Mathematical induction is a unique and special way to prove the things, in only two steps.

Step 1. Show that it is true for n = 1.*Step 2.* Show that if n = k is true then n = k+1 is also true.

For example:

Prob. By principal of mathematical induction prove that$11^{n+2} + 12^{2n+1}$ is divisible by 133, n ∈ N.

Solution.*Step 1 P(1)-* Show it is true for n = 1$11^{n+2} + 12^{2n+1} = 11^{1+2} + 12^{2(1)+1}$ = 1331 + 1728 = 3059

Yes 3059 is divisible by 133.$11^{1+2} + 12^{2(1)+1}$ is true.
Step 2 P(k)- Assume it is true for n = k

$11^{k+2} + 12^{2(k)+1}$ is true.
(above line is an assumption only, which we will use as a fact in rest of the solution)

Now, prove that $11^{(k+1)+2} + 12^{2(k+1)+1}$ is divisible by 133. (here n = k +1 now, P(k+1))We have, P(k+1)

$11^{(k+1)+2} + 12^{2(k+1)+1} = 11^{k+3} + 12^{2k+3}$

$11^{(k+1)+2} + 12^{2(k+1)+1} = 11^{k+2} \times 11 + 12^{2k+1} \times 12^2$

$11^{(k+1)+2} + 12^{2(k+1)+1} = (11^{k+2} \times 11) + (12^{2k+1} \times 144)$

$11^{(k+1)+2} + 12^{2(k+1)+1} = (11^{k+2} \times 11) + (12^{2k+1} \times (11 + 133))$

$11^{(k+1)+2} + 12^{2(k+1)+1} = (11^{k+2} + 12^{2k+1}) \times 11 + (12^{2n+1} \times 133)$

$11^{(k+1)+2} + 12^{2(k+1)+1} = ((11^{k+2} + 12^{2k+1}) \times 11) + (12^{2n+1} \times 133)$

Here $11^{k+2}+12^{2k+1}$ is divisible by 133 as assumed in n = k, P(1),

And 12^{2n+1} x 133 is multiple of 133 so it is divisible by 133.
So,

$11^{(k+1)+2} + 12^{2(k+1)+1}$ = ((divisible by 133)x 11)+(divisible by 133)

$11^{(k+1)+2} + 12^{2(k+1)+1}$ = divisible by 133.

In this problem
If n = n, i.e, P(1) is true then n = n+1, i.e, P(n+1) is also true. Hence proved.

Related Posts:

1. SET
2. Relation
3. Net 34
4. prove that- AX(B∩C) = (AXB) ∩ (AXC)
5. Prove that- A∩(B∪C) = (A∩B) ∪ (A∩C)
6. prove that – (A∩B)X(C∩D) = (AXC)∩(BXD)
7. Show that- (P∩Q)X(R∩S) = (PXR)∩(QXS)
8. Binary operations
9. Algebraic structure
10. Group
11. Show that (…, -4, -3, -2, -1, 0, 1, 2, 3, 4,…} is group
12. Show that a*b=b*a
13. if a*c = c*a and b*c = c*b, then (a*b)*c = c*(a*b)
14. Undirected Graph and Incident Matrix
15. Prove the following by using the principle of mathematical induction for all n ∈ N, $1^3 + 2^3 + 3^3 + \ldots + n^3 = [n (n + 1)/2]^2$

16. Prove that G={−1,1,i,−i} is a group under multiplication.
17. Hasse diagram for the “less than or equal to” relation on the set S= { 0,1,2,3,4,5}