EXERCISE - O

SINGLE CORRECT TYPE QUESTIONS

1. If the coefficients of x^7 & x^8 in the expansion of $\left[2+\frac{x}{3}\right]^n$ are equal, then the value of n is:

(A) 15 (B) 45 (C) 55 (D) 56

MBT090

2. If the second term of the expansion $\left[a^{1/13}+\frac{a}{\sqrt{a^{-1}}}\right]^n$ is $14a^{\frac{5}{2}}$, then the value of $\frac{{}^nC_3}{{}^nC_2}$ is

(A) 4 (B) 3 (C) 12 (D) 6

MBT091

3. The value of m, for which the coefficients of the $(2m+1)^{th}$ and $(4m+5)^{th}$ terms in the expansion of $(1+x)^{10}$ are equal to, is

(A) 3 (B) 1 (C) 5 (D) 8

MBT092

4. If $k \in R^+$ and the middle term of $\left(\frac{k}{2}+2\right)^8$ is 1120, then value of k is

(A) 3 (B) 2 (C) 1 (D) 4

MBT093

5. The largest real value for x such that $\sum_{k=0}^{4}\left(\frac{5^{4-k}}{(4-k)!}\right)\left(\frac{x^k}{k!}\right)=\frac{8}{3}$ is –

(A) $2\sqrt{2}-5$ (B) $2\sqrt{2}+5$ (C) $-2\sqrt{2}-5$ (D) $-2\sqrt{2}+5$

MBT094

6. Number of rational terms in the expansion of $\left(\sqrt{2}+\sqrt[4]{3}\right)^{100}$ is :

(A) 25 (B) 26 (C) 27 (D) 28

MBT095

7. In the expansion of $\left(7^{\frac{1}{3}}+11^{\frac{1}{9}}\right)^{6561}$, the number of terms free from radicals is

(A) 730 (B) 729 (C) 725 (D) 750

MBT096

8. If $n \in N$ & n is even, then $\frac{1}{1!(n-1)!}+\frac{1}{3!(n-3)!}+\frac{1}{5!(n-5)!}+\ldots+\frac{1}{(n-1)!1!}=$

(A) 2^n (B) $\frac{2^{n-1}}{n!}$ (C) $2^n n!$ (D) none of these

MBT097

9. Set of value of r for which, ${}^{18}C_{r-2}+2\cdot{}^{18}C_{r-1}+{}^{18}Cr \geq {}^{20}C_{13}$ contains :

(A) 4 element (B) 5 elements (C) 7 elements (D) 10 elements

MBT098

10. Let $\binom{n}{k}$ represents the combination of $'n'$ things taken $'k'$ at a time, then the value of the sum $\binom{99}{97}+\binom{98}{96}+\binom{97}{95}+...+\binom{3}{1}+\binom{2}{0}$ equals -

(A) $\binom{99}{97}$ (B) $\binom{100}{98}$ (C) $\binom{99}{98}$ (D) $\binom{100}{97}$

MBT099

11. The sum of the co-efficients of all the even powers of x in the expansion of $(2x^2-3x+1)^{11}$ is -

(A) 2×6^{10} (B) 3×6^{10} (C) 6^{11} (D) none

MBT100

12. The co-efficient of x^4 in the expansion of $(1-x+2x^2)^{12}$ is

(A) ${}^{12}C_3$ (B) ${}^{13}C_3$ (C) ${}^{14}C_4$ (D) ${}^{12}C_3+3\,{}^{13}C_3+{}^{14}C_4$

MBT101

13. If $\sum_{r=1}^{10} r(r-1)\ {}^{10}C_r = k\times 2^9$, then k is equal to -

(A) 10 (B) 45 (C) 90 (D) 100

MBT102

14. The sum $\frac{\binom{11}{0}}{1}+\frac{\binom{11}{1}}{2}+\frac{\binom{11}{2}}{3}+...+\frac{\binom{11}{11}}{12}$ equals $\left(\text{where } \binom{n}{r} \text{denotes } {}^nC_r\right)$

(A) $\frac{2^{11}}{12}$ (B) $\frac{2^{12}}{12}$ (C) $\frac{2^{11}-1}{12}$ (D) $\frac{2^{12}-1}{12}$

MBT103

15. Let ${}^0C_0=1$, then $\sum_{m=0}^{n}\sum_{p=0}^{m} {}^nC_m.{}^mC_p$ is equal to

(A) 2^n-1 (B) 3^n (C) 3^n-1 (D) 2^n

MBT104

16. The last three digits in 10! are :

(A) 800 (B) 700 (C) 500 (D) 600

MBT105

17. Find numerically greatest term in the expansion of $(2+3x)^9$, when $x=3/2$

(A) ${}^9C_6\times 2^9\times\left(\frac{3}{2}\right)^{12}$ (B) ${}^9C_3\times 2^9\times\left(\frac{3}{2}\right)^{6}$ (C) ${}^9C_5\times 2^9\times\left(\frac{3}{2}\right)^{10}$ (D) ${}^9C_4\times 2^9\times\left(\frac{3}{2}\right)^{8}$

MBT106

18. The greatest integer less than or equal to $\left(\sqrt{2}+1\right)^6$ is

(A) 196 (B) 197 (C) 198 (D) 199

MBT107

MULTIPLE CORRECT TYPE QUESTIONS

19. If it is known that the third term of the binomial expansion $\left(x+x^{\log_{10} x}\right)^5$ is 10^6 then x is equal to-

(A) 10 (B) $10^{-\frac{5}{2}}$ (C) 100 (D) 5

MBT108

20. In the expansion of $\left(x^3+3\cdot 2^{-\log_{\sqrt{2}}\sqrt{x^3}}\right)^{11}$

(A) there appears a term with the power x^2

(B) there does not appear a term with the power x^2

(C) there appears a term with the power x^{-3}

(D) the ratio of the co-efficient of x^3 to that of x^{-3} is $\frac{1}{3}$

MBT109

21. Let $\left(1+x^2\right)^2(1+x)^n = A_0 + A_1x + A_2x^2 + \ldots$. If A_0, A_1, A_2 are in A.P. then the value of n is -

(A) 2 (B) 3 (C) 5 (D) 7

MBT110

22. In the expansion $\left(\sqrt[3]{4}+\frac{1}{\sqrt[4]{6}}\right)^{20}$

(A) The number of irrational terms is 19 (B) Middle term is irrational

(C) The number of rational terms is 2 (D) 9th term is rational

MBT111

23. $7^9 + 9^7$ is divisible by :

(A) 16 (B) 24 (C) 64 (D) 72

MBT112

24. Which of the following statement(s) is/are correct ?

(A) $1+\frac{2}{2}+\frac{3}{2^2}+\frac{4}{2^3}+\ldots+\infty=4$

(B) Integral part of $\left(9+4\sqrt{5}\right)^n$, $n \in N$ is even.

