

# Simplifying Variable Expressions

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Score: \_\_\_\_\_ / 18

## Quick Review and Helpful Hints

To *simplify* an expression, combine *like terms* – terms with the same variable raised to the same power. First use the *distributive property* to clear parentheses ( $a(b + c) = ab + ac$ ), then add or subtract the like terms. Constants combine with constants.

▶ **Example:** Simplify  $3(2x + 4) - 5x + 7$ . **Work:** Distribute the 3:  $6x + 12 - 5x + 7$ . Combine the  $x$ -terms:  $6x - 5x = x$ . Combine the constants:  $12 + 7 = 19$ .  
 ★ **Answer:**  $x + 19$

$$3(x + 2)$$

$$= 3x + 6$$

Distribute to each term, then combine.

### Practice Problems

Simplify each expression.

- |                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>1. <math>2x + 5x</math> _____</p> <p>2. <math>8a - 3a</math> _____</p> <p>3. <math>4x + 3 + 2x</math> _____</p> <p>4. <math>7y - 2 - y + 5</math> _____</p> <p>5. <math>3(x + 2)</math> _____</p> <p>6. <math>5(2x - 1)</math> _____</p> <p>7. <math>2(x + 3) + 4x</math> _____</p> | <p>8. <math>6x - 2(x + 1)</math> _____</p> <p>9. <math>4(a + 2) + 3(a - 1)</math> _____</p> <p>10. <math>3x + 2y - x + 4y</math> _____</p> <p>11. <math>-2(3x - 4)</math> _____</p> <p>12. <math>5 + 2(x - 3)</math> _____</p> <p>13. <math>8m - 3(m - 2)</math> _____</p> <p>14. <math>2(x + 5) + 3(2x - 1)</math> _____</p> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Word Problems

15. A rectangle has length  $x + 4$  and width 3. Write a simplified expression for its perimeter. \_\_\_\_\_
16. You buy  $x$  shirts at \$7 each and one \$5 cap. Write a simplified expression for the total cost. \_\_\_\_\_
17. There are 3 boxes that each hold  $(x + 2)$  pencils, plus 4 loose pencils. Write a simplified expression for the total. \_\_\_\_\_
18. A taxi charges \$3 plus \$2 per mile, then a \$4 coupon is applied. Write a simplified expression for the cost of  $m$  miles. \_\_\_\_\_



## Answer Keys

- |              |               |               |
|--------------|---------------|---------------|
| 1. $7x$      | 7. $6x + 6$   | 13. $5m + 6$  |
| 2. $5a$      | 8. $4x - 2$   | 14. $8x + 7$  |
| 3. $6x + 3$  | 9. $7a + 5$   | 15. $2x + 14$ |
| 4. $6y + 3$  | 10. $2x + 6y$ | 16. $7x + 5$  |
| 5. $3x + 6$  | 11. $-6x + 8$ | 17. $3x + 10$ |
| 6. $10x - 5$ | 12. $2x - 1$  | 18. $2m - 1$  |

### 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 These are like terms, so just add the coefficients:  $2x + 5x = 7x$ . So the final answer is  $7x$ .
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 Both terms have  $a$ , so subtract the coefficients:  $8a - 3a = 5a$ . So the final answer is  $5a$ .
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 Group the  $x$ -terms and the numbers:  $(4x + 2x) + 3 = 6x + 3$ . So the final answer is  $6x + 3$ .
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 Combine the  $y$ -terms ( $7y - y = 6y$ ) and the constants ( $-2 + 5 = 3$ ):  $6y + 3$ . So the final answer is  $6y + 3$ .
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 Distribute the 3 to each term inside:  $3 \cdot x + 3 \cdot 2 = 3x + 6$ . So the final answer is  $3x + 6$ .
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 Distribute the 5:  $5 \cdot 2x - 5 \cdot 1 = 10x - 5$ . So the final answer is  $10x - 5$ .
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 first:  $2x + 6$ . Then add the  $4x$ :  $2x + 4x + 6 = 6x + 6$ . So the final answer is  $6x + 6$ .
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 the  $-2$ :  $6x - 2x - 2$ . Combine:  $4x - 2$ . So the final answer is  $4x - 2$ .
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 Distribute both:  $4a + 8$  and  $3a - 3$ . Combine:  $(4a + 3a) + (8 - 3) = 7a + 5$ . So the final answer is  $7a + 5$ .

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 Combine the  $x$ -terms ( $3x - x = 2x$ ) and the  $y$ -terms ( $2y + 4y = 6y$ ):  $2x + 6y$ . So the final answer is  $2x + 6y$ .
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 A negative multiplier flips each sign:  $-2 \cdot 3x = -6x$  and  $-2 \cdot (-4) = +8$ , giving  $-6x + 8$ . So the final answer is  $-6x + 8$ .
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:  $5 + 2x - 6$ . Combine the constants  $5 - 6 = -1$ :  $2x - 1$ . So the final answer is  $2x - 1$ .
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 the  $-3$ :  $8m - 3m + 6$ . Combine:  $5m + 6$ . So the final answer is  $5m + 6$ .
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 both:  $2x + 10$  and  $6x - 3$ . Combine:  $(2x + 6x) + (10 - 3) = 8x + 7$ . So the final answer is  $8x + 7$ .
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 Perimeter is  $2(\text{length} + \text{width}) = 2((x + 4) + 3) = 2(x + 7) = 2x + 14$ . So the final answer is  $2x + 14$ .
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 Each shirt costs \$7, so  $x$  shirts cost  $7x$ ; add the \$5 cap:  $7x + 5$ . So the final answer is  $7x + 5$ .
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 Three boxes give  $3(x + 2) = 3x + 6$  pencils; add the 4 loose ones:  $3x + 10$ . So the final answer is  $3x + 10$ .
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 The cost is  $3 + 2m$ , then subtract the \$4 coupon:  $3 + 2m - 4 = 2m - 1$ . So the final answer is  $2m - 1$ .



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