

Principle of Mathematical Induction

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If $p(n)$ is a given statement, n is a natural number

Step 1 :- Verify if statement is true for $n=1$

i.e. $p(1)$ is true.

Step 2 :- Assume that the statement is true for $n=k$

i.e. $p(k)$ is true.

Step 3 :- If the statement is true for $n=k+1$ then the statement is true for all values of n .

Some Properties which can be proved using Principle of Mathematical Induction

$$1. 1 + 2 + 3 + \dots + n = \frac{n(n+1)}{2}, n \geq 1$$

$$2. 1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}, n \geq 1$$

$$3. 1^3 + 2^3 + 3^3 + \dots + n^3 = \frac{n^2(n+1)^2}{4}, n \geq 1$$

$$4. 1 + 3 + 5 + \dots + (2n-1) = n^2, n \geq 1$$

$$5. 2^n > n, n \geq 1$$