

# Adding and Subtracting Polynomials

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

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

Score: \_\_\_\_\_ / 18

## Quick Review and Helpful Hints

Add or subtract polynomials by combining *like terms* – terms with the same variable and exponent. When *subtracting*, first distribute the minus sign to every term in the second polynomial (it flips each sign), then combine.

▶ **Example:** Simplify  $(3x^2 + 5x) - (x^2 - 2x)$ . **Work:** Distribute the minus sign:  $3x^2 + 5x - x^2 + 2x$ . Combine like terms:  $(3x^2 - x^2) + (5x + 2x)$ .  
 ★ **Answer:**  $2x^2 + 7x$

$3x^2$	$+5x$
$-x^2$	$-2x$
$= 2x^2 + 7x$	

Combine like terms column by column.

## ◆ Practice Problems

Simplify each expression.

1.  $(3x + 7) + (5x - 2)$  \_\_\_\_\_

2.  $(2x + 1) + (4x + 6)$  \_\_\_\_\_

3.  $(x^2 + 4x) + (2x^2 - x + 3)$  \_\_\_\_\_

4.  $(5a - 3) + (2a + 8)$  \_\_\_\_\_

5.  $(6x^2 - 3x + 1) - (2x^2 + x - 4)$  \_\_\_\_\_

6.  $(7a^2 - 5a) - (3a^2 - 5a + 2)$  \_\_\_\_\_

7.  $(4y^3 + y - 6) + (y^3 - 3y + 9)$  \_\_\_\_\_

8.  $(8m^2 - 2m + 5) - (8m^2 - 2m + 5)$  \_\_\_\_\_

9.  $(x^2 + 3xy + y^2) + (2x^2 - xy)$  \_\_\_\_\_

10.  $(9p - 4) - (3p + 6)$  \_\_\_\_\_

11.  $(2x^2 + 5) + (3x^2 - 2)$  \_\_\_\_\_

12.  $(10x - 7) - (4x - 3)$  \_\_\_\_\_

13.  $(a^2 + 2a + 1) + (a^2 - 2a - 1)$  \_\_\_\_\_

14.  $(5x^2 - x) - (2x^2 - 3x + 4)$  \_\_\_\_\_

## ◆ Word Problems

15. One side of a path is  $(2x + 3)$  m and another is  $(x + 5)$  m. Write their total length, simplified. \_\_\_\_\_16. A rectangle has sides  $(3x + 1)$  and  $(x + 2)$ . Simplify  $2[(3x + 1) + (x + 2)]$  for its perimeter. \_\_\_\_\_17. Profit is revenue  $(5x^2 + 20x)$  minus cost  $(2x^2 + 8x + 10)$ . Write the profit, simplified. \_\_\_\_\_18. Add the polynomials  $(x^2 + x)$  and  $(3x^2 - 4x + 2)$ . \_\_\_\_\_

## Answer Keys

1.  $8x + 5$

2.  $6x + 7$

3.  $3x^2 + 3x + 3$

4.  $7a + 5$

5.  $4x^2 - 4x + 5$

6.  $4a^2 - 2$

7.  $5y^3 - 2y + 3$

8.  $0$

9.  $3x^2 + 2xy + y^2$

10.  $6p - 10$

11.  $5x^2 + 3$

12.  $6x - 4$

13.  $2a^2$

14.  $3x^2 + 2x - 4$

15.  $3x + 8$

16.  $8x + 6$

17.  $3x^2 + 12x - 10$

18.  $4x^2 - 3x + 2$

### 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 Combine like terms:  $(3x + 5x) + (7 - 2) = 8x + 5$ . So the final answer is  $8x + 5$ .

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 Combine:  $(2x + 4x) + (1 + 6) = 6x + 7$ . So the final answer is  $6x + 7$ .

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 Group by power:  $(x^2 + 2x^2) + (4x - x) + 3 = 3x^2 + 3x + 3$ . So the final answer is  $3x^2 + 3x + 3$ .

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:  $(5a + 2a) + (-3 + 8) = 7a + 5$ . So the final answer is  $7a + 5$ .

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 minus:  $6x^2 - 3x + 1 - 2x^2 - x + 4$ . Combine:  $4x^2 - 4x + 5$ . So the final answer is  $4x^2 - 4x + 5$ .

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 minus:  $7a^2 - 5a - 3a^2 + 5a - 2$ . The  $a$ -terms cancel:  $4a^2 - 2$ . So the final answer is  $4a^2 - 2$ .

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 Add like terms:  $(4y^3 + y^3) + (y - 3y) + (-6 + 9) = 5y^3 - 2y + 3$ . So the final answer is  $5y^3 - 2y + 3$ .

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 Subtracting a polynomial from itself leaves nothing:  $0$ . So the final answer is  $0$ .

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 Combine like terms:  $(x^2 + 2x^2) + (3xy - xy) + y^2 = 3x^2 + 2xy + y^2$ . So the final answer is  $3x^2 + 2xy + y^2$ .

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 Distribute the minus:  $9p - 4 - 3p - 6$ . Combine:  $6p - 10$ . So the final answer is  $6p - 10$ .

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 Add the  $x^2$  terms and the constants:  $5x^2 + 3$ . So the final answer is  $5x^2 + 3$ .

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 minus:  $10x - 7 - 4x + 3 = 6x - 4$ . So the final answer is  $6x - 4$ .

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 The  $a$ -terms and constants cancel, leaving  $a^2 + a^2 = 2a^2$ . So the final answer is  $2a^2$ .

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 minus:  $5x^2 - x - 2x^2 + 3x - 4$ . Combine:  $3x^2 + 2x - 4$ . So the final answer is  $3x^2 + 2x - 4$ .

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 Add the like terms:  $(2x + x) + (3 + 5) = 3x + 8$ . So the final answer is  $3x + 8$ .

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 Inside:  $(3x + 1) + (x + 2) = 4x + 3$ . Then  $2(4x + 3) = 8x + 6$ . So the final answer is  $8x + 6$ .

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 Distribute the minus:  $5x^2 + 20x - 2x^2 - 8x - 10$ . Combine:  $3x^2 + 12x - 10$ . So the final answer is  $3x^2 + 12x - 10$ .

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 Combine like terms:  $(x^2 + 3x^2) + (x - 4x) + 2 = 4x^2 - 3x + 2$ . So the final answer is  $4x^2 - 3x + 2$ .



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