Day 330 **B Tier 10-a-day: Model Solutions**

1 Simplifying ratios

Write the ratio 25 : 40 : 30 in its simplest form.

The highest common factor of 25, 40 and 30 is 5
Divide each part by 5
Answer: 5 : 8 : 6

2 Using the nth term

The nth term of a sequence is 4n + 1
(a) Work out the 9th term.
(b) Is 121 a term in the sequence? You must show how you get your answer.

(a) Replace n with 9: 4 × 9 + 1 = 37
(b) Solve 4n + 1 = 121: 4n = 120
n = 120 ÷ 4 = 30, a whole number, so 121 is in the sequence
Answer: (a) 37 (b) Yes, it is term number 30

3 Prime factors

Write 264 as a product of its prime factors.
Give your answer in index form.

Divide by prime numbers, smallest first:
264 ÷ 2 = 132, 132 ÷ 2 = 66, 66 ÷ 2 = 33, 33 ÷ 3 = 11, 11 is prime
264 = 2 × 2 × 2 × 3 × 11
In index form: 264 = 2^3 × 3 × 11
Answer: 2^3 × 3 × 11

4 Relative frequency

A spinner has coloured sections. It is spun 400 times and lands on green 300 times.
What is the relative frequency of green?
Give your answer as a decimal.

300 ÷ 400 = 0.75
Answer: 0.75

5 Metric units

(a) Change 2.3 kg to g.
(b) Change 1295 mm to m.

(a) 1 kg = 1000 g, so multiply by 1000: 2.3 × 1000 = 2300
(b) 1 m = 1000 mm, so divide by 1000: 1295 ÷ 1000 = 1.295
Answer: (a) 2300 g (b) 1.295 m

6 Changing the subject

Make n the subject of the formula
C = 5n + 7

Subtract 7 from both sides: C − 7 = 5n
Divide both sides by 5
Answer: n = $\frac{C - 7}{5}$

7 Arc length and sector area

The diagram shows a sector of a circle with radius 3 m and angle 45°. (Calculator)
Work out the length of the arc of the sector.
Give your answer correct to 1 decimal place.
The diagram is not drawn accurately.

Arc length = $\frac{45}{360}$ × 2 × π × 3
= 2.356... = 2.4 m (1 d.p.)
Answer: 2.4 m

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8 Fraction problems

A paddling pool is $\frac{1}{8}$ full.

30 litres of water are added.

The paddling pool is now $\frac{1}{5}$ full.

Work out the capacity of the paddling pool.

Fraction added = $\frac{1}{5} - \frac{1}{8} = \frac{3}{40}$

$\frac{3}{40}$ of the capacity = 30 litres

$\frac{1}{40}$ of the capacity = 30 ÷ 3 = 10 litres

Whole capacity = 10 × 40 = 400 litres

Answer: 400 litres

9 Prisms and density

A prism has a cross-section with area 30 m^2.

The length of the prism is 13 m.

Work out the volume of the prism.

Volume = area of cross-section × length

30 × 13 = 390

Answer: 390 m^3

10 Simultaneous equations

Solve the simultaneous equations

$4x - 4y = 28$

$5x + 2y = 14$

Multiply the second equation by 2: $10x + 4y = 28$

The y terms have opposite signs, so add the equations: $14x = 56$

$x = 4$

Substitute $x = 4$ into the first equation: $-4y = 28 - 16 = 12$

$y = -3$

Answer: $x = 4$, $y = -3$