

CHAPTER-8
BINOMIAL THEOREMS
02 MARK TYPE QUESTIONS

Q. NO	QUESTION	MARK
1.	Write the general term $(x^2 - y)^6$.	2
2.	When n is a positive integer, the no. of terms in the expansion of $(x + a)^n$ is?	2
3.	In the expansion of $\left(x + \frac{1}{x}\right)^6$. Find the 3rd term from the end.	2
4.	Find the coefficient of x^5 in $(x + 3)^9$.	2
5.	Find the no. of terms in the expansion of $(1 - 2x + x^2)^7$	2
6.	Compute $(96)^4$ using binomial theorem	2
7.	If x is the number of terms in $(m^2 + 2mn + n^2)^8$, then find the sum of prime factors of x	2
8.	The 3 rd term in the expansion of $\left(\frac{x}{3} + \frac{1}{x}\right)^5$ is $\frac{a}{b}x$, then find $a+b$	2
9.	Find the ratio of the first and last term of the expansion $\left(\sqrt[3]{2} + \frac{1}{\sqrt[3]{3}}\right)^{3n}$	2
10.	The number of terms in the expansion of $(x + 2y + 3z)^5$ is $7k$, find k	2
11.	In the expansion of $(1 + a)^{15}$, prove that coefficient a^6, a^9 are equal.	2
12.	Find a positive value of m for which the coefficient of x^3 in the expansion of $(1 + x)^m$ is 35.	2
13.	Using binomial theorem, find 11^5 .	2
14.	Expanding $\left(x - \frac{1}{x}\right)^6$, find the term which lies exactly at the middle of the expansion.	2
15.	Using binomial theorem indicate which number is larger $(1.1)^{10000}$ or 1000 ?	2
16.	Expand $(x^2 + 2a)^5$ using binomial theorem	2
17.	Expand using binomial theorem $\left(x^2 + \frac{2}{x}\right)^4$ $x \neq 0$	2
18.	Find the number of terms in the expansion of $(\sqrt{x} + \sqrt{y})^{10} + (\sqrt{x} - \sqrt{y})^{10}$	2
19.	Prove that $\sum_{r=0}^n {}^nC_r 3^r = 4^n$	2
20.	The first three terms in the expansion of $(1+ax)^n$ are $1+12x+64x^2$. Find n and a	2

21.	Compute $(102)^4$	2
22.	Using binomial theorem, prove that $6^n - 5n$ always leaves remainder 1 when divided by 25.	2
23.	Find $(\alpha + \beta)^4 - (\alpha - \beta)^4$.	2
24.	Expand the following $(1 - x + x^2)^4$	2
25.	Find the greatest term in the expansion of $\sqrt{3} \left(1 + \frac{1}{\sqrt{3}}\right)^{20}$.	2
26.	Expand the expression $(1-3x)^5$ using binomial theorem.	2
27.	Demonstrate how the expression $(x^2 + 1)^5$ can be expanded by the help of binomial theorem.	2
28.	Evaluate using Binomial theorem : $(95)^3$	2
29.	Evaluate : $(\sqrt{2} + 1)^5 + (\sqrt{2} - 1)^5$	2

ANSWERS:

Q. NO	ANSWER	MARKS
1.	$T^{r+1} = {}^6C_r(x^2)^{6-r}(-y)^r$ $= {}^6C_r(x)^{12-2r}(-1)^r \cdot y^r.$	2
2.	The no. of terms in the expansion of $(x + a)^n$ is one more than the index n i.e $(n + 1)$	2
3.	3rd term from end = $(6 - 3 + 2)^{\text{th}}$ term from beginning $T_5 = {}^6C_4 x^{6-4} \left(\frac{1}{x}\right)^4$ $= {}^6C_4 x^2 x^{-4}$ $= 15x^{-2} = 15/x^2.$	2
4.	$T_{r+1} = {}^9C_r(x)^{9-r}3^r$ Put $9 - r = 5$ $r = 4$ $T_5 = {}^9C_4 x^5 3^4$ coefficient of x^5 is ${}^9C_4 3^4$	2
5.	$(1 - 2x + x^2)^7$ $= (x^2 - 2x + 1)^7$ $= ((x - 1)^2)^7$ $= (x - 1)^{14}$ No. of term is 15.	
6.	$(96)^4 = (100 - 4)^4$ $= {}^4C_0 100^4 4^0 - {}^4C_1 100^3 4^1 + {}^4C_2 100^2 4^2 - {}^4C_3 100^1 4^3 + {}^4C_4 100^0 4^4$ $= 100000000 - 16000000 + 960000 - 25600 + 256$ $= 84934656$	2
7.	$(m^2 + 2mn + n^2)^8 = [(m + n)^2]^8 = (m + n)^{16}$ Thus, number of terms = $16+1=17=x$ Prime factors of 17 is 17 only Sum=17	2
8.	$T_3 = {}^5C_2 \left(\frac{x}{3}\right)^3 \left(\frac{1}{x}\right)^2 = \frac{10}{27}x$ Thus, $a+b=37$	2
9.	$\text{Ratio} = \frac{{}^{3n}C_0 (\sqrt[3]{2})^{3n}}{{}^{3n}C_{3n} \left(\frac{1}{\sqrt[3]{3}}\right)^{3n}} = \frac{6^n}{1}$ Ratio = $6^n:1$	2
10.	The number of terms in the expansion of $(x + 2y + 3z)^5$ $= \frac{(5+1)(5+2)}{2}$	2