(C) $({}^nC_0 + {}^nC_1 + {}^nC_2 + \ldots + {}^nC_n)^2 = 1 + {}^{2n}C_1 + {}^{2n}C_2 + \ldots + {}^{2n}C_{2n}$

(D) $\frac{1}{(3+2x)^2}$ can be expanded as infinite series in ascending powers of x only if $|x| < \frac{2}{3}$.

MBT113

25. ${}^nC_0 - 2\times 3\,{}^nC_1 + 3\times 3^2\,{}^nC_2 - 4\times 3^3\,{}^nC_3 + \ldots + (-1)^n(n+1)\,{}^nC_n 3^n$ is equal to

(A) $2^n\left(\frac{3n}{2}+1\right)$ if n is even (B) $2^n\left(n+\frac{3}{2}\right)$ if n is even

(C) $-2^n\left(\frac{3n}{2}+1\right)$ if n is odd (D) $2^n\left(n+\frac{3}{2}\right)$ if n is odd

MBT114

26. The sum of the series $\sum_{r=1}^{n}(-1)^{r-1}\cdot {}^{n}C_{r}(a-r)$ is equal to

(A) 5 if $a=5$ (B) –5 if $a=5$ (C) –5 if $a=-5$ (D) 5 if $a=-5$

MBT115

27. Let $P(n)=\sum_{r=0}^{n}\frac{(-1)^{r}r}{r+1}{}^{n}C_{r}$. Now which of the following holds good ?

(A) $|P_{10}|$ is harmonic mean of $|P_9|$ & $|P_{11}|$

(B) $\sum_{r=5}^{10}P(r)P(r-1)=-\frac{6}{55}$

(C) $|P_{10}|$ is arithmetic mean of $|P_9|$ & $|P_{11}|$

(D) $\sum_{r=5}^{10}P(r)P(r-1)=\frac{6}{55}$

MBT116

28. Let $(1+x)^m = C_0 + C_1x + C_2x^2 + C_3x^3 + \ldots + C_mx^m$, where $C_r = {}^{m}C_r$ and $A = C_1C_3 + C_2C_4 + C_3C_5 + C_4C_6 + \ldots + C_{m-2}C_m$, then -

(A) $A \geq {}^{2m}C_{m-2}$ (B) $A < {}^{2m}C_{m-2}$

(C) $A > C_0^2 + C_1^2 + C_2^2 + \ldots C_m^2$ (D) $A < C_0^2 + C_1^2 + C_2^2 + \ldots C_m^2$

MBT117

29. If $\left(1+x+2x^2\right)^{20}=a_0+a_1x+a_2x^2+\ldots.+a_{40}x^{40}$, then $a_0+a_2+a_4\ldots..+a_{38}$ is equal to

(A) $2^{19}\left(2^{30}+1\right)$ (B) $2^{19}\left(2^{20}-1\right)$ (C) $2^{39}-2^{19}$ (D) $2^{39}+2^{19}$

MBT118

30. If $\left(1+2x+3x^2\right)^{10}=a_0+a_1x+a_2x^2+\ldots+a_{20}x^{20}$, then

(A) $a_1=20$ (B) $a_2=210$ (C) $a_4=8085$ (D) $a_{20}=2^2.3^7.7$

MBT119

31. The expansion of $(3x + 2)^{-\frac{1}{2}}$ is valid in ascending powers of x, if x lies in the interval

(A) $\left(0,\frac{2}{3}\right)$ (B) $\left(-\frac{3}{3},\frac{3}{2}\right)$ (C) $\left(-\frac{2}{3},\frac{2}{3}\right)$ (D) $\left(-\infty,-\frac{3}{2}\right)\cup\left(\frac{3}{2},\infty\right)$

MBT120

32. If $(9+\sqrt{80})^n = I + f$ where I, n are integers and $0 < f < 1$, then -

(A) I is an odd integer (B) I is an even integer

(C) $(I + f)(1-f) = 1$ (D) $1-f=(9-\sqrt{80})^n$

MBT121

33. The coefficient of x^4 in $\left(\frac{1+x}{1-x}\right)^2$, $|x|<1$, is

(A) 4 (B) – 4 (C) $10 + {}^{4}C_2$ (D) 16

MBT122

COMPREHENSION TYPE QUESTIONS

Paragraph for Question No. 34 to 35

If $n \in N$ and if $\left(1+4x+4x^2\right)^n = \sum_{r=0}^{2n} a_r x^r$, where $a_0, a_1, a_2, ..., a_{2n}$ are real numbers.

34. The unit place of $2\sum_{r=0}^{n} a_{2r}$ can be

(A) 0 (B) 2 (C) 4 (D) 8

MBT123

35. The unit place of $2\sum_{r=1}^{n} a_{2r-1}$ can be

(A) 0 (B) 2 (C) 4 (D) 8

MBT124

Paragraph for Question No. 36 to 38

Let us consider the binomial expression $(1+x)^n = \sum_{r=0}^{n} a_r x^r$, where a_1, a_2, a_3 are in A.P.

Consider another binomial expression $A=\left(2^{1/3}+3^{1/4}\right)^{14n}$. The expansion of A contains some rational terms $T_{b_1}, T_{b_2}, ...T_{b_m}$ $\left(b_1 < b_2 < b_3 < ..... < b_m\right)$, where n is greater than the even prime number.

