Day 44 **B Tier 10-a-day: Model Solutions**

1 Faces, edges and vertices

Write down the number of faces, edges and vertices of a triangular prism.

Faces: two 3-sided ends and 3 rectangles = 5
Edges: 3 on each end plus 3 joining them = 9
Vertices: 3 on each end = 6
Answer: faces: 5 edges: 9 vertices: 6

2 Simplifying ratios

Write the ratio 24 : 40 : 32 in its simplest form.

The highest common factor of 24, 40 and 32 is 8
Divide each part by 8
Answer: 3 : 5 : 4

3 Adding fractions

Work out

(a) $\frac{1}{4} + \frac{4}{9}$

(b) $\frac{11}{12} - \frac{1}{5}$

Give each answer in its simplest form.

(a) Common denominator 36: $\frac{9}{36} + \frac{16}{36} = \frac{25}{36}$

(b) Common denominator 60: $\frac{55}{60} - \frac{12}{60} = \frac{43}{60}$

Answer: (a) $\frac{25}{36}$ (b) $\frac{43}{60}$

4 Best buys

Coffee is sold in two sizes.
Small: 250 g for £1.10
Large: 500 g for £1.90
Which size is better value for money?
You must show your working.

Compare the cost of 500 g of each
Small: 2 × £1.10 = £2.20
Large: 1 × £1.90 = £1.90
The large is cheaper for the same amount
Answer: The large size

5 Term-to-term rules

The first term of a sequence is 1.
The term-to-term rule is: multiply by 2 and then add 4.
Work out the 4th term.

2nd term: 1 × 2 + 4 = 6
3rd term: 6 × 2 + 4 = 16
4th term: 16 × 2 + 4 = 36
Answer: 36

6 Combining ratios

In a bag of counters, the ratio of black to yellow is 5 : 7.
The ratio of yellow to white is 8 : 3.
Write down the ratio black : yellow : white.

Make the yellow part the same in both ratios: lowest common multiple of 7 and 8 is 56
black : yellow = 40 : 56
yellow : white = 56 : 21
black : yellow : white = 40 : 56 : 21
Answer: 40 : 56 : 21

Day 44 **B Tier 10-a-day: Model Solutions**

7 Ordering standard form

Write these numbers in order of size.
Start with the smallest.
8.1×10^3, 740,000, 6.1×10^{-4}, 93,000

Write each in standard form: 8.1×10^3, 7.4×10^5, 6.1×10^{-4}, 9.3×10^4
Compare the powers of 10 first (the bigger the power, the bigger the number)
Order: 6.1×10^{-4}, 8.1×10^3, 93,000, 740,000
Answer: 6.1×10^{-4}, 8.1×10^3, 93,000, 740,000

8 Solving inequalities

Solve $\frac{y}{3} + 8 > 13$

Subtract 8 from both sides: $\frac{y}{3} > 5$
Multiply both sides by 3
Answer: y > 15

9 Area of an isosceles trapezium

An isosceles trapezium has parallel sides of length 30 m and 6 m.
Each sloping side is 15 m long.
(a) Work out the perpendicular height of the trapezium.
(b) Work out the area of the trapezium.

(a) The difference in the parallel sides is 30 − 6 = 24, so each end sticks out 12
$h^2 = 15^2 - 12^2 = 225 - 144 = 81$, so h = 9
(b) Area = ½ × (30 + 6) × 9 = 162
Answer: (a) 9 m (b) 162 m^2

10 Algebraic proof

Show that $(2n + 5)^2 - (2n - 5)^2$ is a multiple of 40 for any whole number n.

Expand: $(2n + 5)^2 = 4n^2 + 20n + 25$ and $(2n - 5)^2 = 4n^2 - 20n + 25$
Subtract: the $4n^2$ terms and the 25s cancel, leaving 40n
40n is a multiple of 40
Answer: 40n is a multiple of 40