Day 129 **B Tier 10-a-day: Model Solutions**

1 Faces, edges and vertices

Write down the number of faces and vertices of a hexagonal prism.

Faces: two 6-sided ends and 6 rectangles = 8
Vertices: 6 on each end = 12
Answer: faces: 8 vertices: 12

2 Types of number

Here is a list of numbers.
91, 44, 60, 72, 36, 88, 59, 90
From the list, write down
(a) a factor of 60
(b) an odd number that is not prime

(a) 60 (60 ÷ 60 = 1) divides exactly into 60
(b) 91 is odd but has more than two factors
Answer: (a) 60 (b) 91

3 Forming equations

I think of a number.
I divide it by 3 and then add 2.
The answer is 5.
Work out my number.

Let the number be n: $\frac{n}{3} + 2 = 5$

Subtract 2: $\frac{n}{3} = 3$

Multiply by 3
Answer: 9

4 Mode and median from a table

The table shows the goals scored in each match by a team.
(a) Write down the mode.
(b) Work out the median.

(a) The highest frequency is 9, for 2
(b) Total frequency = 21, so the median is the number 11 value
Running totals of frequency: 9, 12, 17, 18, 21
The median is 3
Answer: (a) 2 (b) 3

5 Trigonometry: finding a side

Work out the length of p. (Calculator)
Give your answer correct to 1 decimal place.
The diagram is not drawn accurately.

Label the sides: p is the opposite and 16 m is the hypotenuse
We use sin (opposite and hypotenuse)

$\sin 40° = \frac{p}{16}$

$p = 16 \times \sin 40° = 10.285...$
p = 10.3 m (1 d.p.)
Answer: p = 10.3 m

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6 Equations with fractional answers

Solve $5x - 1 = 6$

Give your answer as a fraction in its simplest form.

Add 1 to both sides: $5x = 7$

Divide both sides by 5: $x = \frac{7}{5}$

Answer: $x = \frac{7}{5}$

7 Ratio with a difference

Nia and Aisha share some money in the ratio 5 : 2.

Nia gets £9 more than Aisha.

Work out the total amount of money.

Difference in parts: $5 - 2 = 3$

3 parts = £9, so 1 part = £3

Total parts = 5 + 2 = 7

Total = 7 × £3 = £21

Answer: £21

8 Simple interest

Chloe invests £1000 for 2 years.

The account pays 3.5% simple interest per year.

(a) Work out the interest earned each year.

(b) Work out the total amount in the account after 2 years.

(a) 3.5% of £1000 = 1000 ÷ 100 × 3.5 = £35

(b) Interest over 2 years: 2 × £35 = £70

Total = £1000 + £70 = £1070

Answer: (a) £35 (b) £1070

9 Trigonometry in isosceles triangles

Triangle XYZ is isosceles with XY = XZ = 18 cm. (Calculator)

The base YZ = 32 cm.

Work out the size of angle XYZ.

Give your answer correct to 1 decimal place.

Split the triangle into two right-angled triangles. Half the base = 32 ÷ 2 = 16

$\cos Y = \frac{16}{18}$

Angle XYZ = $\cos^{-1}(\frac{16}{18}) = 27.266...$

= 27.3° (1 d.p.)

Answer: 27.3°

10 Algebraic proof

Show that $(2n + 9)^2 - 81$ is a multiple of 4 for any whole number n.

Expand: $(2n + 9)^2 = 4n^2 + 36n + 81$

Subtract 81: $4n^2 + 36n$

Factorise: 4n(n + 9), which is a multiple of 4

Answer: 4n(n + 9) is a multiple of 4