Day 71 **B Tier 10-a-day: Model Solutions**

1 Volume of a cylinder

A cylinder has radius 4 m and height 11 m.
Work out its volume.
Give your answer in terms of π.

Volume = $\pi \times \text{radius}^2 \times \text{height}$
$\pi \times 4^2 \times 11 = \pi \times 16 \times 11$
$= 176\pi$
Answer: 176π m^3

2 Factors and multiples

(a) Write down all the factors of 60.
(b) Write down all the multiples of 7 between 55 and 76.

(a) Find pairs that multiply to make 60: 1 × 60, 2 × 30, 3 × 20, 4 × 15, 5 × 12, 6 × 10
(b) Count up in 7s: 56, 63, 70
Answer: (a) 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, 60 (b) 56, 63, 70

3 Transformations of a point

(a) The point P(1, −4) is rotated 90° clockwise about the origin. Write down the coordinates of the image.
(b) The point P(1, −4) is rotated 180° about the origin. Write down the coordinates of the image.

(a) A 90° clockwise turn takes (x, y) to (y, −x): (−4, −1)
(b) A half turn takes (x, y) to (−x, −y): (−1, 4)
Answer: (a) (−4, −1) (b) (−1, 4)

4 Midpoint of a line segment

M is the midpoint of AB.
A is the point (9, 8) and M is the point (6, 4).
Find the coordinates of B.

From A to M, x changes by −3 and y changes by −4
Do the same change again from M to get to B: x = 6 − 3 = 3, y = 4 − 4 = 0
Answer: (3, 0)

5 Fuel use

A car uses 30 litres of petrol to travel 300 km.
Work out how many kilometres it travels on each litre of petrol.

300 ÷ 30 = 10
Answer: 10 km per litre

6 Where a line crosses the axes

A straight line has equation y = 3x + 15
(a) Write down the coordinates of the point where the line crosses the y-axis.
(b) Work out the coordinates of the point where the line crosses the x-axis.

(a) When x = 0, y = 15
(b) The line crosses the x-axis when y = 0: 3x + 15 = 0
3x = −15
x = −5
Answer: (a) (0, 15) (b) (−5, 0)

7 Radius from area or circumference

The area of a circle is 64π m^2.
Work out the radius of the circle.

Area = πr^2, so $r^2 = 64$
$r = \sqrt{64} = 8$
Answer: 8 m

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8 Venn diagram problems

23 households were asked.
5 of them have a cat and 10 of them have a dog.
2 of them did both.
(a) How many did neither?
(b) One is chosen at random. Find the probability that they have a cat but do not have a dog.

(a) Union = 5 + 10 − 2 = 13
Neither = 23 − 13 = 10
(b) Only have a cat = 5 − 2 = 3
P = 3 out of 23

Answer: (a) 10 (b) $\frac{3}{23}$

9 Bounds

The length of a rectangle is 9 cm and its width is 9 cm.
Both measurements are correct to the nearest cm.
Work out the upper bound for the perimeter of the rectangle.

Upper bound of each side = value + 0.5: 9.5 cm and 9.5 cm
Perimeter = 2 × (9.5 + 9.5) = 38 cm
Answer: 38 cm

10 Simultaneous equations problem

A shop sells pens and pencils. All pens cost the same and all pencils cost the same.
3 pens and 2 pencils cost 230p.
4 pens and 2 pencils cost 270p.
Work out the cost of one pen and the cost of one pencil.

Let a = cost of one pen and b = cost of one pencil
3a + 2b = 230 and 4a + 2b = 270
Subtract: 1a = 270 − 230 = 40, so a = 40
Substitute: 3 × 40 + 2b = 230, so 2b = 110 and b = 55
Answer: One pen costs 40p and one pencil costs 55p