Day 314 **B Tier 10-a-day: Model Solutions**

1 Factors and multiples

Write down all the common factors of 12 and 18.

Factors of 12: 1, 2, 3, 4, 6, 12
Factors of 18: 1, 2, 3, 6, 9, 18
The common factors are the numbers in both lists
Answer: 1, 2, 3, 6

2 Perimeter and area of compound shapes

The diagram shows the shape of a kitchen floor.
All the corners are right angles. All lengths are in m.
(a) Calculate the perimeter.
(b) Calculate the area.

(a) Missing lengths: $18 - 4 = 14$ and $16 - 4 = 12$
Perimeter = 18 + 4 + 14 + 12 + 4 + 16 = 68
(b) Split into two rectangles: $18 \times 4 = 72$ and $4 \times 12 = 48$
72 + 48 = 120
Answer: (a) 68 m (b) 120 m^2

3 Density

A metal block has a density of 2.7 g/cm^3 and a volume of 100 cm^3.
Work out its mass.

Mass = density × volume
$2.7 \times 100 = 270$
Answer: 270 g

4 Estimation

Estimate the value of
$2.03 \times 76.4 + 0.221$
Show your rounding to 1 significant figure.

Round each number to 1 significant figure: 2.03 → 2, 76.4 → 80, 0.221 → 0.2
Estimate = $2 \times 80 + 0.2 = 160.2$
Answer: 160.2

5 Compound areas

A rectangular pond is 10 m by 13 m.
There is a path of width 2 m all the way round the outside of the pond.
Work out the area of the path.

Outer rectangle: $(10 + 4) \times (13 + 4) = 14 \times 17 = 238$
Pond: $10 \times 13 = 130$
$238 - 130 = 108$
Answer: 108 m^2

6 Harder linear equations

Solve $24 - 4x = 2x$

Add 4x to both sides: $24 = 6x$
Add 0 to both sides: $24 = 6x$
Divide both sides by 6
Answer: $x = 4$

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7 Prisms and density

A triangular prism has a right-angled triangle as its cross-section.
The two shorter sides of the triangle are 6 cm and 11 cm.
The length of the prism is 12 cm.
Work out the volume of the prism.

Area of triangle = ½ × 6 × 11 = 33
Volume = 33 × 12 = 396
Answer: 396 cm^3

8 Population density

Town A has a population of 5,000.
Its area is 25 km^2.
Work out the population density.
Give your answer in people per km^2.

Population density = population ÷ area
5,000 ÷ 25 = 200
Answer: 200 people per km^2

9 Iteration

Here is an iteration formula.

$x_{n+1} = 6 + \frac{20}{x_n}$

$x_0 = 5$

(a) Work out x_1

(b) Work out x_2. Give your answer correct to 3 decimal places. (Calculator)

(a) $x_1 = 6 + \frac{20}{5} = 6 + 4 = 10$

(b) $x_2 = 6 + \frac{20}{10} = 8.0...$

= 8.000
Answer: (a) 10 (b) 8.000

10 Algebraic proof

Show that (n + 5)(n + 6) − n(n + 11) has the same value for every whole number n.

Expand the first part: $n^2 + 6n + 5n + 30 = n^2 + 11n + 30$
Expand the second part: $n^2 + 11n$
Subtract: the n^2 terms and the n terms cancel, leaving 30
Answer: The value is always 30