Principle Of Mathematical Induction

☑ **The Principal of Mathematical induction :** Suppose there is a given statement $P(n)$ involving the natural no. n such that

(i) The statement is true for $n=1$, i.e., $P(1)$ is true and

(ii) If the statement is true for $n=k$ (where k is some positive integer), then the statement is true for $n=k+1$, i.e., truth of $P(k)$ implies the truth of $P(k+1)$.

Then $P(n)$ is true for all natural numbers n.

☑ **Basic Step :** The first step in a proof that uses mathematical induction is to prove that $P(1)$ is true. This step is called the basic step.

☑ **Inductive Step :** The step where we suppose that $P(k)$ is true for some positive integer k and we need to prove that $P(k+1)$ is true is called Inductive step.

☑ **Inductive hypothesis :** The assumption that the given statement is true for $n=k$ in inductive step is called Inductive hypothesis.

📍 **Note :**

$$1 + 2 + 3 + \ldots + n = \frac{n(n+1)}{2}$$ is the connect one.

$$1^2 + 2^2 + 3^2 + \ldots + n^2 = \frac{n(n+1)(2n+1)}{6}$$

$$(ab)^n = a^n b^n$$

$$1^3 + 2^3 + 3^3 + \ldots + n^3 = \left[\frac{n(n+1)}{2}\right]^2$$