36. The value of $a_1 + a_2 + a_3$ is –

MBT125

37. The value of $\sum_{r=0}^{n} a_r$ is –

MBT126

38. The smallest value of b_m can be –

MBT127

MATCHING LIST TYPE QUESTION

39.

	List-I	List-II
(A)	If $\sum_{r=0}^{10}(r+2^r)\,{}^{10}C_r = 10.2^a + 3^b$, then $(a+b)$ is equal to	(P) 7
(B)	If 4^{th} term in the expansion of $\left(x+(ax)^{-1}\right)^m$, $m \in N$ is $\frac{5}{2}$, then ma is equal to	(Q) 12
(C)	Let λ be the value of numerically greatest term in the expansion of $(1+5x)^{10}$ at $x = 1$, then $\frac{\lambda}{{}^{10}C_9 .5^7}$ is equal to	(R) 19
(D)	If ${}^nP_r = 5040\left({}^{n-1}C_r + {}^{n-1}C_{r-1}\right)$, then r is equal to	(S) 25

(A) A → R, B → Q, C → S, D → P (B) A → R, B → Q, C → P, D → S
(C) A → Q, B → R, C → S, D → P (D) A → R, B → S, C → Q, D → P

MBT128

MATRIX MATCH TYPE QUESTION

40.

	Column-I		**Column-II**
(A)	The coefficient of x^{-9} in the expansion of $\left(\frac{x^2}{2}+\frac{2}{x}\right)^9$ is	(P)	1512
(B)	The term independent of x in the expansion of $\left(2x+\frac{3}{x}\right)^6$ is	(Q)	476
(C)	The coefficient of x^{10} in the expansion of $\left(1+x^2-x^3\right)^8$ is	(R)	512
(D)	The coefficient of x^4 in the expansion of $(3x+1)^7\left(1-2x+3x^2\right)$ is	(S)	4320

MBT129

EXERCISE - S

1. Let a and b be the coefficient of x^3 in $(1+x+2x^2+3x^3)^4$ and $(1+x+2x^2+3x^3+4x^4)^4$ respectively, then value of $(a-b)$ is

MBT130

2. Let $a=\left(4^{1/401}-1\right)$ and let $b_n={}^nC_1+{}^nC_2\cdot a+{}^nC_3\cdot a^2+\ ...\ +{}^nC_n\cdot a^{n-1}$, then the value of $\frac{\left(b_{2006}-b_{2005}\right)}{512}$ is

MBT131

3. The coefficients of three consecutive terms of $(1+x)^{n+5}$ are in the ratio $5:10:14$. Then $n=$

MBT134

4. The index n of the binomial $\left(\frac{x}{5}+\frac{2}{5}\right)^n$ if the 9^{th} term of the expansion has uniquely numerically greatest coefficient $(n\in N)$, is

MBT135

5. The sum of the roots (real or complex) of the equation $x^{2001}+\left(\frac{1}{2}-x\right)^{2001}=0$, is

MBT136

6. The coefficient of x^{49} in the polynomial $\left(x-\frac{C_1}{C_0}\right)\left(x-2^2\cdot\frac{C_2}{C_1}\right)\left(x-3^2\cdot\frac{C_3}{C_2}\right)...\left(x-50^2\cdot\frac{C_{50}}{C_{49}}\right)$, where $C_r={}^{50}C_r$, is

MBT137

7. The coefficient of x^7 in the expansion of $(1-x-x^2+x^3)^6$ is :-

MBT138

8. Let $f(x)=1-x+x^2-x^3+\ ...\ +x^{16}-x^{17}=a_0+a_1(1+x)+a_2(1+x)^2+\ ...\ +a_{17}(1+x)^{17}$, then the value of a_2 is

MBT139

9. Let $P=\left(2+\sqrt{3}\right)^5$ and $f=P-[P]$, where $[P]$ denotes the greatest integer function, then the value of $\left(\frac{f^2}{1-f}\right)-720$ is

MBT132

10. If $\left(7+4\sqrt{3}\right)^n=p+\beta$ where n & p are positive integers and β is a proper fraction then value of $(1-\beta)(p+\beta)-1$ is

MBT133

EXERCISE - JEE (Main) PYQ

1. If the third term in the binomial expansion of $\left(1+x^{\log_2 x}\right)^5$ equals 2560, then a possible value of x is : **[JEE (Main) 2019]**

(1) $2\sqrt{2}$ (2) $\frac{1}{8}$ (3) $4\sqrt{2}$ (4) $\frac{1}{4}$

MBT042

2. The positive value of λ for which the co-efficient of x^2 in the expression $x^2\left(\sqrt{x}+\frac{\lambda}{x^2}\right)^{10}$ is 720, is: **[JEE (Main) 2019]**

(1) $\sqrt{5}$ (2) 4 (3) $2\sqrt{2}$ (4) 3

MBT043

3. If $\sum_{r=0}^{25}\{{}^{50}C_r \cdot {}^{50-r}C_{25-r}\} = k({}^{50}C_{25})$, then k is equal to : **[JEE (Main) 2019]**

(1) $2^{25}-1$ (2) $(25)^2$ (3) 2^{25} (4) 2^{24}

MBT044

4. Let $(x+10)^{50}+(x-10)^{50} = a_0+a_1x+a_2x^2+\ldots..+a_{50}x^{50}$, for all $x \in R$, then $\frac{a_2}{a_0}$ is equal to: **[JEE (Main) 2019]**

(1) 12.50 (2) 12.00 (3) 12.75 (4) 12.25

MBT046

5. The sum of the series $2.{}^{20}C_0+5.{}^{20}C_1+8.{}^{20}C_2+11.{}^{20}C_3+\ldots+62.{}^{20}C_{20}$ is equal to : **[JEE (Main) 2019]**

(1) 2^{24} (2) 2^{25} (3) 2^{26} (4) 2^{23}

MBT048

6. If the coefficients of x^2 and x^3 are both zero, in the expansion of the expression $(1+ax+bx^2)(1-3x)^{15}$ in powers of x, then the ordered pair (a,b) is equal to : **[JEE (Main) 2019]**

(1) (28, 315) (2) (–54, 315) (3) (–21, 714) (4) (24, 861)

