicular height of the trapezium.
(b) Work out the area of the trapezium.

(a) The difference in the parallel sides is 14 − 4 = 10, so each end sticks out 5
$h^2 = 13^2 - 5^2 = 169 - 25 = 144$, so h = 12
(b) Area = ½ × (14 + 4) × 12 = 108
Answer: (a) 12 m (b) 108 m^2

10 Combined mean

In a test, the mean mark of 20 Class A is 42.
The mean mark of 5 Class B is 62.
Work out the mean mark of all 25 students.

Total for Class A = 20 × 42 = 840
Total for Class B = 5 × 62 = 310
Overall mean = (840 + 310) ÷ 25 = 1150 ÷ 25 = 46
Answer: 46