1.12 The X Factor

Discover

Representing a quantity with a letter, word, or name is commonplace in real life and has already been seen in the previous lesson. When we move from a specific numeric situation to a generalized situation using variables, we move from arithmetic to algebra. Here is some key vocabulary we will use often.

look IT UP

Algebra

Algebra: Algebra is a branch of mathematics in which letters are used to represent numbers and numeric operations are generalized.

Constant: A constant is a value that does not change. For example, numbers are constants.

Term: A term is a constant or variable or the product or quotient of constants and/or variables. For example, 5, M, and $5M$ are all terms.

Expression: An expression is a mathematical phrase containing one or more terms separated by plus or minus signs. For example, $1.03S + 1{,}000$ is an expression with two terms.

Equation: An equation is a mathematical statement that two expressions are equal. For example, $1.05S = 1.03S + 1{,}000$ is an equation.

It is helpful to think of an expression as a phrase and an equation as a complete sentence.

STICKY note

Pi is approximately 3.14159.... Its decimal expansion continues forever and never forms a pattern that repeats. We have a symbol, π, to allow us to write the number exactly and succinctly. Even though the number π is represented by a symbol, it is still a constant and not a variable.

One way to make sense of this terminology is to compare and contrast the terminology using a Venn diagram.

1. Make a Venn diagram with one circle labeled "Constant" and the other labeled "Variable."

   a. Decide if the circles will overlap. If you can think of some characteristic that constants and variables share, then the circles should overlap.

b. In each circle, list examples and attributes.

2. Repeat #1 but with expressions and equations.

lesson

WRAP-UP

What's the point?

Being able to understand and distinguish between constants, variables, equations, and expressions is an important skill to have as we begin our work with algebra.

What did you learn?

How to differentiate between variables and constants
How to differentiate between expressions and equations

Cycle 1 Question: What can be learned?

In this book, we strive to use meaningful variables and do not often use x. Why is it a good practice to use variables other than x?

1.12 Homework

Skills

MyMathLab

- Differentiate between variables and constants.
- Differentiate between expressions and equations.

1. Identify all components of this statement: $2n + 5 = 9$. There may be more than one answer for each.

a. Expression:

b. Equation:

c. Variable:

d. Constant:

e. Term:

2. Identify each of the following as either an *expression* or an *equation*.

a. $3(x - 2)$

b. $3(x - 2) = 0$

c. $3 - 2$

d. $3 - 2x$

e. $3 = 2x$

f. 3

Concepts and Applications

- Differentiate between variables and constants.
- Differentiate between expressions and equations.

3. The acceleration due to gravity is $g = 9.8\ \text{m/s}^2$. One student argues that acceleration is a variable since it is represented by a letter. Another student claims it's a constant since it doesn't change. Who's right?

4. When we begin solving equations, one rule we will use is to add the same quantity to both sides of the equation. Why aren't we able to add the same quantity to both sides of an expression?

5. a. Evaluate the expression $5x - 20$ when $x = 4$ by replacing the variable with the number 4. Compute the result.

b. Check that the equation $5x - 20 = 0$ is true when $x = 4$ by replacing the variable with the number 4. Compute the left side of the equation. Determine if it is equal to the right side of the equation.

6. There is a common misconception that algebra is not valuable or used in real life. Can you give an example of a situation in which we used algebra that could be seen in the workplace?

7. a. Write an expression with at least three terms.

b. Write an equation with at least two terms on each side.

8. Looking forward, looking back Your gym is increasing its fees by 15% and then adding on a $10 fee for a parking pass. Write an expression for your new gym fees if your old fees are represented by the variable F.

1.13 Take 2 and Call Me...

Connect

The information that accompanies over-the-counter and prescription medicines is full of important data that often involves mathematics. Use this **line graph**, which is a series of connected, ordered pair data points, to answer the questions after it about a medicine that contains acetaminophen. The vertical axis represents the concentration of acetaminophen in the body, measured in micrograms per milliliter of blood.