Day 112 **B Tier 10-a-day: Model Solutions**

1 Currency conversion

£1 = 1.1 dollars
A holiday costs $220.
Work out the cost in pounds.

Divide by the rate: 220 ÷ 1.1
= £200
Answer: £200

2 Metric conversions

(a) Convert 2 m to mm.
(b) Convert 4 litres to cm^3.

(a) m → mm: multiply by 1000: 2 × 1000 = 2000
(b) 1 litre = 1000 cm^3. 4 × 1000 = 4000
Answer: (a) 2000 mm (b) 4000 cm^3

3 Substitution with negative numbers

Work out the value of 2a + 3b
when a = −2 and b = 7

Substitute: 2 × (−2) + 3 × 7
−4 + 21 = 17
Answer: 17

4 Bearings with Pythagoras and trigonometry

A boat sails 5 km on a bearing of 090° from P to Q, then 12 km on a bearing of 180° to R. (Calculator)
(a) Work out the distance PR.
(b) Work out the bearing of R from P.
Give your answers correct to 1 decimal place.

(a) Triangle PQR has a right angle at Q
$PR^2 = 5^2 + 12^2 = 169$
$PR = \sqrt{169} = 13$ km
(b) tan (angle QPR) = $\frac{12}{5}$, so angle QPR = 67.380° (to 3 d.p.)
PQ is on a bearing of 090°, and R is a further 67.380° clockwise from PQ
Bearing = 90 + 67.380 = 157.4°
Answer: (a) 13 km (b) 157.4°

5 Real-life graphs

A taxi firm charges a fixed amount plus a cost for each mile.
The graph shows the total cost.
(a) Write down the fixed charge.
(b) Work out the cost for each mile.

(a) The fixed charge is the cost when nothing has been used, where the line meets the vertical axis
(b) Take two points on the line, for example (0, 4) and (8, 28)
Cost for each mile = (28 − 4) ÷ 8 = 3
Answer: (a) £4 (b) £3

6 Ordering standard form

Write these numbers in order of size.
Start with the smallest.
2.5×10^2, 4400, 4.5×10^1, 4.4×10^{-5}

Write each in standard form: 2.5×10^2, 4.4×10^3, 4.5×10^1, 4.4×10^{-5}
Compare the powers of 10 first (the bigger the power, the bigger the number)
Order: 4.4×10^{-5}, 4.5×10^1, 2.5×10^2, 4400
Answer: 4.4×10^{-5}, 4.5×10^1, 2.5×10^2, 4400

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7 Solving inequalities

Solve $\frac{p}{2} + 6 \leq 11$

Subtract 6 from both sides: $\frac{p}{2} \leq 5$

Multiply both sides by 2

Answer: $p \leq 10$

8 LCM problems

Two buses leave a bus station at 09:30.
One bus leaves every 24 minutes.
The other bus leaves every 15 minutes.
At what time do both buses next leave together?

Multiples of 24: 24, 48, 72, 96, 120
Multiples of 15: 15, 30, 45, 60, 75, 90, 105, 120
The first common multiple is 120, so the LCM is 120 minutes
09:30 + 120 minutes = 11:30
Answer: 11:30

9 Cumulative frequency

The cumulative frequency graph shows the times taken by 40 students to complete a puzzle.
(a) Use the graph to estimate the median.
(b) Work out an estimate for the interquartile range.

(a) Median is at 40 ÷ 2 = 20: read across from 20 on the vertical axis to the curve, then down: 56
(b) Lower quartile at 10: 52. Upper quartile at 30: 60
IQR = 60 − 52 = 8
Answer: (a) 56 minutes (b) 8 minutes

10 Bounds

The length of a rectangle is 10 cm and its width is 18 cm.
Both measurements are correct to the nearest cm.
Work out the lower bound for the area of the rectangle.

Lower bound of each side = value − 0.5: 9.5 cm and 17.5 cm
Area = 9.5 × 17.5 = 166.25 cm^2
Answer: 166.25 cm^2