Day 235 **B Tier 10-a-day: Model Solutions**

1 Expanding double brackets

Expand and simplify (x + 4)(x + 7)

Multiply every term in the first bracket by every term in the second:

$x^2 + 7x + 4x + 28$

Collect the x terms: $x^2 + 11x + 28$

Answer: $x^2 + 11x + 28$

2 Standard form

Write each number as an ordinary number.

(a) 2.8×10^4

(b) 2.7×10^{-5}

(a) Multiply by 10, 4 times: move the decimal point 4 places right

$2.8 \times 10^4 = 28{,}000$

(b) $10^{-5} = 0.00001$, so move the decimal point 5 places left

$2.7 \times 10^{-5} = 0.000027$

Answer: (a) 28,000 (b) 0.000027

3 Using the nth term

The nth term of a sequence is 9n − 3

(a) Work out the 8th term.

(b) Is 159 a term in the sequence? You must show how you get your answer.

(a) Replace n with 8: 9 × 8 − 3 = 69

(b) Solve 9n − 3 = 159: 9n = 162

n = 162 ÷ 9 = 18, a whole number, so 159 is in the sequence

Answer: (a) 69 (b) Yes, it is term number 18

4 Volume of cones and pyramids

A cone has base radius 7 cm and vertical height 3 cm.

Volume of a cone = $\frac{1}{3}\pi r^2 h$

Work out the volume of the cone.

Give your answer in terms of π.

Volume = $\frac{1}{3} \times \pi \times 7^2 \times 3$

$= \frac{1}{3} \times \pi \times 49 \times 3 = 49\pi$

Answer: 49π cm^3

5 Comparing fractions and percentages

Priya has $\frac{5}{8}$ of £136.

Sophie has 45% of £320.

Who has more money? You must show your working.

Priya: 136 ÷ 8 × 5 = £85

Sophie: 320 ÷ 100 × 45 = £144

£144 is more than £85, so Sophie has more

Answer: Sophie

6 Solving equations

Solve $\frac{y}{2} + 4 = 6$

Subtract 4 from both sides: $\frac{y}{2} = 2$

Multiply both sides by 2

Answer: y = 4

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7 Capture-recapture

80 snails in a lake are caught, tagged and returned to the lake.
Later, a sample of 40 snails is caught and 10 of them are tagged.
Estimate the total number of snails in the lake.

Proportion tagged in the sample = 10 ÷ 40
This is the same proportion as 80 out of the whole population
Population ≈ 80 × 40 ÷ 10 = 320
Answer: 320

8 Radius from area or circumference

The circumference of a circle is 26π m.
Work out the radius of the circle.

Circumference = $2\pi r$, so $2r = 26$
$r = 26 \div 2 = 13$
Answer: 13 m

9 Grouped frequency tables

The table shows the lengths of some leaves.
(a) Write down the modal class.
(b) Work out an estimate for the mean.

(a) The highest frequency is 10
(b) Use the midpoint of each class: 20, 40, 60, 80
Sum of midpoint × frequency = 20 × 3 + 40 × 3 + 60 × 10 + 80 × 9 = 1500
Total frequency = 25
Estimate = 1500 ÷ 25 = 60
Answer: (a) $50 < l \leq 70$ (b) 60

10 Area of shaded regions

The diagram shows two circles with the same centre.
The radius of the larger circle is 14 cm.
The radius of the smaller circle is 12 cm.
Work out the area of the shaded region.
Give your answer in terms of π.
The diagram is not drawn accurately.

Area of large circle = $\pi \times 14^2 = 196\pi$
Area of small circle = $\pi \times 12^2 = 144\pi$
$196\pi - 144\pi = 52\pi$
Answer: 52π cm^2