

# 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.

- |                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>1. <math>2x + 3 = 11</math> _____</p> <p>2. <math>3x - 5 = 16</math> _____</p> <p>3. <math>5x + 2 = 22</math> _____</p> <p>4. <math>4x - 7 = 9</math> _____</p> <p>5. <math>2x + 3x = 20</math> _____</p> <p>6. <math>7x - 2x = 15</math> _____</p> <p>7. <math>2(x + 4) = 18</math> _____</p> | <p>8. <math>3(x - 1) = 12</math> _____</p> <p>9. <math>2x + 5 = x + 9</math> _____</p> <p>10. <math>5x - 3 = 2x + 9</math> _____</p> <p>11. <math>4(x + 2) = 2x + 14</math> _____</p> <p>12. <math>3x + 7 = 2(x + 5)</math> _____</p> <p>13. <math>2(2x - 1) + 3 = 13</math> _____</p> <p>14. <math>6x - 2(x - 1) = 14</math> _____</p> |
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### 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.  $x = 4$

2.  $x = 7$

3.  $x = 4$

4.  $x = 4$

5.  $x = 4$

6.  $x = 3$

7.  $x = 5$

8.  $x = 5$

9.  $x = 4$

10.  $x = 4$

11.  $x = 3$

12.  $x = 3$

13.  $x = 3$

14.  $x = 3$

15. 6

16. 7 miles

17. 6

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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