**Day 110** **B Tier 10-a-day: Model Solutions**

## 1 Simplifying ratios

Write the ratio 12 : 2 : 4 in its simplest form.

The highest common factor of 12, 2 and 4 is 2
Divide each part by 2
**Answer: 6 : 1 : 2**

## 2 Factorising quadratics

Factorise $x^2 - x - 30$

Find two numbers that multiply to give $-30$ and add to give $-1$
The numbers are $-6$ and 5
**Answer: $(x - 6)(x + 5)$**

## 3 Counting outcomes

A 4-digit code is made using only the digits 1, 2, 3, 4, 5, 6.
A digit can be used more than once.
How many different codes are possible?

Each digit has 6 choices
$6 \times 6 \times 6 \times 6 = 1296$
**Answer: 1296**

## 4 Scale drawings and maps

A river is 0.75 km long.
It is drawn on a map with scale 1 : 25 000.
Work out the length of the river on the map, in cm.

0.75 km = 75 000 cm
75 000 ÷ 25 000 = 3 cm
**Answer: 3 cm**

## 5 Fractions and decimals

(a) Write $\frac{11}{40}$ as a decimal.

(b) Write $\frac{5}{6}$ as a recurring decimal.

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

(a) 11 ÷ 40 = 0.275
(b) 5 ÷ 6: use short division, adding zeros
5 ÷ 6 = 0.83333333...
The digit 3 repeats
**Answer: (a) 0.275 (b) 0.83333333... (3 repeats)**

## 6 Reflection

The diagram shows triangle ABC on a grid.
(a) Write down the coordinates of the image of C after a reflection in the y-axis.
(b) Write down the coordinates of the image of A after a reflection in the line y = 2.

(a) C is at (2, 1). Reflect in the y-axis: $(-2, 1)$
(b) A is at (1, 3). Reflect in the line y = 2: (1, 1)
**Answer: (a) $(-2, 1)$ (b) (1, 1)**

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## 7 LCM problems

Two buses leave a bus station at 11:45.
One bus leaves every 9 minutes.
The other bus leaves every 15 minutes.
At what time do both buses next leave together?

Multiples of 9: 9, 18, 27, 36, 45
Multiples of 15: 15, 30, 45
The first common multiple is 45, so the LCM is 45 minutes
11:45 + 45 minutes = 12:30
**Answer: 12:30**

## 8 Simultaneous equations

Solve the simultaneous equations
$x + 3y = 10$
$5x - 3y = 14$

The y terms have opposite signs, so add the equations: $6x = 24$
$x = 4$
Substitute $x = 4$ into the first equation: $3y = 10 - 4 = 6$
$y = 2$
**Answer: $x = 4$, $y = 2$**

## 9 Combining ratios

In a bag of counters, the ratio of red to white is 2 : 5.
The ratio of white to green is 1 : 8.
Write down the ratio red : white : green.

Make the white part the same in both ratios: lowest common multiple of 5 and 1 is 5
red : white = 2 : 5
white : green = 5 : 40
red : white : green = 2 : 5 : 40
**Answer: 2 : 5 : 40**

## 10 Solving quadratic equations

Solve $x^2 - 2x - 8 = 0$

Factorise: $(x - 4)(x + 2) = 0$
Either $x - 4 = 0$ or $x + 2 = 0$
**Answer: $x = -2$ or $x = 4$**