Day 343 **B Tier 10-a-day: Model Solutions**

1 Faces, edges and vertices

Write down the number of faces and vertices of a hexagonal-based pyramid.

Faces: a 6-sided base and 6 triangles = 7
Vertices: 6 on the base plus the top point = 7
Answer: faces: 7 vertices: 7

2 Place value

Here are four digit cards.
5 2 8 9
Use all four cards to make the largest possible number.
Work out the difference between the largest and smallest possible numbers.

Largest: put the digits in order, biggest first: 9852
Smallest: put the digits in order, smallest first: 2589
9852 − 2589 = 7263
Answer: 7263

3 Sharing in a ratio

Isla and Priya share 30 cards in the ratio 1 : 2.
Work out how many Priya gets.

1 + 2 = 3 parts
1 part = 30 ÷ 3 = 10
Priya gets 2 × 10 = 20
Answer: 20

4 Equations with unknowns on both sides

Solve $6x + 9 = 5x + 18$

Subtract 5x from both sides: $x + 9 = 18$
Subtract 9 from both sides: $1x = 9$
Divide both sides by 1
Answer: $x = 9$

5 Mean from a frequency table

The table shows the numbers of brothers and sisters of some students.
Work out the mean.

Multiply each value by its frequency and add: 0 × 3 + 1 × 1 + 2 × 2 + 3 × 2 + 4 × 7 = 39
Total frequency = 3 + 1 + 2 + 2 + 7 = 15
Mean = 39 ÷ 15 = 2.6
Answer: 2.6

6 Simultaneous equations

Solve the simultaneous equations
$3x + y = 21$
$2x - y = 9$

The y terms have opposite signs, so add the equations: $5x = 30$
$x = 6$
Substitute x = 6 into the first equation: $y = 21 - 18 = 3$
$y = 3$
Answer: $x = 6$, $y = 3$

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7 Trigonometry: finding a side

Calculate 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 adjacent and 18 cm is the opposite
We use tan (opposite and adjacent)

$\tan 24° = \frac{18}{x}$

$x = \frac{18}{\tan 24°} = 40.429...$

x = 40.4 cm (1 d.p.)

Answer: x = 40.4 cm

8 Population density

Region D has a population of 250.
Its area is 10 km^2.
Work out the population density.
Give your answer in people per km^2.

Population density = population ÷ area
250 ÷ 10 = 25

Answer: 25 people per km^2

9 Ordering standard form

Write these numbers in order of size.
Start with the smallest.
2.8×10^2, 0.42, 3.5×10^1, 0.0005

Write each in standard form: 2.8×10^2, 4.2×10^{-1}, 3.5×10^1, 5×10^{-4}
Compare the powers of 10 first (the bigger the power, the bigger the number)
Order: 0.0005, 0.42, 3.5×10^1, 2.8×10^2

Answer: 0.0005, 0.42, 3.5×10^1, 2.8×10^2

10 Equation of a line

Line L has equation $y = -x + 5$
Line M is parallel to line L and passes through the point (−1, 5).
Find the equation of line M.

Parallel lines have the same gradient, so line M is $y = -1x + c$
Substitute $x = -1$ and $y = 5$: $5 = -1 \times (-1) + c$
$c = 5 - 1 = 4$

Answer: $y = -x + 4$