



## MATHS

### BOOKS - NDA PREVIOUS YEARS

### BINOMIAL THEROREM, MATHEMATICAL INDUCTION

Mqs

1. The coefficient of  $x^3$  in the expansion of  $\frac{3 - 2x}{(1 + 3x)^3}$  is

A.  $-272$

B.  $-540$

C.  $-870$

D.  $-918$

Answer: D





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2. What are the last two digits of the number  $9^{200}$

A. 19

B. 21

C. 41

D. 1

**Answer: D**



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3. For any positive integer  $n$ , if  $4^n - 3n$  is divided by 9, then what is the remainder ?

A. 8

B. 6

C. 4

D. 1

**Answer: D**



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4. What is the coefficient of  $x^5$  in the expansion  $(1 - 2x + 3x^2 - 4x^3 + \dots \infty)^{-5}$  ?

A.  $(10!) / (5!)^2$

B.  $5^{-5}$

C.  $5^5$

D.  $10! / \{6!(4!)\}$

**Answer: A**



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5. What is the middle term in the expansion of  $\left(\frac{x\sqrt{y}}{3} - \frac{3}{y\sqrt{x}}\right)^{12}$  ?

A.  $C(12, 7)x^3y^{-3}$

B.  $C(12, 6)x^{-3}y^3$

C.  $C(12, 7)x^{-3}y^3$

D.  $C(12, 6)x^3y^{-3}$

**Answer: D**



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6. If  $x^4$  occurs in the  $r$ th term in the expansion of  $\left(x^4 + \frac{1}{x^3}\right)^{15}$ , then

find the value of  $r$ .

A. 4

B. 8

C. 9

D. 10

**Answer: C**



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7. After simplification, what is the number of terms in the expansion of

$$\left[(3x + y)^5\right]^4 - \left[(3x - y)^4\right]^5 ?$$

A. 4

B. 5

C. 10

D. 11

**Answer: C**



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8. What is the coefficient of  $x^3y^4$  in  $(2x + 3y^2)^5$  ?

A. 240

B. 360

C. 720

D. 1080

**Answer: C**



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9. What is the approximate value of  $(1.02)^8$  ?

A. 1.171

B. 1.175

C. 1.177

D. 1.179

**Answer: A**



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10. What is the last digit of  $3^{3^{4n}} + 1$ , where  $n$  is a natural number?

A. 2

B. 7

C. 8

D. None of these

**Answer: D**



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11. If  $t_r$  is the  $r$ th term in the expansion of  $(1 + x)^{101}$ , then what is the ratio  $\frac{t_{20}}{t_{19}}$  equal to ?

A.  $\frac{20x}{19}$

B.  $83x$

C.  $19x$

D.  $\frac{83x}{19}$

**Answer: D**



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**12.** What is the value of

$${}^8C_0 - {}^8C_1 + {}^8C_2 - {}^8C_3 + {}^8C_4 - {}^8C_5 + {}^8C_6 - {}^8C_7 + {}^8C_8$$

A. 0

B. 1

C. 2

D.  $2^8$

**Answer: A**



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13. Find the term independent of  $x$  in the expansion of

$$(1 + x + 2x^3) \left[ \left( \frac{3x^2}{2} \right) - \left( \frac{1}{3} \right) \right]^9$$

A.  $1/3$

B.  $17/54$

C.  $1/4$

D. No such term exists in the expansion

**Answer: B**

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14. What is the coefficient of  $x^4$  in the expansion of

$$(1 + 2x + 3x^2 + 4x^3 + \dots)^{1/2} ?$$

A.  $1/4$

B.  $1/16$

C. 1

D.  $1/128$

**Answer: C**



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**15.** Consider the following statements

- I. The coefficient of the middle term in the expansion of  $(1 + x)^8$  is equal to the middle of  $\left(x + \frac{1}{x}\right)^8$ .
- II. The coefficient of the middle term in the expansion of  $(1 + x)^8$  is less than the coefficient of the fifth term in the expansion of  $(1 + x)^7$ .

Which of the above statements is/are correct ?

A. I only

B. II only

C. Both I and II

D. Neither I nor II

**Answer: A**



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**16.** What is the sum of the coefficients of all the terms in the expansion of

$$(45x - 49)^4 ?$$

A.  $-256$

B.  $-100$

C.  $100$

D.  $256$

**Answer: D**



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17. What is the coefficient of  $x^{17}$  in the expansion of  $\left(3x - \frac{x^3}{6}\right)^9$  ?

A.  $\frac{189}{8}$

B.  $\frac{567}{2}$

C.  $\frac{21}{16}$

D. None of these

**Answer: A**



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18. The number of terms in the expansion of  $(a + b + c)^n$ , where  $n \in \mathbb{N}$ .

