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## 8-1 Adding and Subtracting Polynomials

## Vocabulary



A monomial is a number, variable, or product of a number and one or more variables.

A polynomial is a sum of one or more monomials.

Examples: Monomials

↖ one term

Binomials

↖ 2 terms

Trinomials

↖ 3 terms

Example 1: The Degree of a Monomial

The degree of a monomial is the sum of the exponents of its variables. If the term is just a non-zero constant, the degree is zero. Find the degree of each monomial.

a.  $4x^1$

degree 1

b.  $7x^2y^3$

degree 5

c.  $-3x^5y$

degree 6

d.  $6xp^7m^2$

deg 10

c.  $-4 = -4x^0$   
deg 0

✓ Understanding Check:

Find the degree of

a.  $-5xy^2$

b.  $3x^4y^2z$

c. 5

✓ Understanding Check:

Find the degree of

a.  $-5x^3y^2$

Degree = ⑤

b.  $3x^4y^2z^1$

Degree = ⑦

c.  $5^1$

Degree = 0

**Example 2: The Degree of a Polynomial**

The degree of a polynomial is the degree of the term in the polynomial with the highest degree.

Find the degree of each polynomial.

a.  $7p^4 + 6p^2$   
 $\text{deg } 4$   $\text{deg } 2$   
 $\text{deg} = 4$

b.  $4x^3y^2 + 6x^2y - 2xy$   
 $\text{deg } 5$

c.  $-5xy^2 - 2x^5y$   
 $\text{deg } 6$

**✓ Understanding Check:**

Find the degree of:

a.  $-4x^3w^5 - 6xw + 5w^7$   
 $\text{deg} = 7$

b.  $3x^4y^3z - 4x^5y^2z^2$   
 $\text{deg } 9$

**✓ Understanding Check:**

Find the degree of:

a.  $-4x^3w^5 - 6xw + 5w^7$   
 $\text{deg} = 8$

b.  $3x^4y^3z - 4x^5y^2z^2$   
 $\text{deg} = 9$

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**The polynomial can further be named by its degree.**

Polynomials with a degree of 1 are called linear.  
 Polynomials with a degree of 2 are called quadratic.  
 Polynomials with a degree of 3 are called cubic.  
 Polynomials with a degree of 4 are called 4th degree.  
 Polynomials with a degree of 5 are called 5th degree.  
 and so on.....

**Example 3: Classifying Polynomials**

Find the degree of each polynomial and name it based on the degree and number of terms.

- |                           |                  |                         |
|---------------------------|------------------|-------------------------|
| 1. $7x + 4$               | Degree: <u>1</u> | Name: <u>linear</u>     |
| 2. $3x^2 + 2x + 1$        | Degree: <u>2</u> | Name: <u>quadratic</u>  |
| 3. $4x^3$                 | Degree: <u>3</u> | Name: <u>cubic</u>      |
| 4. $4x^2 - 1$             | Degree: <u>2</u> | Name: <u>quadratic</u>  |
| 5. $7x^5 + 2x^3 - 4x + 1$ | Degree: <u>5</u> | Name: <u>5th degree</u> |

order the terms in decreasing degree

### Review: Standard Form of a Polynomial

Write each polynomial in standard form and then name it based on the degree and number of terms.

- |                   |                 |                    |
|-------------------|-----------------|--------------------|
| 1. $-9x + 6x^2$   | $6x^2 - 9x$     | quadratic binomial |
| 2. $3y - 4 - y^3$ | $-y^3 + 3y - 4$ | cubic trinomial    |
| 3. $7 - 11v$      | $-11v + 7$      | linear binomial    |

### ✓ Understanding Check:

- |                    |       |       |
|--------------------|-------|-------|
| a. $-8 + 4x^3$     | _____ | _____ |
| b. $7x - 3 - 2x^2$ | _____ | _____ |

### ✓ Understanding Check:

- |                    |                  |                     |
|--------------------|------------------|---------------------|
| a. $-8 + 4x^3$     | $4x^3 - 8$       | cubic binomial      |
| b. $7x - 3 - 2x^2$ | $-2x^2 + 7x - 3$ | quadratic trinomial |

Write in st. form

$$1) \quad 3x^1 + 7^0 = 3x + 7 \quad \text{linear binomial}$$

$$2) \quad 2x^1 - x^2 + x^3 - 2^0 = x^3 - x^2 + 2x - 2 \quad \text{cubic/4 terms}$$

**Review: Add or subtract the polynomials and name the answer**

Add the polynomials, then give the degree and name of the answer:

1.  $(4x^2 + 6x + 7) + (2x^2 - 9x + 1)$

$$6x^2 - 3x + 8$$

quadratic binomial

2.  $(2x^3 + 5x^2 - 3x) - (x^3 - 8x^2 + 11)$

$$2x^3 + 5x^2 - 3x - x^3 + 8x^2 - 11$$

$$x^3 + 13x^2 - 3x - 11$$

cubic w/ 4 terms

**✓ Understanding Check:**

Add the following polynomials and name them.

a.  $(12m^2 + 4) + (8m^2 + 5)$

b.  $(8d^4 - 9d) - (2d^4 + d) + (7d + 6)$

a.  $(12m^2 + 4) + (8m^2 + 5)$

$20m^2 + 9$

quadratic binomial

b.  $(8d^4 - 9d) - (2d^4 + d) + (7d + 6)$

$6d^4 - 3d + 6$

4<sup>th</sup> degree trinomial

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**Vocabulary and Skills Review Activity****Use the terms to the right to:**

