Day 88 **B Tier 10-a-day: Model Solutions**

1 Solving equations

Solve $p + 8 = 23$

Subtract 8 from both sides

Answer: p = 15

2 Currency conversion

£1 = 1.2 Swiss francs

(a) Change £200 into Swiss francs.

(b) Change 48 francs into pounds.

(a) $200 \times 1.2 = 240$

(b) Divide by the rate: $48 \div 1.2 = 40$

Answer: (a) 240 francs (b) £40

3 Symmetry

How many lines of symmetry does a rectangle have?

A rectangle has 2 lines of symmetry (through the middle of opposite sides)

Answer: 2

4 Mean from a frequency table

The table shows the numbers of brothers and sisters of some students.

Work out the mean.

Multiply each value by its frequency and add: $3 \times 6 + 4 \times 5 + 5 \times 5 + 6 \times 9 + 7 \times 7 + 8 \times 4 = 198$

Total frequency = $6 + 5 + 5 + 9 + 7 + 4 = 36$

Mean = $198 \div 36 = 5.5$

Answer: 5.5

5 Algebraic proof

Show that $(2n + 1)^2 - 1$ is a multiple of 4 for any whole number n.

Expand: $(2n + 1)^2 = 4n^2 + 4n + 1$

Subtract 1: $4n^2 + 4n$

Factorise: $4n(n + 1)$, which is a multiple of 4

Answer: 4n(n + 1) is a multiple of 4

6 Transformations of a point

(a) The point P(−2, 3) is rotated 90° anticlockwise about the origin. Write down the coordinates of the image.

(b) The point P(−2, 3) 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): (−3, −2)

(b) A 90° clockwise turn takes (x, y) to (y, −x): (3, 2)

Answer: (a) (−3, −2) (b) (3, 2)

7 Negative and zero indices

Work out

(a) 5^{-3}

(b) $11^0 + \sqrt{4}$

(a) A negative power means the reciprocal: $5^{-3} = \frac{1}{5^3} = \frac{1}{125}$

(b) Anything to the power 0 is 1, so $11^0 = 1$

$\sqrt{4} = 2$, so $1 + 2 = 3$

Answer: (a) $\frac{1}{125}$ (b) 3

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8 Area of shaded regions

The diagram shows two circles with the same centre.
The radius of the larger circle is 10 cm.
The radius of the smaller circle is 2 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 = $\pi \times 10^2 = 100\pi$
Area of small circle = $\pi \times 2^2 = 4\pi$
$100\pi - 4\pi = 96\pi$
Answer: 96π cm^2

9 Percentage increase and decrease

A TV costs £40. In a sale the price is reduced by 10%.
(a) Work out the new price.
(b) A car is worth £4000. Its value goes down by 30% in a year. Work out its new value.

(a) The multiplier is 0.9, so new price = £40 × 0.9 = £36
(b) The multiplier is 0.7, so new value = £4000 × 0.7 = £2800
Answer: (a) £36 (b) £2800

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 50% of the new price.
The final price is £30.
Work out the original price of the sofa.

Multipliers: 0.6 and 0.5
Overall multiplier = 0.6 × 0.5 = 0.3
Original price = £30 ÷ 0.3 = £100
Answer: £100