

Multi-Step Equations

Name: _____

Date: _____

Score: _____ / 18

Quick Review and Helpful Hints

To solve, first simplify each side: clear parentheses with the distributive property and combine like terms. Then undo the operations in reverse order – add or subtract to move constants, and multiply or divide to free the variable. If the variable appears on both sides, move all variable terms to one side first.

▶ **Example:** Solve $4(x - 2) + 6 = 18$. **Work:** Distribute: $4x - 8 + 6 = 18$. Combine like terms: $4x - 2 = 18$. Add 2: $4x = 20$. Divide by 4: $x = 5$.

★ **Answer:** $x = 5$



Do the same to both sides to stay balanced.

◆ Practice Problems

Solve each equation for the variable.

1. $2x + 3 = 11$

2. $3x - 5 = 16$

3. $5x + 2 = 22$

4. $4x - 7 = 9$

5. $2x + 3x = 20$

6. $7x - 2x = 15$

7. $2(x + 4) = 18$

8. $3(x - 1) = 12$

9. $2x + 5 = x + 9$

10. $5x - 3 = 2x + 9$

11. $4(x + 2) = 2x + 14$

12. $3x + 7 = 2(x + 5)$

13. $2(2x - 1) + 3 = 13$

14. $6x - 2(x - 1) = 14$

◆ Word Problems

15. The sum of a number and 7, then doubled, is 26. Find the number.

16. A taxi charges \$3 plus \$2 per mile. A ride costs \$17. How many miles was it?

17. A rectangle's perimeter is 30. Its length is 3 more than its width. Find the width.

18. Five less than three times a number is 16. Find the number.



Answer Keys

- | | | |
|------------|-------------|-------------|
| 1. $x = 4$ | 7. $x = 5$ | 13. $x = 3$ |
| 2. $x = 7$ | 8. $x = 5$ | 14. $x = 3$ |
| 3. $x = 4$ | 9. $x = 4$ | 15. 6 |
| 4. $x = 4$ | 10. $x = 4$ | 16. 7 miles |
| 5. $x = 4$ | 11. $x = 3$ | 17. 6 |
| 6. $x = 3$ | 12. $x = 3$ | 18. 7 |

Step-by-Step Explanations

1. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Subtract 3 from both sides: $2x = 8$. Then divide by 2: $x = 4$. So the final answer is $x = 4$.

2. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Add 5 to both sides: $3x = 21$. Divide by 3: $x = 7$. So the final answer is $x = 7$.

3. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Subtract 2: $5x = 20$. Divide by 5: $x = 4$. So the final answer is $x = 4$.

4. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Add 7: $4x = 16$. Divide by 4: $x = 4$. So the final answer is $x = 4$.

5. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Combine like terms first: $5x = 20$. Divide by 5: $x = 4$. So the final answer is $x = 4$.

6. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Combine: $5x = 15$. Divide by 5: $x = 3$. So the final answer is $x = 3$.

7. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Distribute: $2x + 8 = 18$. Subtract 8: $2x = 10$. Divide by 2: $x = 5$. So the final answer is $x = 5$.

8. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Distribute: $3x - 3 = 12$. Add 3: $3x = 15$. Divide by 3: $x = 5$. So the final answer is $x = 5$.

9. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Subtract x from both sides: $x + 5 = 9$. Subtract 5: $x = 4$. So the final answer is $x = 4$.

10. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Subtract $2x$: $3x - 3 = 9$. Add 3: $3x = 12$. Divide by 3: $x = 4$. So the final answer is $x = 4$.

11. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Distribute: $4x + 8 = 2x + 14$. Subtract $2x$: $2x + 8 = 14$. Subtract 8: $2x = 6$, so $x = 3$. So the final answer is $x = 3$.

12. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Distribute the right side: $3x + 7 = 2x + 10$. Subtract $2x$: $x + 7 = 10$, so $x = 3$. So the final answer is $x = 3$.

13. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Distribute: $4x - 2 + 3 = 13$, so $4x + 1 = 13$. Subtract 1: $4x = 12$, $x = 3$. So the final answer is $x = 3$.

14. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Distribute the -2 : $6x - 2x + 2 = 14$, so $4x + 2 = 14$. Subtract 2: $4x = 12$, $x = 3$. So the final answer is $x = 3$.

15. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is "Doubled" means $2(x + 7) = 26$. Divide by 2: $x + 7 = 13$. Subtract 7: $x = 6$. So the final answer is 6.

16. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Cost is $3 + 2m = 17$. Subtract 3: $2m = 14$. Divide by 2: $m = 7$ miles. So the final answer is 7 miles.

17. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Perimeter: $2(w + (w + 3)) = 30$, so $4w + 6 = 30$. Then $4w = 24$ and $w = 6$. So the final answer is 6.

18. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is "Five less than three times a number" is $3x - 5 = 16$. Add 5: $3x = 21$, so $x = 7$. So the final answer is 7.



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