Day 181 **B Tier 10-a-day: Model Solutions**

1 Fractions of amounts

A bag has 30 counters.

$\frac{1}{2}$ of the counters are red.

How many are not red?

$\frac{1}{2}$ of 30 = 30 ÷ 2 × 1 = 15

Not red: 30 − 15 = 15

Answer: 15

2 Speed

A runner travels 24 km in 3 hours.

Work out its average speed in km per hour.

Speed = distance ÷ time

Time = 3 hours

24 ÷ 3 = 8

Answer: 8 km per hour

3 Surface area of cuboids

An open box (no lid) is a cuboid measuring 13 cm by 6 cm by 2 cm.

The base is 13 cm by 6 cm.

Work out the total area of card needed to make the box.

Base: 13 × 6 = 78

Two long sides: 2 × 13 × 2 = 52

Two short sides: 2 × 6 × 2 = 24

78 + 52 + 24 = 154

Answer: 154 cm^2

4 Standard form

Write each number as an ordinary number.

(a) 5.7×10^3

(b) 9.5×10^{-4}

(a) Multiply by 10, 3 times: move the decimal point 3 places right

$5.7 \times 10^3 = 5700$

(b) $10^{-4} = 0.0001$, so move the decimal point 4 places left

$9.5 \times 10^{-4} = 0.00095$

Answer: (a) 5700 (b) 0.00095

5 Quadratic graphs

The diagram shows the graph of

$y = -x^2 - 4x$

(a) Write down the solutions of $-x^2 - 4x = 0$

(b) Write down the coordinates of the maximum point of the graph.

(a) The solutions are where the graph crosses the x-axis

(b) The highest point of the curve is halfway between the two solutions, at $x = -2$

Answer: (a) $x = -4$ and $x = 0$ (b) $(-2, 4)$

6 Congruent triangles

Triangle ABC has sides of 8 cm and 9 cm, and an angle of 45° that is not between them.

Triangle XYZ has sides of 8 cm and 9 cm, and an angle of 45° between them.

Are the two triangles congruent?

Give a reason for your answer.

In triangle ABC the angle is not between the two sides, in triangle XYZ it is

Two sides and a non-included angle do not prove congruence

Answer: No, the equal angle is in a different position

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7 Changing the subject

Make n the subject of the formula

$C = \frac{n + 5}{3}$

Multiply both sides by 3: $3C = n + 5$
Subtract 5 from both sides
Answer: $n = 3C - 5$

8 Mode and median from a table

The table shows the goals scored in each match by a team.
(a) Write down the mode.
(b) Work out the median.

(a) The highest frequency is 9, for 7
(b) Total frequency = 32, so the median is the numbers 16 and 17 values
Running totals of frequency: 3, 11, 14, 16, 23, 32
The median is 5.5
Answer: (a) 7 (b) 5.5

9 Where a line crosses the axes

A straight line has equation $y = x - 3$
(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 $x = 0$, $y = -3$
(b) The line crosses the x-axis when $y = 0$: $x - 3 = 0$
$1x = 3$
$x = 3$
Answer: (a) (0, −3) (b) (3, 0)

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 $40 \div 2 = 20$: read across from 20 on the vertical axis to the curve, then down: 20
(b) Lower quartile at 10: 10. Upper quartile at 30: 60
IQR = 60 − 10 = 50
Answer: (a) 20 minutes (b) 50 minutes