Day 142 **B Tier 10-a-day: Model Solutions**

1 Ratio, one part known

The ratio of cats to dogs among the pets at a rescue centre is 3 : 2.
There are 21 cats.
How many dogs are there?

3 parts = 21 cats
1 part = 21 ÷ 3 = 7
dogs: 2 × 7 = 14
Answer: 14

2 Using the nth term

The nth term of a sequence is 8n + 3
(a) Work out the 10th term.
(b) Is 203 a term in the sequence? You must show how you get your answer.

(a) Replace n with 10: 8 × 10 + 3 = 83
(b) Solve 8n + 3 = 203: 8n = 200
n = 200 ÷ 8 = 25, a whole number, so 203 is in the sequence
Answer: (a) 83 (b) Yes, it is term number 25

3 Circumference and area of a circle

The diagram shows a circle with diameter 13 m. (Calculator)
Work out the circumference of the circle.
Give your answer correct to 1 decimal place.
The diagram is not drawn accurately.

Circumference = π × diameter
π × 13 = 40.841...
= 40.8 m (1 d.p.)
Answer: 40.8 m

4 Equations with fractional answers

Solve $6x - 7 = 9$
Give your answer as a fraction in its simplest form.

Add 7 to both sides: $6x = 16$
Divide both sides by 6: $x = \frac{16}{6}$
Simplify the fraction
Answer: $x = \frac{8}{3}$

5 HCF and LCM from prime factors

$A = 5^2 \times 7$
$B = 2^2 \times 3 \times 5^2$
Write down, as a product of prime factors,
(a) the HCF of A and B
(b) the LCM of A and B

(a) HCF: take the smaller power of each prime that is in both: 5^2
(b) LCM: take the larger power of every prime: $2^2 \times 3 \times 5^2 \times 7$
Answer: (a) 5^2 (b) $2^2 \times 3 \times 5^2 \times 7$

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6 Pay and overtime

Sam earns £10 per hour for the first 35 hours worked each week.
Any extra hours are paid at time and a half.
Last week Sam worked 37 hours.
Work out Sam's total pay for last week.

Normal pay: 35 × £10 = £350
Overtime rate: 1.5 × £10 = £15 per hour
Overtime pay: 2 × £15 = £30
Total = £350 + £30 = £380
Answer: £380

7 Trigonometry: finding an angle

Find the size of angle b. (Calculator)
Give your answer correct to 1 decimal place.
The diagram is not drawn accurately.

We know the opposite (8 m) and the hypotenuse (10 m), so use sin

$\sin b = \frac{8}{10}$

$b = \sin^{-1}(\frac{8}{10}) = 53.130...$

b = 53.1° (1 d.p.)
Answer: b = 53.1°

8 Bounds

The length of a rectangle is 25 cm and its width is 8 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: 24.5 cm and 7.5 cm
Area = 24.5 × 7.5 = 183.75 cm^2
Answer: 183.75 cm^2

9 Map scales

The scale of a map is 1 : 10,000.
Two villages are 1.75 km apart.
How far apart are they on the map?
Give your answer in centimetres.

1.75 km = 175,000 cm
Divide by 10,000: 175,000 ÷ 10,000 = 17.5
Answer: 17.5 cm

10 Reverse repeated percentages

In a sale, the price of a sofa is reduced by 20%. (Calculator)
Two weeks later it is reduced by a further 20% of the new price.
The final price is £96.
Work out the original price of the sofa.

Multipliers: 0.8 and 0.8
Overall multiplier = 0.8 × 0.8 = 0.64
Original price = £96 ÷ 0.64 = £150
Answer: £150