



MATHS

NCERT - NCERT MATHEMATICS (GUJRATI)

BINOMIAL THEOREM

Example

1. Expand $\left(X^2 + \frac{3}{x}\right)^4$, $x \neq 0$



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2. Compute $(98)^5$.



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3. Which is larger $(1.01)^{1000000}$ or 10,000?



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4. Using binomial theorem. Prove that $6^n - 5n$ always leaves remainder 1 when divided by 25.



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5. Find a if the 17^{th} and 18^{th} terms of the expansion $(2 + a)^{50}$ are equal.



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6. Show that the middle term in the expansion of $(1 + x)^{2n}$ is $\frac{1.3.5 \dots (2n - 1)}{n!} 2^n \cdot x^n$, where n is a positive integer.



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7. Find the coefficient of $x^6 y^3$ in the expansion of $(x + 2y)^9$.



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8. The second, third and fourth terms in the binomial expansion $(x + a)^n$ are 240, 720 and 1080, respectively. Find x, a and n .



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9. The coefficients of three consecutive terms in the expansion of $(1 + a)^n$ are in the ratio 1: 7: 42 Find n.



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10. Find the term independent of x in the expansion of $\left(\frac{3}{2}x^2 - \frac{1}{3x}\right)^6$.



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11. If the coefficients of $a^r - 1$, a^r and $a^r + 1$ in the expansion of $(1 + a)^n$ are in arithmetic progression, prove that $n^2 - n(4r+1) + 4r^2 - 2 = 0$.



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12. Show that the coefficient of the middle term in the expansion of $(1 + x)^{2n}$ is equal to the sum of the coefficients of two middle terms in the expansion of $(1 + x)^{2n-1}$



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13. Find the coefficient of a^4 in the product $(1 + 2a)^5$ using binomial theorem.



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14. Find the r^{th} term from the end in the expansion of $(x + a)^n$.



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15. Find the term independent of x in the expansion of $\left(\sqrt[3]{x} + \frac{1}{2}\sqrt[3]{x}\right)^{18}$, $x > 0$.

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16. The sum of the coefficients of the first three terms in the expansion of $\left(x - \frac{3}{x^2}\right)^m$, $x \neq 0$, m being a natural number, is 559. Find the term of the expansion containing x^3 .

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17. If the coefficients of $(r - 5)^{th}$ and $(2r - 1)^{th}$ terms in the expansion of $(1 + x)^{34}$ are equal, find r .



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Exercise 8 1

1. Expand the expression

$$(1 - 2x)^5$$



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2. Expand the expression

$$\left(\frac{2}{x} - \frac{x}{2}\right)^5$$



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3. Expand the expression

$$(2x - 3)^6$$



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4. Expand the expression

$$\left(\frac{x}{3} + \frac{1}{x}\right)^5$$



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5. Expand the expression

$$\left(x + \frac{1}{x}\right)^6$$



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6. Using binomial theorem, evaluate : $(96)^3$



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7. Using binomial theorem, evaluate $:(96)^3$



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8. Using binomial theorem, evaluate $(101)^4$



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9. Using binomial theorem, evaluate $(99)^5$



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10. Using Binomial Theorem, indicate which number is larger $(1.1)^{10000}$ or 1000.



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11. Find $(a + b)^4 - (a - b)^4$. Hence, evaluate $(\sqrt{3} + \sqrt{2})^4 - (\sqrt{3} - \sqrt{2})^4$.



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12. Find $(x + 1)^6 + (x - 1)^6$. Hence or otherwise evaluate $(\sqrt{2} + 1)^6 + (\sqrt{2} - 1)^6$.



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13. Show that $9^{n+1} - 8n - 9$ is divisible by 64, whenever n is a positive interger.



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14. Prove that $\sum_{r=0}^n 3^r n C_r = 4^n$.



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Exercise 8 2

1. Find the coefficient of x^5 in $(x + 3)^8$



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2. Find the coefficient of a^5b^7 in $(a - 2b)^{12}$.



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3. Write the general term in the expansion of $(x^2 - y)^6$



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4. Write the general term in the expansion of $(x^2 - yx)^{12} \cdot x \neq 0$.



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5. Find the 4th term in the expansion of $(x - 2y)^{12}$.



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6. Find the 13th term in the expansion of

$$\left(9x - \frac{1}{3}\sqrt{x}\right)^{18}, x \neq 0.$$



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7. Find the middle terms in the expansions of

$$\left(3 - \frac{x^3}{6^7}\right)$$



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8. Find the middle terms in the expansions of

$$\left(\frac{x}{3} + 9Y\right)^{10}.$$



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9. In the expansion of $(1 + a)^m + n$, prove that coefficients of a^m and a^n are equal.



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10. The coefficients of the $(r - 1)^{th}$, r^{th} and $(r + 1)^{th}$ terms in the expansion of $(x + 1)^n$ are in the ratio 1 : 3 : 5 Find n and r.



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11. Prove that the coefficient of x^n in the expansion of $(1 + x)^{2n}$ is twice the coefficient of x^n in the expansion of $(1 + x)^{2n-1}$.



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12. Find a positive value of m for which the coefficient of x^2 in the expansion $(1 + x)^m$ is 6.



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Miscellaneous Exercise On Chapter 8

1. Find $a, b,$ and n in the expansion of $(a + b)^n$ if the first three terms of the expansion are 729, 7290 and 30375, respectively.



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2. Find a if the coefficients of x^2 and x^3 in the expansion of $(3 + ax)^9$ are equal.



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3. Find the coefficient of x^5 in the product $(1 + 2x)^6 (1 - x)^7$ using binomial theorem.



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4. If a and b are distinct integers, prove that $a - b$ is a factor of $a^n - b^n$, whenever n is a positive integer.



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5. Evaluate $(\sqrt{3} + \sqrt{2})^6 - (\sqrt{3} - \sqrt{2})^6$.



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6. Find the value of $(a^2 + \sqrt{a^2} - 1)^4 + (a^2 - \sqrt{a^2} - 1)^4$.



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7. Find an approximation of $(0.99)^5$ using the first three terms of its expansion.



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8. Find n , if the ratio of the fifth term from beginning to the fifth term from the end in the expansion of $\left(\sqrt[4]{2} + \frac{1}{\sqrt[4]{3}}\right)^n$ is $\sqrt{6}:1$.



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9. Expand using Binomial Theorem

$$\left(1 + \frac{x}{2} - \frac{2}{x}\right)^4, x \neq 0.$$



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10. Find the expansion of $(3x^2 - 2ax + 3a^2)^3$ using binomial theorem.



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