

Variables and Expressions

 Guided Notes

A **numerical expression** is a mathematical phrase that contains only constants and/or operations.

To evaluate a numerical expression, you find its numerical value.

Sample Problem 1: Find the value of each numerical expression. Follow the order of operations when finding each value.

a. $12 + 10 \div 2 - 4 =$

$$\begin{aligned} &12 + 10 \div 2 - 4 = \\ &= 12 + 5 - 4 = \\ &= 17 - 4 = \\ &= \mathbf{13} \end{aligned}$$

b. $20 \div 10 + 6 =$

$$\begin{aligned} &20 \div 10 + 6 = \\ &= 2 + 6 = \\ &= \mathbf{8} \end{aligned}$$

c. $12 * 2 - 6 \div 3 =$

$$\begin{aligned} &12 * 2 - 6 \div 3 = \\ &= 24 - 2 = \\ &= \mathbf{22} \end{aligned}$$

A **variable expression** is a mathematical phrase that may contain variables, constants, and/or operations.

A **variable** is a letter that is used to represent one or more numbers. The letters x and y are used very often as variables in algebra, but variables can be any letter (z, k, l, m, k).

Any number not joined to a variable is called a **constant**. It's called that because its value doesn't change, even if the value of the variable changes.

Each algebraic expression is made up of **terms**.

A term can be a signed number, a variable, or a constant multiplied by a variable or variables.

Each term in an algebraic expression is separated by a + sign or a - sign.

When a term is made up of a constant multiplied by a variable or variables, that constant is called a **coefficient**.

Example:

$$\begin{array}{c} \text{Coefficient} \rightarrow 5x + 7 \leftarrow \text{Constant} \\ \quad \quad \quad \uparrow \\ \quad \quad \quad \text{Variable} \end{array}$$

The terms having the same algebraic factors are called **like terms**.

The terms having different algebraic factors are called **unlike terms**.

Expression with one term is called a **monomial**, with two unlike terms is called a **binomial**, in general, an expression with one or more than one term (with nonnegative integral exponents of the variables) is called a **polynomial**.

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Sample Problem 2: Find the terms, constant/s and coefficient/s for each expression.

a. $2x - 10$

Terms: $2x$ and 10

Variable: x

Constant: 10

Coefficient: 2

b. $x + 4y + 32$

Terms: x , $4y$, and 32

Variable: x, y

Constant: 32

Coefficients: 1 and 4

Expressions are like instructions that tell you what you have to do to a number or variable.

Expressions are used to write word problems in math terms.

Sample Problem 3: Write an algebraic expression for each verbal phrase.

a. A number minus 10

$$x - 10$$

b. The product of a number and 6

$$x * 6$$

c. 12 less than a number

$$x - 12$$

d. 16 plus a number

$$16 + x$$

e. The sum of n and 8, divided by 4

$$(n + 8) \div 4$$

f. 4 more than 2 times a number

$$4 + 2x$$

Substituting Values into Algebraic Expressions

To evaluate an algebraic expression, you substitute values for the variables and then simplify the resulting numerical expression.

Sample Problem 4: Evaluate each expression using the values given.

a. $x + y$ when $x = 2$ and $y = 6$

$$\begin{aligned} x + y &= \\ = 2 + 6 &= \\ = 8 & \end{aligned}$$

when $x = 2$ and $y = 6$

b. $3x - 4y$ when $x = 7$ and $y = 1$

$$\begin{aligned} 3x - 4y &= \\ = 3 * 7 - 4 * 1 &= \\ = 21 - 4 &= \\ = 17 & \end{aligned}$$

when $x = 7$ and $y = 1$

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c. $10a - 4(2 + b)$
when $a = 7$ and $b = 2$

$$\begin{aligned} 10a - 4(2 + b) &= \text{when } a = 7 \text{ and } b = 2 \\ &= 10 * 7 - 4(2 + 2) = \\ &= 70 - 4 * 4 = \\ &= 70 - 16 = \\ &= \mathbf{54} \end{aligned}$$

Sample Problem 5: If $a = 8$, $b = 3$, and $c = 6$, evaluate the following by substituting these values into the following expressions.

a. $a + 4b \div c =$

$$\begin{aligned} a + 4b \div c &= \\ &= 8 + 4 * 3 \div 6 = \\ &= 8 + 12 \div 6 = \\ &= 8 + 2 = \\ &= \mathbf{10} \end{aligned}$$

b. $4a + 2bc - 3 =$

$$\begin{aligned} 4a + 2bc - 3 &= \\ &= 4 * 8 + 2 * 3 * 6 - 3 = \\ &= 32 + 36 - 3 = \\ &= 32 + 33 = \\ &= \mathbf{65} \end{aligned}$$

c. $\frac{3a + 2b}{c} =$

$$\begin{aligned} \frac{3a + 2b}{c} &= \\ &= \frac{3 * 8 + 2 * 3}{6} = \\ &= \frac{24 + 6}{6} = \\ &= \frac{30}{6} = \\ &= \mathbf{5} \end{aligned}$$