Day 258 **B Tier 10-a-day: Model Solutions**

1 Term-to-term rules

The first term of a sequence is 3.
The term-to-term rule is: multiply by 4 and then add 1.
Work out the 4th term.

2nd term: 3 × 4 + 1 = 13
3rd term: 13 × 4 + 1 = 53
4th term: 53 × 4 + 1 = 213
Answer: 213

2 Percentages of amounts

Work out
(a) 20% of £180
(b) 80% of 320

(a) 10% of £180 = £18
20% = 2 × £18 = £36
(b) 10% of 320 = 32
80% = 8 × 32 = 256
Answer: (a) £36 (b) 256

3 Enlargement

A rectangle is 12 m long and 4 m wide.
It is enlarged by scale factor 4.
(a) Write down the length and width of the enlarged rectangle.
(b) Work out the perimeter of the enlarged rectangle.

(a) 12 × 4 = 48 and 4 × 4 = 16
(b) Perimeter = 2 × (48 + 16) = 128
Answer: (a) 48 m by 16 m (b) 128 m

4 Midpoint of a line segment

A is the point (7, −8) and B is the point (−7, −8).
Find the coordinates of the midpoint of AB.

Add the x-coordinates and halve: (7 − 7) ÷ 2 = 0
Add the y-coordinates and halve: (−8 − 8) ÷ 2 = −8
Answer: (0, −8)

5 Trigonometry: finding a side

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

Label the sides: x is the opposite and 18 cm is the adjacent
We use tan (opposite and adjacent)

$\tan 54° = \frac{x}{18}$

x = 18 × tan 54° = 24.775...
x = 24.8 cm (1 d.p.)
Answer: x = 24.8 cm

6 Difference of two squares

Factorise $144 - y^2$

$144 = 12^2$, so this is a difference of two squares
$12^2 - y^2 = (12 - y)(12 + y)$
Answer: (12 − y)(12 + y)

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7 Best buys

Rice is sold in two sizes.
Small: 250 g for £1.02
Large: 500 g for £2.20
Which size is better value for money?
You must show your working.

Compare the cost of 500 g of each
Small: 2 × £1.02 = £2.04
Large: 1 × £2.20 = £2.20
The small is cheaper for the same amount
Answer: The small size

8 Error intervals

The number x is rounded to the nearest 10.
The result is 150.
Write down the error interval for x.

The rounding unit is 10, so x can be up to half of this, 5, either side of 150
Lower bound = 150 − 5 = 145 and upper bound = 150 + 5 = 155
Answer: $145 \leq x < 155$

9 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 ÷ 2 = 20: read across from 20 on the vertical axis to the curve, then down: 17.5
(b) Lower quartile at 10: 12.5. Upper quartile at 30: 40
IQR = 40 − 12.5 = 27.5
Answer: (a) 17.5 minutes (b) 27.5 minutes

10 Chords and the centre of a circle

A circle has centre O and radius 15 cm.
AB is a chord and M is the midpoint of AB. OM is perpendicular to AB.
Work out the value of x.
The diagram is not drawn accurately.

AM = 24 ÷ 2 = 12
Triangle OMA has a right angle at M, and OA is the hypotenuse
$x^2 = 15^2 - 12^2 = 225 - 144 = 81$
$x = \sqrt{81} = 9$
Answer: x = 9 cm