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

1 Percentage change

Ali buys a bookcase for £250.
He sells it for £237.50.
Work out his percentage loss.

Loss = £250.00 − £237.50 = £12.50

Percentage loss = $\frac{£12.50}{£250.00} \times 100 = 5\%$

Answer: 5%

2 Similar shapes: finding a length

The two triangles are similar.
Work out the value of x.
The diagrams are not drawn accurately.

Scale factor from the large triangle to the small triangle = 18 ÷ 30 = $\frac{3}{5}$

$x = 40 \times \frac{3}{5} = 24$

Answer: x = 24 m

3 HCF and LCM

(a) Write 66 and 24 as products of prime factors.
(b) Find the highest common factor (HCF) and the lowest common multiple (LCM) of 66 and 24.

(a) $66 = 2 \times 3 \times 11$ and $24 = 2^3 \times 3$
(b) HCF: multiply the prime factors in both lists, taking the smaller power: $2 \times 3 = 6$
LCM: take the larger power of every prime: $2^3 \times 3 \times 11 = 264$
Answer: (a) $66 = 2 \times 3 \times 11$, $24 = 2^3 \times 3$ (b) HCF = 6, LCM = 264

4 Equation of a line from a graph

Find the equation of the straight line shown.
Give your answer in the form y = mx + c

The line crosses the y-axis at (0, −1), so c = −1

Gradient = $\frac{\text{change in y}}{\text{change in x}}$: from (0, −1) to (−4, 5), y changes by 6 and x changes by −4

$m = -\frac{3}{2}$

$y = -\frac{3}{2}x - 1$

Answer: $y = -\frac{3}{2}x - 1$

5 Pythagoras in context

Mo walks 8 km north and then 6 km east.
Work out the distance Mo is now from the starting point.

The two directions are at right angles
$\text{Distance}^2 = 8^2 + 6^2 = 100$
$\text{Distance} = \sqrt{100} = 10$
Answer: 10 km

6 Double inequalities

(a) Solve $-19 < 5x + 1 < 11$
(b) Write down all the integer values of x that satisfy this inequality.

(a) Subtract 1 from every part: $-20 < 5x < 10$
Divide every part by 5: $-4 < x < 2$
(b) The integers are −3, −2, −1, 0, 1
Answer: (a) $-4 < x < 2$ (b) −3, −2, −1, 0, 1

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7 Venn diagram probability

The Venn diagram shows information about 23 people.
One person is chosen at random.
(a) Find the probability that the person is in both French and Spanish.
(b) Find the probability that the person is in French or Spanish or both.

(a) Both: 3 out of 23 = $\frac{3}{23}$

(b) 10 + 3 + 5 = 18, so 18 out of 23 = $\frac{18}{23}$

Answer: (a) $\frac{3}{23}$ (b) $\frac{18}{23}$

8 Forming quadratic equations

A rectangle has width x cm and length (x + 2) cm.
The area of the rectangle is 80 cm^2.
(a) Show that $x^2 + 2x - 80 = 0$
(b) Work out the value of x.

(a) Area = length × width, so $x(x + 2) = 80$
$x^2 + 2x = 80$
$x^2 + 2x - 80 = 0$
(b) Factorise: $(x - 8)(x + 10) = 0$
$x = 8$ or $x = -10$
A length cannot be negative, so $x = 8$
Answer: (a) Shown (b) x = 8

9 Venn diagrams from information

There are 21 students in a class.
14 students do drama and 11 students do choir.
4 students do neither.
(a) Work out how many students do both.
(b) One student is chosen at random. Find the probability that they do drama only.

(a) Students doing at least one = 21 − 4 = 17
Both = 14 + 11 − 17 = 8
(b) drama only = 14 − 8 = 6
Probability = $\frac{6}{21} = \frac{2}{7}$

Answer: (a) 8 (b) $\frac{2}{7}$

10 Successive percentage changes

The price of a ticket is increased by 20% and then the new amount is decreased by 15%.
Work out the overall percentage increase.

Multipliers: increase of 20% is 1.2, decrease of 15% is 0.85
Overall multiplier = 1.2 × 0.85 = 1.02
1.02 means a percentage increase of 2%
Answer: 2% increase