	$= 21$ $7k = 21$ $k=3$	
11.	The coefficient of $a^6 = C(15,6)$ The coefficient of $a^9 = C(15,9)$ And $C(15,6) = C(15,9)$ as $C(n,r) = C(n,n-r)$	2
12.	$C(m,3)=35$ So, $m(m-1)(m-2)=210$ And $m(m-1)(m-2)=7.6.5$ Hence, $m=7$	2
13.	$(10 + 1)^5 = 10^5 + 5 \cdot 10^4 + 10 \cdot 10^3 + 10 \cdot 10^2 + 5 \cdot 10^1 + 1 = 161051$	2
14.	$(x - \frac{1}{x})^6 = x^6 - 6x^4 + 15x^2 - 20 + 15\frac{1}{x^2} - 6\frac{1}{x^4} + \frac{1}{x^6}$ So, the middle term is -20	2
15.	$(1.1)^{10000} = (1 + 0.1)^{10000} = 1 + C(10000,1)(.01) + \text{positive numbers} = 1001 + \text{positive numbers} > 1000$	2
16.	$x^{10} + 10x^8a + 40x^6a^2 + 80x^4a^3 + 80x^2a^4 + 32a^5$	2
17.	$x^8 + 8x^5 + 24x^2 + \frac{32}{x} + \frac{16}{x^4}$	2
18.	6 terms	2
19.	$(1+3)^n = \sum_{r=0}^n C_r^n 3^r \text{ or } 4^n = \sum_{r=0}^n C_r^n 3^r$	2
20.	$n = 9, a = \frac{4}{3}$	2
21.	108243216	2
22.	YES	2
23.	$\alpha\beta(\alpha^2 + \beta^2)$	2
24.	$1 - 4x + 10x^2 - 16x^3 + 19x^4 - 16x^5 + 10x^6 - 4x^7 + x^8$	2
25.	$T_8 = 25840/9$	2
26.	We know that Considering the following elements, $x = 1$, $y = -3x$ and $n = 5$ $(1-3x)^5 = {}^5C_0 1^5 + {}^5C_1 1^4 (-3x)^1 + {}^5C_2 1^3 (-3x)^2 + {}^5C_3 1^2 (-3x)^3 + {}^5C_4 1^1 (-3x)^4 + {}^5C_0 1^0 (-3x)^5$ $\Rightarrow 1 - 5(3x) + 10(9x^2) - 10(27x^3) + 5(81x^4) - (243x^5)$ $\Rightarrow 1 - 15x + 90x^2 - 270x^3 + 405x^4 - 243x^5$ Therefore, the expanded form of $(1-3x)^5$ is $1 - 15x + 90x^2 - 270x^3 + 405x^4 - 243x^5$	2
27.	The binomial theorem formula states that: $(x+y)^n = nC_0 x^n + nC_1 x^{n-1}y + nC_2 x^{n-2}y^2 + nC_3 x^{n-3}y^3 + \dots + nC_r x^{n-r}y^r + \dots + nC_0 x^0 y^n$ Here, $x = x^2$, $y = 1$ and $n = 5$	2

	Substituting the following values of x, y and n in the above equation we get, $\Rightarrow {}^5C_0(x^2)^5 + {}^5C_1(x^2)^4 + {}^5C_2(x^2)^3 + {}^5C_3(x^2)^2 + {}^5C_4(x^2)^1 + {}^5C_5$ $\Rightarrow x^{10} + 5x^8 + 10x^6 + 10x^4 + 5x^2 + 1$ Therefore, the binomial expansion of $(x^2 + 1)^5$ is $x^{10} + 5x^8 + 10x^6 + 10x^4 + 5x^2 + 1$	
28.	Given, $(95)^3$ 95 can be expressed as the sum or difference of two numbers, and then the binomial theorem can be applied. The given question can be written as $95 = 100 - 5$ $(95)^3 = (100 - 5)^3$ $= {}^3C_0 (100)^3 - {}^3C_1 (100)^2 (5) - {}^3C_2 (100) (5)^2 - {}^3C_3 (5)^3$ $= (100)^3 - 3 (100)^2 (5) + 3 (100) (5)^2 - (5)^3$ $= 1000000 - 150000 + 7500 - 125$ $= 857375$	2
29.	Here, we can see $(x + y)^5 + (x - y)^5 = 2[{}^5C_0 x^5 + {}^5C_2 x^3 y^2 + {}^5C_4 xy^4]$ $= 2(x^5 + 10 x^3 y^2 + 5xy^4)$ Thus, $(\sqrt{2} + 1)^5 + (\sqrt{2} - 1)^5 = 2[(\sqrt{2})^5 + 10(\sqrt{2})^3(1)^2 + 5(\sqrt{2})(1)^4]$ $= 58\sqrt{2}$	2