

CHAPTER-8
BINOMIAL THEOREMS
04 MARK TYPE QUESTIONS

Q. NO	QUESTION	MARK
1.	Expand $(x + 1/x)^6$	4
2.	Find the coefficient of a^5b^7 in $(a - 2b)^{12}$	4
3.	Expand using binomial theorem: $\left(1 + \frac{x}{3} - \frac{3}{x}\right)^4, x \neq 0$	4
4.	The coefficient of $(r - 1)^{\text{th}}$ and $(2r - 5)^{\text{th}}$ terms in the expansion of $\left(\frac{x}{y} + \frac{z}{t}\right)^{10}$ are equal find r and the value of $(r + 2)^{\text{th}}$ term.	4
5.	If the coefficients of $2^{\text{nd}}, 3^{\text{rd}}, 4^{\text{th}}$ terms in the expansion of $(1 + x)^n, n \in \mathbb{N}$, are in A.P. then find the value of n.	4
6.	Write first three terms in the expansion of $(3 + ax)^9$. Find a, if the coefficients of x^2, x^3 in the expansion of $(3 + ax)^9$ are equal	4
7.	Find the coefficients of x^4 and x^5 in $(1 + 2x)^6(1 - x)^7$	4
8.	If P be the sum of odd terms and Q that of even terms in the expansion of $(x + y)^n$ then prove that $(x^2 - y^2) = P^2 - Q^2$	4
9.	In the expansion of $(x + a)^n$ if the sum of odd terms is denoted by O and the sum of even term by E. Then prove that (i) $O^2 - E^2 = (x^2 - a^2)^n$ (ii) $4OE = (x + a)^{2n} - (x - a)^{2n}$	4
10.	If p is a real number and if the middle term in the expansion of $\left(2 + \frac{p}{2}\right)^8$ is 1120, find p	4

ANSWERS:

