

CBSE Class 6 Maths Notes Chapter 11 Algebra

The branch of mathematics in which we study numbers is called arithmetic. The branch of mathematics in which we study shapes is called geometry. Another branch of mathematics is Algebra.

In algebra, we use letters. Use of letters helps us in numerous ways as follows:

- Using letters we can write rules and formulae in a general way.
- Using letters we can talk about any number and not just a particular number.
- The letters may stand for unknown quantities. By learning methods of determining unknowns, we develop powerful tools for solving puzzles and many problems from daily life.
- Since letters stand for numbers, operations can be performed on them as on numbers. This leads to the study of algebraic expressions and their properties.

Matchstick Patterns

We can make letters and other shapes using matchsticks. We can write a general relation between the number of matchsticks required for repeating a given shape. The number of times a given shape is repeated varies; it takes on values 1, 2, 3, It is a variable, denoted by some letter n .

The Idea of a Variable

Variable means something that can vary (or change). The value of a variable is not fixed. It can take different values. The length of a square can have any value. It is a variable. But the number of angles of a triangle has a fixed value 3. It is not a variable. We may use any letter n, l, m, p, x, y, z , etc. to show a variable.

More Matchstick Patterns

We can make many letters of the alphabet and other shapes from matchsticks. For example U, V, triangle, Square, etc. In matchstick patterns, we use the variable n to give us the general rule for the number of matchsticks required to make a pattern. This is an important use of variables in Mathematics.

More Examples of Variables

To show a variable, we may use any letter as n, m, l, p, x, y, z , etc. Recall that a variable is a number, which does not have a fixed value. It can take on various values. For example, the number 10, or the number 100 or any other given number is not a variable. They have fixed values. Similarly, the number of corners of a quadrilateral (4) is fixed; it is also not a variable.

Use of Variables in Common Rules

Rules from geometry

Perimeter of a square $(p) = 4l$, where l is the length of the side of the square

Perimeter of a rectangle $(p) = 2l + 2b$, where l is the length and b is the breadth of the rectangle.

Rules from Arithmetic

Commutativity of Addition

Let a and b be two variables, which can take any numerical value.

Then, $a + b = b + a$

Commutativity of Multiplication

Let a and b be two variables.

Then, $a \times b = b \times a$

Distributivity of multiplication over addition

Let a , b and c be three variables.

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

Associativity of addition

Let a , b and c be three variables.

Then, $(a + b) + c = a + (b + c)$.

Expressions With Variables

We know that variables can take different values; they have no fixed value. But they are numbers. That is why as in the case of numbers, operations of addition, subtraction, multiplication, and division can be performed on them. Using different operations, we can form expressions with variables like $x - 2$, $x + 1$, $3n$, $2m$, $\frac{p}{4}$, $2y + 5$, $3l - 7$, etc.

Note: A number of expressions can be immediately evaluated.

For example: $3 \times 4 + 6 = 12 + 6 = 18$

But an expression containing the variable x cannot be evaluated until x is assigned same value.

For example,

When $x = 1$, $4x + 3 = 4 \times 1 + 3 = 4 + 3 = 7$.

Using Expressions Practically

Many statements described in ordinary language can be changed to statements using expressions with variables.

What is the Equation?

An equation is a condition on a variable. It is expressed by saying that expression with a variable is equal to a fixed number.

For example, $x - 3 = 2$.

An equation has two sides, LHS and RHS and between them, is file sign of equality (=).

The equation states that the value of the left-hand side (LHS) is equal to the value of the right-hand side (RHS).

If the LHS is not equal to the RHS, we do not get an equation.

For example, the statement $2n > 10$ or $2n < 10$ is not an equation.

Note: An equation like $10 - 1 = 9$ is called a numerical equation as neither of its two sides contains a variable. Usually, the word equation is used only for equations involving one or more variables.

Solution of an Equation

The value of the variable in an equation for which LHS of the equation becomes equal to RHS of the equation is said to satisfy the equation and itself is called a solution of the equation. For example, $n = 2$ is a solution to the equation $2n = 4$, where $n = 3$ is not a solution of the equation $3n = 13$.

Getting a Solution to the Equation

For getting the solution of an equation, one method is trial and error method. In this method, we assign some value to the variable and check whether it satisfies the equation. We go on assigning this way different values to the variable until we find the right value which satisfies the equation.

But this is not a direct and practical way of finding a solution. We need a more systematic way of getting a solution of the equation than the trial and error method. In case of very simple equations, the variable is replaced by a place holder I and its value is determined by usual methods. Thus the value of the variable obtained is the solution of the equation.

Using an Equation

Originally, we are given an equation in a variable whose value is unknown to us. To solve the equation means to find the unknown value. Thus a variable in an equation is looked upon as unknown and starting from the unknown, we can see up the equation. Solving the equation is thus a method of finding the unknown. It is, therefore, a powerful method of solving puzzles and problems.