Variables

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In mathematics, an algebraic expression is an expression which consists of the combination of variables, constants, coefficients, fundamental operations such as addition, subtraction, multiplication and division. Each term constitutes the basic of algebra. In this article, let us discuss the term "**Variables"** in detail. Here the variable definition, types of variables, its properties and examples are explained.

Variable is a characteristics that can be measured and that can assume different values. Some of the variables are like Height, Age, Income, province or country of birth, garden obtained at school and type of housing, those are examples of variables. Variables may be classified in to two main categories. Those are nominal or Ordinal for categorical variables, discrete or continuous for numeric variables.

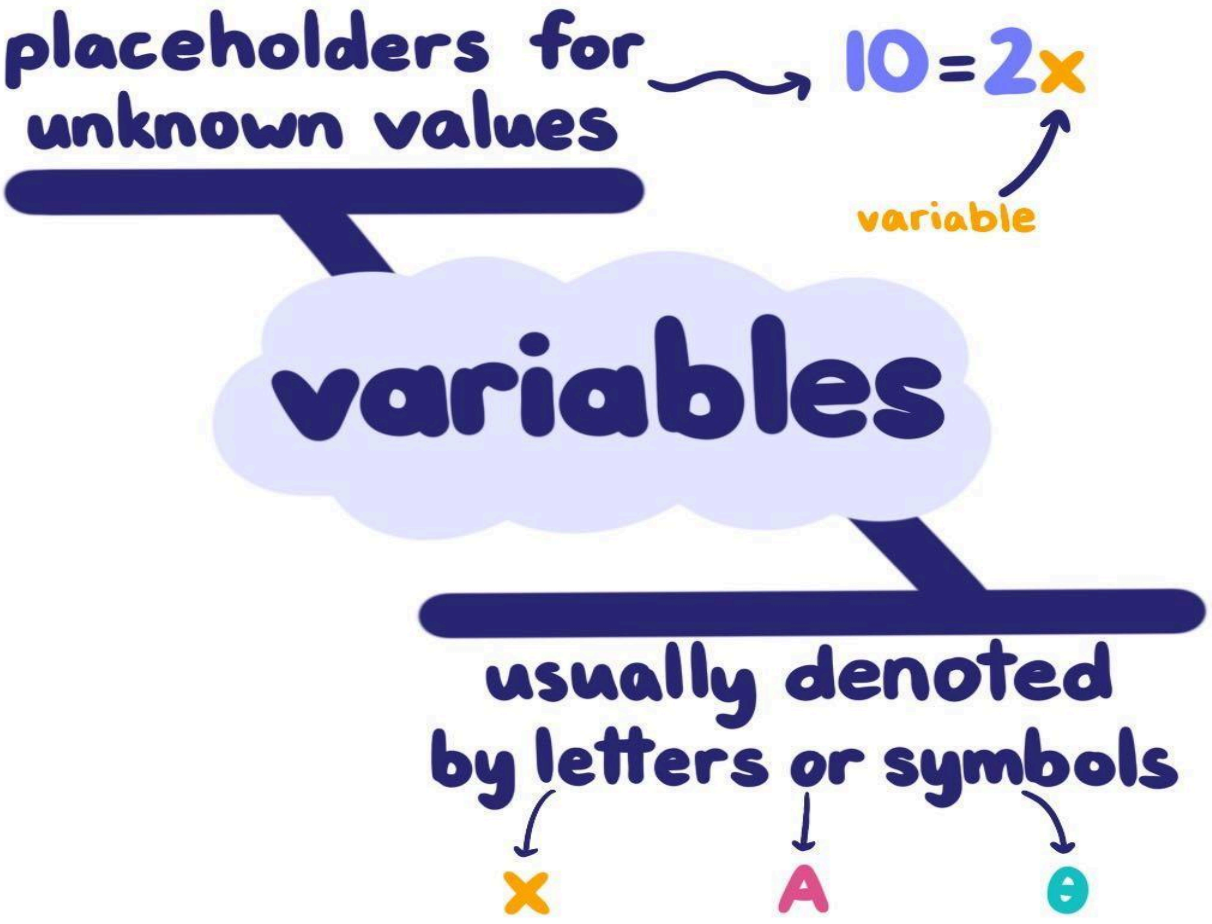

Figure 1

Variables and Definition in Maths

In algebra variable is an alphabet which is used to represent the unknown number. It represents the value. Variable is a quantity that may be changed according to the mathematical problem. The generic letter which are used in many algebraic expressions and equations are x,y,z. In other words, a variable is symbol for a number were the value is not known.

