Day 140 **B Tier 10-a-day: Model Solutions**

1 Where a line crosses the axes

A straight line has equation $y = -2x - 4$

(a) Write down the coordinates of the point where the line crosses the y-axis.

(b) Work out the coordinates of the point where the line crosses the x-axis.

(a) When $x = 0$, $y = -4$

(b) The line crosses the x-axis when $y = 0$: $-2x - 4 = 0$

$-2x = 4$

$x = -2$

Answer: (a) (0, −4) (b) (−2, 0)

2 Currency conversion

£1 = 1.4 dollars

A holiday costs $84.

Work out the cost in pounds.

Divide by the rate: $84 \div 1.4$

= £60

Answer: £60

3 Angles in parallel lines

In the diagram, EF is parallel to GH.

(a) Work out the size of angle r.

(b) Give a reason for your answer.

The diagram is not drawn accurately.

Angle r and the 57° angle are corresponding angles (F shape)

r = 57°

Corresponding angles are equal

Answer: (a) r = 57° (b) Corresponding angles are equal

4 HCF and LCM

Find the (a) highest common factor (HCF), (b) lowest common multiple (LCM) of 10 and 8.

$10 = 2 \times 5$ and $8 = 2^3$

(a) HCF: multiply the primes in both lists, using the smaller power: 2

(b) LCM: use the larger power of every prime: $2^3 \times 5 = 40$

Answer: (a) 2 (b) 40

5 Substitution into formulae

$s = ut + \frac{1}{2}at^2$

Work out the value of s when $u = 7$, $a = 3$ and $t = 4$

$s = 7 \times 4 + \frac{1}{2} \times 3 \times 4^2$

$s = 28 + \frac{1}{2} \times 3 \times 16$

$s = 28 + 24 = 52$

Answer: s = 52

6 Prisms and density

A block of ice is a cuboid measuring 4 cm by 7 cm by 7 cm.

The density of ice is 0.9 g/cm^3.

Work out the mass of the block.

Volume = $4 \times 7 \times 7 = 196$ cm^3

Mass = density × volume

$0.9 \times 196 = 176.4$ g

Answer: 176.4 g

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7 Fractions and decimals

(a) Write $\frac{39}{50}$ as a decimal.

(b) Write $\frac{5}{6}$ as a recurring decimal.

For part (b), write down the first 8 decimal places and say which digits repeat.

(a) 39 ÷ 50 = 0.78
(b) 5 ÷ 6: use short division, adding zeros
5 ÷ 6 = 0.83333333...
The digit 3 repeats
Answer: (a) 0.78 (b) 0.83333333... (3 repeats)

8 Trigonometry: finding a side

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

Label the sides: y is the hypotenuse and 12 cm is the adjacent
We use cos (adjacent and hypotenuse)

$\cos 64° = \frac{12}{y}$

$y = \frac{12}{\cos 64°} = 27.374...$

y = 27.4 cm (1 d.p.)
Answer: y = 27.4 cm

9 Trial and improvement

The equation $x^3 + 2x = 39$ has a solution between 3 and 4. (Calculator)
Use trial and improvement to find this solution.
Give your answer correct to 1 decimal place.

x = 3.5: $3.5^3 + 2 \times 3.5 = 49.875$ (too big)
x = 3.2: $3.2^3 + 2 \times 3.2 = 39.168$ (too big)
x = 3.1: $3.1^3 + 2 \times 3.1 = 35.991$ (too small)
x = 3.15: value = 37.556 (too small), so the solution is above 3.15
So x = 3.2 to 1 decimal place
Answer: x = 3.2

10 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: 40
(b) Lower quartile at 10: 30. Upper quartile at 30: 100
IQR = 100 − 30 = 70
Answer: (a) 40 minutes (b) 70 minutes