

# Solving Multi-Step Equations

Algebra 1 • Section 2.3

Name: \_\_\_\_\_

Date: \_\_\_\_\_

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## Quick Review and Helpful Hints

Solving means undoing operations in a sensible order while keeping both sides balanced. Show one clean move at a time, and substitute the answer back when the equation is easy to check.

▷ **Example:** Solve  $4x - 9 = 23$ .

**Work:** Add 9 to both sides:  $4x = 32$ . Divide by 4, so  $x = 8$ .

★ **Answer:**  $x = 8$

## ◆ Practice Problems

Solve each problem. Show enough work that another student could follow your thinking.

1. Solve  $2(x + 5) = 34$ . \_\_\_\_\_

6. Solve  $2(4y - 3) = 5y + 15$ . \_\_\_\_\_

2. Solve  $3(a - 4) + 7 = 22$ . \_\_\_\_\_

7. Solve  $9 - 3(2r + 1) = 0$ . \_\_\_\_\_

3. Solve  $5 - 2(3p - 1) = -17$ . \_\_\_\_\_

8. Solve  $6 + \frac{m-2}{4} = 10$ . \_\_\_\_\_

4. Solve  $4(2n + 1) - 3n = 29$ . \_\_\_\_\_

9. Solve  $7(2q - 1) - 4q = 23$ . \_\_\_\_\_

5. Solve  $\frac{x+6}{3} = 8$ . \_\_\_\_\_

10. Solve  $18 = 3(2z + 4)$ . \_\_\_\_\_

## ◆ Word Problems

11. A gym charges \$25 plus \$8 per class. After a \$5 coupon, the total is \$84. How many classes? \_\_\_\_\_

12. Three times the sum of a number and 4 is 45. Find the number. \_\_\_\_\_



## Answer Keys

1.  $x = 12$

2.  $a = 9$

3.  $p = 4$

4.  $n = 5$

5.  $x = 18$

6.  $y = 7$

7.  $r = 1$

8.  $m = 18$

9.  $q = 3$

10.  $z = 1$

11. 8 classes

12. 11

### Step-by-Step Explanations

1. Either distribute or just divide by 2 — both lead to  $x + 5 = 17$ , so  $x = 12$ .
2. Spread the 3 inside, tidy up to  $3a - 5 = 22$ , then add 5 and divide by 3 for  $a = 9$ .
3. Distribute carefully to  $5 - 6p + 2 = -17$ , combine to  $7 - 6p = -17$ , and finish with  $p = 4$ .
4. Open the parentheses, then merge like terms into  $5n + 4 = 29$  — much friendlier to solve, giving  $n = 5$ .
5. The whole top is divided by 3, so multiply both sides by 3 first, then subtract 6.
6. Distribute the left into  $8y - 6$ , gather  $y$  terms and constants, and  $3y = 21$  gives  $y = 7$ .

7. Distribute the  $-3$ , simplify to  $6 - 6r = 0$ , and balancing both sides shows  $r = 1$ .
8. Clear the  $+6$  so the fraction equals 4, multiply by 4 to undo it, then add the 2 back.
9. After distributing and collecting terms you get  $10q - 7 = 23$ , a clean two-step finish to  $q = 3$ .
10. Dividing both sides by 3 early makes things lighter:  $6 = 2z + 4$  quickly gives  $z = 1$ .
11. Write  $25 + 8c - 5 = 84$ , fold the constants into  $20 + 8c = 84$ , and  $8c = 64$  means 8 classes.
12. 'Three times the sum' becomes  $3(n + 4) = 45$ ; divide by 3 for  $n + 4 = 15$ , then subtract 4.



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