For example, x+5=10

Here “x” is a variable.000

The value of the variable “x” can be easily found by solving the equation. In this case, if the equation is solved, the value of the variable “x” is obtained as 5. It means that x=5

Similarly the term variable is used in statistics also. In statistics, a variable may be sometimes called a data item. It represents the number/characteristics that can be measured. For example sex, age, income, capital, expenditure are examples of variables in statistics.

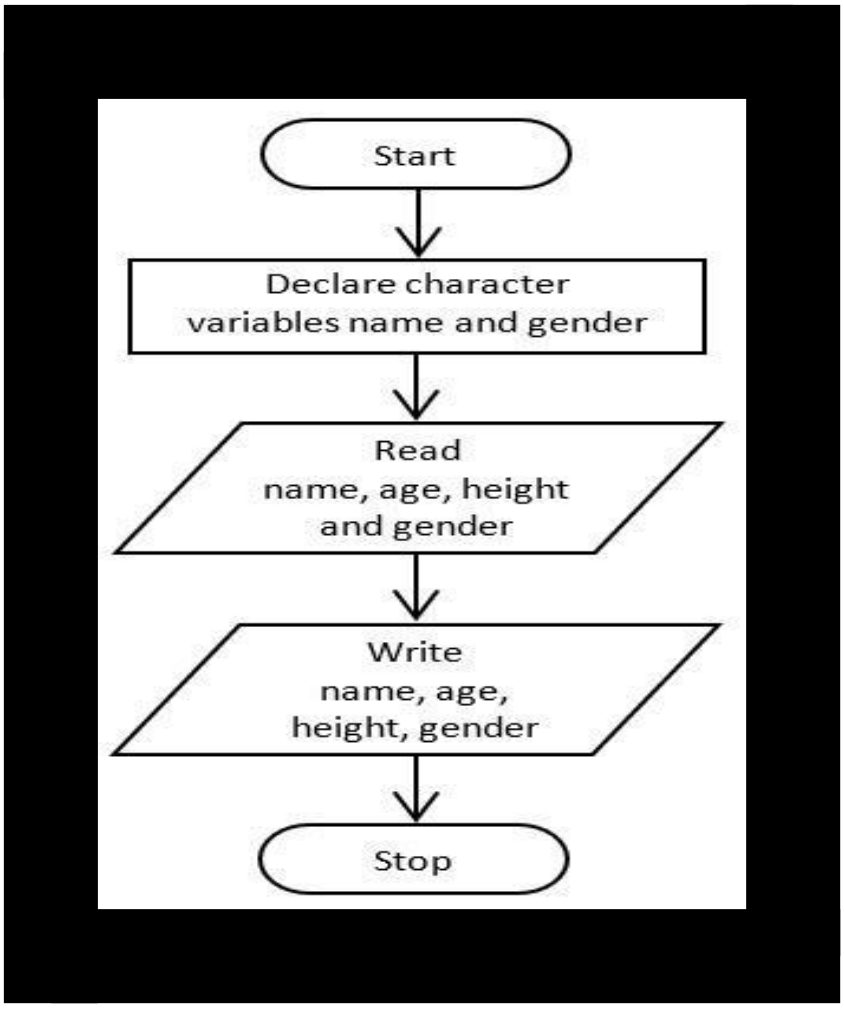

Figure 2

Types of Variables

Variables are broadly classified in two categories, namely: Dependent and Independent Variable.

