Day 176 **B Tier 10-a-day: Model Solutions**

1 Scale drawings and maps

A road is 80 m long.
It is drawn on a map with scale 1 : 1000.
Work out the length of the road on the map, in cm.

80 m = 8000 cm
8000 ÷ 1000 = 8 cm
Answer: 8 cm

2 Using the nth term

The nth term of a sequence is 2n + 1
(a) Work out the 12th term.
(b) Is 38 a term in the sequence? You must show how you get your answer.

(a) Replace n with 12: 2 × 12 + 1 = 25
(b) Solve 2n + 1 = 38: 2n = 37
n = 37 ÷ 2 = 18.5, which is not a whole number, so 38 is not in the sequence
Answer: (a) 25 (b) No, n is not a whole number

3 Interior angles of regular polygons

Work out the size of one interior angle of a regular dodecagon.

Exterior angle = 360° ÷ 12 = 30°
Interior angle = 180° − 30° = 150°
Answer: 150°

4 Counting outcomes

A coin is thrown 2 times.
Each throw lands on heads or tails.
How many different sequences of heads and tails are possible?

Each throw has 2 outcomes
2 × 2 = 4
Answer: 4

5 Mixed numbers

Work out $3\frac{7}{8} + 1\frac{1}{6}$

Give your answer as a mixed number.

Whole numbers: 3 + 1 = 4

Fractions: $\frac{7}{8} + \frac{1}{6} = \frac{25}{24} = 1\frac{1}{24}$

Total = $5\frac{1}{24}$

Answer: $5\frac{1}{24}$

6 Simplifying ratios

Write the ratio 21 : 12 in its simplest form.

The highest common factor of 21 and 12 is 3
21 ÷ 3 = 7 and 12 ÷ 3 = 4
Answer: 7 : 4

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7 Trigonometry: finding a side

Calculate the length of x. (Calculator)
Give your answer correct to 1 decimal place.
The diagram is not drawn accurately.

Label the sides: x is the adjacent and 10 cm is the hypotenuse
We use cos (adjacent and hypotenuse)

$\cos 21° = \frac{x}{10}$

$x = 10 \times \cos 21° = 9.336...$
$x = 9.3$ cm (1 d.p.)
Answer: x = 9.3 cm

8 Distance, speed and time

A boat travels 45 km at an average speed of 30 km/h.
How long does the journey take?
Give your answer in hours and minutes.

Time = distance ÷ speed
45 ÷ 30 = 1.5 hours
1.5 hours = 1 hour 30 minutes
Answer: 1 hour 30 minutes

9 Simultaneous equations problem

A takeaway sells burgers and portions of chips.
1 burger and 2 portions of chips cost £11.
3 burgers and 2 portions of chips cost £25.
Work out the cost of one burger and the cost of one portion of chips.

Let a = cost of one burger and b = cost of one portion of chips
$1a + 2b = 11$ and $3a + 2b = 25$
Subtract: $2a = 25 - 11 = 14$, so $a = 7$
Substitute: $1 \times 7 + 2b = 11$, so $2b = 4$ and $b = 2$
Answer: One burger costs £7 and one portion of chips costs £2

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 £225.
Work out the original price of the sofa.

Multipliers: 0.5 and 0.9
Overall multiplier = $0.5 \times 0.9 = 0.45$
Original price = £225 ÷ 0.45 = £500
Answer: £500