Class 11 Maths Chapter 7: Binomial Theorem - Notes, Important Questions and MCQs (2026-27)

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Class 11 Maths Chapter 7, Binomial Theorem, gives a quick way to expand powers of a binomial like $(a + b)^n$ without repeated multiplication.

These notes cover Pascal's triangle, the statement and proof of the binomial theorem for positive integral indices, observations about the expansion, special cases and simple applications such as approximations and comparing large numbers.

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Chapter Overview

A binomial is an algebraic expression with two terms, such as $a + b$ or $2x - 3y$. Multiplying $(a + b)$ by itself repeatedly becomes tedious for large powers.

The binomial theorem expresses $(a + b)^n$ as a sum of terms whose coefficients are the combinations ${}^nC_r$ – the same numbers that appear in Pascal's triangle.

Important Topics and Concepts

Pascal's Triangle

- Coefficients of the expansions of $(a + b)^0$, $(a + b)^1$, $(a + b)^2$, ... form a triangular array.

- Each row begins and ends with 1; every other number is the sum of the two numbers above it.
- Rows: 1; 1 1; 1 2 1; 1 3 3 1; 1 4 6 4 1; 1 5 10 10 5 1.
- The numbers in row n are ${}^nC_0$, ${}^nC_1$, …, ${}^nC_n$ – named after Blaise Pascal, though known earlier to Indian mathematician Pingala as Meru Prastara.

Binomial Theorem for Positive Integral Index

- $(a + b)^n = {}^nC_0a^n + {}^nC_1a^{n-1}b + {}^nC_2a^{n-2}b^2 + \ldots + {}^nC_{n-1}ab^{n-1} + {}^nC_nb^n$.
- The coefficients ${}^nC_r$ are called binomial coefficients.
- The theorem is proved by mathematical reasoning using Pascal's rule ${}^nC_r + {}^nC_{r-1} = {}^{n+1}C_r$.

Observations

- The expansion has n + 1 terms.
- In successive terms, the power of a decreases by 1 and the power of b increases by 1.
- In each term, the sum of the indices of a and b is n.
- Coefficients equidistant from the beginning and end are equal (${}^nC_r = {}^nC_{n-r}$).

Special Cases

- $(x - y)^n = {}^nC_0x^n - {}^nC_1x^{n-1}y + {}^nC_2x^{n-2}y^2 - \ldots + (-1)^n\,{}^nC_ny^n$ – signs alternate.
- $(1 + x)^n = {}^nC_0 + {}^nC_1x + {}^nC_2x^2 + \ldots + {}^nC_nx^n$.
- Putting x = 1: ${}^nC_0 + {}^nC_1 + \ldots + {}^nC_n = 2^n$.
- $(1 - x)^n = {}^nC_0 - {}^nC_1x + {}^nC_2x^2 - \ldots + (-1)^n\,{}^nC_nx^n$; with x = 1, the alternating sum is 0.

Applications

- Expanding expressions like $(x + 2)^5$ or $(2x - 3)^4$.
- Evaluating powers of numbers close to round figures, e.g. $(98)^5 = (100 - 2)^5$ or $(102)^5 = (100 + 2)^5$.
- Comparing numbers, e.g. showing $(1.01)^{1000000} > 10000$.
- Proving divisibility, e.g. $6^n - 5n - 1$ is divisible by 25 for positive integers n.

Pascal's Triangle (n = 0 to 6)

n	Coefficients	Sum = 2^n
0	1	1
1	1 1	2
2	1 2 1	4
3	1 3 3 1	8
4	1 4 6 4 1	16
5	1 5 10 10 5 1	32
6	1 6 15 20 15 6 1	64

Important Definitions and Terms

Term	Meaning
Binomial	An expression with two terms.

Term	Meaning
Binomial coefficient	${}^nC_r$ appearing in the expansion of $(a + b)^n$.
Pascal’s triangle	Triangular array of binomial coefficients.
Index	The power n in $(a + b)^n$.
Meru Prastara	Pingala’s ancient name for the triangle of coefficients.

Short Answer Questions

Q1. How many terms are in the expansion of $(a + b)^{10}$?

$n + 1 = 11$ terms.

Q2. Expand $(x + 2)^3$.

$x^3 + 3x^2(2) + 3x(4) + 8 = x^3 + 6x^2 + 12x + 8$.

Q3. Expand $(1 - 2x)^4$.

$1 - 8x + 24x^2 - 32x^3 + 16x^4$.

Q4. Find the sum of the coefficients of $(1 + x)^7$.

$2^7 = 128$.

Q5. Write the 5th row of Pascal’s triangle.

1 5 10 10 5 1 (for n = 5).

Q6. Evaluate $(99)^3$ using the binomial theorem.

$(100 - 1)^3 = 1000000 - 30000 + 300 - 1 = 970299$.

Q7. What is ${}^nC_0 - {}^nC_1 + {}^nC_2 - \ldots + (-1)^n{}^nC_n$?

0, obtained by putting $x = 1$ in $(1 - x)^n$.

Q8. Expand $(2x - 3)^3$.

$8x^3 - 36x^2 + 54x - 27$.

Long Answer Questions

Q1. Expand $(x^2 + 3/x)^4$, $x \neq 0$.

Using the theorem: ${}^4C_0(x^2)^4 + {}^4C_1(x^2)^3(3/x) + {}^4C_2(x^2)^2(3/x)^2 + {}^4C_3(x^2)(3/x)^3 + {}^4C_4(3/x)^4$.

