

# Introduction to Equations and Solutions

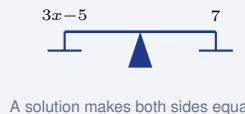
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## Quick Review and Helpful Hints

An *equation* states that two expressions are equal. A *solution* is a value of the variable that makes the equation true. To check whether a number is a solution, substitute it for the variable and see if both sides come out equal.

▷ **Example:** Is  $x = 4$  a solution of  $3x - 5 = 7$ ? **Work:** Substitute 4 for  $x$ :  $3(4) - 5 = 12 - 5 = 7$ . The left side equals the right side ( $7 = 7$ ).

★ **Answer:** Yes



A solution makes both sides equal.

### Practice Problems

Tell whether the value is a solution (Yes/No), or solve the equation.

- |   |   |
|---|---|
| 1. Is $x = 3$ a solution of $x + 5 = 8$ ? _____       | 8. Is $x = 10$ a solution of $x + 3 = 12$ ? _____     |
| 2. Is $x = 2$ a solution of $4x = 12$ ? _____         | 9. Solve $x + 6 = 10$ _____                           |
| 3. Is $x = 5$ a solution of $2x - 1 = 9$ ? _____      | 10. Solve $x - 3 = 5$ _____                           |
| 4. Is $x = -1$ a solution of $3x + 4 = 1$ ? _____     | 11. Solve $2x = 14$ _____                             |
| 5. Is $x = 6$ a solution of $x - 2 = 3$ ? _____       | 12. Solve $\frac{x}{3} = 4$ _____                     |
| 6. Is $x = 0$ a solution of $5x + 7 = 7$ ? _____      | 13. Is $x = -2$ a solution of $x^2 = 4$ ? _____       |
| 7. Is $x = 4$ a solution of $\frac{x}{2} = 2$ ? _____ | 14. Is $x = 3$ a solution of $2x + 1 = x + 4$ ? _____ |

### Word Problems

15. A number plus 8 equals 15. Write an equation and solve for the number. \_\_\_\_\_
16. Twice a number is 18. Find the number. \_\_\_\_\_
17. Maria has \$ $x$ . After earning \$5 she has \$20. Solve  $x + 5 = 20$ . \_\_\_\_\_
18. Is  $t = 4$  a solution of  $3t - 2 = 10$ ? Check by substituting. \_\_\_\_\_



## Answer Keys

- |                                 |                                       |                                       |
|---------------------------------|---------------------------------------|---------------------------------------|
| 1. <input type="checkbox"/> Yes | 7. <input type="checkbox"/> Yes       | 13. <input type="checkbox"/> Yes      |
| 2. <input type="checkbox"/> No  | 8. <input type="checkbox"/> No        | 14. <input type="checkbox"/> Yes      |
| 3. <input type="checkbox"/> Yes | 9. <input type="checkbox"/> $x = 4$   | 15. <input type="checkbox"/> $x = 7$  |
| 4. <input type="checkbox"/> Yes | 10. <input type="checkbox"/> $x = 8$  | 16. <input type="checkbox"/> 9        |
| 5. <input type="checkbox"/> No  | 11. <input type="checkbox"/> $x = 7$  | 17. <input type="checkbox"/> $x = 15$ |
| 6. <input type="checkbox"/> Yes | 12. <input type="checkbox"/> $x = 12$ | 18. <input type="checkbox"/> Yes      |

### 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 Substitute 3:  $3 + 5 = 8$ . True, so yes. So the final answer is Yes.
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 Substitute 2:  $4(2) = 8$ , not 12. So no. So the final answer is No.
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 Substitute 5:  $2(5) - 1 = 9$ . True, so yes. So the final answer is Yes.
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 Substitute  $-1$ :  $3(-1) + 4 = -3 + 4 = 1$ . True, so yes. So the final answer is Yes.
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 Substitute 6:  $6 - 2 = 4$ , not 3. So no. So the final answer is No.
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 Substitute 0:  $5(0) + 7 = 7$ . True, so yes. So the final answer is Yes.
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 Substitute 4:  $\frac{4}{2} = 2$ . True, so yes. So the final answer is Yes.
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 Substitute 10:  $10 + 3 = 13$ , not 12. So no. So the final answer is No.
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 6 from both sides:  $x = 4$ . 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 Add 3 to both sides:  $x = 8$ . So the final answer is  $x = 8$ .
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 Divide both sides by 2:  $x = 7$ . So the final answer is  $x = 7$ .
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 Multiply both sides by 3:  $x = 12$ . So the final answer is  $x = 12$ .
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 Substitute  $-2$ :  $(-2)^2 = 4$ . True, so yes. So the final answer is Yes.
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 Substitute 3: left  $2(3) + 1 = 7$ , right  $3 + 4 = 7$ . Equal, so yes. So the final answer is Yes.
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 The equation is  $x + 8 = 15$ . Subtract 8:  $x = 7$ . So the final answer is  $x = 7$ .
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 The equation is  $2x = 18$ . Divide by 2:  $x = 9$ . So the final answer is 9.
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 Subtract 5 from both sides:  $x = 15$ . So the final answer is  $x = 15$ .
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 Substitute 4:  $3(4) - 2 = 12 - 2 = 10$ . True, so yes. So the final answer is Yes.



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