About Variables

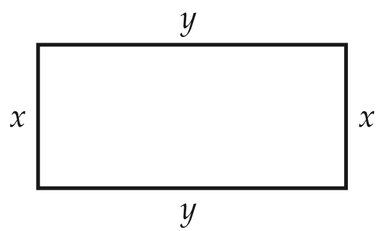
The identity of Mr. *x* is a mystery and that's the way he likes it. In the world of algebra, *x* and his other alphabetic associates, like *a*, *b*, *n*, *y* and *z*, are common characters. These letters are referred to as variables and are frequently used in algebra problems to represent unknown values.

Sometimes, it will be your job to figure out the value of the mystifying variable ($x = 7$). Other times, you will need to determine how a variable relates to another variable, such as in the equation $x = y + 5$. If you understand the relationship between two variables, then when you find the value of one variable, you can often find the value of the other variable.

When you are assigning variables, you can use any letter. Often, it is helpful to use letters that remind you of the value they are intended to represent. For example, you could use *n* to represent the number of people you are inviting to a party, *s* for the number of snacks you need per person or *d* for number of days it will take you to clean up.

x = height of rectangle

y = width of rectangle



Perimeter of rectangle = $x + x + y + y$

Area of rectangle = $x \times y$

- A variable is a letter, such as x or y, which represents an unknown number.
- For example, we could use x to represent the height of a rectangle and y to represent the width of a rectangle.

  Note: Numbers, such as 1, 2 and 3, are known as constants because they do not change.
- Variables allow you to solve problems using many different values. For example, you can use variables to determine the perimeter and area of a rectangle of any size.
- The perimeter of a rectangle, or the total distance around the outside of a rectangle, would be $x + x + y + y$.
- The area of a rectangle, or the amount of space within a rectangle, which is defined by the length times the width, would be $x \times y$.

Evaluate an Expression

As you may have noticed, mathematical statements do not always use numbers exclusively. Often the statements contain one or more variables. If you know the value of each variable, you can solve the problem—also known as evaluating an expression.

To evaluate an expression, you replace the variables in the expression with their numerical values, otherwise known as plugging numbers into an expression. For the best results, you should surround the values you plug into an expression with parentheses so that positive and negative numbers don't get mixed up with the mathematical operations of the problem. For example, plugging the value of $x = -4$ into the equation $y + 4x$ would be open to errors if it was written as $y + 4 - 4$. Using parentheses and writing the expression as $y + 4(-4)$ removes any ambiguity. Once you have replaced the variables in an expression, you simplify the expression using the normal rules—parentheses first, then exponents, then multiplication and divide, and then addition and subtraction.

You will frequently evaluate an expression to check your answers after you have solved for a variable.

Evaluate the expression $x + y + z$
when $x = 2$, $y = 3$ and $z = 4$

$x + y + z$

$= (2) + (3) + (4) = 9$

Evaluate the expression $20 \div (x - y)$
when $x = 9$ and $y = 4$

$20 \div (x - y)$

$= 20 \div (9 - 4) = 20 \div 5 = 4$

Evaluate the expression $2(x + y)$
when $x = 5$ and $y = 8$

$2(x + y)$

$= 2(5 + 8) = 2(13) = 2 \times 13 = 26$

Evaluate the expression $x^2 + (y - 4)$
when $x = 3$ and $y = 6$

$x^2 + (y - 4)$

$=(3)^2 + (6 - 4) = 9 + 2 = 11$

- An expression consists of numbers, variables or a combination of the two, which are connected by signs, such as $+$, $-$, $\times$ or $\div$.

  Note: A variable is a letter, such as x or y, which represents an unknown number.
- When you are asked to evaluate an expression, you will need to find the answer to the problem.

1 To evaluate an expression, replace the variables with the given number for each variable and then simplify the expression.

- Above are more examples of evaluating expressions.

  Note: When a sign does not appear between a number and variable, such as $3x$, you multiply the number and variable together.

Note: For information on exponents, such as x^2, see page 54.