Equivalent Expressions

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Mathematics 9
Polynomials
Equivalent Expressions

A. Definitions

1. **algebraic order:** terms in an algebra expression written in alphabetical order. Terms with higher exponents are written ahead of terms with lower exponents. The constant is always written last.

   $5x + 2y$, $x^2 + 3x + 2y^2 + 5y$, $2m^2 - 3n + 7$

2. **variable:** a letter that represents an unknown number.

   $x, y, a, b, c, m, n \ldots$ ← lower case.

3. **coefficient:** a number that comes before a variable and that multiplies the variable.

   $5x$, $-3y$

4. **exponent:** the small raised number that determines how many times the base is multiplied by itself.

   $5x^3$

5. **like terms:** terms which have the same variable(s) and exponent combinations.

   $5x$ & $-3x$, $7a^2b$ & $-a^2b$, $4m^2np^3$ & $-8m^2np^3$

B. Examples

1. For each of the following identify the coefficients, variables and exponents.

a) $3c^4$
- 3 – coefficient
- c – variable.
- 4 – exponent.

b) $-xy^2$
- −1 - coefficient
- x, y – variables
- 1, 2 – exponent.

c) $7s^2t^3u$
- 7 – coefficient
- s, t, u – variables
- 1, 2, 3 – exponents.

2. Identify the like terms.

a) $5b^2$ $3bc$ $3cb$ $-2b$ $7c$ $6b$ $-8bc$

b) 11 $4ab^2$ -3 $5a^2b$ $7ab$ 3.1

3. Combine the like terms in each expression.

a) $4x - 2x + 3 - 6$

$2x - 3$

b) $2x^2 + 3x - 1 + x^2 - 4x - 5$

$3x^2 - x - 6$

c) $4 - 2yx + 5x^2 + 2xy - 2x^2$

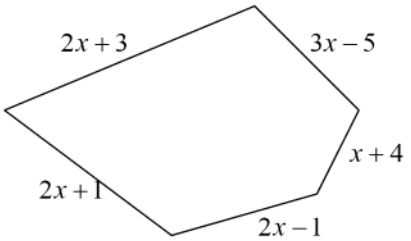
$-2xy$

$3x^2 + 4$

4. Write an expression for the perimeter of the following figure. Then combine the like terms.

distance around outside.

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



$10x + 2$

5. A rental car company charges customers a flat rate of $50 plus $3 for each day the car is rented.

a) Write an algebra expression to represent the cost to a customer renting for d days.

d = days.

$50 + 3d$

$3d + 50$

b) How much would it cost to rent a car for 8 days?

$3d + 50$

$3(8) + 50$

$24 + 50$

$= \$74$

c) How much would it cost to rent a car for 15 days?

$3d + 50$

$3(15) + 50$

$45 + 50$

$= \$95$

Assignment: 5.2 Equivalent Expressions Assignment

5.2 Equivalent Expressions

***MathLinks 9*, pages 183–189**

Key Ideas Review

1. Complete the following statements.

   a) In the monomial $6ab$, the variables are _____ and _____.

   b) In the monomial $-7wx^2$, the coefficient is _____. The variables are w and x.

   The exponent for w is _____ and the exponent of x is _____.

   c) For the monomial 18, is there a coefficient or variable? YES NO

2. In the three *like* terms below, circle what is *alike* among them. Then, combine the terms.

   $3x^2$ $-4x^2$ $-x^2$ Combined term: _____

3. Are the terms below like terms? YES NO Explain.

   $5x$ $5x^2$ $5y$

Check Your Understanding

4. For each of the following, state the value of the coefficient. Then, state the number of variables for each term.

   a) y b) $-3b^2$

   c) $6st$ d) -15

   e) $-dh$ f) bc

5. Use the following monomial expressions to answer the questions below.

   $-cd$ $9r$ $4x$ k^2 $-xy$ $-3jk$

   a) Which have a coefficient of -1?

   b) Which have two variables?

   c) Which have a coefficient of 1?

   d) Which have only one variable, with an exponent of 1?

6. Circle the like terms in each group.

a) 14 $3r$ $-r^2$ $-r$ $3s$

b) $-4y$ $8xy$ $2x$ $0.3y$ $\frac{y}{2}$

c) $12c$ cd $1.2d$ $6cd$ cd^2

7. Rearrange the polynomial by grouping like terms.

a) $9 - 5c - 8 + 5c^2 + c - c^2$

b) $8m - 9 + 2m^2 + 6 + 3m^2 - 6m$

c) $-5d^2 + 3d - 2 + 6d^2 - 8d + 7$

8. Rearrange each polynomial by grouping like terms. Then, simplify by adding or subtracting.

a) $-b^2 + 6 + 5b^2 - 8 + 9$

b) $7t + 14 + 6t - 5 - 3t^2 + 4t^2$

c) $5n - 3n^2 - 7 + 9n + 3 - 2n^2$

d) $3y^2 + 4 - 6y^2 - 6 + 3y - 5 + 2y$

9. Write and simplify an expression for the perimeter of the triangle by combining like terms.

10. a) Draw a figure with a perimeter that is represented by $(s) + (2s) + (s + 5) + (3s)$, where each value in parentheses represents the length of one side. Label each side length. Explain why you made each side the length that you did.

b) Simplify the expression for the perimeter by combining like terms.

11. A mechanic charges \$70 an hour plus the cost of parts to repair a vehicle. The parts cost \$215 for the repair on Tamara's car.

a) Write an expression for the total cost, C, of repairing Tamara's car for any number of hours, n.

b) Use the expression you created in part a) to calculate the cost of repairs that take $3\frac{1}{2}$ h.

5.2 Equivalent Expressions

1. a) a, b b) -7; 1 for w, 2 for x c) No
2. x^2 should be circled in each term; $-2x^2$
3. No. They are not like terms because either the variables differ or the exponents of the variables differ.
4. a) 1; 1 b) -3; 1 c) 6; 2 d) no value; 0 e) -1; 2 f) 1; 2
5. a) $-cd$, $-xy$ b) $-cd$, $-xy$, $-3jk$ c) k^2 d) $9r$, $4x$
6. a) $3r$, $-r$ b) $-4y$, $0.3y$, $\frac{y}{2}$ c) cd, $6cd$
7. Examples:
   a) $5c^2 - c^2 - 5c + c + 9 - 8$
   b) $3m^2 + 2m^2 + 8m - 6m - 9 + 6$
   c) $6d^2 - 5d^2 - 8d + 3d + 7 - 2$
8. The order of the terms may vary.
   a) $-b^2 + 5b^2 + 6 - 8 + 9$; $4b^2 + 7$
   b) $4t^2 - 3t^2 + 7t + 6t - 5 + 14$; $t^2 + 13t + 9$
   c) $-2n^2 - 3n^2 + 9n + 5n + 3 - 7$; $-5n^2 + 14n - 4$
   d) $3y^2 - 6y^2 + 3y + 2y + 4 - 6 - 5$; $-3y^2 + 5y - 7$
9. $3b + 6$
10. a) Example:

    I made the shortest side, s, 10 units. If $s = 10$, then $s + 5$ is 15 units, $2s$ is 20 units, and $3s$ is the longest at 30 units.

    b) $7s + 5$
11. a) $C = 70n + 215$ b) \$460