Day 87 **B Tier 10-a-day: Model Solutions**

1 Continuing sequences

Here are the first four terms of a sequence.
4, 7, 12, 19
(a) Write down the next two terms.
(b) Describe the rule for continuing the sequence.

The differences are 3, 5, 7, going up by 2 each time
Next differences: 9 then 11
19 + 9 = 28 and 28 + 11 = 39
Answer: (a) 28, 39 (b) The differences go up by 2 each time

2 Transformations of a point

(a) The point P(5, 1) is enlarged with scale factor −2 and centre the origin. Write down the coordinates of the image.
(b) The point P(5, 1) is rotated 180° about the origin. Write down the coordinates of the image.

(a) Multiply each coordinate by −2: (−10, −2)
(b) A half turn takes (x, y) to (−x, −y): (−5, −1)
Answer: (a) (−10, −2) (b) (−5, −1)

3 Negative numbers

Work out
(a) −6 − (−8)
(b) (−8) × 7

(a) Subtracting a negative is the same as adding: −6 + 8 = 2
(b) Negative × positive = negative: 8 × 7 = 56, so the answer is −56
Answer: (a) 2 (b) −56

4 Median and range

Here are the number of books read by some students.
27, 42, 44, 21, 23, 45, 24
(a) Find the median.
(b) Work out the range.

(a) Put in order: 21, 23, 24, 27, 42, 44, 45
The middle value is number 4: 27
(b) Range = largest − smallest = 45 − 21 = 24
Answer: (a) 27 (b) 24

5 Solving inequalities

Solve $5n - 6 > -1$

Add 6 to both sides: $5n > 5$
Divide both sides by 5 (a positive number, so the inequality sign stays the same)
Answer: $n > 1$

6 Trigonometry: finding a side

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

Label the sides: b is the hypotenuse and 12 cm is the opposite
We use sin (opposite and hypotenuse)

$\sin 53° = \frac{12}{b}$

$b = \frac{12}{\sin 53°} = 15.026...$

b = 15.0 cm (1 d.p.)
Answer: b = 15.0 cm

Day 87 **B Tier 10-a-day: Model Solutions**

7 Capture-recapture

30 fish in a lake are caught, tagged and returned to the lake.
Later, a sample of 60 fish is caught and 2 of them are tagged.
Estimate the total number of fish in the lake.

Proportion tagged in the sample = 2 ÷ 60
This is the same proportion as 30 out of the whole population
Population ≈ 30 × 60 ÷ 2 = 900
Answer: 900

8 Difference of two squares

Factorise $25x^2 - 121$

$25x^2 = (5x)^2$ and $121 = 11^2$
$(5x)^2 - 11^2 = (5x - 11)(5x + 11)$
Answer: $(5x - 11)(5x + 11)$

9 Volume of cones and pyramids

A square-based pyramid has base side 8 cm and vertical height 15 cm.

Volume of a pyramid = $\frac{1}{3}$ × base area × height

Work out the volume of the pyramid.

Base area = 8 × 8 = 64

Volume = $\frac{1}{3}$ × 64 × 15 = 320

Answer: 320 cm^3

10 Reverse repeated percentages

In a sale, the price of a sofa is reduced by 40%. (Calculator)
Two weeks later it is reduced by a further 5% of the new price.
The final price is £57.
Work out the original price of the sofa.

Multipliers: 0.6 and 0.95
Overall multiplier = 0.6 × 0.95 = 0.57
Original price = £57 ÷ 0.57 = £100
Answer: £100