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CLASS 11 & 12th



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CLASS 11th

# Mathematical Reasoning

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## 01. Statements or Propositions

**Definition** A statement or a proposition is an assertive (or a declarative) sentence which is either true or false but not both.

A true statement is also known as a valid statement. If a statement is false, we say that it is an invalid statement.

**Open Statement** A declarative sentence containing variable (s) is an open statement if. It becomes a statement when the variable (s) is (are) replaced by some definite value (s).

**Truth Set** The set of all those values of the variable (s) in an open statement for which it becomes a true statement is called the truth set of the open statement.

**Truth Value** The truth or falsity of a statement is called its truth value.

**Simple Statement** Any statement or proposition whose truth value does not explicitly depend on another statement is said to be a simple statement.

**Compound Statements** If a statement is combination of two or more simple statement, then it is said to be a compound statement or a compound proposition.

The simple statements which form a compound statement are known as its sub-statements or components or constituents.

If  $p, q, r, \dots$  are sub-statements of a compound statement  $S$ , then we write the compound statement as  $S(p, q, r, \dots)$ .

The fundamental property of a compound statement is that its truth value is completely determined by the truth values of the sub-statements together with the way in which they are connected to form the compound statement.

**Connectives** The phrases or words which connect simple statement are called logical connectives or sentential connectives or simply connectives or logical operators.

Connective	Symbol	Nature of the Compound statement formed by using the connective
and	$\wedge$	conjunction
or	$\vee$	Disjunction
If .... then	$\Rightarrow$ or $\rightarrow$	Implication or conditional
If and only if (iff)	$\Leftrightarrow$ or $\leftrightarrow$	Equivalence or bio-conditional
not	$\sim$ or $\neg$	Negation

**Remark** Negation is called a connective although it does not combine two or more statements. In fact, it only modifies a statement.