

# Simplifying Polynomials

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Score: \_\_\_\_\_ / 24

## Q Quick Review

To **simplify** a polynomial, combine *like terms* — terms with the *same variable raised to the same exponent*. So  $3x^2$  and  $5x^2$  are like (both  $x^2$ );  $3x^2$  and  $5x$  are not. When you combine, you add the coefficients and keep the variable factor untouched:  $3x^2 + 5x^2 = 8x^2$ , not  $8x^4$ .

When a minus sign sits outside parentheses, **distribute it** to every term inside. The classic trap:  $-(x^2 + 4x - 5) = -x^2 - 4x + 5$ , *not*  $-x^2 + 4x - 5$ . The negative flips each sign, including the constants. Write it out explicitly before combining — saves heartache later.

When a coefficient sits outside parentheses, distribute that coefficient to every term, then combine. So  $2(x^2 - 3x + 1) = 2x^2 - 6x + 2$ , hitting each piece. After distributing, group and combine like terms by degree and write the result in **standard form** (descending exponents).

**Watch for:** constants are always like terms with each other (sign doesn't matter — 7 and  $-3$  are like terms). Coefficients combine; exponents do not change. Multivariable terms like  $3xy$  are like with  $-5xy$  but not with  $3x$  or  $3y$ .

## PRACTICE

Simplify each expression and write the result in standard form.

1.  $5x + 3x - 2$  \_\_\_\_\_
2.  $-(2x - 5) + 3x$  \_\_\_\_\_
3.  $4x^2 - 3x + 5 - 2x^2 + x - 7$  \_\_\_\_\_
4.  $2(x^2 - 3x + 1) - (x^2 + 4x - 5)$  \_\_\_\_\_
5.  $3xy + 2x - 5xy + 4 - x$  \_\_\_\_\_
6.  $3x(x^2 - 2) - x(2x - 5)$  \_\_\_\_\_
7.  $4(2x^3 - x + 1) - 2x(x^2 - 3) + 5$  \_\_\_\_\_
8.  $2(3x^2 - x + 4) - (x^2 - 5x - 6)$  \_\_\_\_\_
9.  $x^2 + 5x + 3 - 2(x^2 - x + 1)$  \_\_\_\_\_
10.  $(7x^2 - 4) - (3x^2 + x - 9)$  \_\_\_\_\_
11.  $5x^3 + 2x - x^3 + 4 - 3x + x^3$  \_\_\_\_\_
12.  $a(a - 3) + 2(a^2 - a + 1)$  \_\_\_\_\_
13.  $3(2x - 1) - 2(x + 4) + 5$  \_\_\_\_\_
14.  $x^2y - 2xy^2 + 3x^2y + xy^2$  \_\_\_\_\_
15.  $-(x^3 - 2x^2 + x) - (2x^3 + x^2 - 3x)$  \_\_\_\_\_
16.  $4y^2 - (y^2 - 2y + 3) + y$  \_\_\_\_\_
17. Simplify  $P(x) = 4x^2 - 3x + 7 + 2x^2 + 5x - 9$ . The table gives  $P(x)$  at several inputs — use the pattern to also find  $P(3)$ . \_\_\_\_\_

$x$	$-1$	$0$	$1$	$2$
$P(x)$	$2$	$-2$	$6$	$26$

18. Coefficient of  $x$  in  $3(x^2 + ax - 2) - (2x^2 - 5x + 4)$  is 11. Find  $a$ . \_\_\_\_\_



19. The table breaks two terms into their variable and exponent. Are  $5x$  and  $5x^2$  like terms? \_\_\_\_\_

Term	Variable	Exponent
$5x$	$x$	1
$5x^2$	$x$	2

20. Simplify  $S(x) = -2(3x - 4) + 5(x - 1) - 3$ . The table shows  $S(x)$  for a few inputs; use it to predict  $S(3)$ . \_\_\_\_\_

$x$	-2	-1	0	1	2
$S(x)$	2	1	0	-1	-2

### ◆ Word Problems

21. A rectangle's length is  $(3x + 5)$  feet and its width is  $(2x - 1)$  feet. Write a simplified expression for the perimeter. \_\_\_\_\_

22. A school's expected ticket revenue is  $R(x) = 12x^2 + 8x + 150$  and its expected costs are  $C(x) = 5x^2 + 11x + 90$ . Write a simplified expression for the expected profit  $R(x) - C(x)$ . \_\_\_\_\_

23. Three friends combine their savings. Aria has  $(2x + 5)$  dollars, Ben has  $(3x - 2)$  dollars, and Cara has  $(x + 7)$  dollars. Write a simplified expression for their total, then evaluate it when  $x = 10$ . \_\_\_\_\_

24. A cost function is  $C(x) = 3(x^2 + 2x - 1) + 2(x^2 - x + 4)$ . Write  $C(x)$  in simplified standard form. \_\_\_\_\_



