Day 90 **B Tier 10-a-day: Model Solutions**

1 Powers and roots

Work out

(a) $\sqrt[3]{64} \times 13$

(b) the square root of 169

(a) $\sqrt[3]{64} = 4$ because $4 \times 4 \times 4 = 64$, so $4 \times 13 = 52$

(b) $13 \times 13 = 169$, so the square root is 13

Answer: (a) 52 (b) 13

2 Transformations of a point

(a) The point P(1, 5) is rotated 90° anticlockwise about the origin. Write down the coordinates of the image.

(b) The point P(1, 5) is rotated 90° clockwise about the origin. Write down the coordinates of the image.

(a) A 90° anticlockwise turn takes (x, y) to (−y, x): (−5, 1)

(b) A 90° clockwise turn takes (x, y) to (y, −x): (5, −1)

Answer: (a) (−5, 1) (b) (5, −1)

3 Pie charts

In a survey, 16 people chose cycle.

There were 30 people in the survey altogether.

The results are shown in a pie chart. Work out the angle for cycle.

Fraction = 16 out of 30

Angle = 16 ÷ 30 × 360° = 192°

Answer: 192°

4 Comparing fractions and percentages

Owen has $\frac{9}{10}$ of £50.

Kofi has 20% of £40.

Who has more money? You must show your working.

Owen: 50 ÷ 10 × 9 = £45

Kofi: 40 ÷ 100 × 20 = £8

£45 is more than £8, so Owen has more

Answer: Owen

5 Equation of a straight line graph

The diagram shows a straight line.

(a) Work out the gradient of the line.

(b) Find the equation of the line.

(a) The line crosses the y-axis at −1. Pick two points on the line and work out change in y divided by change in x

Gradient = −1

(b) The equation is y = mx + c with m = −1 and c = −1

Answer: (a) −1 (b) y = −x − 1

6 Perimeter with algebra

An isosceles triangle has two equal sides of length (2x) cm and a third side of length (x − 2) cm.

The perimeter of the triangle is 53 cm.

Work out the value of x.

2(2x) + (x − 2) = 53

5x − 2 = 53

5x = 55

x = 11

Answer: x = 11

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7 Solving quadratic equations

Solve $x^2 - 25 = 0$

Factorise as a difference of two squares: $(x - 5)(x + 5) = 0$
Either $x - 5 = 0$ or $x + 5 = 0$
Answer: $x = -5$ or $x = 5$

8 Trigonometry: finding an angle

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

We know the adjacent (20 cm) and the hypotenuse (25 cm), so use cos

$\cos x = \frac{20}{25}$

$x = \cos^{-1}(\frac{20}{25}) = 36.870...$

$x = 36.9°$ (1 d.p.)
Answer: $x = 36.9°$

9 Bounds

The length of a rectangle is 11 cm and its width is 20 cm.
Both measurements are correct to the nearest cm.
Work out the lower bound for the area of the rectangle.

Lower bound of each side = value − 0.5: 10.5 cm and 19.5 cm
Area = $10.5 \times 19.5 = 204.75$ cm^2
Answer: 204.75 cm^2

10 Cumulative frequency

The cumulative frequency graph shows the times taken by 40 students to complete a puzzle.
(a) Use the graph to estimate the median.
(b) Work out an estimate for the interquartile range.

(a) Median is at $40 \div 2 = 20$: read across from 20 on the vertical axis to the curve, then down: 57.5
(b) Lower quartile at 10: 45. Upper quartile at 30: 76
IQR = $76 - 45 = 31$
Answer: (a) 57.5 minutes (b) 31 minutes