Day 311 **B Tier 10-a-day: Model Solutions**

1 Place value

Here are four digit cards.

7 8 9 6

Use all four cards to make the largest possible even number.

The last digit must be even. Put the biggest remaining digits first.

The largest even number is 9876

Answer: 9876

2 Interior angles of regular polygons

Work out the sum of the interior angles of a nonagon.

Sum = $(n - 2) \times 180°$

$(9 - 2) \times 180 = 7 \times 180 = 1260°$

Answer: 1260°

3 Quadratic equation problem

A rectangle has length $(x + 6)$ cm and width $(x - 7)$ cm.

The area of the rectangle is 30 cm^2.

(a) Show that $x^2 - x - 72 = 0$

(b) Hence work out the length of the rectangle.

(a) Area = length × width: $(x + 6)(x - 7) = 30$

Expand: $x^2 - x - 42 = 30$

Subtract 30 from both sides: $x^2 - x - 72 = 0$

(b) Factorise: $(x - 9)(x + 8) = 0$, so $x = 9$ or $x = -8$

A length cannot be negative, so $x = 9$. Length = 9 + 6 = 15

Answer: (b) 15 cm

4 Compound areas

A rectangular wall measures 11 m by 9 m.

A rectangle measuring 3 m by 4 m is cut out.

Work out the area that is left.

Whole area = 11 × 9 = 99

Area cut out = 3 × 4 = 12

99 − 12 = 87

Answer: 87 m^2

5 Fractions of amounts

Work out

(a) $\frac{3}{5}$ of 40

(b) $\frac{3}{4}$ of £60

(a) 40 ÷ 5 = 8, then 8 × 3 = 24

(b) 60 ÷ 12 = 5, then 5 × 9 = 45

Answer: (a) 24 (b) £45

6 Speed

A cyclist travels 30 km in 1 hour 15 minutes.

Work out its average speed in km per hour.

Speed = distance ÷ time

Time = 1.25 hours

30 ÷ 1.25 = 24

Answer: 24 km per hour

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7 Volume of cones and pyramids

A cone has base radius 8 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 = $\frac{1}{3} \times \pi \times 8^2 \times 12$

= $\frac{1}{3} \times \pi \times 64 \times 12 = 256\pi$

Answer: 256π m^3

8 Equation of a line

A straight line has gradient -1 and passes through the point (1, 7).
Find the equation of the line.

The equation is $y = -1x + c$
Substitute $x = 1$ and $y = 7$: $7 = -1 \times 1 + c$
$7 = -1 + c$
$c = 7 - (-1) = 8$
Answer: $y = -x + 8$

9 Speed unit conversion

A bird flies at 16 metres per second.
Work out this speed in kilometres per hour.

In 1 hour (3600 s) it travels $16 \times 3600 = 57{,}600$ m
57,600 m = 57.6 km
Answer: 57.6 km/h

10 Currency conversion

£1 = 1.2 euros
(a) Change £80 into euros.
(b) Change €180 into pounds.

(a) $80 \times 1.2 = 96$
(b) Divide by the rate: $180 \div 1.2 = 150$
Answer: (a) €96 (b) £150