MBT050

7. The number of ordered pairs (r,k) for which $6\cdot{}^{35}C_r = (k^2-3)\cdot{}^{36}C_{r+1}$, where k is an integer, is: **[JEE (Main) 2020]**

(1) 3 (2) 2 (3) 4 (4) 6

MBT052

8. If a, b and c are the greatest value of ${}^{19}C_p$, ${}^{20}C_q$ and ${}^{21}C_r$ respectively, then **[JEE (Main) 2020]**

(1) $\frac{a}{11}=\frac{b}{22}=\frac{c}{21}$ (2) $\frac{a}{10}=\frac{b}{11}=\frac{c}{21}$ (3) $\frac{a}{10}=\frac{b}{11}=\frac{c}{42}$ (4) $\frac{a}{11}=\frac{b}{22}=\frac{c}{42}$

MBT053

9. If α and β be the coefficients of x^4 and x^2 respectively in the expansion of $\left(x+\sqrt{x^2-1}\right)^6+\left(x-\sqrt{x^2-1}\right)^6$, then **[JEE (Main) 2020]**

(1) α + β = 60 (2) α + β = –30 (3) α – β = –132 (4) α – β = 60

MBT054

10. The value of $-{}^{15}C_1 + 2.{}^{15}C_2 - 3.{}^{15}C_3 + \ldots\ldots - 15.{}^{15}C_{15} + {}^{14}C_1 + {}^{14}C_3 + {}^{14}C_5 + \ldots + {}^{14}C_{11}$ is :

[JEE (Main) 2020]

(1) $2^{16}-1$ (2) $2^{13}-14$ (3) 2^{14} (4) $2^{13}-13$

MBT055

11. If $n \geq 2$ is a positive integer, then the sum of the series ${}^{n+1}C_2 + 2({}^{2}C_2 + {}^{3}C_2 + {}^{4}C_2 + \ldots + {}^{n}C_2)$ is:

[JEE (Main) 2021]

(1) $\frac{n(n-1)(2n+1)}{6}$ (2) $\frac{n(n+1)(2n+1)}{6}$ (3) $\frac{n(2n+1)(3n+1)}{6}$ (4) $\frac{n(n+1)^2(n+2)}{12}$

MBT056

12. The number of elements in the set $\{n \in \{1, 2, 3, \ldots, 100\} \mid (11)^n > (10)^n + (9)^n\}$ is.

[JEE (Main) 2021]

MBT140

13. The ratio of the coefficient of the middle term in the expansion of $(1 + x)^{20}$ and the sum of the coefficients of two middle terms in expansion of $(1 + x)^{19}$ is _____. **[JEE (Main) 2021]**

MBT141

14. Let $[x]$ denote greatest integer less than or equal to x. If for $n \in \mathbb{N}, (1-x+x^3)^n = \sum_{j=0}^{3n} a_j x^j$, then $\sum_{j=0}^{\left[\frac{3n}{2}\right]} a_{2j} + 4\sum_{j=0}^{\left[\frac{3n-1}{2}\right]} a_{2j+1}$ is equal to : **[JEE (Main) 2021]**

(1) 2 (2) 2^{n-1} (3) 1 (4) n

MBT142

15. Let $\left(1 + x + 2x^2\right)^{20} = a_0 + a_1x + a_2x^2 + \ldots + a_{40}x^{40}$. then $a_1 + a_3 + a_5 + \ldots + a_{37}$ is equal to

[JEE (Main) 2021]

(1) $2^{20}(2^{20} - 21)$ (2) $2^{19}(2^{20} - 21)$ (3) $2^{19}(2^{20} + 21)$ (4) $2^{20}(2^{20} + 21)$

MBT143

16. The coefficient of x^{101} in the expression $(5+x)^{500} + x(5+x)^{499} + x^2(5+x)^{498} + \ldots\ldots x^{500}$, $x > 0$, is

[JEE (Main) 2022]

(1) ${}^{501}C_{101}(5)^{399}$ (2) ${}^{501}C_{101}(5)^{400}$ (3) ${}^{501}C_{100}(5)^{400}$ (4) ${}^{500}C_{101}(5)^{399}$

MBT144

17. If the sum of the coefficients of all the positive powers of x, in the binomial expansion of $\left(x^n + \frac{2}{x^5}\right)^7$ is 939, then the sum of all the possible integral values of n is : **[JEE (Main) 2022]**

MBT145

18. Let $n \geq 5$ be an integer. If $9^n - 8n - 1 = 64\alpha$ and $6^n - 5n - 1 = 25\beta$, then $\alpha - \beta$ is equal to:

[JEE (Main) 2022]

(1) $1 + {}^{n}C_2(8-5) + {}^{n}C_3(8^2-5^2) + \ldots + {}^{n}C_n(8^{n-1} - 5^{n-1})$

(2) $1 + {}^{n}C_3(8-5) + {}^{n}C_4(8^2-5^2) + \ldots + {}^{n}C_n(8^{n-2} - 5^{n-2})$

(3) ${}^{n}C_3(8-5) + {}^{n}C_4(8^2-5^2) + \ldots + {}^{n}C_n(8^{n-2} - 5^{n-2})$

(4) ${}^{n}C_4(8-5) + {}^{n}C_5(8^2-5^2) + \ldots + {}^{n}C_n(8^{n-3} - 5^{n-3})$

MBT146

19. The remainder when $(2021)^{2023}$ is divided by 7 is: **[JEE (Main) 2022]**

(1) 1 (2) 2 (3) 5 (4) 6

MBT147

20. The remainder when $(2021)^{2022} + (2022)^{2021}$ is divided by 7 is **[JEE (Main) 2022]**

(1) 0 (2) 1 (3) 2 (4) 6

MBT148

21. If $\left({}^{40}C_0\right)+\left({}^{41}C_1\right)+\left({}^{42}C_1\right)+....+\left({}^{60}C_{20}\right)=\frac{m}{n}\,{}^{60}C_{20}\,{}^{60}C_{20}$, m and n are coprime, then $m + n$ is equal to.