A.  $n + 1$

B.  $n + 2$

C.  $n(n + 1)$

D.  $\frac{(n + 1)(n + 2)}{2}$

**Answer: D**



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**19.** What is the sum of all the coefficients in the expansion of  $(1 + x)^n$  ?

A.  $2^n$

B.  $2^n - 1$

C.  $2^n - 1$

D.  $2(n - 1)$

**Answer: A**



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**20.** What is the coefficient of  $x^4$  in the expansion of  $\left(\frac{1-x}{1+x}\right)^2$  ?

A.  $-16$

B. 16

C. 8

D. -18

**Answer: B**



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21. What is the middle term in the expansion of  $\left(1 - \frac{x}{2}\right)^8$  ?

A.  $\frac{35x^4}{8}$

B.  $\frac{17x^5}{8}$

C.  $\frac{35x^5}{8}$

D. None of these

**Answer: A**



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22. Consider the expansion  $\left(x^2 + \frac{1}{x}\right)^{15}$ .

What is the ratio of coefficient of  $x^{15}$  to term independent of  $x$  in the given expansion ?

A.  $1/64$

B.  $1/32$

C.  $1/16$

D.  $1/4$

**Answer: B**



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23. For all  $n \in N$ ,  $2^{4n} - 15n - 1$  is divisible by

A. 125

B. 225

C. 450

D. None of these

**Answer: B**



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24. In the expansion of  $(1 + x)^n$ , the sum of the coefficients of the terms in even positions is  $2^{n-1}$

A.  $2^n$

B.  $2^n - 1$

C.  $2^n + 1$

D. None of these

**Answer: B**



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25. The value of the term independent of  $x$  in the expansion of

$$\left(x^2 - \frac{1}{x}\right)^9 \text{ is :}$$

A. 9

B. 18

C. 48

D. 84

**Answer: D**



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26. What is the sum of the coefficients in the expansion of  $(1 + x)^n$  ?

A.  $2^n$

B.  $2^n - 1$

C.  $2^n + 1$

D.  $n + 1$

**Answer: A**



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27. What is  $\sum_{r=0}^n C(n, r)$  equal to ?

A.  $2^n - 1$

B.  $n$

C.  $n!$

D.  $2^n$

**Answer: D**



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28. If  $C(28, 2r) = C(28, 2r - 4)$ , then what is  $r$  equal to ?

A. 7

B. 8

C. 12

D. 16

**Answer: B**



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**29.** Let  $n$  be a positive integer and  $(1 + x)^n = a_0 + a_1x + a_2x^2 + \dots + a_nx^n$ . What is  $a_0 + a_1 + a_2 + \dots$  equal to ?

A. 1

B.  $2^n$

C.  $2^n - 1$

D.  $2^n + 1$

**Answer: B**



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**30.** How many terms are there in the expansion of  $(1 + 2x + x^2)^{10}$  ?

A. 11

B. 20

C. 21

D. 30

**Answer: C**



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**31.** In the expansion of  $\left(x^3 - \frac{1}{x^2}\right)^n$ ,  $n \in N$ , if the sum of the coefficients of  $x^5$  and  $x^{10}$ , then  $n$  is a. 25 b. 20 c. 15 d. none of these

A. 5

B. 10

C. 15

D. None of these

**Answer: C**



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32. In the expansion of  $\left(x^3 - \frac{1}{x^2}\right)^n$ ,  $n \in N$ , if the sum of the coefficients of  $x^5$  and  $x^{10}$ , then  $n$  is a. 25 b. 20 c. 15 d. none of these

A. 5005

B. 7200

C. -5005

D. -7200

**Answer: C**



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33. In the expansion of  $\left(x^3 - \frac{1}{x^2}\right)^n$ ,  $n \in N$ , if the sum of the coefficients of  $x^5$  and  $x^{10}$ , then  $n$  is a. 25 b. 20 c. 15 d. none of these

A. 0

B. 1

C. -1

D. None of these

Answer: A



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34. Given that

$$C(n, r) : C(n, r + 1) = 1 : 2 \text{ and } C(n, r + 1) : C(n, r + 2) = 2 : 3.$$

What is  $n$  equal to ?

A. 11

B. 12

C. 13

D. 14

**Answer: D**



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**35.**

Given

that

$$C(n, r) : C(n, r + 1) = 1 : 2 \text{ and } C(n, r + 1) : C(n, r + 2) = 2 : 3.$$

What is  $r$  equal to ?

A. 2

B. 3

C. 4

D. 5

**Answer: C**



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**36.** Given that

$$C(n, r) : C(n, r + 1) = 1 : 2 \text{ and } C(n, r + 1) : C(n, r + 2) = 2 : 3.$$

What is  $P(n, r) : C(n, r)$  equal to ?

