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.
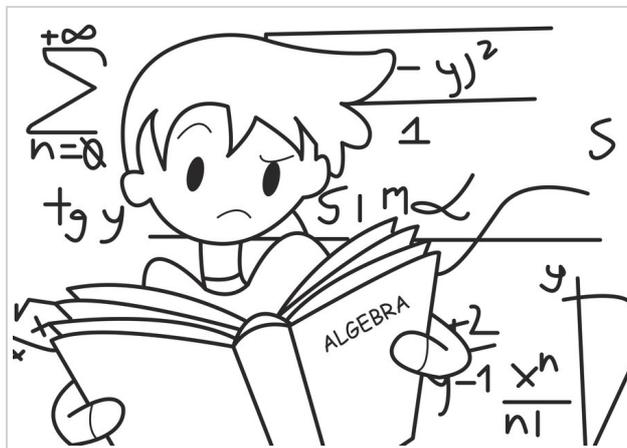
A **quantity** whose **value does not vary** is called a **constant**. An **expression consisting** of **variables, constants** and **mathematical operators** is called an **algebraic expression**.

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**. The following are simple rules to frame the perimeter of geometrical figures using variables.

If the length of the side is denoted by variable's', then the perimeter of a square is equal to $4s$	
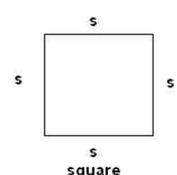
'l' and its breadth variable $4s$

rectangle
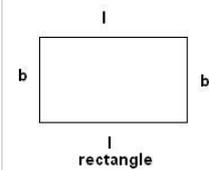
If the lengths of the sides of a triangle are denoted by x, y and z then the perimeter of the triangle is equal to $x + y + z.$

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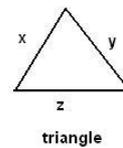
The following are some simple rules for the properties of numbers using variables.

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 $(a \times b) \times c = a \times (b \times c)$

Distributive property of multiplication over addition:

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

Equations
- 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.
  $Eg: The\ equation\ \dfrac{n}{3} = 15\ is\ satisfied\ for\ n = 45.$

- 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.
  $Eg: a - 2 = 30, 72 \div 9 = 8$

- An equation is said to be algebraic equation if it consists of a variable.
  $20x = 400$

- A **single variable** equation will have a **unique** solution.
  $Eg: 15n = 225$

- An equation that does not have any variable is called a **numerical** or an **arithmetic** equation.
  $Eg: 17 \times 2 = 34$

- 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.