Test answers - Solving one-step and two-step equations

Year: Year 7 · Duration: 45 minutes · /20

Answer to Question 1 (4 marks)

a. Undo "add 8" by subtracting 8 from both sides: $x = 21 - 8 =$**13**. Check: $13 + 8 = 21$. (1 mark)
b. Undo "divide by 5" by multiplying both sides by 5: $y = 7 \times 5 =$**35**. Check: $35 \div 5 = 7$. (1 mark)
c. Two steps, undone in reverse order. Add 4 to both sides: $3a = 18$. Then divide by 3: $a = 6$. Check: $3 \times 6 - 4 = 14$. (1 mark)
d. Multiply both sides by 3 to clear the fraction: $n + 2 = 18$. Subtract 2: $n = 16$. Check: $(16 + 2) \div 3 = 6$. (1 mark)

The balance idea is the key: whatever is done to one side must be done to the other so the equation stays true.

Answer to Question 2 (4 marks)

a. Expand the bracket: $4x - 8 = 20$ (1 mark). Add 8 to both sides: $4x = 28$. Divide by 4: $x = 7$ (1 mark). A quicker route is to divide both sides by 4 first, $x - 2 = 5$, which gives the same answer.
b. The unknown is on both sides, so subtract $2x$ from both sides to keep the x terms on the left: $3x + 3 = 18$ (1 mark). Subtract 3: $3x = 15$. Divide by 3: $x = 5$ (1 mark).

Check (a): $4(7 - 2) = 4 \times 5 = 20$. Check (b): left side $5 \times 5 + 3 = 28$ and right side $2 \times 5 + 18 = 28$, so both sides balance.

Answer to Question 3 (4 marks)

a. Call the number n. Multiplying by 5 gives $5n$, subtracting 8 gives $5n - 8$, and the result is 27: $5n - 8 = 27$. (1 mark)
b. Undo the subtraction by adding 8 to both sides: $5n = 35$ (1 mark). Undo the multiplication by dividing by 5: $n = 7$ (1 mark).
c. Follow the instructions with 7: $7 \times 5 = 35$, then $35 - 8 = 27$. This is the answer stated in the puzzle, so my number is correct. (1 mark)

Working backwards gives the same result: start from 27, add 8 to get 35, then divide by 5 to get 7. Writing $5(n - 8)$ in part (a) would be wrong, because the subtraction happens after the multiplication.

Answer to Question 4 (4 marks)

a. The total cost is the joining fee plus £6 for each of the n lessons: $15 + 6n = 63$. (1 mark)
b. Subtract the fee from both sides: $6n = 48$ (1 mark). Divide by 6: $n = 8$ lessons (1 mark). Check: $15 + 6 \times 8 = 15 + 48 = 63$.
c. For 8 lessons Ravi's club costs $5 + 7 \times 8 = 5 + 56 = £61$, and Hamza's club costs £63. Ravi's club is cheaper by $63 - 61 =$**£2**. (1 mark)

The answer depends on the number of lessons. Ravi's club has the cheaper fee but dearer lessons, so it is cheaper only up to 9 lessons; at 10 lessons both clubs cost £75.

Answer to Question 5 (4 marks)

a. The perimeter is two lengths plus two widths: $2(3x + 2) + 2(x + 4) = 6x + 4 + 2x + 8 = 8x + 12$. The perimeter is 52 cm, so $8x + 12 = 52$. (1 mark)
b. Subtract 12 from both sides: $8x = 40$. Divide by 8: $x = 5$. (1 mark)
c. Substitute $x = 5$: the length is $3 \times 5 + 2 = 17$ cm and the width is $5 + 4 = 9$ cm (1 mark). The area is $17 \times 9 =$**153 cm²** (1 mark).

Check: $2(17 + 9) = 2 \times 26 = 52$ cm, matching the perimeter in the question. Note that area is in cm² while perimeter is in cm; mixing the units loses the final mark.