Day 192 **B Tier 10-a-day: Model Solutions**

1 Metric conversions

(a) Convert 4.5 tonnes to kg.
(b) Convert 2 cm^2 to mm^2.

(a) tonnes → kg: multiply by 1000: 4.5 × 1000 = 4500
(b) 1 cm = 10 mm, so 1 cm^2 = 10 × 10 = 100 mm^2. 2 × 100 = 200
Answer: (a) 4500 kg (b) 200 mm^2

2 Order of operations

Work out
(a) $5^2 - (8 - 6) \times 4$
(b) $5 + 3 \times 5^2$

(a) Brackets: 8 − 6 = 2
Powers: 5^2 = 25
Multiply: 2 × 4 = 8
Subtract: 25 − 8 = 17
(b) Powers first: 5^2 = 25
Then multiply: 3 × 25 = 75
Then add: 5 + 75 = 80
Answer: (a) 17 (b) 80

3 Missing value from a mean

The mean of 5 numbers is 30.
Four of the numbers are 27, 33, 29, 31.
Work out the fifth number.

Total = 5 × 30 = 150
Given total = 120
Fifth = 150 − 120 = 30
Answer: 30

4 Term-to-term rules

The first term of a sequence is 4.
The term-to-term rule is: multiply by 2 and then add 4.
Work out the 4th term.

2nd term: 4 × 2 + 4 = 12
3rd term: 12 × 2 + 4 = 28
4th term: 28 × 2 + 4 = 60
Answer: 60

5 Negative numbers

Work out
(a) −7 − (−2)
(b) (−5) × 5

(a) Subtracting a negative is the same as adding: −7 + 2 = −5
(b) Negative × positive = negative: 5 × 5 = 25, so the answer is −25
Answer: (a) −5 (b) −25

6 Stratified sampling

A stratified sample of 60 students is taken from the 500 students in the table.
Work out how many students should be sampled from Group A.

Sample fraction = 60 ÷ 500
Group A: 300 ÷ 500 × 60 = 36
Answer: 36

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7 Comparing fractions and percentages

Leah has $\frac{1}{5}$ of £20.

Chloe has 25% of £60.

Who has more money? You must show your working.

Leah: 20 ÷ 5 × 1 = £4

Chloe: 60 ÷ 100 × 25 = £15

£15 is more than £4, so Chloe has more

Answer: Chloe

8 Circle theorems

A, B and C are points on a circle, centre O.

Angle ACB = 32°.

Work out the size of angle AOB, marked x.

Give a reason for your answer.

The diagram is not drawn accurately.

The angle at the centre is twice the angle at the circumference

x = 2 × 32 = 64°

Answer: x = 64°

9 Simultaneous equations

Solve the simultaneous equations

4x − 4y = −16

x + 2y = 17

Multiply the second equation by 2: 2x + 4y = 34

The y terms have opposite signs, so add the equations: 6x = 18

x = 3

Substitute x = 3 into the first equation: −4y = −16 − 12 = −28

y = 7

Answer: x = 3, y = 7

10 Median and range

Here are the times, in seconds, taken to run 100 m.

46, 41, 63, 43, 66, 64

(a) Find the median.

(b) Work out the range.

(a) Put in order: 41, 43, 46, 63, 64, 66

The middle two values are 46 and 63, so the median is 109 ÷ 2 = 54.5

(b) Range = largest − smallest = 66 − 41 = 25

Answer: (a) 54.5 (b) 25