Day 55 **B Tier 10-a-day: Model Solutions**

1 Expanding and simplifying

Expand and simplify $6(x + 3) + 2(x - 3)$

Expand each bracket: $6x + 18 + 2x - 6$
Collect like terms: $8x + 12$
Answer: $8x + 12$

2 Adding fractions

Work out
(a) $\frac{1}{4} + \frac{3}{10}$
(b) $\frac{7}{10} - \frac{1}{6}$
Give each answer in its simplest form.

(a) Common denominator 20: $\frac{5}{20} + \frac{6}{20} = \frac{11}{20}$
(b) Common denominator 30: $\frac{21}{30} - \frac{5}{30} = \frac{16}{30} = \frac{8}{15}$
Answer: (a) $\frac{11}{20}$ (b) $\frac{8}{15}$

3 Map scales

The scale of a map is 1 : 100,000.
Two villages are 6 km apart.
How far apart are they on the map?
Give your answer in centimetres.

6 km = 600,000 cm
Divide by 100,000: 600,000 ÷ 100,000 = 6
Answer: 6 cm

4 Laws of indices

Write each answer as a single power of 3.
(a) $3^6 \times 3^6$
(b) $3^{12} \div 3^6$

(a) Add the powers: 6 + 6 = 12
(b) Subtract the powers: 12 − 6 = 6
Answer: (a) 3^{12} (b) 3^6

5 Scale drawings and maps

On a map, 1 cm represents 25 km.
Two towns are 7.5 cm apart on the map.
(a) Work out the real distance between the towns.
(b) Write the scale of the map in the form 1 : n.

(a) 7.5 × 25 = 187.5 km
(b) 25 km = 2 500 000 cm
So 1 cm on the map is 2 500 000 cm in real life
Answer: (a) 187.5 km (b) 1 : 2 500 000

6 Harder linear equations

Solve $14 - 2x = x + 11$

Add 2x to both sides: $14 = 3x + 11$
Subtract 11 from both sides: $3 = 3x$
Divide both sides by 3
Answer: $x = 1$

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7 Compound interest

£800 is invested for 2 years at 5% compound interest per year. (Calculator)
Work out the total interest earned.

Multiplier = 1.05

Value after 2 years = $800 \times 1.05^2 = £882$

Interest = £882 − £800 = £82

Answer: £82

8 Chords and the centre of a circle

A circle has centre O and radius 5 m.
AB is a chord and M is the midpoint of AB. OM is perpendicular to AB.
Work out the value of x.
The diagram is not drawn accurately.

AM = 8 ÷ 2 = 4

Triangle OMA has a right angle at M, and OA is the hypotenuse

$x^2 = 5^2 - 4^2 = 25 - 16 = 9$

$x = \sqrt{9} = 3$

Answer: x = 3 m

9 Where a line crosses the axes

A straight line has equation $y = -2x + 10$
(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 = 10

(b) The line crosses the x-axis when y = 0: $-2x + 10 = 0$

$-2x = -10$

$x = 5$

Answer: (a) (0, 10) (b) (5, 0)

10 Tree diagrams

A bag contains 3 red counters and 2 blue counters.
Maya takes one at random, replaces it, then takes a second.
Work out the probability that the two are the same colour.

P(both red) = $\frac{9}{25}$

P(both blue) = $\frac{4}{25}$

Add: $\frac{9}{25} + \frac{4}{25} = \frac{13}{25}$

Answer: $\frac{13}{25}$