Skill Check

$125^{2/3}$

Chapter 7-1
Adding and Subtracting Polynomials:

Vocabulary:

Monomial: number, a variable, or the product of a number and one or more variable with whole number exponents.

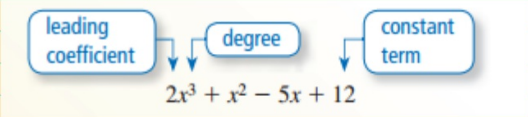
polynomials: is a monomial or a sum of monomials. Each monomial is called a term.

binomial: a polynomial with two terms

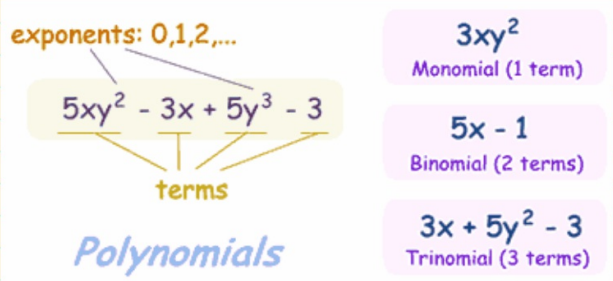
trinomial: a polynomial with 3 terms

standard form: A polynomial in one variable

leading coefficient: When you write a polynomial in standard form, the coefficient of the first term



Examples:



Example 1
Find the Degrees of Monomials:

Find the degree of each monomial.

a. $5x^2$ **b.** $-\frac{1}{2}xy^3$ **c.** $8x^3y^3$ **d.** -3

SOLUTION

a. The exponent of x is 2.

▶ So, the degree of the monomial is 2.

b. The exponent of x is 1, and the exponent of y is 3.

▶ So, the degree of the monomial is $1 + 3$, or 4.

c. The exponent of x is 3, and the exponent of y is 3.

▶ So, the degree of the monomial is $3 + 3$, or 6.

d. You can rewrite -3 as $-3x^0$.

▶ So, the degree of the monomial is 0.

Find the degree of the monomial.

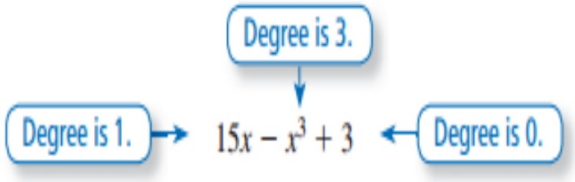
1. $-3x^4$ **2.** $7c^3d^2$ **3.** $\frac{5}{3}y$ **4.** -20.5

1. 4
2. 5
3. 1
4. 0

Example 2: Writing a Polynomial in Standard Form

Write $15x - x^3 + 3$ in standard form. Identify the degree and leading coefficient of the polynomial.

Consider the degree of each term of the polynomial.



You can write the polynomial in standard form as $-x^3 + 15x + 3$. The greatest degree is 3, so the degree of the polynomial is 3, and the leading coefficient is -1.

Example 3:
Classify Polynomials:

Write each polynomial in standard form. Identify the degree and classify each polynomial by the number of terms.

a. $-3z^4$ **b.** $4 + 5x^2 - x$ **c.** $8q + q^5$

SOLUTION

Polynomial	Standard Form	Degree	Type of Polynomial
a. $-3z^4$	$-3z^4$	4	monomial
b. $4 + 5x^2 - x$	$5x^2 - x + 4$	2	trinomial
c. $8q + q^5$	$q^5 + 8q$	5	binomial

Write the polynomial in standard form. Identify the degree and leading coefficient of the polynomial. Then classify the polynomial by the number of terms.

