Day 207 **A Tier 10-a-day: Model Solutions**

1 Isosceles triangles and exterior angles

PQR is an isosceles triangle with PQ = PR.
QRS is a straight line.
Angle PRS = 133°.
Work out the size of angle x.
The diagram is not drawn accurately.

Angles on a straight line add up to 180°
Angle PRQ = 180 − 133 = 47°
Base angles are equal, so angle PQR = 47°
x = 180 − 47 − 47 = 86
Answer: x = 86°

2 Rearranging formulae

Make m the subject of $n = \frac{m - 4}{2}$

Multiply both sides by 2: 2n = m − 4
Add 4 to both sides
m = 2n + 4
Answer: m = 2n + 4

3 Bearings

The bearing of B from A is 290°.
Work out the bearing of A from B.
The diagram is not drawn accurately.

The north lines at A and B are parallel
Back bearing = 290° − 180° = 110°
Answer: 110°

4 Standard form notation

(a) Write 0.000039 in standard form.
(b) Write 8.9×10^3 as an ordinary number.

(a) Move the decimal point 5 places to get 3.9: 3.9×10^{-5}
(b) Move the decimal point 3 places to the right: 8,900
Answer: (a) 3.9×10^{-5} (b) 8,900

5 Equations with fractions

Solve $\frac{x + 1}{4} - \frac{x - 3}{5} = 1$

Multiply every term by 20 (the lowest common multiple of 4 and 5)
5(x + 1) − 4(x − 3) = 20 × 1
x + 17 = 20
x = 3
Answer: x = 3

6 Rates of flow

A tank is in the shape of a cuboid measuring 60 cm by 150 cm by 40 cm.
It already contains 100 litres of water.
Water flows in at 4 litres per minute until the tank is full.
Work out how long this takes. Give your answer in minutes.

Volume = 60 × 150 × 40 = 360000 cm^3 = 360 litres
Water needed = 360 − 100 = 260 litres
Time = 260 ÷ 4 = 65 minutes
Answer: 65 minutes

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7 Bounds

A rectangle has length 25 cm and width 30 cm.
Each measurement is correct to the nearest cm.
Work out the lower bound for the perimeter of the rectangle.

Lower bound of length = 24.5 cm, lower bound of width = 29.5 cm
Perimeter = 2 × (24.5 + 29.5) = 108 cm
Answer: 108 cm

8 Inverse proportion

6 workers take 9 days to build a wall.
All the workers work at the same rate.
How many workers are needed to build a wall in 3 days?

Total work = 6 × 9 = 54 worker-day
Number needed = 54 ÷ 3 = 18
Answer: 18

9 Pythagoras in three dimensions

The diagram shows a cuboid.
Work out the length of the diagonal AG.
The diagram is not drawn accurately.

$AG^2 = 2^2 + 6^2 + 3^2$
$= 4 + 36 + 9 = 49$
$AG = \sqrt{49} = 7$
Answer: 7 cm

10 Finding a rate of compound change

Jack invests £17,500 in a savings account. (Calculator)
Compound interest is paid at a fixed rate each year.
After 2 years the investment is worth £21,175.
Work out the annual rate of interest.

Overall multiplier = £21,175 ÷ £17,500 = 1.21
Take the square root: $\sqrt{1.21} = 1.1$
Rate = (1.1 − 1) × 100 = 10%
Answer: 10%