8-1: ADDING AND SUBTRACTING POLYNOMIALS

Lesson Objectives:

- *Classify polynomials*
- *Add and subtract polynomials*

1 Describing Polynomials

(term)

A **monomial** is an expression that is a number, a variable, or a product of a number and one or more variables.

$4,\ x,\ 5x,\ -3x^2y,\ 7x^3y^2z^4$

The **degree of a monomial** is the sum of the exponents of its variables. For a nonzero constant, the degree is 0. Zero has no degree.

EXAMPLE 1: DEGREE OF A MONOMIAL

Find the degree of each monomial.

1. $3xy^3$ — 4
2. 18 — 0
3. $5m$ — 1
4. $4x^5$ — 5

EXAMPLE 2: CLASSIFYING POLYNOMIALS

A **polynomial** is a monomial or the sum or difference of two or more monomials.

4 2 1 0

$3x^4 + 5x^2 - 7x + 1$

The polynomial shown above is in standard form. **Standard form of a polynomial** means that the degrees of its monomial terms decrease from left to right.

The **degree of a polynomial** in one variable is the same as the degree of the monomial with the greatest exponent. The degree of $3x^4 + 5x^2 - 7x + 1$ is 4.

After you simplify a polynomial by combining like terms, you can name the polynomial based on its degree of the number of monomials it contains.

Polynomial	Degree	Name Using Degree	Number of Terms	Name Using Number of Terms
5	0	constant	1	monomial
$7x + 4$	1	linear	2	binomial
$3x^2 + 2x + 1$	2	quadratic	3	trinomial
$4x^3$	3	cubic	1	monomial
$9x^4 + 11x$	4	4th degree	2	binomial
$3x^4 + 5x^2 - 7x + 1$	4	4th degree	4	polynomial of 4 terms

• simplified
• decreasing degree L to R

Write each polynomial in standard form. Then name each polynomial by its degree and the number of its terms.

5. $-2+7x$

$7x-2$

linear binomial

6. $3x^5-2-2x^5+7x$

x^5+7x-2

5th degree trinomial

7. $6x^2+7-9x^4$

$-9x^4+6x^2+7$

4th degree trinomial

8. $3y-4-y^3$

$-y^3+3y-4$

cubic trinomial

9. $8+7v-11v$

$-4v+8$

linear binomial

2 Adding and Subtracting Polynomials

EXAMPLE 3: ADDING POLYNOMIALS

Simplify.

10. $(6x^2+3x+7)+(2x^2-6x-4)$

$8x^2-3x+3$

quadratic trinomial

11. $(12m^2+4)+(8m^2+5)$

$20m^2+9$

quadratic binomial

12. $(t^2-6)+(3t^2+11)$

$4t^2+5$

quadratic binomial

13. $(9w^3+8w^2)+(7w^3+4)$

$16w^3+8w^2+4$

cubic trinomial

14. $(2p^3-6p^2+10p)+(-9p^3-11p^2+3p)$

$-7p^3-17p^2+13p$

cubic trinomial

EXAMPLE 4: SUBTRACTING POLYNOMIALS

Simplify.

15. $(2x^3+4x^2+6)-(5x^3+2x-2)$

$2x^3+4x^2+6+(-5x^3)-2x+2$

$-3x^3+4x^2-2x+8$

cubic polynomial of 4 terms

16. $(v^3+6v^2-v)-(9v^3-7v^2+3v)$

$v^3+6v^2-v+(-9v^3)+7v^2-3v$

$-8v^3+13v^2-4v$

cubic trinomial

17. $(30d^3 - 29d^2 - 3d) - (2d^3 + d^2)$

$30d^3 - 29d^2 - 3d + (-2d^3) - d^2$

$28d^3 - 30d^2 - 3d$

cubic trinomial

18. $(y^3 + 3y - 1) - (y^3 + 3y + 5)$

$y^3 + 3y - 1 + (-y^3) - 3y - 5$

-6

constant

19. $(4x^2 + 5x + 1) - (6x^2 + x + 8)$

20. $(3x + x^2 - x^3) - (x^3 + 2x^2 + 5x)$

21. $(2x^2 + 3 - x) - (2 + 2x^2 - 5x)$

$2x^2 + 3 - x + (-2) - 2x^2 + 5x$

$4x + 1$

linear binomial

22. $(5x^4 - 3x^3 + 2x^2 + x - 1) - (3x^4 - 3x^3 - 2x^2 + 3x + 7)$

23. $(2x + 3) - (x - 4) + (x + 2)$

$2x + 3 + (-x) + 4 + x + 2$

$2x + 9$

linear binomial

24. $(x^2 + 4) - (x - 4) + (x^2 - 2x)$

$x^2 + 4 + (-x) + 4 + x^2 - 2x$

$2x^2 - 3x + 8$

quadratic trinomial

Due FRI.