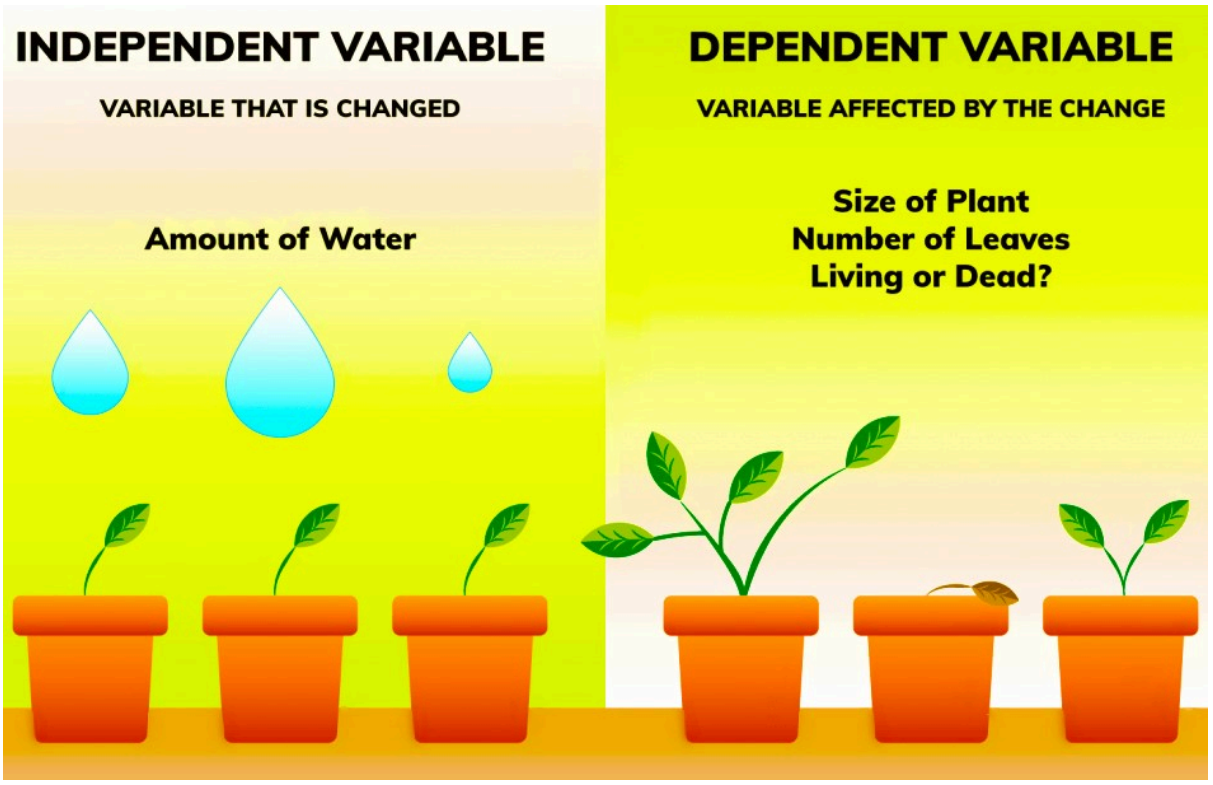

Figure 3

Dependent Variable

The dependent variable is a variable that depends on the value of some other number or variables. In short, the dependent variable is the output of the function. The value of the dependent variable changes, if there is a change in the value of an independent variable. The variable is dependent because its value depends on what we put in to the function.

Example: y= 4+2x

Here, Y is called a dependent variable. The value of Y completely depends on the function 4+2x

Independent variable

The independent variable does not depend on the values. It is called the input of functions. The value of independent variables is not affected by any value of functions,

Example: x= 2y + 3z

Here is X is called a dependent variable

Y and Z are the independent variables

Because the value of y and z are not affected by any another values.

