

What IS Algebra anyway?

➤ Experiencing Mathematics (student activity)

Algebra has been called “arithmetic with letters,” but it is much more than that. Algebra is a powerful language with its own symbols and vocabulary and is sometimes called the “language of science.” Algebra is a set of procedures and principles that are used to solve problems. Algebra is an organized mathematical system.

One goal of this course is to recognize the different uses of variables (and symbols) and use them to form a set of problem-solving rules and procedures. The table below lists six ways that variables are used.

	Variables are used ...	Examples:
I.	As <i>placeholders for assigned values</i> .	Evaluate $a^2 - b^2$ when $a = -5$ and $b = -3$.
II.	In <i>formulas</i> for values that vary.	$A = l \cdot w$ $P = 2l + 2w$
III.	As <i>objects in a mathematical system or set of rules</i> . Symbols and variables can represent an infinite number of values. Operations are performed upon variables.	Identity Property of Addition: $+ 0 =$ Commutative Property of Multiplication: $x \cdot y = y \cdot x$
IV.	As <i>placeholders for unknown values</i> in equations.	Solve for x : $x + 4 = 10$
V.	As <i>placeholders between symbols</i> denoting relationships between quantities.	$a \quad b \quad c \quad d$ $\quad \quad \quad 0$ Relationships: $a < b$ and $d > c$
VI.	To <i>generalize or describe a pattern</i> .	$P = 8x - 1000$ $S = 3n + 1$

- To illustrate the use of a variable or symbol as a *placeholder with assigned values*, assign your own values, using any real number other than zero or one, to the diamond and the variables x and y : $\diamond = \underline{\hspace{1cm}}$, $x = \underline{\hspace{1cm}}$, $y = \underline{\hspace{1cm}}$.

Substitute the values and perform the operations. Write the appropriate symbol, either “=”, “<”, or “>”, on the line between the quantities. Show your work.

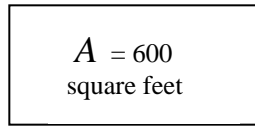
a) $\diamond + \diamond \underline{\hspace{1cm}} 3$

b) $2 - 3x \underline{\hspace{1cm}} 5y$

2. To illustrate how variables are used in *an equation or formula*, recall the formula for the area of a rectangle: $A = l * w$, where A is a variable that represents the area, l is a variable that represents the length, and w is a variable that represents the width. The variables in the formula represent values vary.

Find the missing width in each rectangle below given the total area of each rectangle is 600 square feet: Area = $A = 600$ square feet.

a)

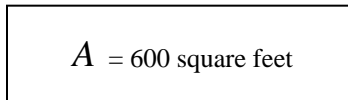


$$w = ?$$

$$l = 30 \text{ feet}$$

What is the width? _____

b)



$$w = ?$$

$$l = 50 \text{ feet}$$

What is the width? _____

3. To illustrate the use of variables as *objects in a mathematical structure of set of rules*, list two Properties of Real Numbers that illustrate the use of variables as objects in a set of rules:

a) _____

b) _____

4. To illustrate how a variable can represent an *unknown value*, find the value of the variable that satisfies each equation.

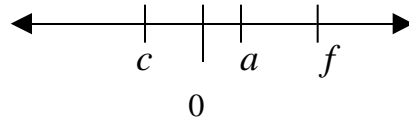
a) $x + 2 = 10$

$$x = \underline{\hspace{2cm}}$$

b) $12 - y = 3$

$$y = \underline{\hspace{2cm}}$$

5. Variables may be used as *placeholders between symbols* to denote a relationship between quantities.



The exact values of the variables, c , a , and f above, are unknown. Write the appropriate symbol, either “=”, “<”, or “>”, on the line between the quantities.

a) $a ? f$ _____ c

b) c _____ 0

6. Create your own example for each of the six uses of variables:

a) Variables as placeholder for *assigned values*: _____

b) Variables in *equations or formulas*: _____

c) Variables as objects in a *mathematical system*: _____

d) Variables as placeholders for *unknown values*: _____

e) Variables as placeholders *between symbols*: _____

f) Variables used to *describe a pattern* in a problem situation: _____