Worked solutions | Algebra

Solving and checking linear equations

8 questions | 31 marks

Equivalent correct methods and notation earn corresponding marks. Include units and directions where asked. Each worked step identifies the mark allocation.

1. Solve $x + 9 = 23$. Name the inverse operation, show a balanced equation and verify your solution by substitution. [3 marks]

Subtract 9 from both sides: $x + 9 - 9 = 23 - 9$. (1 mark)

Simplify to $x = 14$. (1 mark)

Check: $14 + 9 = 23$, matching the original right side. (1 mark)

Answer: $x = 14$

2. Solve $y - 8 = 17$. Explain why you add rather than subtract 8, then check your answer. [3 marks]

Adding 8 undoes subtracting 8: $y - 8 + 8 = 17 + 8$. (1 mark)

Therefore $y = 25$. (1 mark)

Check: $25 - 8 = 17$, so the original equation is true. (1 mark)

Answer: $y = 25$

3. Solve $6p = 54$. Show the operation applied to both sides and check by substitution. [3 marks]

Divide both sides by 6: $\frac{6p}{6} = \frac{54}{6}$. (1 mark)

This gives $p = 9$. (1 mark)

Check: $6 \times 9 = 54$, equal to the right side. (1 mark)

Answer: $p = 9$

4. A number n satisfies $\frac{n}{4} = 7$. Solve the equation and check your answer. Explain why dividing 7 by 4 would use the wrong inverse operation. [4 marks]

Multiply both sides by 4: $4 \times \frac{n}{4} = 4 \times 7$. (1 mark)

Simplify: $n = 28$. (1 mark)

Check: $\frac{28}{4} = 7$, so the solution works. (1 mark)

Division by 4 must be undone by multiplication by 4; dividing again would not isolate n. (1 mark)

Answer: $n = 28$; multiply by 4 to undo division by 4.

5. Solve $4a + 7 = 35$. State the two inverse operations in order, show your working and check the solution. [4 marks]

First subtract 7 from both sides: $4a = 35 - 7 = 28$. (1 mark)

Then divide both sides by 4: $a = \frac{28}{4}$. (1 mark)

Therefore $a = 7$. (1 mark)

Check: $4 \times 7 + 7 = 28 + 7 = 35$, matching the right side. (1 mark)

Answer: $a = 7$

6. Solve $\frac{b}{3} - 2 = 4$. Show how you undo each operation, then verify your answer in the original equation. [4 marks]

Add 2 to both sides: $\frac{b}{3} = 4 + 2 = 6$. (1 mark)

Multiply both sides by 3: $b = 6 \times 3$. (1 mark)

Therefore $b = 18$. (1 mark)

Check: $\frac{18}{3} - 2 = 6 - 2 = 4$, equal to the original right side. (1 mark)

Answer: $b = 18$

7. Amira claims that $t = 8$ solves $3t + 5 = 23$. Check her claim by substitution. If it fails, solve the equation and verify the correct answer. [5 marks]

Substitute the claimed value: $3 \times 8 + 5 = 24 + 5 = 29$. (1 mark)

Since $29 \neq 23$, $t = 8$ is not a solution. (1 mark)

Subtract 5 from both sides of the original equation: $3t = 18$. (1 mark)

Divide both sides by 3: $t = 6$. (1 mark)

Check the correct answer: $3 \times 6 + 5 = 18 + 5 = 23$. (1 mark)

Answer: The claim fails because $3 \times 8 + 5 = 29 \neq 23$. The correct solution is $t = 6$.

8. A group pays a fixed booking fee of 8 dollars and 3 dollars per passenger for a shuttle trip. The total bill is 35 dollars. Define a variable for the number of passengers, form an equation, solve it and check the total cost. [5 marks]

Let p be the number of passengers. Each passenger costs 3, so the equation is $3p + 8 = 35$. (1 mark)

Subtract 8 from both sides: $3p = 27$. (1 mark)

Divide both sides by 3: $p = 9$. (1 mark)

Check the bill: $3 \times 9 + 8 = 27 + 8 = 35$ dollars. (1 mark)

The group has 9 passengers, a natural-number count that fits the situation. (1 mark)

Answer: There are 9 passengers; $3p + 8 = 35$ gives $p = 9$.

Curriculum alignment

Australian Curriculum, published by ACARA; QCAA curriculum mapping | Version 9.0 | AC9M7A03

One variable, natural-number solutions, inverse operations, simple division equations and short practical contexts. Each solution is checked in the original equation. Variables on both sides, expanding brackets, and negative or fractional solutions are outside this lesson.

Official curriculum source | Checked 2026-11-02