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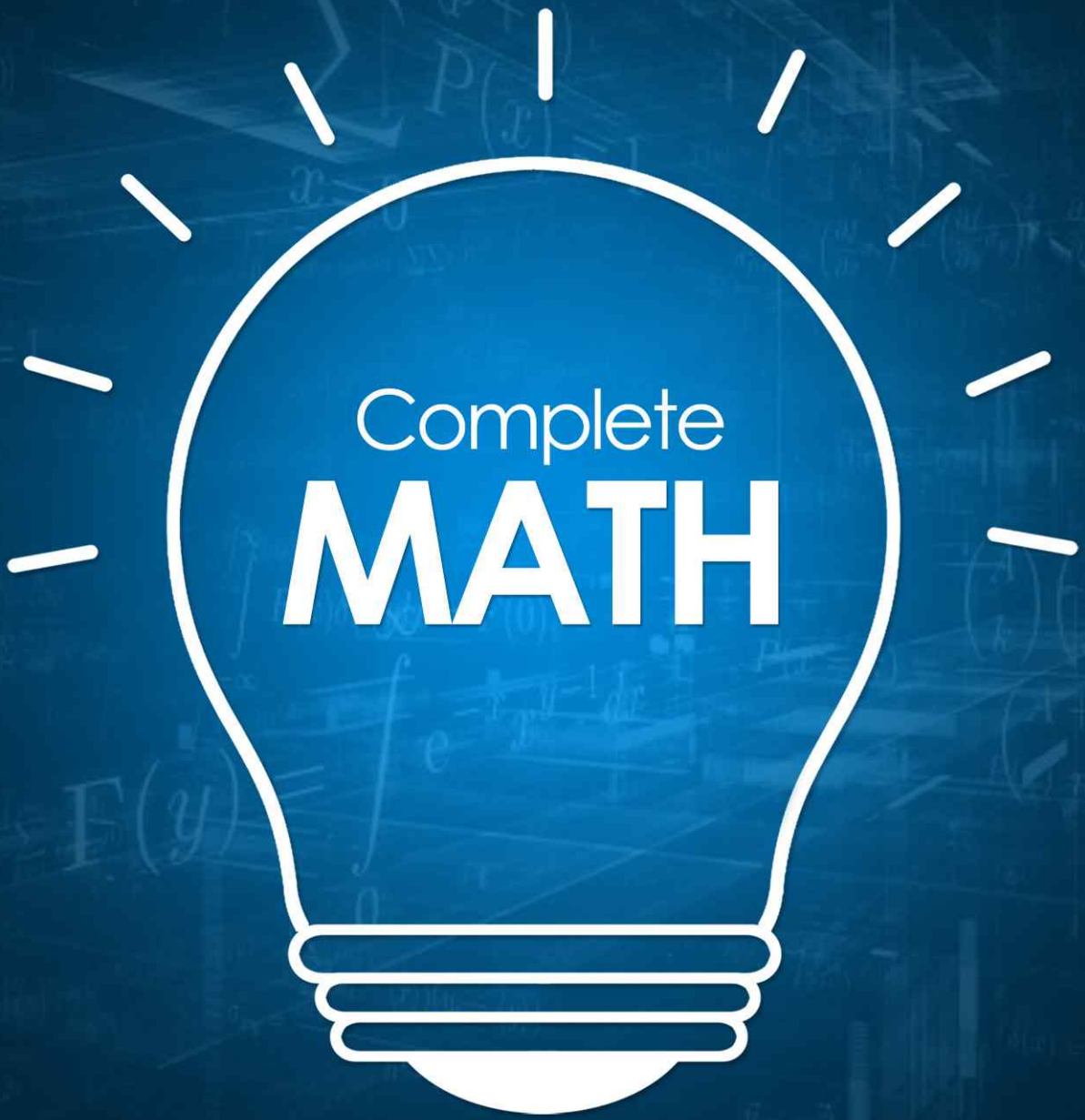

Complete MATH

IIT-JEE · CBSE eBOOKS

CLASS 11&12th

CLASS 11th

SETS

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01. Definition of Set

Set as "a well defined collection of objects".

