

Mathematical Induction الاستنتاج الرياضي

Mathematical induction is a mathematical proof technique, most commonly used to establish a given statement for all natural numbers, although it can be used to prove statements about any well-ordered set.

Description

1. Basic of induction, Show it is true for  $n=1$ .
2. Induction step, Assume it is true for  $n=k$ .
3. prove it is true for " $k+1$ ".

Example1:-

Show that  $1 + 3 + 5 + \dots + (2n-1) = n^2$  by mathematical induction?

Solution:

1. Show it is true for  $n=1$

$1 = 1^2$  is True

2. Assume it is true for  $n=k$

$1 + 3 + 5 + \dots + (2k-1) = k^2$  is True

3. Now, prove it is true for " $k+1$ "

$(2(k+1)-1) = (2k+1)$  add this to both side

$1 + 3 + 5 + \dots + (2k-1) + (2k+1) = k^2 + (2k+1)$

$k^2 + 2k + 1 = (k+1)^2$

They are the same! So it is true.

So:  $1 + 3 + 5 + \dots + 2(k-1) + (2k+1) = (k+1)^2$  is True  
 $= n^2$

