Day 175 **A Tier 10-a-day: Model Solutions**

1 Percentage change

Ali buys a painting for £40.
He sells it for £32.
Work out his percentage loss.

Loss = £40.00 − £32.00 = £8.00

Percentage loss = $\frac{£8.00}{£40.00}$ × 100 = 20%

Answer: 20%

2 Exchange rates

The exchange rate is £1 = €1.15. (Calculator)
A hotel room costs €287.50 a night.
Work out the cost in pounds.

Divide by the exchange rate: 287.5 ÷ 1.15
= £250

Answer: £250

3 Straight line graphs

A straight line has equation −4x + 2y = −8
(a) Find the gradient of the line.
(b) Find the coordinates of the point where the line crosses the x-axis.

(a) Rearrange into y = mx + c: 2y = 4x − 8
y = 2x − 4
The gradient is 2
(b) On the x-axis, y = 0: −4x = −8, so x = 2

Answer: (a) 2 (b) (2, 0)

4 Converting units of area and volume

A rectangular table top is 250 cm by 90 cm.
Work out its area in m^2.

Area = 250 × 90 = 22500 cm^2
1 m^2 = 10 000 cm^2
22500 ÷ 10 000 = 2.25

Answer: 2.25 m^2

5 Mixing in a ratio

Jug A contains 36 litres of a mixture of orange juice and lemonade in the ratio 5 : 4.
Jug B contains 8 litres of a mixture of orange juice and lemonade in the ratio 7 : 1.
The contents of both jugs are mixed together.
Work out the ratio of orange juice to lemonade in the mixture. Give your answer in its simplest form.

Jug A: orange juice = 5 × 36 ÷ 9 = 20 litres, lemonade = 16 litres
Jug B: orange juice = 7 litres, lemonade = 1 litres
Total: orange juice = 27 litres, lemonade = 17 litres
Ratio = 27 : 17 = 27 : 17

Answer: 27 : 17

6 Rearranging formulae

Make w the subject of $z = \frac{4w + 8}{3}$

Multiply both sides by 3: 3z = 4w + 8
Subtract 8 from both sides: 4w = 3z − 8
Divide both sides by 4
$w = \frac{3z - 8}{4}$

Answer: $w = \frac{3z - 8}{4}$

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7 Volume of composite solids

A solid is made from a cylinder and a cone.
The cylinder has radius 3 cm and height 5 cm.
The cone has the same radius as the cylinder and perpendicular height 8 cm.
Work out the total volume. Give your answer in terms of π.

Cylinder = $\pi \times 3^2 \times 5 = 45\pi$

Cone = $\frac{1}{3} \times \pi \times 3^2 \times 8 = 24\pi$

Total = $45\pi + 24\pi = 69\pi$

Answer: 69π cm^3

8 Tree diagrams

The tree diagram shows probabilities for two events.
(a) Work out the values of p and q.
(b) Work out the probability that Leah buys an ice cream.

(a) Probabilities on pairs of branches add up to 1.
p = 1 − 0.6 = 0.4 and q = 1 − 0.3 = 0.7
(b) P(ice cream) = 0.3 × 0.6 + 0.7 × 0.8
= 0.18 + 0.56 = 0.74
Answer: (a) p = 0.4, q = 0.7 (b) 0.74

9 Bounds

A rectangle has length 13 cm and width 24 cm.
Each measurement is correct to the nearest cm.
Work out the lower bound for the area of the rectangle.

Lower bound of length = 13 − 0.5 = 12.5 cm
Lower bound of width = 24 − 0.5 = 23.5 cm
Lower bound of area = 12.5 × 23.5 = 293.75 cm^2
Answer: 293.75 cm^2

10 Simultaneous equations (one quadratic)

Solve the simultaneous equations
$x^2 + y^2 = 289$
$y = x - 7$

Substitute $y = x - 7$ into $x^2 + y^2 = 289$
$x^2 + (x - 7)^2 = 289$
$2x^2 - 14x - 240 = 0$
Divide by 2: $x^2 - 7x - 120 = 0$
$(x + 8)(x - 15) = 0$
$x = -8$ or $x = 15$
Use $y = x - 7$ to find y: when $x = -8$, $y = -15$; when $x = 15$, $y = 8$
Answer: x = −8, y = −15 and x = 15, y = 8