Day 28 **B Tier 10-a-day: Model Solutions**

1 Simplifying ratios

Write the ratio 0.08 kg : 400 g in its simplest form.

Change to the same units: 0.08 kg = 80 g
80 : 400
Divide both by 80 to get 1 : 5
Answer: 1 : 5

2 Prime factors

Write 147 as a product of its prime factors.
Give your answer in index form.

Divide by prime numbers, smallest first:
147 ÷ 3 = 49, 49 ÷ 7 = 7, 7 is prime
147 = 3 × 7 × 7
In index form: $147 = 3 \times 7^2$
Answer: 3×7^2

3 Surface area of cuboids

A cube has side length 13 cm.
Work out the total surface area of the cube.

A cube has 6 identical square faces
Area of one face = 13 × 13 = 169
6 × 169 = 1014
Answer: 1014 cm^2

4 Perimeter expressions

A rectangle has length (4x + 7) cm and width (2x + 4) cm.
Write down an expression, in terms of x, for the perimeter of the rectangle.
Give your answer in its simplest form.

Perimeter = 2 × length + 2 × width
2(4x + 7) + 2(2x + 4) = 8x + 14 + 4x + 8
= 12x + 22
Answer: 12x + 22 cm

5 Pay and overtime

Kira earns £14 per hour for the first 35 hours worked each week.
Any extra hours are paid at time and a half.
Last week Kira worked 43 hours.
Work out Kira's total pay for last week.

Normal pay: 35 × £14 = £490
Overtime rate: 1.5 × £14 = £21 per hour
Overtime pay: 8 × £21 = £168
Total = £490 + £168 = £658
Answer: £658

6 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 81 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 = 81
5n = 80
n = 80 ÷ 5 = 16
Answer: (a) 5n + 1 (b) 16

Day 28 **B Tier 10-a-day: Model Solutions**

7 Prisms and density

A triangular prism has a right-angled triangle as its cross-section.
The two shorter sides of the triangle are 3 cm and 10 cm.
The length of the prism is 6 cm.
Work out the volume of the prism.

Area of triangle = ½ × 3 × 10 = 15
Volume = 15 × 6 = 90
Answer: 90 cm^3

8 Growth in standard form

There are 7.1×10^2 cells in a sample.
The number doubles every day.
How many are there after 5 days?
Give your answer in standard form.

Each day multiply by 2, so multiply by $2^5 = 32$
$7.1 \times 10^2 \times 32 = 227.2 \times 10^2$
In standard form: 2.272×10^4
Answer: 2.272×10^4

9 Cumulative frequency

The cumulative frequency graph shows the times taken by 40 students to complete a puzzle.
(a) Use the graph to estimate the median.
(b) Work out an estimate for the interquartile range.

(a) Median is at 40 ÷ 2 = 20: read across from 20 on the vertical axis to the curve, then down: 16
(b) Lower quartile at 10: 8. Upper quartile at 30: 40
IQR = 40 − 8 = 32
Answer: (a) 16 minutes (b) 32 minutes

10 Proving a triangle is right-angled

A triangle has sides of length 25 cm, 7 cm and 24 cm.
Is the triangle right-angled?
You must show your working.

The longest side is 25. Check whether $a^2 + b^2 = c^2$
$7^2 + 24^2 = 49 + 576 = 625$
$25^2 = 625$
These are equal, so the triangle is right-angled
Answer: Yes, $7^2 + 24^2 = 25^2$