[JEE (Main) 2022]

MBT149

22. If $\sum_{k=1}^{31}\left({}^{31}C_k\right)\left({}^{31}C_{k-1}\right)-\sum_{k=1}^{30}\left({}^{30}C_k\right)\left({}^{30}C_{k-1}\right)=\frac{\alpha(60!)}{(30!)(31!)}$, Where $\alpha \in R$, then the value of 16α is equal to

[JEE (Main) 2022]

(1) 1411 (2) 1320 (3) 1615 (4) 1855

MBT150

23. Let the coefficients of x^{-1} and x^{-3} in the expansion of $\left(2x^{\frac{1}{5}}-\frac{1}{x^{\frac{1}{5}}}\right)^{15}$, $x > 0$, be m and n respectively.

If r is a positive integer such $mn^2 = {}^{15}C_r . 2^r$, then the value of r is equal to__.

[JEE (Main) 2022]

MBT151

24. The value $\sum_{r=0}^{22}{}^{22}C_r\,{}^{23}C_r$ is **[JEE (Main) 2023]**

(1) ${}^{45}C_{23}$ (2) ${}^{44}C_{23}$ (3) ${}^{45}C_{24}$ (4) ${}^{44}C_{22}$

MBT152

25. The constant term in the expansion of $\left(2x+\frac{1}{x^7}+3x^2\right)^5$ is. **[JEE (Main) 2023]**

MBT153

26. If the coefficient of x^{15} in the expansion of $\left(ax^3+\frac{1}{bx^{\frac{1}{3}}}\right)^{15}$ is equal to the coefficient of x^{-15} in the expansion of $\left(ax^{\frac{1}{3}}-\frac{1}{bx^3}\right)^{15}$, where a and b are positive real numbers, then for each such ordered pair (a, b) :

[JEE (Main) 2023]

(1) $a = b$ (2) $ab = 1$ (3) $a = 3b$ (4) $ab = 3$

MBT154

27. If the coefficient of x^7 in $\left(ax-\frac{1}{bx^2}\right)^{13}$ and the coefficient of x^{-5} in $\left(ax+\frac{1}{bx^2}\right)^{13}$ are equal, then a^4b^4 is equal to : **[JEE (Main) 2023]**

(1) 44 (2) 22 (3) 11 (4) 33

MBT155

28. If the constant term in the binomial expansion of $\left(\frac{x^{\frac{5}{2}}}{2}-\frac{4}{x^{\ell}}\right)^{9}$ is – 84 and the Coefficient of $x^{-3\ell}$ is $2^{\alpha}\beta$, where $\beta<0$ is an odd number, Then $|\alpha\ell-\beta|$ is equal to.

[JEE (Main) 2023]

MBT156

29. Let the sixth term in the binomial expansion of $\left(\sqrt{2^{\log_2\left(10-3^x\right)}}+\sqrt[5]{2^{(x-2)\log_2 3}}\right)^{m}$, in the increasing powers of $2^{(x-2)\log_2 3}$, be 21. If the binomial coefficients of the second, third and fourth terms in the expansion are respectively the first, third and fifth terms of an A.P., then the sum of the squares of all possible values of x is.

[JEE (Main) 2023]

MBT157

30. Let the number $(22)^{2022} + (2022)^{22}$ leave the remainder α when divided by 3 and β when divided by 7. Then $(\alpha^2 + \beta^2)$ is equal to **[JEE (Main) 2023]**

(1) 10 (2) 5 (3) 20 (4) 13

MBT158

EXERCISE - JEE (Advanced) PYQ

1. For r = 0, 1,....,10, let A_r, B_r and C_r denote, respectively, the coefficient of x^r in the expansions of $(1+x)^{10}$, $(1+x)^{20}$ and $(1+x)^{30}$. Then $\sum_{r=1}^{10} A_r(B_{10}B_r - C_{10}A_r)$ is equal to - **[JEE (Advanced) 2010]**

(A) $B_{10} - C_{10}$ (B) $A_{10}\left(B_{10}^2 - C_{10}A_{10}\right)$ (C) 0 (D) $C_{10} - B_{10}$

MBT159

2. The coefficients of three consecutive terms of $(1+x)^{n+5}$ are in the ratio 5 : 10 : 14. Then n = **[JEE (Advanced) 2013]**

MBT160

3. Coefficient of x^{11} in the expansion of $(1+x^2)^4(1+x^3)^7(1+x^4)^{12}$ is – **[JEE (Advanced) 2014]**

(A) 1051 (B) 1106 (C) 1113 (D) 1120

MBT161

4. Let m be the smallest positive integer such that the coefficient of x^2 in the expansion of $(1+x)^2 + (1+x)^3 + \ldots\ldots\ldots + (1+x)^{49} + (1+mx)^{50}$ is $(3n+1)\,{}^{51}C_3$ for some positive integer n. Then the value of n is **[JEE (Advanced) 2016]**

MBT075

5. Let $X = ({}^{10}C_1)^2 + 2({}^{10}C_2)^2 + 3({}^{10}C_3)^2 + \ldots + 10({}^{10}C_{10})^2$, where ${}^{10}C_r, r \in \{1,2,\ldots,10\}$ denote binomial coefficients. Then, the value of $\frac{1}{1430}X$ is ____. **[JEE (Advanced) 2018]**

MBT076

6. Suppose $det\begin{bmatrix} \sum_{k=0}^{n} k & \sum_{k=0}^{n} {}^{n}C_k k^2 \\ \sum_{k=0}^{n} {}^{n}C_k k & \sum_{k=0}^{n} {}^{n}C_k 3^k \end{bmatrix} = 0$, holds for some positive integer n.

Then $\sum_{k=0}^{n} \frac{{}^{n}C_k}{k+1}$ equals. **[JEE (Advanced) 2019]**

MBT077

7. For non-negative integers s and r, let $\binom{s}{r} = \begin{cases} \frac{s!}{r!(s-r)!} & \text{if } r \le s, \\ 0 & \text{if } r > s. \end{cases}$

For positive integers m and n, let $g(m,n) = \sum_{p=0}^{m+n} \frac{f(m,n,p)}{\binom{n+p}{p}}$ **[JEE (Advanced) 2020]**

Where for any non-negative integer p, $f(m,n,p) = \sum_{i=0}^{p} \binom{m}{i}\binom{n+i}{p}\binom{p+n}{p-i}$

Then which of the following statements is/are TRUE?

