

# MIND MAP : LEARNING MADE SIMPLE CHAPTER - 4

## Specific Instances to Generalisation

e.g.: Rohit eats food. Vikas eats food. Rohit and Vikas are men. Then all men eat food. Statement is true for  $n=1, n=k$  and  $n=k+1$ , then, the statement is true for all natural numbers  $n$ .

Induction

## Principle of Mathematical Induction

Deduction

## Generalisation of Specific Instance

e.g.: Rohit is a man and all men eat food, therefore, Rohit eats food.

Example

Steps for Principle of Mathematical Induction Proof

Ex: Prove that  $2^n > n$  for all positive integer  $n$ .

**Solution: Step1:** Let  $P(1): 2^1 > 1$

**Step2:** When  $n=1, 2^1 > 1$ . Hence  $P(1)$  is true

**Step3:** Assume that  $P(k)$  is true for any positive integer  $k, 2^k > k$

**Step4:** We shall now prove that  $P(k+1)$  is true

Multiplying both sides of step(3) by 2, we get

$$2 \cdot 2^k > 2k$$

$$\Rightarrow 2^{k+1} > 2k$$

$$\Rightarrow 2^{k+1} = k+k$$

$$\Rightarrow 2^{k+1} > k+1 \quad (\text{since } k > 1)$$

Therefore,  $P(k+1)$  is true when  $P(k)$

is true Hence, by P.M.I.,  $P(n)$  is true for every positive integer  $n$ .

**Step1:** Let  $P(n)$  be a result or statement formulated in terms of  $n$  in a given equation

**Step2:** Prove that  $P(1)$  is true.

**Step3:** Assume that  $P(k)$  is true.

**Step4:** Using step 3, prove that  $P(k+1)$  is true.

**Step5:** Thus,  $P(1)$  is true and  $P(k+1)$  is true whenever  $P(k)$  is true

Hence, by the principle of mathematical induction,  $P(n)$  is true for all natural numbers  $n$ .