Day 262 **B Tier 10-a-day: Model Solutions**

1 Fuel use

A car travels 8 km on each litre of petrol. (Calculator)
Petrol costs £1.50 per litre.
Work out the cost of the petrol for a journey of 120 km.

Litres needed = 120 ÷ 8 = 15
Cost = 15 × £1.50 = £22.50
Answer: £22.50

2 Collecting like terms

Simplify 7a + 3b + 3a − 5b

Collect the a terms: 7a + 3a = 10a
Collect the b terms: 3b − 5b = −2b
Answer: 10a − 2b

3 Perimeter and area of compound shapes

The diagram shows the shape of a garden.
All the corners are right angles. All lengths are in m.
(a) Work out the perimeter.
(b) Work out the area.

(a) Missing lengths: 19 − 9 = 10 and 14 − 9 = 5
Perimeter = 19 + 9 + 10 + 5 + 9 + 14 = 66
(b) Split into two rectangles: 19 × 9 = 171 and 9 × 5 = 45
171 + 45 = 216
Answer: (a) 66 m (b) 216 m^2

4 Multiplying and dividing

Work out 314 × 20

Split 20 into 20 + 0
314 × 20 = 6280
314 × 0 = 0
6280 + 0 = 6280
Answer: 6280

5 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 x.
The diagram is not drawn accurately.

(a) Scale factor = 12 ÷ 6 = 2
(b) x is on the smaller triangle, so divide: 14 ÷ 2 = 7
Answer: (a) 2 (b) x = 7 cm

6 Difference of two squares

Factorise $16x^2 - 9$

$16x^2 = (4x)^2$ and $9 = 3^2$
$(4x)^2 - 3^2 = (4x - 3)(4x + 3)$
Answer: (4x − 3)(4x + 3)

7 Speed unit conversion

A kite flies at 15 metres per second.
Work out this speed in kilometres per hour.

In 1 hour (3600 s) it travels 15 × 3600 = 54,000 m
54,000 m = 54 km
Answer: 54 km/h

Day 262 **B Tier 10-a-day: Model Solutions**

8 Repeated percentage change

The price of a laptop is £100.
The price is first increased by 30%, then the new price is reduced by 25%.
(a) Work out the final price.
(b) Work out the overall percentage decrease in the price.

(a) Multipliers: 1.3 and 0.75
100 × 1.3 × 0.75 = £97.50
(b) Overall multiplier = 0.975
Overall decrease = 2.5%
Answer: (a) £97.50 (b) 2.5% decrease

9 Trigonometry in isosceles triangles

Triangle PQR is isosceles with PQ = PR = 17 m. (Calculator)
The base QR = 10 m.
Work out the size of angle PQR.
Give your answer correct to 1 decimal place.

Split the triangle into two right-angled triangles. Half the base = 10 ÷ 2 = 5

$\cos Q = \frac{5}{17}$

Angle PQR = $\cos^{-1}(\frac{5}{17})$ = 72.895...

= 72.9° (1 d.p.)
Answer: 72.9°

10 Iteration

Here is an iteration formula.

$x_{n+1} = 6 + \frac{8}{x_n}$

$x_0 = 2$
(a) Work out x_1
(b) Work out x_2. Give your answer correct to 3 decimal places. (Calculator)

(a) $x_1 = 6 + \frac{8}{2} = 6 + 4 = 10$

(b) $x_2 = 6 + \frac{8}{10}$ = 6.8...

= 6.800
Answer: (a) 10 (b) 6.800