Example The collection of vowels in English alphabets. This set contains five elements, namely, a, e, i, o, u.

NOTE ☞ Collection of good teachers in a school is not a set.

02. Reserved Symbols

We reserve some symbols for these set:

① **N** : for the set of natural numbers.
② **Z** : for the set of integers.
③ $\mathbf{Z}^+$: for the set of all positive integers.
④ **Q** : for the set of all rational numbers.
⑤ $\mathbf{Q}^+$: for the set of all positive rational numbers.
⑥ **R** : for the set of all real numbers.
⑦ $\mathbf{R}^+$: for the set of all positive real numbers.
⑧ **C** : for the set of all complex numbers.

03. Description of a Set

A set is often described in the following two forms. One can make use of any one of these two ways according to his (her) convenience.

(i) Roster form or Tabular form
(ii) Set-builder form

ROSTER FORM

In this form a set is described by listing elements, separated by commas, within braces {}.

NOTE ☞ (1) The order in which the elements are written in a set makes no difference.
(2) Also, the repetition of an element has no effect.

SET-BUILDER FORM

In this form, a set is described by a characterizing property $P(x)$ of its elements x. In such a case the set is described by $\{x : P(x)\,\text{holds}\}$ or, $\{x \mid P(x)\,\text{holds}\}$, which is read as 'the set of all x such that $P(x)$ holds'. The symbol $'|'$ or $':'$ is read as 'such that'.

04. Types of Sets

(1) EMPTY SET A set is said to be empty or null or void set if it has no element and it is denoted by ϕ(phi).
In Roster method, ϕ is denoted by $\{\}$.

(2) SINGLETON SET A set consisting of a single element is called a singleton set.

(3) FINITE SET A set is called a finite set if it is either void set or its elements can be listed (counted, labelled) by natural numbers $1, 2, 3, \ldots$ and the process of listing terminates at a certain natural number n (say).

(4) CARDINAL NUMBER OF A FINITE SET The number n in the above definition is called the cardinal number or order of a finite set A and is denoted by $n(A)$.

(5) INFINITE SET A set whose elements cannot be listed by the natural numbers $1, 2, 3, \ldots, n,$ for any natural number n is called an infinite set.

(6) EQUIVALENT SETS Two finite sets A and B are equivalent if their cardinal numbers are some i.e. $n(A) = n(B)$.

(7) EQUAL SETS Two sets A and B are said to be equal if every element of A is a member of B, and every element of B is a member of A.

05. Subsets

Let A and B be two sets. If every element of A is an element of B, then A is called a subset of B.
If A is a subset of B, we write $A \subseteq B$, which is read as "A is a subset of B" or "A is contained in B".
Thus, $A \subseteq B$ if $a \in A \Rightarrow a \in B$.

SOME RESULTS ON SUBSETS

RESULT 1 Every set is a subset of itself.

RESULT 2 The empty set is a subset of every set.

RESULT 3 The total number of subsets of a finite set containing n elements is 2^n.

REMARK

SUBSETS OF THE SET **R** OF REAL NUMBERS

i) The set of all natural numbers $N = \{1, 2, 3, 4, 5, 6, \ldots.\}$

ii) The set of all integers $Z = \{\ldots -3, -2, -1, 0, 1, 2, 3, \ldots\}$

iii) The set of all rational numbers $Q = \{x : x = \frac{m}{n}, m, n \in Z, n \neq 0\}$.

iv) The set of all irrational numbers. It is denoted by T.

Thus,
$T = \{x : x \in R \text{ and } x \notin Q\}$
Clearly, $N \subset Z \subset Q \subset R$, $T \subset R$ and $N \not\subset T$.