

Algebra

Variables

Variable

An unknown quantity which takes various numerical value is called variable.

An unknown quantity can be represented by a variable. Usually, a variable is any letter from the English alphabet that represents an unknown quantity. The relation between the unknown quantity and other quantities can be expressed with the help of the variable. The value of the variable varies with the given condition on the variable.

Constant

A quantity whose value does not vary is called a constant.

Algebraic expression

An expression consisting of variables, constants and mathematical operators is called an algebraic expression.

Mathematical operations such as addition, subtraction, multiplication and division can be easily performed on variables. We can use variables to form expressions based on patterns.

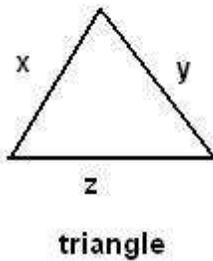
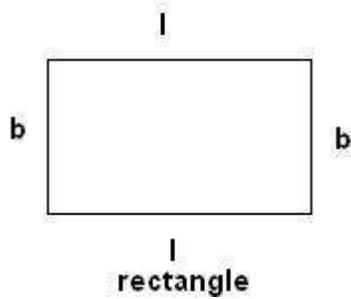
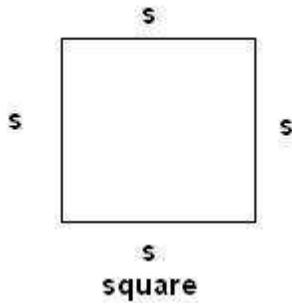
The following are some branches of mathematics:

- The branch of mathematics where letters are used along with numbers is called algebra.
- The branch of mathematics that deals with numbers, operations on numbers and properties of numbers is called arithmetic.
- The branch of mathematics that deals with the figures and shapes is called geometry.

Use of Variables

Variables are used to frame rules to find the perimeter of a polygon. The perimeter of a polygon can be obtained by adding the lengths of its sides.

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The following are some simple rules for the properties of numbers using variables.

Commutative property of addition:

This property states that two numbers can be added in any order. If a and b represent any two numbers, then $a + b = b + a$.

Commutative property of multiplication:

This property states that two numbers can be multiplied in any order. If a and b represent any two numbers, then $a \times b = b \times a$.

Associative property of addition:

This property states that three numbers can be added in any order. If a , b and c represent any three numbers, then $(a + b) + c = a + (b + c)$.

Associative property of multiplication:

This property states that three numbers can be multiplied in any order. If a , b and c represent any three numbers, then $(a \times b) \times c = a \times (b \times c)$.

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Distributive property of multiplication over addition:

This property states that if a , b and c represent any three numbers, then $a \times (b + c) = a \times b + a \times c$.

Expressions with variables

- 1) 5 added to y can be expressed as $y + 5$.
- 2) a multiplied by 8 can be expressed as $8a$.
- 3) x divided by 3 can be expressed as $\frac{x}{3}$.
- 4) First z multiplied by 2, then 5 subtracted from the product can be expressed as $2z - 5$.

Using expression practically

- 1) Saritha has 15 more pens than ameena.

let ameena have x pens then Saritha has $x + 15$ pens.

- 2) Raghu's father's age is 2 years more than 3 times Raghu's age.

Let Raghu's age be t years then Raghu's father's age is $(3t + 2)$ years.

Equations

Equation

A mathematical statement that indicates that the value of the LHS is equal to the value of the RHS is called an equation.

An equation puts a condition on the variable. The value for which the equation is satisfied is the solution of the equation.

e.g. The equation $n + 15 = 3$ is satisfied for $n = 45$.

The value of the variable in an equation that satisfies the equation, or makes its LHS equal to its RHS, is the solution. An equation can contain numbers and variables.

e.g. $a - 2 = 30 \Rightarrow a = 32$.

An equation is said to be an algebraic equation if it consists of a variable.

e.g. $20x = 400$.

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A single variable equation will have a unique solution.

e.g. $15n = 225$.

An equation that does not have any variable is called a numerical or an arithmetic equation.

e.g. $17 \times 2 = 34$.

Different numerical values for the variable are substituted in an algebraic equation, and the solution is obtained by using a method called the trial and error method. If there is no sign of equality between the LHS and the RHS, then it is not an equation.