Name _____ ***8-1 Practice Worksheet*** Period _____

Find the degree of each monomial.

1. $6y^2w^8$ 2. $7c^3$ 3. 6 4. $8ab^3$

Name each polynomial based on its degree and number of terms.

5. $5x^2-2x+3$ 6. $7a^3+4a-12$ 7. $\frac{3}{x}+5$ 8. w^2+2

Write each polynomial in standard form. Then name each polynomial based on its degree and number of terms.

9. $4x-3x^2$ 10. c^2-2+4c 11. $9z^2-11z^2+5z-5$ 12. $-10+4q^2-8q+3q^2$

Simplify.

13. $(w^2+w-4)+(7w^2-4w+8)$ 14. $(g^4+4g)+(9g^4+7g)$ 15. $(7y^3-3y^2+4y)+(8y^4+3y^2)$

16. $(7h^2+4h-8)-(3h^2-2h+10)$ 17. $(24x^5+12x)-(x^3+8x^2-x)$ 18. $(-5x^4+x^2)-(-x^3+8x^2-x)$

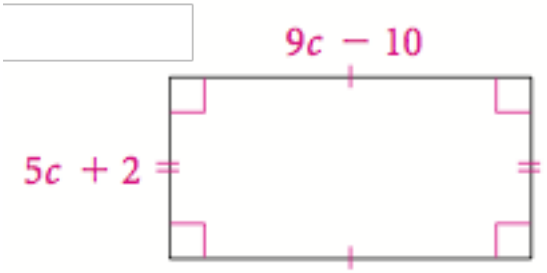
19. $(2x^3-5x^2-1)-(8x^3+3-8x^2)$ 20. $(7a^3-a+3a^2)+(8a^2-3a-4)$ 21. $(6g-7g^8)-(4g+2g^3+11g^2)$

22. $(-4t^4-9t+6)+(13t+5t^4)$ 23. $(11+k^3-6k^4)-(k^2-k^4)$ 24. $(ab^2+ba^3)+(4a^3b-ab^2-5ab)$

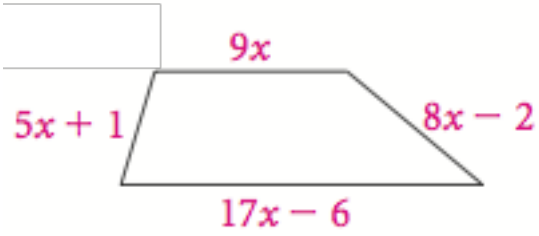
25. $(9pq^6-11p^4q)-(-5pq^6+p^4q^4)$

Find an expression for the perimeter of each figure.

26.

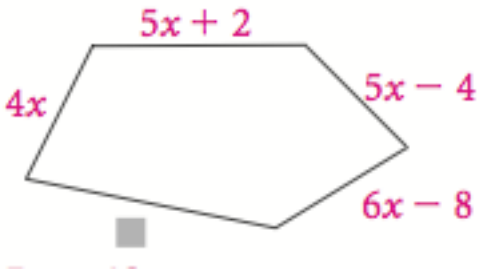


27.

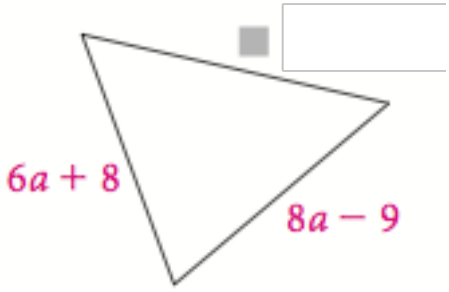


Find an expression for each missing length.

28. Perimeter = 25x + 8



29. Perimeter = 23a – 7



30. You can model the number of men and women in the United States who enrolled in college within a year of graduating from high school with the linear equations shown below. Let t equal the year of enrollment, with $t = 0$ corresponding to 1990. Let $m(t)$ equal the number of men in thousands, and let $w(t)$ equal the number of women in thousands.

$m(t) = 35.4t + 1146.8$	men enrolled in college
$w(t) = 21.6t + 1185.5$	women enrolled in college

a) Add the expressions on the right side of each equation to model the total number of recent high school graduates $p(t)$ who enrolled in college between 1990 and 1998.

b) Use the equation you created in part a) to find the number of high school graduates who enrolled in college in 1995.

c) If you had subtracted the expression on the right side of each equation above, what information would the resulting expression model?