Day 252 **B Tier 10-a-day: Model Solutions**

1 Angles in quadrilaterals

WXYZ is a kite with WX = WZ and YX = YZ.
Angle ZWX = 118° and angle XYZ = 86°.
Work out the size of angle WXY.

Angles in a quadrilateral add up to 360°
Angles WXY and WZY are equal in a kite
360 − 118 − 86 = 156
156 ÷ 2 = 78
Answer: 78°

2 Best buys

Coffee is sold in two sizes.
Small: 250 g for 60p
Large: 500 g for 90p
Which size is better value for money?
You must show your working.

Compare the cost of 500 g of each
Small: 2 × 60p = £1.20
Large: 1 × 90p = 90p
The large is cheaper for the same amount
Answer: The large size

3 Perimeter expressions

A triangle has sides of length (3x + 5) cm, (x − 4) cm and (2x + 5) cm.
Write down an expression, in terms of x, for the perimeter of the triangle.
Give your answer in its simplest form.

Add the three sides: (3x + 5) + (x − 4) + (2x + 5)
x terms: 3x + x + 2x = 6x. Numbers: 5 − 4 + 5 = 6
Answer: 6x + 6 cm

4 Proving a triangle is right-angled

A triangle has sides of length 12 cm, 5 cm and 14 cm.
Is the triangle right-angled?
You must show your working.

The longest side is 14. Check whether $a^2 + b^2 = c^2$
$5^2 + 12^2 = 25 + 144 = 169$
$14^2 = 196$
These are not equal, so the triangle is not right-angled
Answer: No, $5^2 + 12^2 = 169$ but $14^2 = 196$

5 Ratio and changes

In a room, the ratio of boys to girls is 5 : 9.
There are 63 girls.
More boys join so that there are equal numbers of boys and girls.
How many boys join?

9 parts = 63, so 1 part = 7
Originally there are 5 × 7 = 35 boys
To equal 63, add 63 − 35 = 28
Answer: 28

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6 Harder linear equations

Solve $6(x - 1) = 3(x - 3)$

Expand the brackets: $6x - 6 = 3x - 9$
Subtract $3x$ from both sides: $3x - 6 = -9$
Subtract -6 from both sides: $3x = -3$
Divide both sides by 3
Answer: $x = -1$

7 Repeated percentage change

The price of a laptop is £200.
The price is first reduced by 20%, then the new price is reduced by 10%.
(a) Work out the final price.
(b) Work out the overall percentage decrease in the price.

(a) Multipliers: 0.8 and 0.9
$200 \times 0.8 \times 0.9 = £144$
(b) Overall multiplier = 0.72
Overall decrease = 28%
Answer: (a) £144 (b) 28% decrease

8 Trigonometry in isosceles triangles

Triangle PQR is isosceles with PQ = PR = 11 m. (Calculator)
The base QR = 12 m.
Work out the size of angle PQR.
Give your answer correct to 1 decimal place.

Split the triangle into two right-angled triangles. Half the base = $12 \div 2 = 6$

$\cos Q = \frac{6}{11}$

Angle PQR = $\cos^{-1}(\frac{6}{11}) = 56.944...$

= 56.9° (1 d.p.)
Answer: 56.9°

9 Solving quadratic equations

Solve $x^2 - 5x + 6 = 0$

Factorise: $(x - 3)(x - 2) = 0$
Either $x - 3 = 0$ or $x - 2 = 0$
Answer: $x = 2$ or $x = 3$

10 Fractions of amounts

Work out

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

(b) $\frac{1}{3}$ of £12

(a) $40 \div 5 = 8$, then $8 \times 3 = 24$
(b) $12 \div 3 = 4$, then $4 \times 1 = 4$
Answer: (a) 24 (b) £4