(A) $g(m,n) = g(n,m)$ for all positive integers m, n

(B) $g(m,n+1) = g(m+1,n)$ for all positive integers m, n

(C) $g(2m,2n) = 2g(m,n)$ for all positive integers m, n

(D) $g(2m,2n) = (g(m,n))^2$ for all positive integers m, n **MBT078**

8. Let a and b be two nonzero real numbers. If the coefficient of x^5 in the expansion of $\left(ax^2 + \frac{70}{27bx}\right)^4$ is equal to the coefficient of x^{-5} is equal to the coefficient of $\left(ax - \frac{1}{bx^2}\right)^7$, then the value of $2b$ is

[JEE (Advanced) 2023]

MBT079

JEE (Main) Practice Paper

This paper is for yourself practice and assessment the discussion of this paper is optional though you can see PDF solutions or video solutions or solutions in hardcopy whichever is provided.

SECTION–A

- This section contains **TWENTY** questions.
- Each question has **FOUR** options (1), (2), (3) and (4). **ONLY ONE** of these four options is correct.
- For each question, darken the bubble corresponding to the correct option in the ORS.
- For each question, marks will be awarded in one of the following categories:

Full Marks : +4, if only the bubble corresponding to the correct option is darkened.
Zero Marks : 0, if none of the bubbles is darkened.
Negative Marks : –1 in all other cases.

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1. If the 6^{th} term in expansion of $\left(2x^2+\frac{1}{3x^2}\right)^{10}$ is $\frac{a}{b}$ where a & b are coprime natural numbers then $a+b=$

(1) 896 (2) 27 (3) 923 (4) 869

MBT001

2. If the 25^{th} and 26^{th} terms in the expansion of $(1-x)^{44}$ are same then value of x is

(1) $\frac{5}{3}$ (2) $-\frac{5}{3}$ (3) $-\frac{3}{5}$ (4) $-\frac{5}{4}$

MBT002

3. If the sum of the coefficient of $1^{st}, 2^{nd}$ & 3^{rd} terms in the expansion of $\left(x^2+\frac{1}{x}\right)^m$ is 46 then constant term of expansion is

(1) 80 (2) 82 (3) 78 (4) 84

MBT003

4. In the expansion of $\left(\sqrt[3]{2}+\frac{1}{\sqrt[3]{3}}\right)^n$, if the ratio of 7^{th} term from beginning to the 7^{th} term from the end is $\frac{1}{6}$ then value of n is

(1) 9 (2) 8 (3) 5 (4) 6

MBT004

5. If the coefficient of $(2r-1)^{th}$ & $(r+3)^{th}$ terms in the expansion of $(1+x)^{15}$ are equal then sum of all possible value of r is

(1) 8 (2) 9 (3) 10 (4) 12

MBT005

6. The coefficient of $a^3\ b^4\ c^5$ in the expansion of $(ab+bc+ca)^6$ is

(1) 80 (2) 50 (3) 60 (4) 70

MBT006

7. The value of $\frac{1}{1!(n-1)!}+\frac{1}{3!(n-3)!}+\frac{1}{5!(n-5)!}+\ldots\ldots$ is

(1) $\frac{2^n}{(n-1)!}$ (2) $\frac{2^n}{n!}$ (3) $\frac{2^{n-1}}{(n-1)!}$ (4) $\frac{2^{n-1}}{n!}$

MBT007

8. If the sum of the coefficients in expansion of $(a^3x^2 - 2a^2x + 1)^{51}$ vanishes, then possible value of a can be

(1) 1 (2) $\frac{1+\sqrt{5}}{2}$ (3) $\frac{1-\sqrt{5}}{2}$ (4) all of these

MBT008

9. If the middle term in the expansion of $\left(x^2 + \frac{1}{x}\right)^n$ is $924x^6$ then value of n is

(1) 10 (2) 12 (3) 14 (4) 16

MBT009

10. If the sum of coefficient in the expansion of $(x - 2y + 3z)^n$ is128 then the greatest coefficient in the expansion of $(1 + x)^{2n}$ is

(1) ${}^{14}C_7$ (2) ${}^{7}C_4$ (3) ${}^{7}C_3$ (4) ${}^{16}C_8$

MBT010

11. If the coefficient of three consecutive terms in the expansion of $(1 + x)^n$ are 165,330 and 462 respectively then value of ${}^nC_2$ can be

(1) 55 (2) 45 (3) 66 (4) 78

MBT011

12. The last two digits of 17^{256} is

(1) 18 (2) 81 (3) 71 (4) 17

MBT012

13. The sum of ${}^{20}C_0 - {}^{20}C_1 + {}^{20}C_2 - {}^{20}C_3 + \ldots + {}^{20}C_{10}$ is

(1) $\frac{{}^{20}C_{10}}{2}$ (2) 0 (3) ${}^{20}C_{10}$ (4) $-{}^{20}C_{10}$

MBT013

14. The largest real value of x such that $\sum_{k=0}^{4} \frac{3^{4-k}}{(4-k)!}\left(\frac{x^k}{k!}\right) = \frac{32}{3}$ is

(1) 1 (2) 2 (3) 3 (4) 4

MBT014

15. Co-efficient of x^5 in the expansion of $(1 + x^2)^5\,(1 + x)^4$ is

(1) 40 (2) 50 (3) 30 (4) 60

MBT015

16. The value of $\left(\sqrt{5} + 1\right)^5 - \left(\sqrt{5} - 1\right)^5$ is

(1) 252 (2) 352 (3) 452 (4) 532

MBT016

17. The value of ${}^{95}C_4 + \sum_{j=1}^{5} {}^{100-j}C_3$ is

(1) ${}^{95}C_5$ (2) ${}^{100}C_4$ (3) ${}^{99}C_4$ (4) ${}^{100}C_5$

MBT017

18. If ${}^nC_3 + {}^nC_4 > {}^{n+1}C_3$, then -

(1) $n > 6$ (2) $n > 7$ (3) $n < 6$ (4) None of these

MBT018

19. The coefficient of x^4 in the expansion of $(1+x+x^2+x^3)^n$ is -

(1) ${}^nC_4$ (2) ${}^nC_4 + {}^nC_2$

(3) ${}^nC_1 + {}^nC_2 + {}^nC_4 . {}^nC_2$ (4) ${}^nC_4 + {}^nC_2 + {}^nC_1 . {}^nC_2$

