Day 349 **B Tier 10-a-day: Model Solutions**

1 Compound areas

A rectangular poster measures 13 cm by 11 cm.
A rectangle measuring 6 cm by 4 cm is cut out.
Work out the area that is left.

Whole area = 13 × 11 = 143
Area cut out = 6 × 4 = 24
143 − 24 = 119
Answer: 119 cm^2

2 Ratio, one part known

The ratio of adults to children among the people on a bus is 9 : 1.
There are 8 children.
How many adults are there?

1 parts = 8 children
1 part = 8 ÷ 1 = 8
adults: 9 × 8 = 72
Answer: 72

3 Metric units

A jug holds 1.625 litres of juice.
Each glass holds 125 ml.
How many glasses can be filled from the jug?

1.625 litres = 1.625 × 1000 = 1625 ml
1625 ÷ 125 = 13
Answer: 13 glasses

4 Expanding brackets

Expand
(a) 6(3x − 3)
(b) 2x(x + 5)

(a) 6 × 3x = 18x and 6 × (−3) = −18
(b) 2x × x = 2x^2 and 2x × 5 = 10x
Answer: (a) 18x − 18 (b) 2x^2 + 10x

5 Congruent triangles

Triangle PQR has angles of 40° and 75°, and a side of 6 cm between them.
Triangle XYZ has angles of 75° and 40°, and a side of 6 cm between them.
Are the two triangles congruent?
Give a reason for your answer.

Two pairs of equal angles, with the same side between them
So the triangles are congruent (ASA)
Answer: Yes, ASA (two angles and the included side)

6 Equations with fractional answers

Solve 3x + 4 = 15
Give your answer as a fraction in its simplest form.

Subtract 4 from both sides: 3x = 11
Divide both sides by 3: x = $\frac{11}{3}$
Answer: x = $\frac{11}{3}$

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7 Adding fractions

Work out

(a) $\frac{1}{3} + \frac{4}{5}$

(b) $\frac{4}{5} - \frac{1}{12}$

Give each answer in its simplest form.

(a) Common denominator 15: $\frac{5}{15} + \frac{12}{15} = \frac{17}{15}$

(b) Common denominator 60: $\frac{48}{60} - \frac{5}{60} = \frac{43}{60}$

Answer: (a) $1\frac{2}{15}$ (b) $\frac{43}{60}$

8 Area of an isosceles trapezium

An isosceles trapezium has parallel sides of length 17 cm and 5 cm.
Each sloping side is 10 cm long.
(a) Work out the perpendicular height of the trapezium.
(b) Work out the area of the trapezium.

(a) The difference in the parallel sides is 17 − 5 = 12, so each end sticks out 6
$h^2 = 10^2 - 6^2 = 100 - 36 = 64$, so h = 8
(b) Area = ½ × (17 + 5) × 8 = 88

Answer: (a) 8 cm (b) 88 cm^2

9 Speed unit conversion

A car travels at 63 km/h.
Work out its speed in metres per second.

63 km = 63,000 m
1 hour = 3600 seconds
63,000 ÷ 3600 = 17.5 m/s

Answer: 17.5 m/s

10 Simultaneous equations problem

A shop sells pens and pencils. All pens cost the same and all pencils cost the same.
2 pens and 1 pencil cost 250p.
1 pen and 1 pencil cost 135p.
Work out the cost of one pen and the cost of one pencil.

Let a = cost of one pen and b = cost of one pencil
2a + 1b = 250 and 1a + 1b = 135
Subtract: 1a = 250 − 135 = 115, so a = 115
Substitute: 2 × 115 + 1b = 250, so 1b = 20 and b = 20

Answer: One pen costs 115p and one pencil costs 20p