Day 276 **B Tier 10-a-day: Model Solutions**

1 Exterior angles of polygons

Each exterior angle of a regular polygon is 45°.
Work out the number of sides of the polygon.

Exterior angles add up to 360°
Number of sides = 360 ÷ 45 = 8
Answer: 8 sides

2 Median and range

Here are the times, in seconds, taken to run 100 m.
25, 25, 17, 29, 33, 28, 10, 31, 12
(a) Find the median.
(b) Work out the range.

(a) Put in order: 10, 12, 17, 25, 25, 28, 29, 31, 33
The middle value is number 5: 25
(b) Range = largest − smallest = 33 − 10 = 23
Answer: (a) 25 (b) 23

3 Equations with brackets

Solve $2(3x - 5) = 14$

Divide both sides by 2: $3x - 5 = 7$
Add 5 to both sides: $3x = 12$
Divide both sides by 3
Answer: $x = 4$

4 Transformations of a point

(a) The point P(−3, −1) is rotated 90° anticlockwise about the origin. Write down the coordinates of the image.
(b) The point P(−3, −1) 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): (1, −3)
(b) A 90° clockwise turn takes (x, y) to (y, −x): (−1, 3)
Answer: (a) (1, −3) (b) (−1, 3)

5 Density

A steel bar has a density of 7.8 g/cm^3 and a volume of 40 cm^3.
Work out its mass.

Mass = density × volume
7.8 × 40 = 312
Answer: 312 g

6 Repeated percentage change

The price of a laptop is £40.
The price is first reduced by 25%, then the new price is increased by 10%.
(a) Work out the final price.
(b) Work out the overall percentage decrease in the price.

(a) Multipliers: 0.75 and 1.1
40 × 0.75 × 1.1 = £33
(b) Overall multiplier = 0.825
Overall decrease = 17.5%
Answer: (a) £33 (b) 17.5% decrease

7 Solving quadratic equations

Solve $x^2 - 8x = 0$

Factorise: $x(x - 8) = 0$
Either $x = 0$ or $x - 8 = 0$
Answer: $x = 0$ or $x = 8$

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8 Circle theorems

A, B, C and D are points on a circle.
Angle ADC = 84°.
Work out the size of angle ABC, marked x.
Give a reason for your answer.
The diagram is not drawn accurately.

ABCD is a cyclic quadrilateral
Opposite angles of a cyclic quadrilateral add up to 180°
x = 180 − 84 = 96°
Answer: x = 96°

9 Bounds

The length of a rectangle is 28 cm and its width is 15 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: 27.5 cm and 14.5 cm
Area = 27.5 × 14.5 = 398.75 cm^2
Answer: 398.75 cm^2

10 Quadratic equation problem

A rectangle has length (x + 2) cm and width (x − 3) cm.
The area of the rectangle is 14 cm^2.
(a) Show that $x^2 - x - 20 = 0$
(b) Hence work out the length of the rectangle.

(a) Area = length × width: (x + 2)(x − 3) = 14
Expand: $x^2 - x - 6 = 14$
Subtract 14 from both sides: $x^2 - x - 20 = 0$
(b) Factorise: (x − 5)(x + 4) = 0, so x = 5 or x = −4
A length cannot be negative, so x = 5. Length = 5 + 2 = 7
Answer: (b) 7 cm