Day 346 **B Tier 10-a-day: Model Solutions**

1 Bar charts

The bar chart shows some information.
(a) Write down the mode.
(b) What fraction of the total is Orange? Give your answer in its simplest form.

(a) The tallest bar is Banana
(b) Total = 20 + 30 + 25 + 10 + 25 = 110
Orange = 25, so the fraction is 25 out of 110

Answer: (a) Banana (b) $\frac{5}{22}$

2 Symmetry

(a) Write down the number of lines of symmetry of a regular hexagon.
(b) Write down the order of rotational symmetry of a regular hexagon.

A regular hexagon has 6 lines of symmetry
A regular hexagon looks the same 6 times in a full turn, so the order of rotational symmetry is 6
Answer: (a) 6 (b) 6

3 Sharing in a ratio

Gita and Amy share 117 sweets in the ratio 7 : 6.
Work out how many Gita gets.

7 + 6 = 13 parts
1 part = 117 ÷ 13 = 9
Gita gets 7 × 9 = 63
Answer: 63

4 Decimal calculations

Work out
(a) 6.4 × 0.4
(b) 0.18 × 3

(a) 64 × 4 = 256
There are 2 decimal places in total, so the answer is 2.56
(b) 18 × 3 = 54, then divide by 100: 0.54
Answer: (a) 2.56 (b) 0.54

5 Real-life graphs

A plumber charges a call-out fee plus a cost for each hour of work.
The graph shows the total cost.
(a) Write down the fixed charge.
(b) Work out the cost for each hour.

(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, 8) and (4, 28)
Cost for each hour = (28 − 8) ÷ 4 = 5
Answer: (a) £8 (b) £5

6 Density

A metal block has a density of 2.7 g/cm^3 and a volume of 30 cm^3.
Work out its mass.

Mass = density × volume
2.7 × 30 = 81
Answer: 81 g

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7 Pythagoras in context

A hiker walks 9 km north and then 12 km east.
Work out the straight line distance from the start to the finish.

The two walks are at right angles, so use Pythagoras

$d^2 = 9^2 + 12^2 = 81 + 144 = 225$

$d = \sqrt{225} = 15$

Answer: 15 km

8 Simultaneous equations

Solve the simultaneous equations

$x + y = 7$

$3x + 2y = 18$

Multiply the first equation by 2: $2x + 2y = 14$

The y terms have the same sign, so subtract the first equation from the second: $x = 4$

$x = 4$

Substitute $x = 4$ into the first equation: $y = 7 - 4 = 3$

$y = 3$

Answer: x = 4, y = 3

9 Bounds

The length of a rectangle is 25 cm and its width is 28 cm.
Both measurements are correct to the nearest cm.
Work out the upper bound for the perimeter of the rectangle.

Upper bound of each side = value + 0.5: 25.5 cm and 28.5 cm

Perimeter = $2 \times (25.5 + 28.5) = 108$ cm

Answer: 108 cm

10 Trial and improvement

The equation $x^3 - x = 51$ has a solution between 3 and 4. (Calculator)
Use trial and improvement to find this solution.
Give your answer correct to 1 decimal place.

$x = 3.5$: $3.5^3 - 3.5 = 39.375$ (too small)

$x = 3.7$: $3.7^3 - 3.7 = 46.953$ (too small)

$x = 3.8$: $3.8^3 - 3.8 = 51.072$ (too big)

$x = 3.75$: value = 48.984 (too small), so the solution is above 3.75

So $x = 3.8$ to 1 decimal place

Answer: x = 3.8