$= x^8 + 4 \cdot 3x^5 + 6 \cdot 9x^2 + 4 \cdot 27/x + 81/x^4$.

$= x^8 + 12x^5 + 54x^2 + 108/x + 81/x^4$.

Q2. Which is larger: $(1.01)^{1000000}$ or 10000?

$(1.01)^{1000000} = (1 + 0.01)^{1000000} = 1 + 1000000(0.01) +$ positive terms.

$= 1 + 10000 +$ positive terms > 10000.

Hence $(1.01)^{1000000}$ is larger.

Q3. Show that $9^{n+1} - 8n - 9$ is divisible by 64, n a positive integer.

$9^{n+1} = (1 + 8)^{n+1} = 1 + (n+1)8 + {}^{n+1}C_2 8^2 + {}^{n+1}C_3 8^3 + \ldots$

The bracket is an integer, so the expression is divisible by 64.

MCQs with Answers

1. Number of terms in $(a + b)^n$:(a) n (b) n + 1 (c) n − 1 (d) 2nAnswer: (b) n + 1

2. Sum of binomial coefficients of $(1 + x)^n$:(a) n (b) 2n (c) 2^n (d) n^2Answer: (c) 2^n

3. Coefficient of x^2 in $(1 + x)^5$:(a) 5 (b) 10 (c) 20 (d) 1Answer: (b) 10

4. Row 4 of Pascal's triangle:(a) 1 3 3 1 (b) 1 4 6 4 1 (c) 1 5 10 10 5 1 (d) 1 2 1Answer: (b) 1 4 6 4 1

5. $(a - b)^n$ has signs that:(a) Are all positive (b) Alternate (c) Are all negative (d) Depend on aAnswer: (b) Alternate

6. ${}^nC_r$ = (a) ${}^nC_{r+1}$ (b) ${}^nC_{n-r}$ (c) ${}^nP_r$ (d) r!Answer: (b) ${}^nC_{n-r}$

7. In each term of $(a + b)^n$, sum of indices is:(a) n (b) n + 1 (c) 2n (d) rAnswer: (a) n

8. $(1 + 1)^4$ =(a) 8 (b) 16 (c) 4 (d) 32Answer: (b) 16

9. Ancient Indian name for Pascal's triangle:(a) Meru Prastara (b) Sulba Sutra (c) Lilavati (d) AryabhatiyaAnswer: (a) Meru Prastara

10. Last term of $(x + y)^6$:(a) x^6 (b) 6y (c) y^6 (d) $6xy^5$Answer: (c) y^6

Quick Revision Points

- $(a + b)^n = \Sigma\ {}^nC_r\ a^{n-r}\ b^r$, r = 0 to n.
- n + 1 terms.
- Powers of a decrease, b increase; total index n.
- ${}^nC_r = {}^nC_{n-r}$ – symmetric coefficients.
- Pascal's triangle; Meru Prastara.
- $(x - y)^n$ – alternating signs.
- $\Sigma\ {}^nC_r = 2^n$.
- Alternating sum = 0.
- Applications: approximations, comparisons, divisibility.
- General and middle terms are outside 2026-27 scope.

Chapter Summary

The binomial theorem gives the expansion of $(a + b)^n$ for positive integers n using binomial coefficients ${}^nC_r$, which form Pascal's triangle. The expansion has n + 1 terms with symmetric coefficients and indices adding up to n.

Special cases such as $(1 + x)^n$ and $(x - y)^n$ lead to useful results, like the sum of coefficients being 2^n. The theorem helps evaluate powers of numbers, compare large numbers and prove divisibility.

Exam Tips and PYQ Pattern

- Write the general pattern first, then substitute values carefully.
- Watch signs in $(x - y)^n$ expansions.
- Use Pascal's triangle for small n to save time.
- For approximations, split numbers as $100 \pm k$.
- Divisibility proofs: expand, then factor out the required power.
- General term and middle term questions are not in the rationalised syllabus.

Frequently Asked Questions

Is this chapter in the 2026-27 CBSE syllabus?

Yes. It is part of the NCERT Class 11 Mathematics textbook, prescribed in the CBSE 2026-27 syllabus.

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Yes. Use the free PDF link at the top of this page – no signup needed.

What is the binomial theorem?

A formula for expanding $(a + b)^n$ as $\Sigma\ {}^nC_r\ a^{n-r}\ b^r$ for positive integers n.

What is the sum of binomial coefficients?

2^n, obtained by putting $a = b = 1$.

Are general and middle terms in the 2026-27 syllabus?

No. The rationalised syllabus covers the statement, proof, Pascal's triangle and simple applications.

Conclusion

Binomial Theorem is short and scoring. Practise expansions and applications with the Pascal's triangle table and download the free PDF.

More Notes: Class 11 Maths Chapter 6: Permutations and Combinations notes | Class 11 Maths Chapter 8: Sequences and Series notes | All Class 11 Maths notes

Author Bio: Written and reviewed by the Nextoper Editorial Team, a group of CBSE maths educators who build chapter notes directly from the NCERT textbook and past board paper patterns.

Freshness Note: These notes follow the NCERT Class 11 Maths textbook, Mathematics (Class XI) (NCERT reprint 2026-27, rationalised syllabus), and the CBSE syllabus for the 2026-27 session. Last checked on 28 November 2026.