Day 336 **B Tier 10-a-day: Model Solutions**

1 Mean

Here are the number of minutes Ravi waited for a bus.
15, 13, 9, 5, 3, 12
Work out the mean.

Add the values: 15 + 13 + 9 + 5 + 3 + 12 = 57
Divide by the number of values: 57 ÷ 6 = 9.5
Answer: 9.5 minutes

2 Metric conversions

(a) Convert 0.75 m to cm.
(b) Convert 8 m^2 to cm^2.

(a) m → cm: multiply by 100: 0.75 × 100 = 75
(b) 1 m = 100 cm, so 1 m^2 = 100 × 100 = 10 000 cm^2. 8 × 10 000 = 80 000
Answer: (a) 75 cm (b) 80 000 cm^2

3 Factorising

Factorise $y^2 + 4y$

Both terms have y as a factor
$y^2 \div y = y$ and $4y \div y = 4$
Answer: y(y + 4)

4 Ordering standard form

Write these numbers in order of size.
Start with the smallest.
6.1×10^0, 0.0038, 1.8×10^{-2}, 75,000

Write each in standard form: 6.1×10^0, 3.8×10^{-3}, 1.8×10^{-2}, 7.5×10^4
Compare the powers of 10 first (the bigger the power, the bigger the number)
Order: 0.0038, 1.8×10^{-2}, 6.1×10^0, 75,000
Answer: 0.0038, 1.8×10^{-2}, 6.1×10^0, 75,000

5 Angles and algebra

The four angles of a quadrilateral are x°, (x + 36)°, 2x° and (2x + 18)°.
Work out the size of the largest angle.

Angles in a quadrilateral add up to 360°
x + (x + 36) + 2x + (2x + 18) = 360
6x + 54 = 360
6x = 306, so x = 51
The angles are 51°, 87°, 102°, 120°
Answer: 120°

6 LCM problems

Two buses leave a bus station at 08:45.
One bus leaves every 18 minutes.
The other bus leaves every 20 minutes.
At what time do both buses next leave together?

Multiples of 18: 18, 36, 54, 72, 90, 108, 126, 144, 162, 180
Multiples of 20: 20, 40, 60, 80, 100, 120, 140, 160, 180
The first common multiple is 180, so the LCM is 180 minutes
08:45 + 180 minutes = 11:45
Answer: 11:45

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7 Disproving statements

Ali says, "The value of $n^2 - n + 9$ is a prime number for every positive whole number n."
Show that Ali is wrong.

Try n = 1, 2, 3, ... and check each answer
When n = 1: $1^2 + (-1) \times 1 + 9 = 9$
9 is not prime because it has other factors
Answer: n = 1 gives 9, which is not prime

8 Ratio with a difference

Dev and Gita share some money in the ratio 9 : 5.
Dev gets £60 more than Gita.
How much money does Gita get?

Difference in parts: 9 − 5 = 4
4 parts = £60, so 1 part = £15
Gita gets 5 × £15 = £75
Answer: £75

9 Estimation

Estimate the value of
$\frac{80.5}{5.12} + 2.18$
Show your rounding to 1 significant figure.

Round each number to 1 significant figure: 80.5 → 80, 2.18 → 2, 5.12 → 5
Estimate = 80 ÷ 5 + 2 = 18
Answer: 18

10 Trigonometry in isosceles triangles

Triangle XYZ is isosceles with XY = XZ = 11 m. (Calculator)
The base YZ = 10 m.
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 = 10 ÷ 2 = 5
$\cos Y = \frac{5}{11}$
Angle XYZ = $\cos^{-1}(\frac{5}{11}) = 62.964...$
= 63.0° (1 d.p.)
Answer: 63.0°