Day 348 **A Tier 10-a-day: Model Solutions**

1 Sharing in a ratio

Isla and Maya share 96 marbles in the ratio 1 : 7.
How many more marbles does Maya get than Isla?

Total number of parts = 1 + 7 = 8
One part = 96 ÷ 8 = 12
Maya gets 7 × 12 = 84 and Isla gets 1 × 12 = 12
Difference = 84 − 12 = 72
Answer: 72

2 Mixed number multiplication and division

Work out $4\frac{3}{4} \times 2\frac{4}{5}$

Give your answer as a mixed number in its simplest form.

Improper fractions: $\frac{19}{4}$ and $\frac{14}{5}$

Multiply: $\frac{19}{4} \times \frac{14}{5} = \frac{266}{20}$

Simplify: $13\frac{3}{10}$

Answer: $13\frac{3}{10}$

3 Similar shapes: area and volume

Two similar statues have volumes 40 cm^3 and 625 cm^3.
The smaller one has height 4 cm.
Work out the height of the larger one.

Volume scale factor = 625 ÷ 40 = $\frac{125}{8}$

Length scale factor = cube root of $\frac{125}{8} = \frac{5}{2}$

Height = $4 \times \frac{5}{2} = 10$

Answer: 10 cm

4 Profit and loss

Ryan buys a phone for £200 and sells it for £224.
Work out Ryan's percentage profit.

Profit = £224 − £200 = £24

Percentage profit = $\frac{24}{200} \times 100 = 12\%$

Answer: 12%

5 Independent events

The probability that Nia hits the target is 0.6.
The probability that Sam hits the target is 0.1.
The two events are independent.
Work out the probability that both Nia and Sam hit the target.

Multiply the probabilities: 0.6 × 0.1 = 0.06
Answer: 0.06

6 Factorising

Factorise $4x^2 + 15x + 9$

Multiply 4 × 9 = 36. Find two numbers that multiply to 36 and add to 15: 12 and 3
$4x^2 + 15x + 9 = 4x^2 + 12x + 3x + 9$
Factorise in pairs to get (4x + 3)(x + 3)
Answer: (4x + 3)(x + 3)

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7 Converting area and volume units

Change 3 m^2 to cm^2.

1 m = 100 cm, so 1 m^2 = 100 × 100 = 10 000 cm^2
3 × 10 000 = 30000
Answer: 30000 cm^2

8 Perpendicular bisector

A is the point (3, 3) and B is the point (5, 7).
Find the equation of the perpendicular bisector of AB.

Midpoint of AB = $(\frac{3+5}{2}, \frac{3+7}{2}) = (4, 5)$

Gradient of AB = $\frac{4}{2} = 2$

Perpendicular gradient = $-1 \div 2 = -\frac{1}{2}$

$y = -\frac{1}{2}x + c$ through (4, 5): $5 = -\frac{1}{2} \times 4 + c$, so c = 7

$y = -\frac{1}{2}x + 7$

Answer: $y = -\frac{1}{2}x + 7$

9 Recurring decimals, show that

(a) Show that $0.\dot{3}\dot{6} = \frac{4}{11}$

(b) Hence write $1.\dot{3}\dot{6}$ as a mixed number in its simplest form.

(a) Let x = 0.363636..., so 100x = 36.3636...

$100x - x = 36$, so $99x = 36$ and $x = \frac{36}{99} = \frac{4}{11}$

(b) $1.\dot{3}\dot{6} = 1 + \frac{4}{11} = 1\frac{4}{11}$

Answer: (b) $1\frac{4}{11}$

10 Area of a sector

The diagram shows a sector of a circle of radius 15 cm.
Work out the area of the sector.
Give your answer in terms of π.
The diagram is not drawn accurately.

Area = $\frac{120}{360} \times \pi \times 15^2$

$= \frac{1}{3} \times 225\,\pi$

$= 75\pi$

Answer: 75π cm^2