MBT019

20. If $(2-x-x^2)^{2n} = a_0 + a_1x + a_2x^2 + a_3x^3 +$ ..., "then the value of " $a_0 + a_2 + a_4 +$ .... is-

(1) 2^{n-1} (2) 2^{2n} (3) 2^{2n-1} (4) None of these

MBT020

SECTION-B

- This section will have **TEN** questions. Candidate can choose to attempt any 5 question out of these 10 questions. In case if candidate attempts more than 5 questions, first 5 attempted questions will be considered for marking.
- The answer to each question is a **NUMERICAL VALUE.**
- For each question, enter the correct numerical value (Answer should be rounded off to the nearest integer).
- Answer to each question will be evaluated according to the following marking scheme:

  Full Marks : +4, if only correct answer is given.

  Zero Marks : 0, if no answer is given.

  Negative Marks : -1 for incorrect answer

---

1. If $\frac{1}{1!10!} + \frac{1}{2!9!} + \frac{1}{3!8!} + \ldots\ldots + \frac{1}{10!1!} = \frac{2}{k!}(2^{k-1} - 1)$ then find the value of k.

MBT021

2. If second, third and fourth terms in the expansion of $(x+a)^n$ are 240, 720 and 1080 respectively, then n is equal to

MBT022

3. If the sum of the coefficient of the terms of the expansion of polynomial $(1+x-3x^2)^{2143}$ is λ then $\lambda + 5$ is

MBT023

4. If the fractional part of the number $\frac{2^{403}}{15}$ is $\frac{k}{15}$, then k is equal to

MBT024

5. The value of r for which ${}^{20}C_r \, {}^{20}C_0 + {}^{20}C_{r-1} \, {}^{20}C_1 + {}^{20}C_{r-2} \, {}^{20}C_2 + \ldots . {}^{20}C_0 \, {}^{20}C_r$ is maximum, is

MBT025

6. If ${}^nC_4$, ${}^nC_5$ and ${}^nC_6$ are in A.P., then sum of values of n is:

MBT026

7. The total number of irrational terms in the binomial expansion of $\left(7^{1/5} - 3^{1/10}\right)^{60}$ is

MBT027

8. The number of distinct terms in the expansion of $\left(x^3 + \frac{1}{x^3} + 1\right)^{200}$ is

MBT028

9. The sum of last 3 digits of 3^{100} is

MBT029

10. Coefficient of x^{79} in the expansion of $(x + x^2 + x^4)^{20}$ is equal to

MBT030

JEE (Advanced) Practice Paper

This paper is for yourself practice and assessment the discussion of this paper is optional though you can see PDF solutions or video solutions or solutions in hardcopy whichever is provided.

SECTION-I

- This section contains **SIX** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is correct.
- For each question, darken the bubble corresponding to the correct option in the ORS.
- For each question, marks will be awarded in one of the following categories:

Full Marks : +3 If only the bubble corresponding to the correct option is darkened.

Zero Marks : 0 If none of the bubbles is darkened.

Negative Marks : –1 In all other cases

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1. The value of $\sum_{r=0}^{n} {}^{n+r}C_r$ is

(A) ${}^{2n+1}C_n$ (B) ${}^{2n}C_{n+1}$ (C) ${}^{2n}C_n$ (D) ${}^{2n+1}C_{n-1}$

MBT057

2. The number of irrational terms in the expansion of $\left(5^{\frac{1}{6}} + 2^{\frac{1}{8}}\right)^{100}$ is

(A) 95 (B) 96 (C) 97 (D) 98

MBT058

3. The coefficient of x^{50} in $(1+x)^{101}(1-x+x^2)^{100}$ is

(A) 0 (B) 41 (C) 50 (D) 1

MBT059

4. If R is remainder when $6^{83} + 8^{83}$ is divided by 49 then $\frac{R}{5} =$

(A) 35 (B) 7 (C) 28 (D) 4

MBT060

5. The term independent of x in the expansion of $(1 + x + 2x^2)\left(3x^2 - \frac{1}{3x^2}\right)^4$ is

(A) 10 (B) 2 (C) 0 (D) 6

MBT061

6. If the 6^{th} term in the expansion of $\left[\frac{1}{x^{8/3}} + x^2 \log_{10} x\right]^8$ is 5600, then $x =$

(A) 5 (B) 10 (C) 15 (D) 20

MBT062

SECTION-II

- This section contains **SIX** questions.
- Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).
- For each question, choose the correct option(s) to answer the question.
- Answer to each question will be evaluated according to the following marking scheme:

Full Marks	: +4	If only (all) the correct option(s) is (are) chosen.
Partial Marks	: +3	If all the four options are correct but ONLY three options are chosen.
Partial Marks	: +2	If three or more options are correct but ONLY two options are chosen, both of which are correct options.
Partial Marks	: +1	If two or more options are correct but ONLY one option is chosen and it is a correct option.
Zero Marks	: 0	If none of the options is chosen (i.e. the question is unanswered).
Negative Marks	: –2	In all other cases.

For Example : If first, third and fourth are the **ONLY** three correct options for a question with second option being an incorrect option; selecting only all the three correct options will result in +4 marks. Selecting only two of the three correct options (e.g. the first and fourth options), without selecting any incorrect option (second option in this case), will result in +2 marks. Selecting only one of the three correct options (either first or third or fourth option), without selecting any incorrect option (second option in this case), will result in +1 marks. Selecting any incorrect option(s) (second option in this case), with or without selection of any correct option(s) will result in –2 marks.

