Day 78 **B Tier 10-a-day: Model Solutions**

1 Volume of a prism

This prism has a right-angled triangle as its cross-section.
Work out the volume of the prism.
The diagram is not drawn accurately.

Area of cross-section = ½ × 6 × 4 = 12
Volume of prism = area of cross-section × length
12 × 14 = 168
Answer: 168 cm^3

2 Forming expressions

Meg has x football cards.
Sam has 6 more football cards than Meg.
Nia has 2 times as many football cards as Meg.
(a) Write an expression, in terms of x, for the number of football cards Sam has.
(b) Write an expression, in terms of x, for the total number of football cards the three of them have. Give your answer in its simplest form.

(a) Sam has 6 more than Meg: x + 6
(b) Nia has 2x
Total = x + (x + 6) + 2x
Collect like terms: 4x + 6
Answer: (a) x + 6 (b) 4x + 6

3 Metric units

(a) Change 5.1 m to cm.
(b) Change 84 mm to cm.

(a) 1 m = 100 cm, so multiply by 100: 5.1 × 100 = 510
(b) 1 cm = 10 mm, so divide by 10: 84 ÷ 10 = 8.4
Answer: (a) 510 cm (b) 8.4 cm

4 Prisms and density

A prism has a cross-section with area 50 m^2.
The length of the prism is 7 m.
Work out the volume of the prism.

Volume = area of cross-section × length
50 × 7 = 350
Answer: 350 m^3

5 Factorising quadratics

Factorise $x^2 - 5x - 14$

Find two numbers that multiply to give −14 and add to give −5
The numbers are −7 and 2
Answer: (x − 7)(x + 2)

6 Inverse proportion

8 workers take 3 days to dig a trench.
All the workers work at the same rate.
How long would it take 2 workers?

The total work stays the same: 8 × 3 = 24 workers-days
With 2 workers: 24 ÷ 2 = 12 days
Answer: 12 days

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7 Ordering standard form

Write these numbers in order of size.
Start with the smallest.
4×10^5, 44, 3.2×10^{-1}, 0.00044

Write each in standard form: 4×10^5, 4.4×10^1, 3.2×10^{-1}, 4.4×10^{-4}
Compare the powers of 10 first (the bigger the power, the bigger the number)
Order: 0.00044, 3.2×10^{-1}, 44, 4×10^5
Answer: 0.00044, 3.2×10^{-1}, 44, 4×10^5

8 Trigonometry in context

A tower is 39 m tall. (Calculator)
Mia stands 26 m from the base of the tower on level ground.
Work out the angle of elevation of the top of the tower from Mia.
Give your answer correct to 1 decimal place.

The height is the opposite side and the distance is the adjacent side
$\tan \theta = \frac{39}{26}$
$\theta = \tan^{-1}(\frac{39}{26}) = 56.310...$
$\theta = 56.3°$ (1 d.p.)
Answer: 56.3°

9 Stem and leaf diagrams

The stem and leaf diagram shows 11 values.
(a) Find the median.
(b) Work out the range.

(a) 11 values, so the median is the 6th value
Reading in order: 10, 11, 14, 15, 18, 19, 20, 23, 32, 33, 36
Median = 19
(b) Range = 36 − 10 = 26
Answer: (a) 19 (b) 26

10 Percentage as a fraction of

(a) Nina scores 52 out of 200 in a test. Write this as a percentage.
(b) Write 70p as a percentage of £2.

(a) $\frac{52}{200} \times 100 = 26\%$
(b) Change both to pence: 70p and 200p
$\frac{70}{200} \times 100 = 35\%$
Answer: (a) 26% (b) 35%