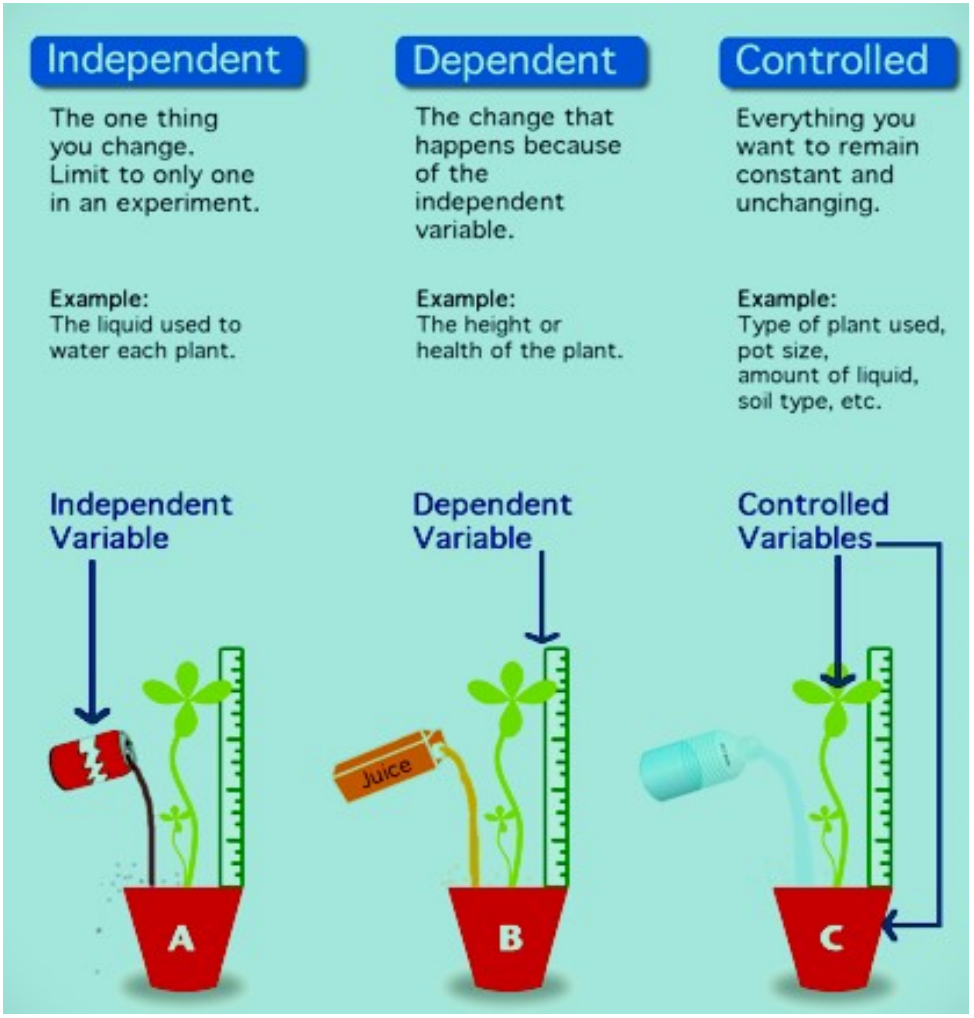

Figure 4

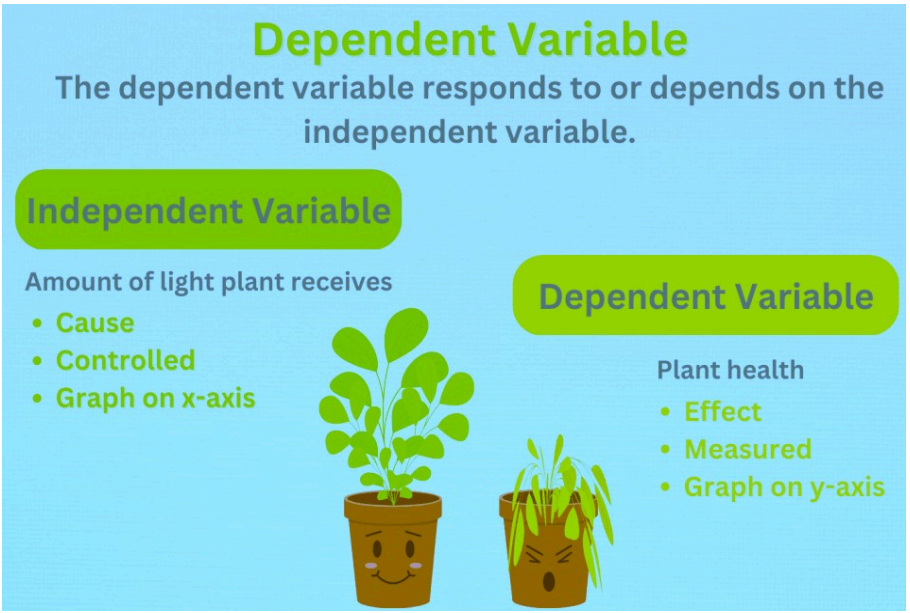

Figure 5

Variables Examples

Question:

Find the value of variable y for the equation $y= 2x^2$ when x=5

Solution

Give Equation: $y=2x^2$

Here x is called independent variable

Y is called dependent variable

When x = 5, the value of y becomes:

$Y = 2x^2$

Now, substituting x= 5 in the given equation, we get

$Y = 2(5)^2$

Y = 2(25)

Y = 50

Therefore, the value of y is 50, when x = 5

Categorical Variable

A categorical variable, also known as a qualitative or discrete variable, is a type of variable in statistics that can take on one of a limited and usually fixed number of possible values, representing different categories or groups. Categorical variables can be further divided into nominal and ordinal variables.