## Answer Keys

- |                      |   |
|----------------------|---|
| 1. $8x - 2$          | 13. $4x - 6$                              |
| 2. $x + 5$           | 14. $4x^2y - xy^2$                        |
| 3. $2x^2 - 2x - 2$   | 15. $-3x^3 + x^2 + 2x$                    |
| 4. $x^2 - 10x + 7$   | 16. $3y^2 + 3y - 3$                       |
| 5. $-2xy + x + 4$    | 17. $6x^2 + 2x - 2, P(3) = 58$            |
| 6. $3x^3 - 2x^2 - x$ | 18. $a = 2$                               |
| 7. $6x^3 + 2x + 9$   | 19. no — different exponents on $x$       |
| 8. $5x^2 + 3x + 14$  | 20. $-x, S(3) = -3$                       |
| 9. $-x^2 + 7x + 1$   | 21. $10x + 8$ feet                        |
| 10. $4x^2 - x + 5$   | 22. $P(x) = 7x^2 - 3x + 60$               |
| 11. $5x^3 - x + 4$   | 23. $6x + 10$ dollars; \$70 when $x = 10$ |
| 12. $3a^2 - 5a + 2$  | 24. $C(x) = 5x^2 + 4x + 5$                |

## Step-by-Step Explanations

- Combine the  $x$ -terms:  $5x + 3x = 8x$ . The constant  $-2$  has no partner and stays as is.
- Distribute the leading minus:  $-(2x-5) = -2x+5$ . Then  $-2x+5+3x = x+5$ . The minus flips both signs inside, so the  $-5$  becomes  $+5$ .
- Group like terms by degree and add the coefficients:  $x^2$  terms  $4 - 2 = 2$ ,  $x$  terms  $-3 + 1 = -2$ , constants  $5 - 7 = -2$ . That gives  $2x^2 - 2x - 2$ .
- Distribute first:  $2(x^2 - 3x + 1) = 2x^2 - 6x + 2$  and  $-(x^2 + 4x - 5) = -x^2 - 4x + 5$ . Combine:  $(2 - 1)x^2 + (-6 - 4)x + (2 + 5) = x^2 - 10x + 7$ .
- A careful way to see it:  $xy$  terms combine:  $3xy - 5xy = -2xy$ .  $x$  terms combine:  $2x - x = x$ . Constant:  $4$ . Note  $xy$  and  $x$  are not like terms — different variable factors. That gives a quick check on the answer.
- Distribute each monomial:  $3x(x^2 - 2) = 3x^3 - 6x$  and  $-x(2x - 5) = -2x^2 + 5x$ . Combine:  $3x^3 - 2x^2 + (-6 + 5)x = 3x^3 - 2x^2 - x$ . The negative in front of  $x(2x - 5)$  flips both inner signs.
- One steady path is:  $4(2x^3 - x + 1) = 8x^3 - 4x + 4$ .  $-2x(x^2 - 3) = -2x^3 + 6x$ . Add the  $+5$ . Combine:  $(8 - 2)x^3 + (-4 + 6)x + (4 + 5) = 6x^3 + 2x + 9$ . That gives a quick check on the answer.
- Distribute:  $2(3x^2 - x + 4) = 6x^2 - 2x + 8$ , and  $-(x^2 - 5x - 6) = -x^2 + 5x + 6$ . Combine:  $5x^2 + 3x + 14$ . Three minus-sign flips in the second piece; write them out.
- A careful way to see it:  $-2(x^2 - x + 1) = -2x^2 + 2x - 2$ . Combine:  $(1 - 2)x^2 + (5 + 2)x + (3 - 2) = -x^2 + 7x + 1$ . That gives a quick check on the answer.
- Distribute the minus:  $-(3x^2 + x - 9) = -3x^2 - x + 9$ . Combine:  $(7 - 3)x^2 - x + (-4 + 9) = 4x^2 - x + 5$ .
- One steady path is: Cubes:  $5x^3 - x^3 + x^3 = 5x^3$ . Linear:  $2x - 3x = -x$ . Constant:  $4$ . Final:  $5x^3 - x + 4$ . That gives a quick check on the answer.
- Distribute:  $a(a - 3) = a^2 - 3a$  and  $2(a^2 - a + 1) = 2a^2 - 2a + 2$ . Combine:  $(1 + 2)a^2 + (-3 - 2)a + 2 = 3a^2 - 5a + 2$ .
- A careful way to see it:  $3(2x - 1) = 6x - 3$ ,  $-2(x + 4) = -2x - 8$ . Combine with the  $+5$ :  $(6 - 2)x + (-3 - 8 + 5) = 4x - 6$ . That gives a quick check on the answer.
- Match the multivariable signatures.  $x^2y$  terms:  $x^2y + 3x^2y = 4x^2y$ .  $xy^2$  terms:  $-2xy^2 + xy^2 = -xy^2$ . These are different multivariable monomials — they don't combine with each other.
- Both groups carry a leading minus, so flip every sign:  $-x^3 + 2x^2 - x$  and  $-2x^3 - x^2 + 3x$ . Combine:  $(-1 - 2)x^3 + (2 - 1)x^2 + (-1 + 3)x = -3x^3 + x^2 + 2x$ .
- Start with the key idea:  $-(y^2 - 2y + 3) = -y^2 + 2y - 3$ . Combine:  $(4 - 1)y^2 + (2 + 1)y - 3 = 3y^2 + 3y - 3$ . That gives a quick check on the answer.
- Combine like terms:  $(4 + 2)x^2 + (-3 + 5)x + (7 - 9) = 6x^2 + 2x - 2$ . That matches the table (for instance  $P(2) = 24 + 4 - 2 = 26$ ). Then  $P(3) = 54 + 6 - 2 = 58$ .
- Distribute:  $3(x^2 + ax - 2) = 3x^2 + 3ax - 6$  and  $-(2x^2 - 5x + 4) = -2x^2 + 5x - 4$ . Combine the linear pieces:  $3ax + 5x = (3a + 5)x$ . Set  $3a + 5 = 11$  to get  $a = 2$ .
- Like terms need matching variables *and* matching exponents. The table shows the same variable  $x$  but exponents 1 and 2, so they don't combine.
- Start with the key idea:  $-2(3x - 4) = -6x + 8$  and  $5(x - 1) = 5x - 5$ . With the  $-3$ :  $(-6 + 5)x + (8 - 5 - 3) = -x$ . The constants cancel, leaving the tidy line in the table, so  $S(3) = -3$ . That gives a quick check on the answer.
- Perimeter is  $2(\text{length}) + 2(\text{width}) = 2(3x + 5) + 2(2x - 1)$ . Distribute:  $6x + 10 + 4x - 2$ . Combine:  $10x + 8$ . (The width restriction  $x > 1/2$  keeps the width positive, but that doesn't change the simplification.)
- Subtract term by term, distributing the minus across every term in  $C$ :  $R - C = 12x^2 + 8x + 150 - 5x^2 - 11x - 90$ . Group:  $(12 - 5)x^2 + (8 - 11)x + (150 - 90) = 7x^2 - 3x + 60$ . A student who adds rather than subtracts gets a wrong answer — profit is *revenue minus cost*.
- Add:  $(2x + 5) + (3x - 2) + (x + 7) = (2 + 3 + 1)x + (5 - 2 + 7) = 6x + 10$ . At  $x = 10$ :  $6(10) + 10 = \$70$ . (The problem's answer should be a positive number of dollars — \$70 is a clean, physically sensible total.)
- Distribute each coefficient:  $3(x^2 + 2x - 1) = 3x^2 + 6x - 3$  and  $2(x^2 - x + 4) = 2x^2 - 2x + 8$ . Combine like terms:  $(3 + 2)x^2 + (6 - 2)x + (-3 + 8) = 5x^2 + 4x + 5$ . Standard form has descending exponents, which is exactly what we get.



