Lesson 2.1 Algebraic Expressions

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MCA
Lesson 2....

Fundamentals of Algebra

2.1 Writing and Evaluating Algebraic Expressions

What You Will Learn

- Define and identify terms, variables, and

- Define and identify terms, variables, and coefficients of algebraic expressions.
- Define exponential form and interpret exponential expressions.
- Evaluate algebraic expressions using real numbers.

Variables and Algebraic Expressions 1

A collection of letters (**variables**) and real numbers (**constants**) combined by using addition, subtraction, multiplication, or division is an **algebraic expression**.

The **terms** of an algebraic expression are those parts that are separated by *addition or subtraction*. For example, the expression $x^2 - 4x + 5$ has three terms (trinomial): x^2, $-4x$, and 5.

For terms such as x^2, $-4x$, and 5, the numerical factor is called the **coefficient** of the term. Here, the coefficients are 1, −4, and 5 is the constant.

Example 1 – Identifying the Terms of Expressions

highlight coefficients highlight constant purple

highlight coefficients Blue highlight constant purple

Algebraic Expression	Terms
a. $6x$	1 term (monomial)
b. $3x + \frac{1}{2}$	2 terms (binomial)
c. $2y - 5x - 7$	3 terms (trinomial)

Variable yellow

Example 4 – Evaluating Algebraic Expressions 1

Evaluate each expression when $x = -3$ and $y = 5$.

a. $-x$ $-(-3) = 3$

b. $x - y$ $-3 - 5 = -8$

c. $3x + 2y$ $3(-3) + 2(5) = -9 + 10 = 1$

d. $y - 2(x + y)$ $5 - 2(-3 + 5) = 5 - 2(2) = 5 - 4 = 1$

e. $y^2 - 3y$ $5^2 - 3(5) = 25 - 15 = 10$

Example 4 – Evaluating Algebraic Expressions 2

a. When $x = -3$, the value of $-x$ is

$-x = -(-3)$ Substitute -3 for x.

$= 3.$ Simplify.

b. When $x = -3$ and $y = 5$, the value of $x - y$ is

$x - y = (-3) - 5$ Substitute -3 for x and 5 for y.

$= -8.$ Subtract.

Example 4 – Evaluating Algebraic Expressions 3

c. When $x = -3$ and $y = 5$, the value of $3x + 2y$ is

$3x + 2y = 3(-3) + 2(5)$ Substitute -3 for x and 5 for y.

$= -9 + 10$ Multiply.

$= 1.$ Add.

d. When $x = -3$ and $y = 5$, the value of $y - 2(x + y)$ is

$y - 2(x + y) = 5 - 2[(-3) + 5]$ Substitute -3 for x and 5 for y.

$= 5 - 2(2)$ Add.

$y - 2(x + y) = 5 - 2[(-3) + 5]$ Substitute −3 for x and 5 for y.

$= 5 - 2(2)$ Add.

$= 1.$ Simplify.

Example 4 – Evaluating Algebraic Expressions 4

e. When $y = 5$, the value of $y^2 - 3y$ is

$y^2 - 3y = (5)^2 - 3(5)$ Substitute 5 for y.

$= 25 - 15$ Simplify.

$= 10.$ Subtract.

Example 5 – Evaluating Algebraic Expressions

a. When $y = -6$, the value of y^2 is

$y^2 = (-6)^2 = 36$

b. When $y = -6$, the value of $-y^2$ is

$-y^2 = -(y^2) = -(-6)^2 = -(36) = -36$

b. When $y = -6$, the value of $-y^2$ is

$-y^2 = -(y^2) =$ $-(-6)^2 = -(36) = -36$

c. When $x = 4$ and $y = -6$, the value of $y - x$ is

$y - x =$ $-6 - 4 = -10$

d. When $x = 4$ and $y = -6$, the value of $|y - x|$ is

$|y - x| =$ $|-6 - 4| = |-10| = 10$

e. When $x = 4$ and $y = -6$, the value of $|x - y|$ is

$|x - y| =$ $|4 - (-6)| = |10| = 10$

Example 6 – Evaluating an Algebraic Expression

When $x = -5$, $y = -2$, and $z = 3$, the value of $\frac{y + 2z}{5y - xz}$ is

$\frac{-2 + 2(3)}{5(-2) - (-5)(3)}$ $\frac{-2 + 6}{-10 - (-15)} = \frac{4}{5}$

Example 6 – Evaluating an Algebraic Expression

Example 6 – Evaluating an Algebraic Expression

When $x = -5$, $y = -2$, and $z = 3$, the value of $\frac{y + 2z}{5y - xz}$ is

$$\frac{y + 2z}{5y - xz} = \frac{-2 + 2(3)}{5(-2) - (-5)(3)}$$ Substitute for x, y, z.

$$= \frac{-2 + 6}{-10 - (-15)}$$ Multiply.

$$= \frac{-2 + 6}{-10 + 15}$$ Add the opposite of −15.

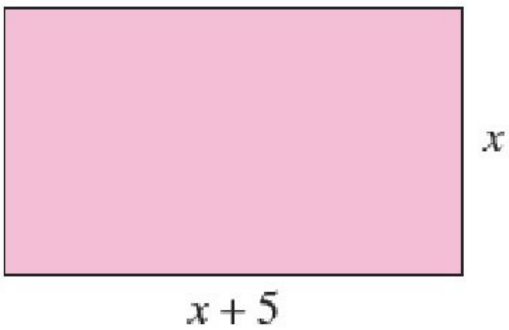
$$= \frac{4}{5}.$$ Simplify.

Example 9 – **Geometry:** Finding the Area of a Rectangle

Write an expression for the area of a rectangle shown below. Then evaluate the expression to find the area of the rectangle when $x = 7$.

$A = lw$

$(x+5)(x)$



$x(x+5)$

$x^2 + 5x$

$7^2 + 5(7)$

$49 + 35 = 84$

Example 9 – **Geometry:** Finding the Area of a Rectangle cont'd

Solution:

Area of a rectangle = Length · Width

$= (x + 5) \cdot x$ Substitute.

To find the area of the rectangle when $x = 7$, substitute 7 for x in the expression for the area.

$(x + 5) \cdot x = (7 + 5) \cdot 7$ Substitute 7 for x.

$= (12) \cdot 7$ Add.

$= 84$ Multiply.

So, the area of the rectangle is 84 square units.