MATHS

NCERT - NCERT MATHEMATICS(TELUGU)

PRINCIPLE OF MATHEMATICAL INDUCTION

Example

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

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

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2. Prove that $2^n > n$ for all positive integers n.

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3. For every positive integer n, prove that $7^n - 3^n$ is divisible by 4.

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4. Prove that $(1+x)^n \geq (1+nx)$ for all natural number n where $x > -1$

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5. Prove the rule of exponents $(ab)^n = a^n b^n$ by using principle of mathematical induction for every natural number.

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Exercise 4 1

1. Use mathematical induction to prove that statement $1^3 + 2^3 + 3^3 + \ldots + n^3 = \frac{n^2(n+1)^2}{4}, \forall n \in N$

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

$1.2.3 + 2, 3, 4 + \ldots\ldots\ldots + (\text{upto n terms}) = \frac{n(n+1)(n+2)(n+3)}{4}$

.

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3. Prove that by using the principle of mathematical induction for all $n \in N$:

$\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \ldots\ldots + \frac{1}{2^n} = 1 - \frac{1}{2^n}$

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4. $\frac{1}{2.5}+\frac{1}{5.8}+\frac{1}{8.11}+\ldots .16$ terms =

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

(iv) $a+ar+ar^2+\ldots\ldots..+\text{n terms}=\frac{a(r^n-1)}{r-1}, r\neq 1.$

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

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

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7. Prove that by using the principle of mathematical induction for all $n\in N$:

$$\left(1+\frac{1}{1}\right)\left(1+\frac{1}{2}\right)\left(1+\frac{1}{3}\right)\dots\left(1+\frac{1}{n}\right)=(n+1)$$

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

(iii) $\frac{1}{1.4}+\frac{1}{4.7}+\frac{1}{7.10}+\dots\dots\dots+\text{n terms}=\frac{n}{3n+1}$.

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9. Prove that by using the principle of mathematical induction for all $n \in N$:

$$1+2+3+\dots.+n<\frac{1}{8}(2n+1)^2$$

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10. Prove that by using the principle of mathematical induction for all

$n \in N$:

$10^{2n-1}+1$ is divisible by 11

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11. Prove that by using the principle of mathematical induction for all

$n \in N$:

$x^{2n}-y^{2n}$ is divisible by x+y

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12. Prove that by using the principle of mathematical induction for all

$n \in N$:

$3^{2n+2}-8n-9$ is divisible by 8

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13. Prove that by using the principle of mathematical induction for all $n \in N$:

$41^n - 14^n$ is multiple of 27

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