Day 73 **B Tier 10-a-day: Model Solutions**

1 Standard form

Write each number as an ordinary number.

(a) 7.2×10^6

(b) 8.6×10^{-5}

(a) Multiply by 10, 6 times: move the decimal point 6 places right

$7.2 \times 10^6 = 7{,}200{,}000$

(b) $10^{-5} = 0.00001$, so move the decimal point 5 places left

$8.6 \times 10^{-5} = 0.000086$

Answer: (a) 7,200,000 (b) 0.000086

2 Integer inequalities

n is an integer.

Write down all the values of n for which

$-6 \leq n < 1$

List the whole numbers between -6 and 1

Include -6 only if the sign is $\leq$, and 1 only if the sign is $\leq$

Answer: $-6, -5, -4, -3, -2, -1, 0$

3 Area of 2D shapes

The diagram shows a parallelogram.

Find the area of the parallelogram.

The diagram is not drawn accurately.

Area of a parallelogram = base × perpendicular height

The slanting side is not needed

$19 \times 12 = 228$

Answer: 228 mm^2

4 Gradient and intercept

A straight line has equation $y = 4x + 4$

(a) Write down the gradient of the line.

(b) Write down the equation of a line that is parallel to this line and passes through the point (0, 8).

(a) The line is in the form $y = mx + c$, so the gradient m is the number in front of x

(b) Parallel lines have the same gradient, 4

It crosses the y-axis at 8, so c = 8

Answer: (a) 4 (b) $y = 4x + 8$

5 Fractions and decimals

(a) Write $\frac{7}{16}$ as a decimal.

(b) Write $\frac{11}{12}$ as a recurring decimal.

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

(a) $7 \div 16 = 0.4375$

(b) $11 \div 12$: use short division, adding zeros

$11 \div 12 = 0.91666666...$

The digit 6 repeats

Answer: (a) 0.4375 (b) 0.91666666... (6 repeats)

6 Growth and decay

The population of a colony of bats is 8,000. (Calculator)

It increases by 10% each year.

Work out the population after 2 years.

Multiplier = 1.1

$8{,}000 \times 1.1^2 = 9{,}680$

Answer: 9,680

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7 Expanding double brackets

Expand and simplify $(x + 5)(x - 4)$

Multiply every term in the first bracket by every term in the second:

$x^2 - 4x + 5x - 20$

Collect the x terms: $x^2 + x - 20$

Answer: $x^2 + x - 20$

8 Perimeter with algebra

An isosceles triangle has two equal sides of length $(x + 1)$ cm and a third side of length $(3x + 1)$ cm.
The perimeter of the triangle is 53 cm.
Work out the value of x.

$2(x + 1) + (3x + 1) = 53$
$5x + 3 = 53$
$5x = 50$
$x = 10$
Answer: $x = 10$

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 $40 \div 2 = 20$: read across from 20 on the vertical axis to the curve, then down: 120
(b) Lower quartile at 10: 60. Upper quartile at 30: 130
IQR = $130 - 60 = 70$
Answer: (a) 120 minutes (b) 70 minutes

10 Proving a triangle is right-angled

A triangle has sides of length 9 m, 16 m and 12 m.
Is the triangle right-angled?
You must show your working.

The longest side is 16. Check whether $a^2 + b^2 = c^2$
$9^2 + 12^2 = 81 + 144 = 225$
$16^2 = 256$
These are not equal, so the triangle is not right-angled
Answer: No, $9^2 + 12^2 = 225$ but $16^2 = 256$