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# Variables and Expressions

Unit 1 Lesson 2

# Variables and Expressions

## Students will be able to:

Write expressions that record operations with numbers and with letters standing for numbers.

### Key Vocabulary:

Variable

Constant

Expressions

Terms

Coefficient

## Variables and Expressions

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

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

a.  $12 + 10 \div 2 - 4 =$   
 $= 12 + 5 - 4 =$   
 $= 17 - 4 =$   
 $= 13$

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

b.  $20 \div 10 + 6 =$

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

$$\begin{aligned} \text{b.} \quad & 20 \div 10 + 6 = \\ & = 2 + 6 = \\ & = 8 \end{aligned}$$

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

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



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

$$\begin{aligned} \text{c.} \quad & 12 * 2 - 6 \div 3 = \\ & = 24 - 2 = \\ & = 22 \end{aligned}$$

## Variables and Expressions

**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* ).

## Variables and Expressions

- 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.



## Variables and Expressions

- 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**.

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

a.  $2x - 10$

**Terms:**

**Variable:**

**Constant:**

**Coefficient**

**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:**  $2$

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

b.  $x + 4y + 32$

**Terms:**

**Variable:**

**Constant:**

**Coefficients:**



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

**b.**  $x + 4y + 32$

**Terms:**  $x$  ,  $4y$  , *and*  $32$

**Variable:**  $x$  ,  $y$

**Constant:**  $32$

**Coefficients:**  $1$  *and*  $4$

## Variables and Expressions

- 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

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

- a. A number minus 10

$$x - 10$$

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

- b. The product of a number and 6

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

**b.** The product of a number and 6

$$x * 6$$

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

- c. 12 less than a number

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

c. 12 less than a number

$$x - 12$$



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

d. 16 plus a number

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

d. 16 plus a number

$$16 + x$$

## Variables and Expressions

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

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

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

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

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

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

f. 4 more than 2 times a number

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

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  $y = 6$*



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

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

$$= 2 + 6 =$$
$$= 8$$

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

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

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

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

$$= 3 * 7 - 4 * 1 =$$

$$= 21 - 4 =$$

$$= 17$$

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

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

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

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

$$\begin{aligned} &= 10 * 7 - 4(2 + 2) = \\ &= 70 - 4 * 4 = \\ &= 70 - 16 = \\ &= 54 \end{aligned}$$

## Variables and Expressions

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

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

## Variables and Expressions

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

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

## Variables and Expressions

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

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



## Variables and Expressions

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

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

## Variables and Expressions

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

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

## Variables and Expressions

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

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