MATHS

BOOKS - TELUGU ACADEMY MATHS (TELUGU ENGLISH)

MATHEMATICAL INDUCTION

Long Answer Questions

1. Using the principle of finite Mathematical Induction prove that

1.2.3+2.3.4+3.4.5.+............ upto n terms = n(n+1)(n+2)(n+3))/4,for all n in N

▶ Watch Video Solution

2. Using the principle of Mathematical Induction , $\forall n \in N$, prove that

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

▶ Watch Video Solution

3. Show that $2+7+12.........+(5n\text{-}3)= \dfrac{n(5n-1)}{2}$

▶ Watch Video Solution

4. Using the principle of finite Mathematical Induction prove that

$$1^2 + \left(1^2 + 2^2\right) + \left(1^2 + 2^2 + 3^2\right) + ... \ nterms = \dfrac{n(n+1)^2(n+2)}{12}, \ \forall n$$

▶ Watch Video Solution

5. Show that $\dfrac{1}{1.3} + \dfrac{1}{3.5} + \dfrac{1}{5.7} + ... + nterms = \dfrac{n}{2n+1}$

▶ Watch Video Solution

6. Show that $\dfrac{1^3}{1} + \dfrac{1^3 + 2^3}{1+3} + ...nterms = \dfrac{n}{24}\left(2n^2 + 9n + 13\right)$

▶ Watch Video Solution

7. Prove that $a + ar + ar^2 + \ldots\ldots + n\text{terms} = \dfrac{a(r^n + 1)}{r - 1}, r \neq 1$

8. Prove that

$$a + (a + d) + (a + 2d) + \ldots\ldots . n\text{terms} = \frac{n}{2}(2a + (n - 1)d)$$

9. By mathematical induction, show that $49^n + 16n - 1$ is divisible by 64 for all positive integer n.

10. Using the principle of Mathematical Induction, show that $2.4^{2n+1} + 3^{3n+1}$ is divisible by 11, $\forall n \in N$

11. Prove that $x^n - y^n$ is divisible by x - y for all positive integers n.

12. Prove that $x^m + y^m$ is divisible by x + y, when m is an odd natural number.

13. Using the principle of finite Mathematical Induction prove the following:

(vi) $2 + 3.2 + 4.2^2 + \ldots \ldots \ldots$ upto n terms $= n.2^n$.

14. Using the principle of M.I, prove that $4^3 + 8^3 + 12^3 + \text{.........} \; n$ terms $=$ $16n^2(n+1)^2$

15. Use mathematical induction to prove that statement $\sum_{k=1}^{n} (2K-1)^2 = \dfrac{n(2n-1)(2n+1)}{3}$ for all $n \in N$

16. Using Mathematical Induction, prove that statement for all $n \in N$

$$\left(1 + \frac{3}{1}\right)\left(1 + \frac{5}{4}\right)\left(1 + \frac{7}{9}\right)\text{.......} \cdot \left(1 + \frac{2n+1}{n^2}\right) = (n+1)^2.$$

17. Prove that: $1^2 + 2^2 + 3^2 + \; + n^2 > \dfrac{n^3}{3}$ for all $n \in N$.

18. Use Mathematical induction to prove that $(1 + x)^n > 1 + nx$ for $n \geq 2, x > -1, x \neq 0$

19. Use mathematical induction to prove that $2n - 3 \leq 2^{n-2}$ for all $n \geq 5, n \in N$