---

7. In the expansion of $\left(\sqrt[3]{4}+\frac{1}{\sqrt[4]{6}}\right)^{20}$

(A) the number of irrational terms is 19 (B) middle term is irrational

(C) the number of rational terms is 2 (D) 9^{th} term is rational

MBT063

8. The sum of the series $\sum_{r=1}^{n}(-1)^{r-1}.{}^{n}C_r(a-r)$ is equal to :

(A) 5 if $a = 5$ (B) –5 if $a = 5$ (C) –5 if $a = -5$ (D) 5 if $a = -5$

MBT064

9. Let $a_n = \frac{1000^n}{n!}$ for $n \in N$, then a_n is greatest, when

(A) $n = 997$ (B) $n = 998$ (C) $n = 999$ (D) $n = 1000$

MBT065

10. In the expansion of $(x+y+z)^{25}$

(A) every term is of the form ${}^{25}C_r.\ {}^{r}C_k.x^{25-r}.y^{r-k}.z^{k}$

(B) the coefficient of $x^8\ y^9\ z^9$ is 0

(C) the number of terms is 325

(D) none of these

MBT066

11. If the sum of the coefficients of all even powers of x in the product $(1+x+x^2+\ldots+x^{2n})(1-x+x^2-x^3+\ldots+x^{2n})$ is 61, then n is greater than

(A) 10 (B) 20 (C) 25 (D) 30

MBT067

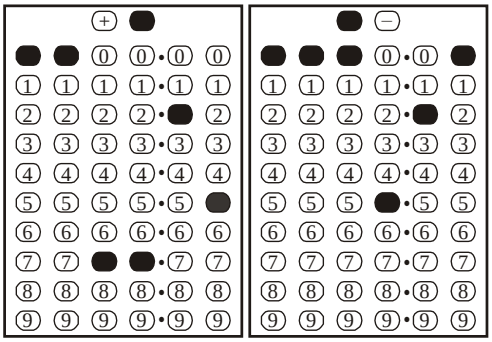
12. Number of rational terms in the expansion of $\left(\sqrt{2}+\sqrt[4]{3}\right)^{100}$ is less than –

(A) 25 (B) 26 (C) 27 (D) 28

MBT068

SECTION-III

- This section contains **SIX** questions.
- The answer to each question is a **NUMERICAL VALUE**.
- For each question, enter the correct numerical value (in decimal notation, truncated/rounded-off to the **second decimal place**; e.g. 6.25, 7.00, –0.33, –.30, 30.27, –127.30, if answer is 11.36777..... then both 11.36 and 11.37 will be correct) by darken the corresponding bubbles in the ORS.
  For Example : If answer is –77.25, 5.2 then fill the bubbles as follows.



- Answer to each question will be evaluated according to the following marking scheme:
  Full Marks : +4 If ONLY the correct numerical value is entered as answer.
  Zero Marks : 0 In all other cases.

---

13. The number of values of r satisfying the equation, ${}^{39}C_{3r-1}-{}^{39}C_{r^2}={}^{39}C_{r^2-1}-{}^{39}C_{3r}$ is :

MBT069

14. If n is a positive integer & $C_k={}^{n}C_k$, find the value of $\left(\sum_{k=1}^{n}\frac{k^3}{n(n+1)^2.(n+2)}\left(\frac{C_k}{C_{k-1}}\right)^2\right)^{-1}$ is :

MBT070

15. The value of the expression $\left(\sum_{r=0}^{10}{}^{10}C_r\right)\left(\sum_{K=0}^{10}(-1)^K\frac{{}^{10}C_K}{2^K}\right)$ is

MBT071

16. The value of λ if $\sum_{m=97}^{100}{}^{100}C_m\,.\,{}^{m}C_{97}=2^{\lambda}\,.\,{}^{100}C_{97}$

MBT072

17. The number of values of $'x'$ for which the fourth term in the expansion,

$$\left(5^{\frac{2}{5}\log_5\sqrt{4^x+44}}+\frac{1}{5^{log_5\sqrt[3]{2^{x-1}+7}}}\right)^8$$ is 336, is :

MBT073

18. $\sum_{r=0}^{n}\frac{2r+3}{r+1}.\,{}^{n}C_r=\frac{(n+k).2^{n+1}-1}{n+1}$ then k is :

MBT074

ANSWER KEY

EXERCISE - O

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	C	A	B	B	A	B	A	B	C	D
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	B	D	B	D	B	A	A	B	A,B	B,C,D
Que.	21	22	23	24	25	26	27	28	29	30
Ans.	A,B	A,B,C,D	A,C	A,C	A,C	A,C	A,D	B,D	B,C	A,B,C
Que.	31	32	33	34	35	36	37	38	39	
Ans.	A,C	A,C,D	C,D	A,B	A,D	63.00	128.00	93.00	A	
Que.	40									
Ans.	A → R; B → S; C → Q; D → P									

EXERCISE - S

1. 0 **2.** 2 **3.** 6 **4.** 12.00 **5.** 500.00
6. –22100.00 **7.** –144.00 **8.** 816.00 **9.** 2 **10.** 0

EXERCISE - JEE (Main) PYQ

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	4	2	3	4	2	1	3	4	3	2
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	2	96	1	3	2	1	57	3	3	1
Que.	21	22	23	24	25	26	27	28	29	30
Ans.	102	1	5	1	1080	2	2	98	4	2

EXERCISE - JEE (Advanced) PYQ

Que.	1	2	3	4	5	6	7	8	
Ans.	D	6	C	5	646	6.20	A,B,D	3	

JEE (Main) Practice Paper

Section-A	Q.	1	2	3	4	5	6	7	8	9	10
	A.	3	4	4	1	2	3	4	4	2	1
	Q.	11	12	13	14	15	16	17	18	19	20
	A.	1	2	1	1	4	2	2	1	4	3
Section-B	Q.	1	2	3	4	5	6	7	8	9	10
	A.	11	5	4	8	20	21	54	401	1	0

JEE (Advanced) Practice Paper

Section-I	**Q.**	**1**	**2**	**3**	**4**	**5**	**6**
	A.	A	C	A	B	D	B
Section-II	**Q.**	**7**	**8**	**9**	**10**	**11**	**12**
	A.	A,B,C,D	A,C	C,D	A,B	A,B,C	C,D
Section-III	**Q.**	**13**	**14**	**15**	**16**	**17**	**18**
	A.	2.00	12.00	1.00	3.00	2.00	2.00