**Day 159** **B Tier 10-a-day: Model Solutions**

## 1 Percentage change

The number of members of a club goes from 300 to 180.
Work out the percentage decrease.

Decrease = 300 − 180 = 120

Percentage decrease = $\frac{120}{300} \times 100 = 40\%$

**Answer: 40% decrease**

## 2 Simplifying ratios

Write the ratio 28 : 8 : 28 in its simplest form.

The highest common factor of 28, 8 and 28 is 4
Divide each part by 4
**Answer: 7 : 2 : 7**

## 3 Ordering decimals

Write these numbers in order of size.
Start with the smallest number.
7.263, 7.18, 7.27, 7.2

Write each number to 3 decimal places:
7.263, 7.180, 7.270, 7.200
Now put them in order: 7.180, 7.200, 7.263, 7.270
**Answer: 7.18, 7.2, 7.263, 7.27**

## 4 Exterior angles of polygons

Each interior angle of a regular polygon is 140°.
Work out the number of sides of the polygon.

Exterior angle = 180° − 140° = 40°
Number of sides = 360 ÷ 40 = 9
**Answer: 9 sides**

## 5 Using the nth term

The nth term of a sequence is 5n − 1
(a) Work out the 9th term.
(b) Is 77 a term in the sequence? You must show how you get your answer.

(a) Replace n with 9: 5 × 9 − 1 = 44
(b) Solve 5n − 1 = 77: 5n = 78
n = 78 ÷ 5 = 15.6, which is not a whole number, so 77 is not in the sequence
**Answer: (a) 44 (b) No, n is not a whole number**

## 6 Negative and zero indices

Work out
(a) $5^{-1}$
(b) $3^0 + \sqrt{81}$

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

(b) Anything to the power 0 is 1, so $3^0 = 1$
$\sqrt{81} = 9$, so 1 + 9 = 10
**Answer: (a) $\frac{1}{5}$ (b) 10**

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## 7 Quadratic graphs

The diagram shows the graph of

$y = x^2 - 4$

(a) Write down the solutions of $x^2 - 4 = 0$

(b) Write down the coordinates of the minimum point of the graph.

(a) The solutions are where the graph crosses the x-axis

(b) The lowest point of the curve is halfway between the two solutions, at x = 0

**Answer: (a) x = −2 and x = 2 (b) (0, −4)**

## 8 Speed unit conversion

A skier travels at 16 metres per second.

Work out this speed in kilometres per hour.

In 1 hour (3600 s) it travels 16 × 3600 = 57,600 m

57,600 m = 57.6 km

**Answer: 57.6 km/h**

## 9 Volume of cones and pyramids

A pyramid has a rectangular base 4 cm by 5 cm and vertical height 6 cm.

Volume of a pyramid = $\frac{1}{3}$ × base area × height

Work out the volume of the pyramid.

Base area = 4 × 5 = 20

Volume = $\frac{1}{3}$ × 20 × 6 = 40

**Answer: 40 $cm^3$**

## 10 Average speed

A coach travels at 30 km/h for 2 hours and then at 72 km/h for 1 hour.

Work out its average speed for the whole journey.

Distance: 30 × 2 = 60 km and 72 × 1 = 72 km

Total distance = 132 km and total time = 3 hours

Average speed = 132 ÷ 3 = 44

**Answer: 44 km/h**