Day 225 **B Tier 10-a-day: Model Solutions**

1 Rates

Electricity costs 30p per unit.
There is also a standing charge of £8.
Work out the total bill for 350 units.

Cost of units: 350 × 30p = 10500p = £105
Add the standing charge: £105 + £8 = £113
Answer: £113

2 Metric units

A jug holds 3.6 litres of juice.
Each glass holds 300 ml.
How many glasses can be filled from the jug?

3.6 litres = 3.6 × 1000 = 3600 ml
3600 ÷ 300 = 12
Answer: 12 glasses

3 Arc length and sector area

The diagram shows a sector of a circle with radius 5 cm and angle 180°. (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 = $\frac{180}{360} \times 2 \times \pi \times 5$
= 15.708... = 15.7 cm (1 d.p.)
Answer: 15.7 cm

4 Gradient of a line

Work out the gradient of the straight line that passes through the points (3, −5) and (6, −11).

Gradient = $\frac{\text{change in y}}{\text{change in x}}$
Change in y = −11 − (−5) = −6
Change in x = 6 − 3 = 3
Gradient = $\frac{-6}{3} = -2$
Answer: −2

5 Standard form

Write each number in standard form.
(a) 460,000
(b) 0.0000093

(a) Move the decimal point 5 places: 4.6×10^5
(b) Move the decimal point 6 places the other way: 9.3×10^{-6}
Answer: (a) 4.6×10^5 (b) 9.3×10^{-6}

6 Factorising quadratics

Factorise $x^2 - 9x + 18$

Find two numbers that multiply to give 18 and add to give −9
The numbers are −6 and −3
Answer: $(x - 6)(x - 3)$

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7 Ratio, one part known

The ratio of cats to dogs among the pets at a rescue centre is 8 : 7.
There are 64 cats.
How many dogs are there?

8 parts = 64 cats
1 part = 64 ÷ 8 = 8
dogs: 7 × 8 = 56
Answer: 56

8 Expanding and simplifying

Expand and simplify 2(x + 1) + 5(x − 3)

Expand each bracket: 2x + 2 + 5x − 15
Collect like terms: 7x − 13
Answer: 7x − 13

9 Circle theorems

A, B, C and D are points on a circle.
Angle ADC = 71°.
Work out the size of angle ABC, marked q.
Give a reason for your answer.
The diagram is not drawn accurately.

ABCD is a cyclic quadrilateral
Opposite angles of a cyclic quadrilateral add up to 180°
q = 180 − 71 = 109°
Answer: q = 109°

10 Isosceles triangles and Pythagoras

Triangle PQR is isosceles with PQ = PR = 13 m.
The base QR = 24 m.
(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
$h^2 = 13^2 - 12^2 = 169 - 144 = 25$, so h = 5
(b) Area = ½ × 24 × 5 = 60
Answer: (a) 5 m (b) 60 m^2