## Build Algebra Confidence From Pre-Algebra Through Algebra II



### The Complete Algebra Success Bundle

Pre-Algebra, Algebra I, and Algebra II in one clear path

Friendly lessons, focused practice, and full-review support for every stage.



Scan for the Bundle

6 Books  
3 Courses  
1 Path

**Bundle Value:** Six coordinated books help students review missing skills, learn new algebra topics, and practice until the steps feel natural.

#### Complete Course Path

- ✓ Starts with Pre-Algebra foundations
- ✓ Moves smoothly into Algebra I skills
- ✓ Extends learning through Algebra II topics
- ✓ Great for review, tutoring, and summer study

One bundle, one steady path.

#### Step-by-Step Lessons

- ✓ Plain-English explanations students can follow
- ✓ Worked examples that show every important step
- ✓ Common mistakes called out before they stick
- ✓ Skill-building practice after each lesson
- ✓ Helpful for independent study or class support

Less guessing. More understanding.

#### Practice That Sticks

- ✓ Matching practice workbooks for extra repetition
- ✓ Review sets to keep older skills fresh
- ✓ Answer explanations for checking thinking
- ✓ Strong support before tests and final exams
- ✓ Designed to build fluency and confidence

Practice today. Remember tomorrow.

### STUDENT FAVORITE • Master Algebra II From the Ground Up



- ✓ 100% Guaranteed
- ✓ Lifetime Support
- ✓ Trusted by Teachers

Start Your Algebra Journey Today! →

### Algebra II for Beginners

Written by a top math teacher & aligned with national and state Algebra II courses. From polynomial functions to logarithms, trigonometry, and rational expressions — explained the easy way.

- ✓ **Complete coverage** of every Algebra II concept — perfect companion to these worksheets
- ✓ **Step-by-step explanations** with worked examples on every topic
- ✓ **QR codes in every chapter** for free video lessons & bonus practice
- ✓ **2 full-length practice tests** with detailed answer keys

★ STUDENT'S #1 CHOICE ★

Teacher-recommended • 12,000+ Happy Students

PDF EDITION



Instant download • any device

PAPERBACK



Paperback on Amazon

Hold it in your hands

Pair these free worksheets with *Algebra II for Beginners* and you have a complete self-paced course — concept lessons, daily practice, and full exam-style reviews, all in one path. → [EffortlessMath.com/product/algebra-ii-for-beginners](https://EffortlessMath.com/product/algebra-ii-for-beginners)