Test answers - Problem solving and GCSE exam practice

Year: Year 11 · Duration: 40 minutes · /20

Answer to Question 1 (4 marks)

a. $360 \div 12 = 30$; **£150** and **£210** (1 for the part, 1 for both) Add the parts: $5 + 7 = 12$. One part is $360 \div 12 = 30$, so the shares are 5×30 and 7×30. Check: $150 + 210 = 360$.
b. $0.12 \times 210 =$ **£25.20** (2) 12% as a decimal is 0.12, so multiply the larger share, £210, by 0.12.

In (b), a non-calculator method is to find 10% (£21) and 2% (£4.20) and add them, giving £25.20 again. A common error in (a) is to divide £360 by 5 and by 7.

Answer to Question 2 (4 marks)

a. $5x - 10 = 3x + 6$, so $2x = 16$ and $x = 8$ (1 each) Expand the bracket, then subtract $3x$ and add 10 to both sides. Check: $5 \times 6 = 30$ and $24 + 6 = 30$.
b. $y = x - 2$, so $3x + 2x - 4 = 16$, $x = 4$, $y = 2$ (1 each) Make y the subject of the second equation and substitute into the first. Check: $12 + 4 = 16$ and $4 - 2 = 2$.

In (a), the check substitutes $x = 8$: $5(8 - 2) = 30$ and $3 \times 8 + 6 = 30$. In (b), elimination also works: double $x - y = 2$ and add.

Answer to Question 3 (4 marks)

a. $\tan x = \dfrac{30}{50}$ (1), $x = \tan^{-1}(0.6)$ (1), 31.0° (1) The height of the tower is opposite the angle and the 50 m distance is adjacent, so we use tangent.
b. $\sqrt{900 + 2500} = \sqrt{3400} =$ **58.3 m** (1) Use Pythagoras with the two shorter sides 30 m and 50 m.

Check (b) with trigonometry: $30 \div \sin 31.0^\circ \approx 58.3$ m. A common error in (a) is to use $\tan^{-1}\left(\frac{50}{30}\right)$, the angle at the top.

Answer to Question 4 (4 marks)

a. Let the numbers be $2n + 1$ and $2n + 3$ (1). Sum $= 4n + 4$ (1) $= 4(n + 1)$ (1), which is a multiple of 4 (1). Consecutive odd numbers differ by 2. Since $n + 1$ is a whole number, $4(n + 1)$ is a multiple of 4 for every whole number n. For example, $5 + 7 = 12 = 4 \times 3$.

A proof must work for every value, so examples alone score no marks. Using n and $n + 2$ is not enough either, because n might be even.

Answer to Question 5 (4 marks)

a. Perimeter $= 2 \times (40 + 25) = 130$ (1); $130 - 3 =$ **127 m** (1) The fence goes round the perimeter, but the 3 m gap for the gate is not fenced, so subtract 3.
b. $127 \times 14.50 =$ **£1 841.50** (2) Multiply the length of fence by the price per metre.

In (a), a common error is to add only $40 + 25$, giving half the perimeter. In (b), using a calculator, $127 \times 14.5 = 1841.5$, written as £1 841.50 in money.