**Day 171** **B Tier 10-a-day: Model Solutions**

## 1 Faces, edges and vertices

Write down the number of edges and vertices of a cube.

Edges: 4 on the top, 4 on the bottom and 4 joining them = 12
Vertices: 4 on the top and 4 on the bottom = 8
**Answer: edges: 12 vertices: 8**

## 2 Number machines

Here is a number machine.
Input → + 6 → − 2 → Output
(a) The input is 7. Work out the output.
(b) The output is 7. Work out the input.

(a) 7 + 6 = 13, then 13 − 2 = 11
(b) Work backwards: undo − 2 to get 9, then undo + 6 to get 3
**Answer: (a) 11 (b) 3**

## 3 Radius from area or circumference

The area of a circle is 25 $m^2$. (Calculator)
Work out the radius of the circle.
Give your answer correct to 1 decimal place.

Area = $\pi r^2$, so $r^2 = 25 \div \pi = 7.958...$
$r = \sqrt{7.958} = 2.821...$
r = 2.8 m (1 d.p.)
**Answer: 2.8 m**

## 4 Scatter graphs

The scatter graph shows information about speed and stopping distance.
A line of best fit is drawn.
(a) Describe the correlation.
(b) Use the line of best fit to estimate the stopping distance when speed is 80.

(a) As one variable goes up, the other goes up
This is positive correlation
(b) Go up from 80 on the horizontal axis to the line, then across to the vertical axis
The reading is about 65 m
**Answer: (a) Positive correlation (b) about 65 m**

## 5 Percentage change

The number of members of a club goes from 250 to 225.
Work out the percentage decrease.

Decrease = 250 − 225 = 25
Percentage decrease = $\frac{25}{250} \times 100 = 10\%$
**Answer: 10% decrease**

## 6 Transformations of a point

(a) The point P(−6, −2) is translated by the vector $\begin{pmatrix} 3 \\ 4 \end{pmatrix}$. Write down the coordinates of the image.
(b) The point P(−6, −2) is reflected in the line y = −x. Write down the coordinates of the image.

(a) Add the vector: (−6 + 3, −2 + 4) = (−3, 2)
(b) Reflecting in y = −x swaps x and y and changes both signs: (2, 6)
**Answer: (a) (−3, 2) (b) (2, 6)**

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## 7 HCF and LCM from prime factors

A = $2^2 \times 3 \times 5 \times 7$

B = $2 \times 7^3$

Write down, as a product of prime factors,

(a) the HCF of A and B

(b) the LCM of A and B

(a) HCF: take the smaller power of each prime that is in both: $2 \times 7$

(b) LCM: take the larger power of every prime: $2^2 \times 3 \times 5 \times 7^3$

**Answer: (a) $2 \times 7$ (b) $2^2 \times 3 \times 5 \times 7^3$**

## 8 Equation of a line

Line L has equation $y = -2x - 1$

Line M is parallel to line L and passes through the point $(-3, 5)$.

Find the equation of line M.

Parallel lines have the same gradient, so line M is $y = -2x + c$

Substitute $x = -3$ and $y = 5$: $5 = -2 \times (-3) + c$

$c = 5 - 6 = -1$

**Answer: $y = -2x - 1$**

## 9 Ratio, one part known

The ratio of cats to dogs among the pets at a rescue centre is 8 : 3.

There are 40 cats.

How many dogs are there?

8 parts = 40 cats

1 part = 40 ÷ 8 = 5

dogs: $3 \times 5 = 15$

**Answer: 15**

## 10 Expanding double brackets

Expand and simplify $(x - 3)(x - 5)$

Multiply every term in the first bracket by every term in the second:

$x^2 - 5x - 3x + 15$

Collect the x terms: $x^2 - 8x + 15$

**Answer: $x^2 - 8x + 15$**