Day 247 **B Tier 10-a-day: Model Solutions**

1 Types of number

Here is a list of numbers.
36, 92, 56, 47, 64, 17, 19, 51
From the list, write down
(a) an odd number that is not prime
(b) a cube number

(a) 51 is odd but has more than two factors
(b) 64 (4 × 4 × 4) is a whole number multiplied by itself twice
Answer: (a) 51 (b) 64

2 Bar charts

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

(a) The tallest bar is Chess
(b) Total = 6 + 10 + 12 + 6 + 4 = 38
Squash = 6, so the fraction is 6 out of 38
Answer: (a) Chess (b) $\frac{3}{19}$

3 Decimal calculations

Work out
(a) 4.7 × 0.8
(b) 0.47 × 5

(a) 47 × 8 = 376
There are 2 decimal places in total, so the answer is 3.76
(b) 47 × 5 = 235, then divide by 100: 2.35
Answer: (a) 3.76 (b) 2.35

4 Mean from a frequency table

The table shows the numbers of brothers and sisters of some students.
Work out the mean.

Multiply each value by its frequency and add: 0 × 6 + 1 × 9 + 2 × 9 + 3 × 6 = 45
Total frequency = 6 + 9 + 9 + 6 = 30
Mean = 45 ÷ 30 = 1.5
Answer: 1.5

5 Standard form

Write each number as an ordinary number.
(a) 9.6×10^3
(b) 8×10^{-5}

(a) Multiply by 10, 3 times: move the decimal point 3 places right
$9.6 \times 10^3 = 9600$
(b) $10^{-5} = 0.00001$, so move the decimal point 5 places left
$8 \times 10^{-5} = 0.00008$
Answer: (a) 9600 (b) 0.00008

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6 Where a line crosses the axes

A straight line has equation $y = x + 2$
(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 $x = 0$, $y = 2$
(b) The line crosses the x-axis when $y = 0$: $x + 2 = 0$
$1x = -2$
$x = -2$
Answer: (a) (0, 2) (b) (−2, 0)

7 Similar shapes

The two triangles are similar.
(a) Work out the scale factor of the enlargement from the smaller triangle to the larger triangle.
(b) Work out the value of q.
The diagram is not drawn accurately.

(a) Scale factor = 48 ÷ 12 = 4
(b) q = 10 × 4 = 40
Answer: (a) 4 (b) q = 40 m

8 Trial and improvement

The equation $x^3 - 2x = 36$ has a solution between 3 and 4. (Calculator)
Use trial and improvement to find this solution.
Give your answer correct to 1 decimal place.

$x = 3.5$: $3.5^3 - 2 \times 3.5 = 35.875$ (too small)
$x = 3.7$: $3.7^3 - 2 \times 3.7 = 43.253$ (too big)
$x = 3.6$: $3.6^3 - 2 \times 3.6 = 39.456$ (too big)
$x = 3.55$: value = 37.639 (too big), so the solution is below 3.55
So x = 3.5 to 1 decimal place
Answer: x = 3.5

9 Trigonometry in isosceles triangles

Triangle XYZ is isosceles with XY = XZ = 6 m. (Calculator)
The base YZ = 6 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 = 6 ÷ 2 = 3

$\cos Y = \frac{3}{6}$

Angle XYZ = $\cos^{-1}(\frac{3}{6})$ = 60.000...

= 60.0° (1 d.p.)
Answer: 60.0°

10 Quadratic equation problem

A rectangle has length (x + 3) cm and width (x − 2) cm.
The area of the rectangle is 36 cm^2.
(a) Show that $x^2 + x - 42 = 0$
(b) Hence work out the length of the rectangle.

(a) Area = length × width: $(x + 3)(x - 2) = 36$
Expand: $x^2 + x - 6 = 36$
Subtract 36 from both sides: $x^2 + x - 42 = 0$
(b) Factorise: $(x - 6)(x + 7) = 0$, so $x = 6$ or $x = -7$
A length cannot be negative, so x = 6. Length = 6 + 3 = 9
Answer: (b) 9 cm