

8-1 Study Guide and Intervention *(continued)*

Adding and Subtracting Polynomials

Add and Subtract Polynomials To add polynomials, you can group like terms horizontally or write them in column form, aligning like terms vertically. **Like terms** are monomial terms that are either identical or differ only in their coefficients, such as $3p$ and $-5p$ or $2x^2y$ and $8x^2y$.

You can subtract a polynomial by adding its additive inverse. To find the additive inverse of a polynomial, replace each term with by adding its additive inverse. To find the additive inverse of a polynomial, replace each term with its additive inverse or opposite.

Example

Find $(3x^2 + 2x - 6) - (2x + x^2 + 3)$.

Horizontal Method

Use additive inverses to rewrite as addition.
Then group like terms.

$$\begin{aligned} (3x^2 + 2x - 6) - (2x + x^2 + 3) \\ &= (3x^2 + 2x - 6) + [(-2x) + (-x^2) + (-3)] \\ &= [3x^2 + (-x^2)] + [2x + (-2x)] + [-6 + (-3)] \\ &= 2x^2 + (-9) \\ &= 2x^2 - 9 \end{aligned}$$

The difference is $2x^2 - 9$.

Vertical Method

Align like terms in columns and subtract by adding the additive inverse.

$$\begin{array}{r} 3x^2 + 2x - 6 \\ (-) \quad x^2 + 2x + 3 \\ \hline 3x^2 + 2x - 6 \\ (+) -x^2 - 2x - 3 \\ \hline 2x^2 \qquad - 9 \end{array}$$

The difference is $2x^2 - 9$.

Exercises

Find each sum or difference.

- $(4a - 5) + (3a + 6)$
- $(6x + 9) + (4x^2 - 7)$
- $(6xy + 2y + 6x) + (4xy - x)$
- $(x^2 + y^2) + (-x^2 + y^2)$
- $(3p^2 - 2p + 3) + (p^2 - 7p + 7)$
- $(2x^2 + 5xy + 4y^2) + (-xy - 6x^2 + 2y^2)$
- $(8p - 5r) - (-6p^2 + 6r - 3)$
- $(8x^2 - 4x - 3) - (-2x - x^2 + 5)$
- $(3x^2 - 2x) - (3x^2 + 5x - 1)$
- $(4x^2 + 6xy + 2y^2) - (-x^2 + 2xy - 5y^2)$
- $(2h - 6j - 2k) - (-7h - 5j - 4k)$
- $(9xy^2 + 5xy) - (-2xy - 8xy^2)$

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Adding and Subtracting Polynomials

Polynomials in Standard Form A **polynomial** is a monomial or a sum of monomials. A **binomial** is the sum of two monomials, and a **trinomial** is the sum of three monomials. Polynomials with more than three terms have no special name. The **degree** of a monomial is the sum of the exponents of all its variables. The **degree of the polynomial** is the same as the degree of the monomial term with the highest degree.

The terms of a polynomial are usually arranged so that the terms are in order from greatest degree to least degree. This is called the **standard form of a polynomial**.

Example Determine whether each expression is a polynomial. If so, identify the polynomial as a *monomial*, *binomial*, or *trinomial*. Then find the degree of the polynomial.

Expression	Polynomial?	Monomial, Binomial, or Trinomial?	Degree of the Polynomial
$3x - 7xyz$	Yes. $3x - 7xyz = 3x + (-7xyz)$, which is the sum of two monomials	binomial	3
-25	Yes. -25 is a real number.	monomial	0
$7n^3 + 3n^{-4}$	No. $3n^{-4} = \frac{3}{n^4}$, which is not a monomial	none of these	—
$9x^3 + 4x + x + 4 + 2x$	Yes. The expression simplifies to $9x^3 + 7x + 4$, which is the sum of three monomials	trinomial	3

Lesson 8-1

Exercises

Determine whether each expression is a polynomial. If it is a polynomial, find the degree and determine whether it is a *monomial*, *binomial*, or *trinomial*.

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|------------------------------|------------------------|
| 1. 36 | 2. $\frac{3}{q^2} + 5$ |
| 3. $7x - x + 5$ | 4. $8g^2h - 7gh + 2$ |
| 5. $\frac{1}{4y^2} + 5y - 8$ | 6. $6x + x^2$ |

Write each polynomial in standard form. Identify the leading coefficient.

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|----------------------|----------------------------|----------------------------|
| 7. $x^3 + x^5 - x^2$ | 8. $x^4 + 4x^3 - 7x^5 + 1$ | 9. $-3x^6 - x^5 + 2x^8$ |
| 10. $2x^7 - x^8$ | 11. $3x + 5x^4 - 2 - x^2$ | 12. $-2x^4 + x - 4x^5 + 3$ |