Q. NO	ANSWER	MARKS
1.	$\begin{aligned} \left(x + \frac{1}{x}\right)^6 &= \left({}^6C_0 x^6\right) + \left({}^6C_1 x^5 \cdot \frac{1}{x}\right) + \left({}^6C_2 x^4 \cdot \frac{1}{x^2}\right) + \\ &\quad \left({}^6C_3 x^3 \cdot \frac{1}{x^3}\right) + \left({}^6C_4 x^2 \cdot \frac{1}{x^4}\right) + \left({}^6C_5 x^1 \cdot \frac{1}{x^5}\right) \\ &\quad + \left({}^6C_6 \cdot \frac{1}{x^6}\right) \\ &= x^6 + 6 \cdot x^5 \cdot \frac{1}{x} + 15x^4 \cdot \frac{1}{x^2} + 20x^3 \cdot \frac{1}{x^3} + 15x^2 \cdot \frac{1}{x^4} \\ &\quad + 6x \cdot \frac{1}{x^5} + \frac{1}{x^6} \\ &= x^6 + 6x^4 + 15x^2 + 20 + \frac{15}{x^2} + \frac{6}{x^4} + \frac{1}{x^6} \end{aligned}$	4
2.	$\begin{aligned} T_{r+1} &= {}^{12}C_r (a)^{12-r} \cdot (-2b)^r \\ \text{Put } 12-r &= 5 = r = 7 \\ T_8 &= {}^{12}C_7 (a)^5 \cdot (-2b)^7 \\ &= {}^{12}C_7 a^5 \cdot (-2)^7 \cdot b^7 \\ &= {}^{12}C_7 (-2)^7 a^5 b^7 \end{aligned}$ coefficient of $a^5 b^7$ is ${}^{12}C_7 (-2)^7$	4
3.	$\begin{aligned} \left(1 + \frac{x}{3} - \frac{3}{x}\right)^4 &= \left[\left(1 + \frac{x}{3}\right) - \frac{3}{x}\right]^4 \\ &= {}^4C_0 \left(1 + \frac{x}{3}\right)^4 \left(\frac{3}{x}\right)^0 - {}^4C_1 \left(1 + \frac{x}{3}\right)^3 \left(\frac{3}{x}\right)^1 + {}^4C_2 \left(1 + \frac{x}{3}\right)^2 \left(\frac{3}{x}\right)^2 - \\ &\quad {}^4C_3 \left(1 + \frac{x}{3}\right)^1 \left(\frac{3}{x}\right)^3 + {}^4C_4 \left(1 + \frac{x}{3}\right)^0 \left(\frac{3}{x}\right)^4 \\ &= \left(1 + \frac{x}{3}\right)^4 - 4 \left(1 + \frac{x}{3}\right)^3 \left(\frac{3}{x}\right)^1 + 6 \left(1 + \frac{x}{3}\right)^2 \left(\frac{3}{x}\right)^2 - 4 \left(1 + \frac{x}{3}\right)^1 \left(\frac{3}{x}\right)^3 + \\ &\quad \left(\frac{3}{x}\right)^4 \\ &= \left(\frac{x}{3}\right)^0 + 4 \left(\frac{x}{3}\right)^1 + 6 \left(\frac{x}{3}\right)^2 + 4 \left(\frac{x}{3}\right)^3 + \left(\frac{x}{3}\right)^4 - 4 \left(\frac{3}{x}\right) \left[\left(\frac{x}{3}\right)^0 + 3 \left(\frac{x}{3}\right)^1 + \right. \\ &\quad \left. 3 \left(\frac{x}{3}\right)^2 + \left(\frac{x}{3}\right)^3\right] + 6 \left(\frac{9}{x^2}\right) \left[\left(\frac{x}{3}\right)^0 + 2 \left(\frac{x}{3}\right)^1 + \left(\frac{x}{3}\right)^2\right] - 4 \left(\frac{27}{x^3}\right) \left(1 + \frac{x}{3}\right) + \frac{81}{x^4} \\ &= 1 + \frac{4x}{3} + \frac{2x^2}{3} + \frac{4x^3}{27} + \frac{x^4}{81} - \frac{12}{x} - 12 - 4x - \frac{4x^2}{9} + \frac{54}{x^2} + \frac{36}{x} + 6 - \frac{108}{x^3} - \\ &\quad \frac{36}{x^2} + \frac{81}{x^4} \\ &= -5 - \frac{8x}{3} + \frac{2x^2}{3} + \frac{4x^3}{27} + \frac{x^4}{81} + \frac{24}{x} + \frac{18}{x^2} - \frac{108}{x^3} + \frac{81}{x^4} \end{aligned}$	4
4.	Coefficient of $T_{r-4} = 10 {}^{Cr-5}$ Coefficient of $T_{2r-8} = 10 {}^{C_{2r-9}}$	4

	As coefficient are equal $10_{C_{r-5}} = 10_{C_{2r-9}}$ Thus, $r - 2 = 2r - 6 \Rightarrow r = 4$ $(r + 2)$th term = 6^{th} term $T_6 = 10_{C_5} \left(\frac{x}{y}\right)^5 \left(\frac{z}{t}\right)^5$	
5.	Given, $C(n,1), C(n,2), C(n,3)$ are in A.P. So, $2C(n,2) = C(n,1) + C(n,3)$ And, $n(n-1) = n + n(n-1)(n-2)/6$ Solving, $n=7$	4
6.	$(3 + ax)^9 = 3^9 + C(9,1)3^8(ax) + C(n,2)3^7(ax)^2 + \dots + (ax)^9$ A/Q $C(n,2)3^7(ax)^2 = C(n,3)3^6(ax)^3$ And $a = \frac{9}{7}$	4
7.	Coefficient of x^4 is -5 , coefficient of x^5 is 171	4
8.	proof	4
9.	i) $(x^2 - a^2)^n$ ii) $[(x + a)^{2n} - (x - a)^{2n}]$	4
10.	± 2	4