Day 92 **B Tier 10-a-day: Model Solutions**

1 Simplifying ratios

Write the ratio 48 : 12 : 6 in its simplest form.

The highest common factor of 48, 12 and 6 is 6
Divide each part by 6
Answer: 8 : 2 : 1

2 Compound areas

A rectangular lawn measures 11 m by 16 m.
A rectangle measuring 4 m by 3 m is cut out.
Work out the area that is left.

Whole area = 11 × 16 = 176
Area cut out = 4 × 3 = 12
176 − 12 = 164
Answer: 164 m^2

3 Distance, speed and time

A cyclist travels at a constant speed of 24 km/h for 10 minutes.
How far does it travel?

10 minutes = $\frac{1}{6}$ hour

Distance = speed × time = $24 \times \frac{1}{6} = 4$

Answer: 4 km

4 Scale drawings and maps

A railway line is 50 m long.
It is drawn on a map with scale 1 : 1000.
Work out the length of the railway line on the map, in cm.

50 m = 5000 cm
5000 ÷ 1000 = 5 cm
Answer: 5 cm

5 Inequalities on a number line

(a) Write down the inequality shown on the number line.
(b) Write down all the integers that satisfy the inequality.

(a) The circle at 1 is filled in and the circle at 4 is filled in
$1 \leq x \leq 4$
(b) The whole numbers on the shaded part: 1, 2, 3, 4
Answer: (a) $1 \leq x \leq 4$ (b) 1, 2, 3, 4

6 Speed

A coach travels 144 miles in 3 hours.
Work out its average speed in miles per hour.

Speed = distance ÷ time
Time = 3 hours
144 ÷ 3 = 48
Answer: 48 miles per hour

Day 92 **B Tier 10-a-day: Model Solutions**

7 Standard form calculations

A spacecraft travels at 3×10^7 km per hour.
It travels for 4.7×10^2 hours at this speed.
Work out how far it travels.
Give your answer in standard form.

Distance = speed × time
$(3 \times 10^7) \times (4.7 \times 10^2) = 14.1 \times 10^9$
In standard form: 1.41×10^{10}
Answer: 1.41×10^{10} km

8 Column vectors

$\mathbf{a} = \begin{pmatrix} 1 \\ -2 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} -6 \\ 0 \end{pmatrix}$
Work out
(a) $\mathbf{a} + 2\mathbf{b}$
(b) $\mathbf{a} + 3\mathbf{b}$

(a) $\begin{pmatrix} 1 \\ -2 \end{pmatrix} + \begin{pmatrix} -12 \\ 0 \end{pmatrix} = \begin{pmatrix} -11 \\ -2 \end{pmatrix}$
(b) $\begin{pmatrix} 1 \\ -2 \end{pmatrix} + \begin{pmatrix} -18 \\ 0 \end{pmatrix} = \begin{pmatrix} -17 \\ -2 \end{pmatrix}$
Answer: (a) $\begin{pmatrix} \mathbf{-11} \\ \mathbf{-2} \end{pmatrix}$ (b) $\begin{pmatrix} \mathbf{-17} \\ \mathbf{-2} \end{pmatrix}$

9 Simultaneous equations problem

A cafe sells cakes and drinks. All cakes cost the same and all drinks cost the same.
2 cakes and 2 drinks cost £10.
3 cakes and 2 drinks cost £14.
Work out the cost of one cake and the cost of one drink.

Let a = cost of one cake and b = cost of one drink
2a + 2b = 10 and 3a + 2b = 14
Subtract: 1a = 14 − 10 = 4, so a = 4
Substitute: 2 × 4 + 2b = 10, so 2b = 2 and b = 1
Answer: One cake costs £4 and one drink costs £1

10 Reverse repeated percentages

In a sale, the price of a sofa is reduced by 50%. (Calculator)
Two weeks later it is reduced by a further 10% of the new price.
The final price is £33.75.
Work out the original price of the sofa.

Multipliers: 0.5 and 0.9
Overall multiplier = 0.5 × 0.9 = 0.45
Original price = £33.75 ÷ 0.45 = £75
Answer: £75