1. Find a term with a coefficient of -5.  $-5x^6y^4$
2. Find a term with a coefficient of 7. \_\_\_\_\_
3. Find a term with a coefficient of 4. \_\_\_\_\_
4. Find a term with a coefficient of 1. \_\_\_\_\_
5. Find a term with a degree of 9. \_\_\_\_\_
6. Find a term with a degree of 7. \_\_\_\_\_
7. Find a term with a degree of 5. \_\_\_\_\_
8. Find another term with a degree of 5. \_\_\_\_\_
9. Find the term with the **highest** degree. \_\_\_\_\_

**Terms**

$4x^3y^4$	$2x^5y^3$	$7x^5y^3$
$6x^2y^3$	$9x^2y^4$	$x^3y^6$
$-5x^6y^4$	$-4x^2y^3$	$3x^2y^4$

\* You **may** use answers more than once.

10. Find the two terms with a degree of 6 that could be added together and add them.

$$\underline{\hspace{2cm}} + \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

11. Find the two terms with a degree of 8 that could be added together and add them.

$$\underline{\hspace{2cm}} + \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

12. Find a term with a coefficient of -4 and another with a coefficient of 6 and add them.

$$\underline{\hspace{2cm}} + \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

13. Find a term with a coefficient of 7 and another with a coefficient -4 and multiply them:

$$\underline{\hspace{2cm}} \cdot \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

14. Find a term with a coefficient of 1 and another with a coefficient 2 and multiply them:

$$\underline{\hspace{2cm}} \cdot \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

**Terms**

$4x^3y^4$	$2x^5y^3$	$7x^5y^3$
$6x^2y^3$	$9x^2y^4$	$x^3y^6$
$-5x^6y^4$	$-4x^2y^3$	$3x^2y^4$

\* You **may** use answers more than once.



Vocabulary and Skills Review ActivityUse the terms to the right to:Terms

1. Find a term with a coefficient of -5.  $-5x^6y^4$

2. Find a term with a coefficient of 7.  $7x^5y^3$

3. Find a term with a coefficient of 4.  $4x^3y^4$

4. Find a term with a coefficient of 1.  $x^3y^6$

5. Find a term with a degree of 9.  $x^3y^6$

6. Find a term with a degree of 7.  $4x^3y^4$

7. Find a term with a degree of 5.  $6x^2y^3$

8. Find another term with a degree of 5.  $-4x^2y^3$

9. Find the term with the highest degree.  $-5x^6y^4$

$4x^3y^4$

$2x^5y^3$

$7x^5y^3$

$6x^2y^3$

$9x^2y^4$

$x^3y^6$

$-5x^6y^4$

$-4x^2y^3$

$3x^2y^4$

\* Tell students that answers will be used more than once.

← These answers can be switched.

10. Find the two terms with a degree of 6 that could be added together and add them.

$9x^2y^4 + 3x^2y^4 = 12x^2y^4$

11. Find the two terms with a degree of 8 that could be added together and add them.

$2x^5y^3 + 7x^5y^3 = 9x^5y^3$

12. Find a term with a coefficient of -4 and another with a coefficient of 6 and add them.

$-4x^2y^3 + 6x^2y^3 = 2x^2y^3$

13. Find a term with a coefficient of 7 and another with a coefficient -4 and multiply them:

$7x^5y^3 \cdot -4x^2y^3 = -28x^7y^6$

14. Find a term with a coefficient of 1 and another with a coefficient 2 and multiply them:

$x^3y^6 \cdot 2x^5y^3 = 2x^8y^9$

GCF:

largest thing that  
divides <sup>evenly</sup> into all terms.

ex: 15, 20 : GCF = 5

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## 8-2 Multiplying and Factoring

You have used the Distributive Property before to multiply a number by a sum or difference. Now you will learn to use the Distributive Property for multiplying powers with the same base when multiplying by a monomial.

### Example 1: Multiplying a Monomial and a Trinomial

a. Simplify:  $-4y^2(5y^4 - 3y^2 + 2)$

Step 1: **Distribute**  
**(use the exponent rules)**

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b. Simplify:  $2x^2y(5x^2y^2 + 6x^3y - 2x + y)$

### ✓ Understanding Check:

**Simplify each product:**

a.  $3b(5b^2 + b + 6)$

b.  $-7h^3(3h^2 - 8h - 1)$

c.  $2xy(-3x^2y - 6xy + 5x + 1)$

✓ Understanding Check:

Simplify each product:

a.  $3b(5b^2 + b + 6)$   
 $15b^3 + 3b^2 + 18b$

b.  $-7h^3(3h^2 - 8h - 1)$   
 $-21h^5 + 56h^4 + 7h^3$

c.  $2xy(-3x^2y - 6xy + 5x + 1)$   
 $-6x^3y^2 - 12x^2y^2 + 10x^2y + 2xy$

**Homework (due Monday, 3/16):**

~~✗~~ - HW Page 75  
→ ~~○~~ HW Page 76

**Reminder:**

**Unit 7 Test is on Friday, 3/13**

Bring notebook to work on HW on Fri  
after test.