Day 12 **B Tier 10-a-day: Model Solutions**

1 Angles in triangles

Triangle ABC is isosceles with AB = AC.
Angle BAC = 126°.
Work out the size of angle ABC.

The base angles of an isosceles triangle are equal
Angles in a triangle add up to 180°
180 − 126 = 54
54 ÷ 2 = 27
Answer: 27°

2 Fuel use

A car uses 20 litres of petrol to travel 400 km.
Work out how many kilometres it travels on each litre of petrol.

400 ÷ 20 = 20
Answer: 20 km per litre

3 Compound areas

Two rectangles are joined to make a shape.
The first is 12 cm by 8 cm.
The second is 14 cm by 3 cm.
Work out the total area of the shape.

First rectangle: 12 × 8 = 96
Second rectangle: 14 × 3 = 42
96 + 42 = 138
Answer: 138 cm^2

4 Using a given calculation

Use the fact that 16 × 46 = 736
to work out
(a) 16 × 460
(b) 73,600 ÷ 16

(a) 16 is unchanged and 460 = 46 × 10
So the answer is 736 × 10 = 7360
(b) 73,600 = 736 × 100 and 16 is unchanged
736 ÷ 16 = 46, so the answer is 46 × 100 = 4600
Answer: (a) 7360 (b) 4600

5 Equations with brackets

Solve 6(x + 3) = 42

Divide both sides by 6: x + 3 = 7
Subtract 3 from both sides: 1x = 4
Answer: x = 4

6 LCM problems

Two buses leave a bus station at 08:15.
One bus leaves every 10 minutes.
The other bus leaves every 30 minutes.
At what time do both buses next leave together?

Multiples of 10: 10, 20, 30
Multiples of 30: 30
The first common multiple is 30, so the LCM is 30 minutes
08:15 + 30 minutes = 08:45
Answer: 08:45

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7 Simultaneous equations

Solve the simultaneous equations
$x - 4y = 13$
$2x + 2y = -4$

Multiply the second equation by 2: $4x + 4y = -8$
The y terms have opposite signs, so add the equations: $5x = 5$
$x = 1$
Substitute $x = 1$ into the first equation: $-4y = 13 - 1 = 12$
$y = -3$
Answer: $x = 1$, $y = -3$

8 Fraction problems

A paddling pool is $\frac{2}{5}$ full.

33 litres of water are added.

The paddling pool is now $\frac{1}{2}$ full.

Work out the capacity of the paddling pool.

Fraction added = $\frac{1}{2} - \frac{2}{5} = \frac{1}{10}$

$\frac{1}{10}$ of the capacity = 33 litres
Whole capacity = $33 \times 10 = 330$ litres
Answer: 330 litres

9 Average speed

A lorry travels at 50 km/h for 1.5 hours and then at 90 km/h for 1.5 hours.
Work out its average speed for the whole journey.

Distance: $50 \times 1.5 = 75$ km and $90 \times 1.5 = 135$ km
Total distance = 210 km and total time = 3 hours
Average speed = $210 \div 3 = 70$
Answer: 70 km/h

10 Trial and improvement

The equation $x^3 - x = 33$ has a solution between 3 and 4. (Calculator)
Use trial and improvement to find this solution.
Give your answer correct to 1 decimal place.

$x = 3.5$: $3.5^3 - 3.5 = 39.375$ (too big)
$x = 3.2$: $3.2^3 - 3.2 = 29.568$ (too small)
$x = 3.3$: $3.3^3 - 3.3 = 32.637$ (too small)
$x = 3.4$: $3.4^3 - 3.4 = 35.904$ (too big)
$x = 3.35$: value = 34.245 (too big), so the solution is below 3.35
So $x = 3.3$ to 1 decimal place
Answer: $x = 3.3$