Solving Linear Equations in One Variable

Name: _____	Date: _____	Score: _____ / 24

Quick Review

To **solve a linear equation** means to find the value of the variable that makes both sides equal. The golden rule: whatever you do to one side, do to the *other* side too, so the equation stays balanced. The usual plan is to **undo operations in reverse** — first add or subtract to move constants, then multiply or divide to peel off the coefficient. If the variable appears on both sides, gather the variable terms on one side first. Always *check* by substituting your answer back in.

◇ **Example:** Solve $5x - 7 = 3x + 9$.

$\Rightarrow$ The variable shows up on both sides, so step one is to get all the x's together. Subtract $3x$ from each side: that leaves $2x - 7 = 9$. Now it's a familiar two-step equation. Undo the subtraction by adding 7 to both sides: $2x = 16$. Finally undo the multiplication by dividing both sides by 2: $x = 8$. Quick check: $5(8) - 7 = 33$ and $3(8) + 9 = 33$ — they match, so $x = 8$ is correct.

Answer: $x = 8$

PRACTICE

Solve each equation for the variable.

1. $x + 6 = 14$ _____

2. $x - 9 = 4$ _____

3. $3x = 27$ _____

4. $\frac{x}{4} = 6$ _____

5. $2x + 5 = 17$ _____

6. $4x - 3 = 21$ _____

7. $7x + 2 = 30$ _____

8. $6x - 8 = 10$ _____

9. $\frac{x}{2} + 3 = 11$ _____

10. $5x + 4 = 4x + 12$ _____

11. $8x - 5 = 6x + 7$ _____

12. $9x + 1 = 5x + 25$ _____

13. $3(x + 4) = 21$ _____

14. $2(x - 5) = 8$ _____

15. $4(2x + 1) = 36$ _____

16. $10x - 7 = 3x + 14$ _____

17. $6(x - 2) = 2(x + 6)$ _____

18. $\frac{2x}{3} = 8$ _____

19. $5x + 9 = 2x - 6$ _____

20. $7 - 2x = 19$ _____

Word Problems

21. Maya thinks of a number, multiplies it by 4, then adds 6, and gets 38. What is her number? _____

22. A rectangle has a perimeter of 48 cm. Its length is 6 cm more than its width. Find the width. _____

23. Two siblings have $\$120$ together. The older one has three times as much as the younger. How much does the younger have? _____

24. A taxi ride costs a $\$3$ base fare plus $\$2$ per mile. The total ride cost $\$23$. How many miles was the ride? _____

Answer Keys

1. $\boxed{x = 8}$
2. $\boxed{x = 13}$
3. $\boxed{x = 9}$
4. $\boxed{x = 24}$
5. $\boxed{x = 6}$
6. $\boxed{x = 6}$
7. $\boxed{x = 4}$
8. $\boxed{x = 3}$
9. $\boxed{x = 16}$
10. $\boxed{x = 8}$
11. $\boxed{x = 6}$
12. $\boxed{x = 6}$
13. $\boxed{x = 3}$
14. $\boxed{x = 9}$
15. $\boxed{x = 4}$
16. $\boxed{x = 3}$
17. $\boxed{x = 6}$
18. $\boxed{x = 12}$
19. $\boxed{x = -5}$
20. $\boxed{x = -6}$
21. $\boxed{8}$
22. $\boxed{9 \text{ cm}}$
23. $\boxed{\$30}$
24. $\boxed{10 \text{ miles}}$

Step-by-Step Explanations

1. Subtract 6 from both sides: $x = 8$.
2. Add 9 to both sides: $x = 13$.
3. Divide both sides by 3: $x = 9$.
4. Multiply both sides by 4: $x = 24$.
5. Subtract 5 to get $2x = 12$, then divide by 2: $x = 6$.
6. Add 3 to get $4x = 24$, then divide by 4: $x = 6$.
7. Subtract 2 to get $7x = 28$, then divide by 7: $x = 4$.
8. Add 8 to get $6x = 18$, then divide by 6: $x = 3$.
9. Subtract 3 to get $\frac{x}{2} = 8$, then multiply by 2: $x = 16$.
10. Subtract $4x$: $x + 4 = 12$, then subtract 4: $x = 8$.
11. Subtract $6x$: $2x - 5 = 7$, add 5: $2x = 12$, so $x = 6$.
12. Subtract $5x$: $4x + 1 = 25$, subtract 1: $4x = 24$, so $x = 6$.
13. Distribute: $3x + 12 = 21$, subtract 12: $3x = 9$, so $x = 3$.
14. Distribute: $2x - 10 = 8$, add 10: $2x = 18$, so $x = 9$.
15. Distribute: $8x + 4 = 36$, subtract 4: $8x = 32$, so $x = 4$.
16. Subtract $3x$: $7x - 7 = 14$, add 7: $7x = 21$, so $x = 3$.
17. Expand: $6x - 12 = 2x + 12$; subtract $2x$: $4x - 12 = 12$; so $4x = 24$, $x = 6$.
18. Multiply both sides by $\frac{3}{2}$: $x = 8 \cdot \frac{3}{2} = 12$.
19. Subtract $2x$: $3x + 9 = -6$, subtract 9: $3x = -15$, so $x = -5$.
20. Subtract 7: $-2x = 12$, then divide by -2: $x = -6$.
21. Let the number be n: $4n + 6 = 38$. Subtract 6: $4n = 32$, then divide by 4: $n = 8$.
22. With width w, length is $w + 6$, so $2(w) + 2(w + 6) = 48$. That is $4w + 12 = 48$, so $4w = 36$ and $w = 9$ cm.
23. Let the younger have y; the older has $3y$. Then $y + 3y = 120$, so $4y = 120$ and $y = \$30$.
24. With m miles, $2m + 3 = 23$. Subtract 3: $2m = 20$, so $m = 10$ miles.

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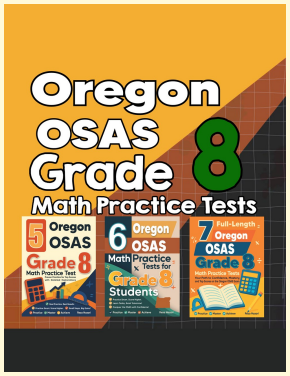

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