



MATHS

BOOKS - JEEVITH PUBLICATIONS MATHS (KANNADA ENGLISH)

MATHEMATICAL INDUCTION

Five Marks Questions With Answers

$$1. 1 + 2 + 3 + \dots + n = \frac{n(n + 1)}{2} \forall n \in N.$$

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

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$$3. 1^3 + 2^3 + 3^3 + \dots + n^3 = \frac{n^2(n+1)^2}{4} \forall n \in \mathbb{N}.$$

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4.

$$1 \cdot 2 + 2 \cdot 3 + 3 \cdot 4 + \dots + n(n+1) = \frac{n}{3}(n+1)(n+2) \forall n \in \mathbb{N}.$$

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5.

$$\frac{1}{1 \cdot 2} + \frac{1}{2 \cdot 3} + \frac{1}{3 \cdot 4} + \dots + \frac{1}{n(n+1)} = \frac{n}{n+1} \forall n \in \mathbb{N}.$$

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6.

$$1 \cdot 2 \cdot 3 + 2 \cdot 3 \cdot 4 + \dots + n(n+1)(n+2) = \frac{n(n+1)(n+2)(n+3)}{4} \forall n$$

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

$$1 \cdot 3 + 2 \cdot 3^2 + 3 \cdot 3^3 + \dots + n \cdot 3^n = \frac{(2n - 1)3^{n+1} + 3}{4}$$

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8.

$$\frac{1}{2 \cdot 5} + \frac{1}{5 \cdot 8} + \frac{1}{8 \cdot 11} + \dots + \frac{1}{(3n - 1)(3n + 2)} = \frac{n}{(6n + 4)} \quad \forall n \in \mathbb{N}$$

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$$9. a + ar + ar^2 + \dots + ar^{n-1} = \frac{a(1 - r^n)}{1 - r} \quad \forall n \in \mathbb{N}.$$

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10.

$$\left(1 + \frac{3}{1}\right) \left(1 + \frac{5}{4}\right) \left(1 + \frac{7}{9}\right) \dots \left(1 + \frac{(2n+1)}{n^2}\right) = (n+1)^2 \forall n \in \mathbb{N}.$$

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11.

$$\frac{1}{1.4} + \frac{1}{4.7} + \frac{1}{7.10} + \dots + \frac{1}{(3n-2)(3n+1)} = \frac{n}{(3n+1)} \forall n \in \mathbb{N}.$$

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12. Prove by induction that : $2^n > n$ for all $n \in \mathbb{N}$.

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13. Prove by induction that $n(n+1)(2n+1)$ is divisible by 6.

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14. $n(n+1)(n+5)$ is a multiple 3.



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15. $10^{2n-1} + 1$ is divisible by 11.



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16. $3^{2n+2} - 8n - 9$ is divisible by 8.



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17. $41^n - 14^n$ is multiple of 27.



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