Day 352 **B Tier 10-a-day: Model Solutions**

1 Congruent triangles

Triangle PQR has sides 4 cm, 8 cm and 12 cm.
Triangle DEF has sides 12 cm, 4 cm and 8 cm.
Are the two triangles congruent?
Give a reason for your answer.

Both triangles have sides 4, 8 and 12
Three pairs of equal sides, so they are congruent (SSS)
Answer: Yes, SSS (three pairs of equal sides)

2 Simplifying ratios

Write the ratio 80 : 70 in its simplest form.

The highest common factor of 80 and 70 is 10
80 ÷ 10 = 8 and 70 ÷ 10 = 7
Answer: 8 : 7

3 Similar shapes

The two triangles are similar.
(a) Write down the scale factor of the enlargement from the smaller triangle to the larger triangle.
(b) Work out the value of a.
The diagram is not drawn accurately.

(a) Scale factor = 16 ÷ 8 = 2
(b) a = 10 × 2 = 20
Answer: (a) 2 (b) a = 20 cm

4 Currency conversion

£1 = 1.2 euros
A holiday costs €180.
Work out the cost in pounds.

Divide by the rate: 180 ÷ 1.2
= £150
Answer: £150

5 Midpoint of a line segment

A is the point (−4, 2) and B is the point (−8, −6).
Find the coordinates of the midpoint of AB.

Add the x-coordinates and halve: (−4 − 8) ÷ 2 = −6
Add the y-coordinates and halve: (2 − 6) ÷ 2 = −2
Answer: (−6, −2)

6 Ordering standard form

Write these numbers in order of size.
Start with the smallest.
8.5×10^{6}, 510, 4.3×10^{-5}, 0.0046

Write each in standard form: 8.5×10^{6}, 5.1×10^{2}, 4.3×10^{-5}, 4.6×10^{-3}
Compare the powers of 10 first (the bigger the power, the bigger the number)
Order: 4.3×10^{-5}, 0.0046, 510, 8.5×10^{6}
Answer: 4.3×10^{-5}, 0.0046, 510, 8.5×10^{6}

Day 352 **B Tier 10-a-day: Model Solutions**

7 Sequences from patterns

Matchsticks are used to make a row of hexagons.
1 hexagon needs 6 matchsticks, 2 hexagons need 11 and 3 hexagons need 16.
(a) Find an expression, in terms of n, for the number of matchsticks needed for n hexagons.
(b) Dan uses 121 matchsticks to make a row. How many hexagons are in his row?

(a) The number of matchsticks goes up by 5 each time, so the rule starts with 5n
When n = 1 we need 6, and 5 × 1 = 5, so add 1: 5n + 1
(b) 5n + 1 = 121
5n = 120
n = 120 ÷ 5 = 24
Answer: (a) 5n + 1 (b) 24

8 Venn diagram problems

34 households were asked.
20 of them have a cat and 18 of them have a dog.
10 of them did both.
(a) How many did neither?
(b) One is chosen at random. Find the probability that they have a cat but do not have a dog.

(a) Union = 20 + 18 − 10 = 28
Neither = 34 − 28 = 6
(b) Only have a cat = 20 − 10 = 10
P = 10 out of 34
Answer: (a) 6 (b) $\frac{5}{17}$

9 Reverse repeated percentages

In a sale, the price of a sofa is reduced by 40%. (Calculator)
Two weeks later it is reduced by a further 10% of the new price.
The final price is £216.
Work out the original price of the sofa.

Multipliers: 0.6 and 0.9
Overall multiplier = 0.6 × 0.9 = 0.54
Original price = £216 ÷ 0.54 = £400
Answer: £400

10 Quadratic equation problem

A rectangle has length (x + 3) cm and width (x − 1) cm.
The area of the rectangle is 12 cm^2.
(a) Show that $x^2 + 2x - 15 = 0$
(b) Hence work out the length of the rectangle.

(a) Area = length × width: (x + 3)(x − 1) = 12
Expand: $x^2 + 2x - 3 = 12$
Subtract 12 from both sides: $x^2 + 2x - 15 = 0$
(b) Factorise: (x − 3)(x + 5) = 0, so x = 3 or x = −5
A length cannot be negative, so x = 3. Length = 3 + 3 = 6
Answer: (b) 6 cm