Test answers - Solving linear equations

Year: Year 8 · Duration: 45 minutes · /20

Answer to Question 1 (4 marks)

a. Add 7 to both sides to undo the subtraction: $5x = 25$ (1 mark). Divide both sides by 5: $x = 5$ (1 mark). Check: $5 \times 5 - 7 = 25 - 7 = 18$.
b. Expand the bracket: $3x + 6 = 2x + 11$ (1 mark). Subtract $2x$ from both sides so that x is only on the left: $x + 6 = 11$. Subtract 6: $x = 5$ (1 mark).

Check (b): the left side is $3(5 + 2) = 21$ and the right side is $2 \times 5 + 11 = 21$, so both sides balance. It is a coincidence that both equations have the same solution; always substitute back into the original equation, not into a later line of working, so that an early slip is caught.

Answer to Question 2 (4 marks)

a. Subtract $3x$ from both sides: $4x + 2 = 18$. Subtract 2: $4x = 16$ (1 mark). Divide by 4: $x = 4$ (1 mark). Check: $7 \times 4 + 2 = 30$ and $3 \times 4 + 18 = 30$.
b. Multiply both sides by 3 to clear the fraction: $x + 5 = 12$. Subtract 5: $x = 7$. Check: $(7 + 5) \div 3 = 4$. (1 mark)
c. Subtract 4 from both sides: $-3x = 15$. Divide both sides by -3: $x = -5$. Check: $4 - 3 \times (-5) = 4 + 15 = 19$. (1 mark)

In (c) the sign of x is easy to lose. Another route is to add $3x$ to both sides first, $4 = 19 + 3x$, which gives $3x = -15$ and the same answer.

Answer to Question 3 (4 marks)

a. The perimeter is the sum of the three sides: $x + (x + 3) + (2x - 1) = 30$. Collect like terms: $4x + 2 = 30$. (1 mark)
b. Subtract 2 from both sides: $4x = 28$. Divide by 4: $x = 7$. (1 mark)
c. Substitute $x = 7$: the sides are 7 cm, $7 + 3 = 10$ cm and $2 \times 7 - 1 = 13$ cm. The longest side is **13 cm**. (1 mark)
d. $7 + 10 + 13 = 30$ cm, which matches the perimeter given. (1 mark)

It is also worth checking that the triangle can exist: the two shorter sides give $7 + 10 = 17$, which is greater than 13, so the three lengths do form a real triangle.

Answer to Question 4 (4 marks)

a. Let m be the number of miles. Taxi A costs $2.5 + 1.6m$ and taxi B costs $4 + 1.1m$. The fares are equal when $2.5 + 1.6m = 4 + 1.1m$. (1 mark)

b. Subtract $1.1m$ from both sides: $2.5 + 0.5m = 4$. Subtract 2.5: $0.5m = 1.5$ (1 mark). Divide by 0.5: $m = 3$ **miles** (1 mark).
c. For 5 miles, taxi A costs $2.5 + 1.6 \times 5 = £10.50$ and taxi B costs $4 + 1.1 \times 5 = £9.50$. **Taxi B** is cheaper, by £1. (1 mark)

Check (b): at 3 miles both cost £7.30. Beyond 3 miles taxi B's lower rate per mile makes it the better choice.

Answer to Question 5 (4 marks)

a. Consecutive even numbers differ by 2, so they are n, $n + 2$ and $n + 4$. The equation is $n + (n + 2) + (n + 4) = 114$. (1 mark)
b. Collect terms: $3n + 6 = 114$. Subtract 6: $3n = 108$. Divide by 3: $n = 36$ (1 mark). The three numbers are **36, 38, 40** (1 mark). Check: $36 + 38 + 40 = 114$.
c. $3n + 6 = 100$ gives $3n = 94$ and $n = 31.33\ldots$, which is not a whole number, let alone an even one, so **no**. (1 mark)

A neat reason for (c): the sum $3n + 6 = 3(n + 2)$ is always a multiple of 3, and 100 is not divisible by 3.