Day 184 **B Tier 10-a-day: Model Solutions**

1 Metric conversions

(a) Convert 6 tonnes to kg.

(b) Convert 5 litres to cm^3.

(a) tonnes → kg: multiply by 1000: 6 × 1000 = 6000

(b) 1 litre = 1000 cm^3. 5 × 1000 = 5000

Answer: (a) 6000 kg (b) 5000 cm^3

2 Place value

Here are four digit cards.

5 4 8 1

Use all four cards to make the largest possible even number.

The last digit must be even. Put the biggest remaining digits first.

The largest even number is 8514

Answer: 8514

3 Symmetry

What is the order of rotational symmetry of an equilateral triangle?

A equilateral triangle looks the same 3 times in a full turn, so the order of rotational symmetry is 3

Answer: 3

4 Estimation

Estimate the value of

$$\frac{5.18 \times 8.98}{1.94}$$

Show your rounding to 1 significant figure.

Round each number to 1 significant figure: 5.18 → 5, 8.98 → 9, 1.94 → 2

Estimate = 5 × 9 ÷ 2 = 22.5

Answer: 22.5

5 Unitary method

3 rulers cost £1.95.

Work out the cost of 12 rulers.

1 ruler costs £1.95 ÷ 3 = 65p

12 rulers cost 12 × 65p = £7.80

Answer: £7.80

6 Algebraic fractions

Write as a single fraction

$$\frac{x}{5} + \frac{x}{3}$$

Common denominator: 15

$$\frac{3x}{15} + \frac{5x}{15}$$

$$\frac{8x}{15}$$

Answer: $\frac{8x}{15}$

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7 Standard form calculations

A spacecraft travels at 7×10^5 km per hour.
It travels for 1.9×10^2 hours at this speed.
Work out how far it travels.
Give your answer in standard form.

Distance = speed × time
$(7 \times 10^5) \times (1.9 \times 10^2) = 13.3 \times 10^7$
In standard form: 1.33×10^8
Answer: 1.33×10^8 km

8 Simultaneous equations problem

A shop sells pens and pencils. All pens cost the same and all pencils cost the same.
2 pens and 3 pencils cost 330p.
1 pen and 3 pencils cost 225p.
Work out the cost of one pen and the cost of one pencil.

Let a = cost of one pen and b = cost of one pencil
2a + 3b = 330 and 1a + 3b = 225
Subtract: 1a = 330 − 225 = 105, so a = 105
Substitute: 2 × 105 + 3b = 330, so 3b = 120 and b = 40
Answer: One pen costs 105p and one pencil costs 40p

9 Area of shaded regions

The diagram shows a rectangle 16 cm by 6 cm with a circle of radius 2 cm cut out.
The circle is in the centre of the rectangle.
Work out the area of the shaded region.
Give your answer in terms of π.
The diagram is not drawn accurately.

Area of rectangle = 16 × 6 = 96
Area of circle = $\pi \times 2^2 = 4\pi$
Shaded area = $96 - 4\pi$
Answer: $96 - 4\pi$ cm^2

10 Independent events

The probability that Amy is late for school on any day is 0.8.
The probability that Ben is late on any day is 0.2.
Whether each is late is independent of the other.
Work out the probability that at least one of them is late on Monday.

P(neither late) = $(1 - 0.8) \times (1 - 0.2) = 0.2 \times 0.8 = 0.16$
P(at least one late) = $1 - 0.16 = 0.84$
Answer: 0.84