Nominal Variable

A nominal variable is one that describes a name, label or category without natural order. Sex and type of dwelling are examples of nominal variables. A nominal variable is a type of categorical variable used in statistics and research. It is characterized by categories with no inherent order or ranking. In other words, the categories represent distinct groups, but there is no meaningful way to order them. Nominal variables are used to label, classify, or categorize data into distinct groups or classes.

Examples of nominal variables include:

Gender: Categories might include male and female.

Eye Colour: Categories could be blue, brown, green, etc.

Marital Status: Categories might include single, married, divorced, etc.

Types of Fruits: Categories could be apple, orange, banana, etc.

In statistical analysis, nominal variables are often used for qualitative data where the focus is on classifying items into distinct categories. However, mathematical operations such as addition, subtraction, or multiplication are not meaningful for nominal variables because there is no inherent order or numeric value associated with the categories.

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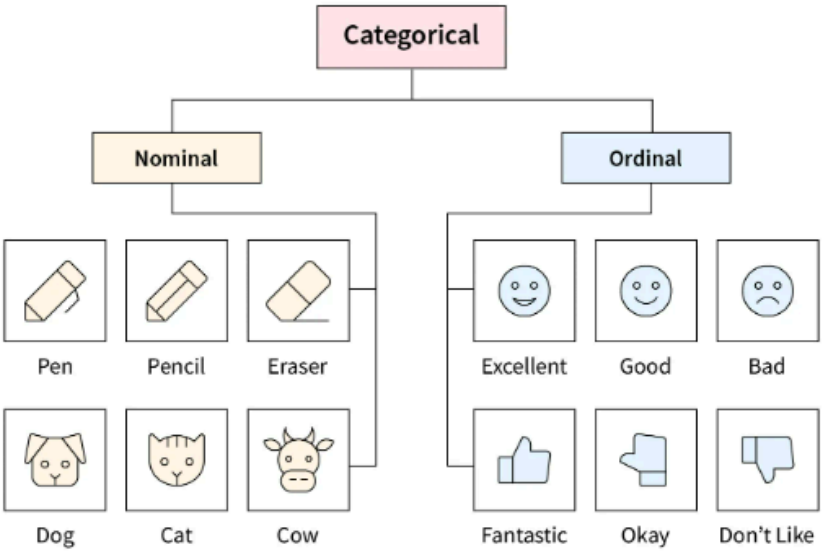
Ordinal Variables:

Ordinal variables, on the other hand, have categories with a clear order or ranking, but the intervals between the categories may not be uniform or meaningful. Examples include education levels (e.g., high school, college, graduate school) or socioeconomic status (e.g., low income, middle income, high income). While you can say that one category is higher or lower than another, you cannot quantify the exact difference between them.

Categorical variables are often used to classify data into groups or to represent qualitative characteristics. They are contrasted with numerical (quantitative) variables, which represent measurable quantities with meaningful numerical values.

In statistical analysis, different methods are used to analyse categorical data, such as chi-squared tests for independence in the case of nominal variables and non-parametric tests for ordinal variables. Additionally, graphical representations like bar charts or pie charts are commonly used to visualize the distribution of categorical data.



Numeric Variable

A numeric variable (also called quantitative variable) is a quantifiable characteristic whose values are numbers (except numbers which are codes standing up for categories). Numeric variables may be either continuous or discrete.

Continuous variables

A variable is said to be continuous if it can assume an infinite number of real values within a given interval. For instance, consider the height of a student. The height can't take any values. It can't be negative and it can't be higher than three metres. But between 0 and 3, the number of possible values is theoretically infinite. A student may be 1.6321748755 … metres tall. In practice, the methods used and the accuracy of the measurement instrument will restrict the precision of the variable. The reported height would be rounded to the nearest centimetre, so it would be 1.63 metres. The age is another example of a continuous variable that is typically rounded down.

Discrete variables

As opposed to a continuous variable, a discrete variable can assume only a finite number of real values within a given interval. An example of a discrete variable would be the score given by a judge to a gymnast in competition: the range is 0 to 10 and the score is always given to one decimal (e.g., a score of 8.5). You can enumerate all possible values (0, 0.1, 0.2…) and see that the number of possible values is finite: it is 101! Another example of a discrete variable is the number of people in a household for a household of size 20 or less. The number of possible values is 20, because it's not possible for a household to include a number of people that would be a fraction of an integer like 2.27 for instance.