Test answers - Linear equations and inequalities

Year: Year 10 · Duration: 45 minutes · /20

Answer to Question 1 (4 marks)

a. $2x = 12$ (1), so $x =$ **6** (1) Subtract $3x$ and 8 from both sides, then divide by 2. Check: $30 + 8 = 38$ and $18 + 20 = 38$. The solution is $x = 6$.

b. $3x - 2 = 20$ (1), $x = \frac{22}{3}$ **(7.33…)** (1) Multiply both sides by 4, add 2, then divide by 3. The solution is $x = \frac{22}{3}$.

Check (b) by substitution: $3 \times \frac{22}{3} - 2 = 20$ and $20 \div 4 = 5$. The exact fraction $\frac{22}{3}$ or $7\frac{1}{3}$ is preferred; a rounded decimal such as 7.3 loses the accuracy mark. In (a), collecting the x terms on the side with the larger coefficient avoids negatives.

Answer to Question 2 (4 marks)

a. First: $45 + 28 \times 5 = 185$. Second: $20 + 33 \times 5 = 185$ (1, 1). Both plumbers charge £185 for 5 hours, so they charge the same.

b. $45 + 28h < 20 + 33h$ (1), so $25 < 5h$ and $h > 5$ (1). Subtract $28h$ and 20 from both sides, then divide by 5. The first plumber is cheaper for jobs longer than 5 hours.

Check (b) with a value: for 6 hours the first plumber charges £213 and the second £218, so the first is indeed cheaper beyond 5 hours.

Answer to Question 3 (4 marks)

a. $4x \leq 20$ (1), so $x \leq 5$ (1) Add 7 to both sides, then divide by 4. The solution is $x \leq 5$.

b. $-6 < 3x < 9$ so $-2 < x < 3$ (1). Integers: **−1, 0, 1, 2** (1) Subtract 1 from all three parts, then divide by 3: $-2 < x < 3$. The integers are -1, 0, 1 and 2.

In (b), dividing by a positive number keeps the inequality signs the same way round, and -2 and 3 are not solutions.

Answer to Question 4 (4 marks)

a. $80 + 6g \leq 350$ (1) The total cost is the fixed £80 plus £6 for each guest, and it must not be more than £350.

b. $6g \leq 270$ (1), $g \leq 45$ (1) Subtract 80 from both sides, then divide by 6.

c. **45 guests** (1) The greatest whole number that satisfies $g \leq 45$ is 45. Check:

$80 + 6 \times 45 = 350$.

In (c), a guest cannot be a fraction, and here 45 guests use exactly the whole budget of £350, so 46 guests would cost £356 and break the budget.

Answer to Question 5 (4 marks)

a. $(x - 5)(x + 2) < 0$ (1), roots -2 and 5 (1), $-2 < x < 5$ (1) The graph of $y = (x - 5)(x + 2)$ is a U-shape crossing the axis at -2 and 5. It is below the axis between the roots, so $-2 < x < 5$.

b. **−1, 0, 1, 2, 3, 4** (1) The end values -2 and 5 are not included because the inequality is strict.

Check with $x = 0$: $-10 < 0$, true.