MATHS

BOOKS - MBD MATHS (ODIA ENGLISH)

PRINCIPLES OF MATHEMATICAL INDUCTION

Question Bank

1. Prove the following by induction.

1 + 2+ 3+....+ n = $n(n+1)/2$

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2. Prove the following by induction.

$1^2 + 2^2 + \ldots. + n^2 = n(n+1)(2n+1)/6$

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3. Prove the following by induction.

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

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4. $5^n - 1$ is divisible by 4.

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5. $7^{2n} + 2^{3n-3}3^{n-1}$ is divisible by 25 for any natural number $n > 1$.

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6. $7.5^{2n-1} + 2^{3n+1}$ is divisible by 17 for every natural$n \geq 1$.

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7. $4^{n+1} + 15n + 14$ is divisible by 9 for every natural number $n \geq 0$

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8. $3^{2(n-1)} + 7$ is divisible by 8 for every natural $n \geq 2$.

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9. $5^{2(n-4)} - 6n + 32$ is divisible by 9 for every natural number $n \geq 5$.

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10. $\frac{1}{1.2} + \frac{1}{2.3} + \ldots\ldots + \frac{1}{n(n+1)} = \frac{n}{n+1}$

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11. $1.3 + 2.4 + 3.5 + \ldots\ldots + n(n+2) = \dfrac{n(n+1)(2n+7)}{6}$

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12.

$x^n - y^n = (x-y)\left(x^{n-1} + x^{n-2}y + \ldots + xy^{n-2} + y^{n-1}\right), x, y \in R$

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13. $1 + 3 + 5 + \ldots\ldots + (2n-1) = n^2$

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14. $2^n > n$, n is a natural number.

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15. $(1.\ 2.\ 3...n)^3 > 8\left(1^3 + 2^3 + 3^3 + \ldots + n^3\right)$, for $n > 3$

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16. $\frac{1}{n+1} + \frac{1}{n+2} + \ldots.. + \frac{1}{3n+1} > 1$ for every positive integer n.

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