Day 264 **B Tier 10-a-day: Model Solutions**

1 Negative numbers

Work out
(a) $-7-(-5)$
(b) $(-4)\times(-3)$

(a) Subtracting a negative is the same as adding: $-7+5=-2$
(b) Negative × negative = positive: $4\times3=12$
Answer: (a) -2 (b) 12

2 Ratio to fraction and percentage

The ratio of cats to dogs at a vets is 1 : 7.
What fraction of them are cats?

Total parts = 1 + 7 = 8
cats are 1 out of 8 parts
Answer: $\frac{1}{8}$

3 Fractions in simplest form

Owen scores 16 out of 60 in a test.
Write his score as a fraction in its simplest form.

16 out of 60 is $\frac{16}{60}$

Divide top and bottom by 4: $\frac{4}{15}$

Answer: $\frac{4}{15}$

4 Stem and leaf diagrams

The stem and leaf diagram shows 11 values.
(a) Find the median.
(b) Work out the range.

(a) 11 values, so the median is the 6th value
Reading in order: 22, 28, 31, 34, 36, 41, 43, 44, 45, 46, 48
Median = 41
(b) Range = 48 − 22 = 26
Answer: (a) 41 (b) 26

5 Metric conversions

(a) Convert 750 kg to tonnes.
(b) Convert 5000 cm^3 to litres.

(a) kg → tonnes: divide by 1000: 750 ÷ 1000 = 0.75
(b) 1 litre = 1000 cm^3. 5000 ÷ 1000 = 5
Answer: (a) 0.75 tonnes (b) 5 litres

6 Equations with unknowns on both sides

Solve $6n+10=2n-14$

Subtract 2n from both sides: $4n+10=-14$
Subtract 10 from both sides: $4n=-24$
Divide both sides by 4
Answer: $n=-6$

Day 264 **B Tier 10-a-day: Model Solutions**

7 Isosceles triangles and Pythagoras

Triangle XYZ is isosceles with XY = XZ = 20 cm.
The base YZ = 24 cm.
(a) Work out the perpendicular height of the triangle.
(b) Work out the area of the triangle.

(a) The height splits the base in half: 24 ÷ 2 = 12
$h^2 = 20^2 - 12^2 = 400 - 144 = 256$, so h = 16
(b) Area = ½ × 24 × 16 = 192

Answer: (a) 16 cm (b) 192 cm^2

8 Sequences from patterns

Matchsticks are used to make a row of squares.
1 square needs 4 matchsticks, 2 squares need 7 and 3 squares need 10.
(a) Find an expression, in terms of n, for the number of matchsticks needed for n squares.
(b) Dan uses 76 matchsticks to make a row. How many squares are in his row?

(a) The number of matchsticks goes up by 3 each time, so the rule starts with 3n
When n = 1 we need 4, and 3 × 1 = 3, so add 1: 3n + 1
(b) 3n + 1 = 76
3n = 75
n = 75 ÷ 3 = 25

Answer: (a) 3n + 1 (b) 25

9 Bounds

The length of a rectangle is 34 cm and its width is 10 cm.
Both measurements are correct to the nearest cm.
Work out the lower bound for the area of the rectangle.

Lower bound of each side = value − 0.5: 33.5 cm and 9.5 cm
Area = 33.5 × 9.5 = 318.25 cm^2

Answer: 318.25 cm^2

10 Volume of cones and pyramids

A cone has base radius 6 m and vertical height 12 m.

Volume of a cone = $\frac{1}{3}\pi r^2 h$

Work out the volume of the cone.
Give your answer in terms of π.

Volume = $\frac{1}{3} \times \pi \times 6^2 \times 12$

$= \frac{1}{3} \times \pi \times 36 \times 12 = 144\pi$

Answer: 144π m^3