Day 77 **B Tier 10-a-day: Model Solutions**

1 Substitution with negative numbers

Work out the value of $31 - x^2$ when $x = -6$

$x^2 = (-6)^2 = 36$
$31 - 36 = -5$
Answer: -5

2 Median and range

Here are the temperatures at noon in a town.
17, 17, 30, 9, 28, 26
(a) Find the median.
(b) Work out the range.

(a) Put in order: 9, 17, 17, 26, 28, 30
The middle two values are 17 and 26, so the median is $43 \div 2 = 21.5$
(b) Range = largest − smallest = $30 - 9 = 21$
Answer: (a) 21.5 (b) 21

3 Bearings

The bearing of Q from P is 073°.
Work out the bearing of P from Q.

73 is less than 180, so add 180°
$73 + 180 = 253$
Answer: 253°

4 HCF and LCM from prime factors

$A = 2^3 \times 5$
$B = 2 \times 5 \times 7^2$
Write down, as a product of prime factors,
(a) the HCF of A and B
(b) the LCM of A and B

(a) HCF: take the smaller power of each prime that is in both: 2×5
(b) LCM: take the larger power of every prime: $2^3 \times 5 \times 7^2$
Answer: (a) 2×5 (b) $2^3 \times 5 \times 7^2$

5 Mean from a frequency table

The table shows the books read by each member of a club in a month.
Work out the mean.

Multiply each value by its frequency and add: $2 \times 7 + 3 \times 4 + 4 \times 8 + 5 \times 4 + 6 \times 2 = 90$
Total frequency = $7 + 4 + 8 + 4 + 2 = 25$
Mean = $90 \div 25 = 3.6$
Answer: 3.6

6 Surface area of cuboids

A cereal box measures 3 cm by 6 cm by 5 cm.
Work out the total surface area.

Top and bottom: $2 \times 3 \times 6 = 36$
Front and back: $2 \times 3 \times 5 = 30$
Two sides: $2 \times 6 \times 5 = 60$
$36 + 30 + 60 = 126$
Answer: 126 cm^2

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7 Direct proportion

F is directly proportional to m.
When m = 10, F = 25.
Find a formula for F in terms of m.

F = km
25 = k × 10, so k = 25 ÷ 10 = 2.5
Answer: F = 2.5m

8 Standard form

Write each number in standard form.
(a) 3,200,000
(b) 0.00024

(a) Move the decimal point 6 places: 3.2×10^{6}
(b) Move the decimal point 4 places the other way: 2.4×10^{-4}
Answer: (a) 3.2×10^{6} (b) 2.4×10^{-4}

9 Equation of a line

Line L has equation $y = -4x - 5$
Line M is parallel to line L and passes through the point (4, 6).
Find the equation of line M.

Parallel lines have the same gradient, so line M is $y = -4x + c$
Substitute x = 4 and y = 6: $6 = -4 \times 4 + c$
$c = 6 - (-16) = 22$
Answer: $y = -4x + 22$

10 Trigonometry in isosceles triangles

Triangle XYZ is isosceles with XY = XZ = 8 cm. (Calculator)
The base YZ = 10 cm.
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 = 10 ÷ 2 = 5

$\cos Y = \frac{5}{8}$

Angle XYZ = $\cos^{-1}(\frac{5}{8}) = 51.318...$

= 51.3° (1 d.p.)
Answer: 51.3°