Day 139 **B Tier 10-a-day: Model Solutions**

1 Faces, edges and vertices

Write down the number of edges and vertices of a cylinder.
Count curved faces and curved edges as well.

Edges: 2 (the two circles)
Vertices: 0 (there are no corners)
Answer: edges: 2 vertices: 0

2 Powers and roots

Write down
(a) the square root of 121
(b) the cube root of 343

(a) $11 \times 11 = 121$, so the square root is 11
(b) $7 \times 7 \times 7 = 343$, so the cube root is 7
Answer: (a) 11 (b) 7

3 Compound areas

Two rectangles are joined to make a shape.
The first is 9 cm by 6 cm.
The second is 3 cm by 12 cm.
Work out the total area of the shape.

First rectangle: $9 \times 6 = 54$
Second rectangle: $3 \times 12 = 36$
$54 + 36 = 90$
Answer: 90 cm^2

4 Map scales

On a map, 1 cm represents 0.25 km.
A lake is 25 cm long on the map.
Work out the real length of the lake.

$25 \times 0.25 = 6.25$
Answer: 6.25 km

5 Solving double inequalities

(a) Solve $2 < 2x + 2 < 6$
(b) Write down the integer values of x that satisfy this inequality.

(a) Subtract 2 in all three parts: $0 < 2x < 4$
Divide all three parts by 2: $0 < x < 2$
(b) The whole numbers in this range are 1
Answer: (a) $0 < x < 2$ (b) 1

6 Mixed numbers

Work out $2\frac{5}{6} + 2\frac{5}{6}$

Give your answer as a mixed number.

Whole numbers: $2 + 2 = 4$

Fractions: $\frac{5}{6} + \frac{5}{6} = \frac{10}{6} = 1\frac{2}{3}$

Total = $5\frac{2}{3}$

Answer: $5\frac{2}{3}$

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7 Expected outcomes

The probability that a biased coin lands on heads is 10%.
Work out how many times you would expect this to happen in 150 throws of the coin.

Expected number = probability × number of trials
10% of 150 = 15
Answer: 15

8 Fraction problems

A fuel tank is $\frac{1}{3}$ full.

90 litres of fuel are added.

The fuel tank is now $\frac{2}{3}$ full.

Work out the capacity of the fuel tank.

Fraction added = $\frac{2}{3} - \frac{1}{3} = \frac{1}{3}$

$\frac{1}{3}$ of the capacity = 90 litres
Whole capacity = 90 × 3 = 270 litres
Answer: 270 litres

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: 72.5
(b) Lower quartile at 10: 60. Upper quartile at 30: 96
IQR = 96 − 60 = 36
Answer: (a) 72.5 minutes (b) 36 minutes

10 Trial and improvement

The equation $x^3 + 2x = 15$ has a solution between 2 and 3. (Calculator)
Use trial and improvement to find this solution.
Give your answer correct to 1 decimal place.

x = 2.5: $2.5^3 + 2 \times 2.5 = 20.625$ (too big)
x = 2.2: $2.2^3 + 2 \times 2.2 = 15.048$ (too big)
x = 2.1: $2.1^3 + 2 \times 2.1 = 13.461$ (too small)
x = 2.15: value = 14.238 (too small), so the solution is above 2.15
So x = 2.2 to 1 decimal place
Answer: x = 2.2