5. $4 - 9z$ **6.** $t^2 - t^3 - 10t$ **7.** $2.8x + x^3$

5. $-9z + 4$; 1; -9; binomial

6. $-t^3 + t^2 - 10t$; 3; -1; trinomial

7. $x^3 + 2.8x$; 3; 1; binomial

Example 4: Adding polynomials:

2 ways

a. $(2x^3 - 5x^2 + x) + (2x^2 + x^3 - 1)$

Vertical:

Horizontal:

Example 4: Adding polynomials:

2 ways

b. $(3x^2 + x - 6) + (x^2 + 4x + 10)$

Vertical:

Horizontal:

SOLUTION

a. Vertical format: Align like terms vertically and add.

$$\begin{array}{r} 2x^3 - 5x^2 + x \\ +\quad x^3 + 2x^2 \qquad - 1 \\ \hline 3x^3 - 3x^2 + x - 1 \end{array}$$

▶ The sum is $3x^3 - 3x^2 + x - 1$.

b. Horizontal format: Group like terms and simplify.

$$\begin{aligned} (3x^2 + x - 6) + (x^2 + 4x + 10) &= (3x^2 + x^2) + (x + 4x) + (-6 + 10) \\ &= 4x^2 + 5x + 4 \end{aligned}$$

▶ The sum is $4x^2 + 5x + 4$.

To subtract a polynomial, add its opposite. To find the opposite of a polynomial, multiply each of its terms by -1.

Example 5: Subtracting polynomials:

2 ways

Find the difference.

a. $(4n^2 + 5) - (-2n^2 + 2n - 4)$

Horizontal:

Vertical:

Example 5: Subtracting polynomials:

2 ways

b. $(4x^2 - 3x + 5) - (3x^2 - x - 8)$

Horizontal:

Vertical:

Find the difference.

a. $(4n^2 + 5) - (-2n^2 + 2n - 4)$ **b.** $(4x^2 - 3x + 5) - (3x^2 - x - 8)$

SOLUTION

a. Vertical format: Align like terms vertically and subtract.

$$\begin{array}{r} 4n^2 \quad +5 \\ -\,(-2n^2 + 2n - 4) \end{array} \Rightarrow \begin{array}{r} 4n^2 \quad +5 \\ +\,2n^2 - 2n + 4 \\ \hline 6n^2 - 2n + 9 \end{array}$$

▶ The difference is $6n^2 - 2n + 9$.

b. Horizontal format: Group like terms and simplify.

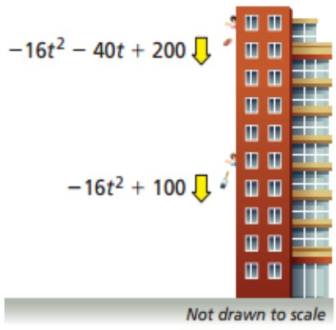
$$\begin{aligned} (4x^2 - 3x + 5) - (3x^2 - x - 8) &= 4x^2 - 3x + 5 - 3x^2 + x + 8 \\ &= (4x^2 - 3x^2) + (-3x + x) + (5 + 8) \\ &= x^2 - 2x + 13 \end{aligned}$$

▶ The difference is $x^2 - 2x + 13$.

Example 6 Word Problem:

EXAMPLE 6 **Solving a Real-Life Problem**

A penny is thrown straight down from a height of 200 feet. At the same time, a paintbrush is dropped from a height of 100 feet. The polynomials represent the heights (in feet) of the objects after t seconds.



a. Write a polynomial that represents the distance between the penny and the paintbrush after t seconds.

b. Interpret the coefficients of the polynomial in part (a).

SOLUTION

a. To find the distance between the objects after t seconds, subtract the polynomials.

$$\begin{array}{lll} \textbf{Penny} & -16t^2 - 40t + 200 & -16t^2 - 40t + 200 \\ \textbf{Paintbrush} & -(-16t^2 + 100) \quad \Rightarrow & +\ 16t^2 - 100 \\ & & -40t + 100 \end{array}$$

▶ The polynomial $-40t + 100$ represents the distance between the objects after t seconds.

b. When $t = 0$, the distance between the objects is $-40(0) + 100 = 100$ feet. So, the constant term 100 represents the distance between the penny and the paintbrush when both objects begin to fall.

As the value of t increases by 1, the value of $-40t + 100$ decreases by 40. This means that the objects become 40 feet closer to each other each second. So, -40 represents the amount that the distance between the objects changes each second.