Day 173 **B Tier 10-a-day: Model Solutions**

1 Best buys

Juice is sold in two sizes.
Small: 300 ml for £1.29
Large: 450 ml for £2.20
Which size is better value for money?
You must show your working.

Compare the cost of 900 ml of each
Small: 3 × £1.29 = £3.87
Large: 2 × £2.20 = £4.40
The small is cheaper for the same amount
Answer: The small size

2 Reflection

The diagram shows triangle ABC on a grid.
(a) Write down the coordinates of the image of A after a reflection in the line x = 1.
(b) Write down the coordinates of the image of B after a reflection in the line x = 2.

(a) A is at (2, 1). Reflect in the line x = 1: (0, 1)
(b) B is at (4, 1). Reflect in the line x = 2: (0, 1)
Answer: (a) (0, 1) (b) (0, 1)

3 Expanding brackets

Expand
(a) 2(4x + 9)
(b) 3x(x − 2)

(a) 2 × 4x = 8x and 2 × 9 = 18
(b) 3x × x = $3x^2$ and 3x × (−2) = −6x
Answer: (a) 8x + 18 (b) $3x^2 - 6x$

4 Standard form

Write each number in standard form.
(a) 17,000,000
(b) 0.000065

(a) Move the decimal point 7 places: 1.7×10^7
(b) Move the decimal point 5 places the other way: 6.5×10^{-5}
Answer: (a) 1.7×10^7 (b) 6.5×10^{-5}

5 Combining ratios

In a bag of counters, the ratio of white to yellow is 4 : 3.
The ratio of yellow to red is 7 : 1.
Write down the ratio white : yellow : red.

Make the yellow part the same in both ratios: lowest common multiple of 3 and 7 is 21
white : yellow = 28 : 21
yellow : red = 21 : 3
white : yellow : red = 28 : 21 : 3
Answer: 28 : 21 : 3

Day 173 **B Tier 10-a-day: Model Solutions**

6 Perimeter with algebra

A rectangle has length (4x + 6) cm and width (3x + 2) cm.
The perimeter of the rectangle is 142 cm.
(a) Work out the value of x.
(b) Work out the area of the rectangle.

(a) $2(4x + 6) + 2(3x + 2) = 142$
$14x + 16 = 142$
$14x = 126$
$x = 9$
(b) Length = 42, width = 29, area = $42 \times 29 = 1218$
Answer: (a) x = 9 (b) 1218 cm^2

7 Changing the subject

Make h the subject of the formula

$A = \frac{1}{2}bh$

Multiply both sides by 2: $2A = bh$
Divide both sides by b
Answer: h = $\frac{2A}{b}$

8 Bounds

The length of a rectangle is 35 cm and its width is 18 cm.
Both measurements are correct to the nearest cm.
Work out the lower bound for the area of the rectangle.

Lower bound of each side = value − 0.5: 34.5 cm and 17.5 cm
Area = $34.5 \times 17.5 = 603.75$ cm^2
Answer: 603.75 cm^2

9 Capture-recapture

30 deer in a lake are caught, tagged and returned to the lake.
Later, a sample of 30 deer is caught and 4 of them are tagged.
Estimate the total number of deer in the lake.

Proportion tagged in the sample = 4 ÷ 30
This is the same proportion as 30 out of the whole population
Population ≈ 30 × 30 ÷ 4 = 225
Answer: 225

10 Algebraic proof

Show that $(2n + 13)^2 - (2n - 13)^2$ is a multiple of 104 for any whole number n.

Expand: $(2n + 13)^2 = 4n^2 + 52n + 169$ and $(2n - 13)^2 = 4n^2 - 52n + 169$
Subtract: the $4n^2$ terms and the 169s cancel, leaving 104n
104n is a multiple of 104
Answer: 104n is a multiple of 104