A. 6

B. 24

C. 120

D. 720

**Answer: B**



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**37.** What is  $\left( \frac{\sqrt{3} + i}{\sqrt{3} - i} \right)^6$  equal to, where  $I = \sqrt{-1}$ ?



A. 1

B.  $1/6$

C. 6

D. 2

**Answer: A**



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38. Consider the expansion  $\left(x^2 + \frac{1}{x}\right)^{15}$ .

What is the independent term in the given expansion ?

A. 2103

B. 3003

C. 4503

D. None of these

**Answer: B**



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39. Consider the expansion  $\left(x^2 + \frac{1}{x}\right)^{15}$ .

What is the ratio of coefficient of  $x^{15}$  to term independent of  $x$  in the given expansion ?

A. 1

B.  $1/2$

C.  $2/3$

D.  $3/4$

**Answer: A**



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40. Consider the expansion  $\left(x^2 + \frac{1}{x}\right)^{15}$ .

Consider the following statements:

1. There are 15 terms in the given expansion.
2. The coefficient of  $x^{12}$  is equal to that of  $x^3$ .

Which of the above statements is/are correct ?

- A. 1 only
- B. 2 only
- C. Both 1 and 2
- D. Neither 1 nor 2

**Answer: B**



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**41.** Consider the expansion  $\left(x^2 + \frac{1}{x}\right)^{15}$ .

Consider the following statements:

1. The term containing  $x^2$  does not exist in the given expansion.
2. The sum of the coefficients of all the terms in the given expansion is  $2^{15}$ .

Which of the above statements is/are correct ?

A. 2 only

B. 3 only

C. Both 1 and 3

D. Neither 1 nor 3

**Answer: C**



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42. Consider the expansion  $\left(x^2 + \frac{1}{x}\right)^{15}$ .

What is the sum of the coefficients of the middle terms in the given expansion ?

A.  $C(15, 9)$

B.  $C(16, 9)$

C.  $C(16, 8)$

D. None of these

**Answer: C**

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43. What is  $\sum_{r=0}^1 {}^{n+r}C_n$  equal to ?

A.  ${}^{n+2}C_1$

B.  ${}^{n+2}C_n$

C.  ${}^{n+3}C_n$

D.  ${}^{n+2}C_{n+1}$

**Answer: A::D**

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44. Find the constant term in the expansion of  $\left(\sqrt{x} + \frac{1}{3x^2}\right)^{10}$ .

A. 5

B. 8

C. 45

D. 90

**Answer: A**



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**45.** Consider the expansion of  $(1 + x)^{2n+1}$

If the coefficients of  $x^r$  and  $x^{r+1}$  are equal in the expansion, then  $r$  is equal to

A.  $n$

B.  $\frac{2n - 1}{2}$

C.  $\frac{2n + 1}{2}$

D.  $n + 1$

**Answer: A**

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46. Consider the expansion of  $(1 + x)^{2n+1}$

The average of the coefficients of the two middle terms in the expansion is

A.  ${}^{2n+1}C_{n+2}$

B.  ${}^{2n+1}C_n$

C.  ${}^{2n+1}C_{n-1}$

D.  ${}^{2n}C_{n+1}$

**Answer: B**

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47. Consider the expansion of  $(1 + x)^{2n+1}$

The sum of the coefficients of all the terms in the expansion is

A.  $2^{2n-1}$

B.  $4^{n-1}$

C.  $2 \times 4^n$

D. None of these

**Answer: C**

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**48.** The coefficient of  $x^{99}$  in  $(x - 1)(x - 2)\dots(x - 100)$  is

A. 5050

B. 5000

C. -5050

D. -5000

**Answer: C**

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49. What is  ${}^{47}C_4 + {}^{51}C_3 + \sum_{j=2}^5 {}^{52-j}C_3$  equal to ?

A.  ${}^{52}C_4$

B.  ${}^{51}C_5$

C.  ${}^{53}C_4$

D.  ${}^{52}C_5$

**Answer: A**



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50. The value of

$$[C(7, 0) + C(7, 1)] + [C(7, 1) + C(7, 2)] + \dots + [C(7, 6) + C(7, 7)]$$

A. 254

B. 255

C. 256

D. 257

**Answer: A**



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51. The expansion of  $(x - y)^n$ ,  $n \geq 5$  is done in the descending power of  $x$ . If the sum of the fifth and sixth terms is zero, then  $\frac{x}{y}$  is equal to

A.  $\frac{n - 5}{6}$

B.  $\frac{n - 4}{5}$

C.  $\frac{5}{n - 4}$

D.  $\frac{6}{n - 5}$

**Answer: B**



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52. The number of terms in the expansion of  $(x + a)^{100} + (x - a)^{100}$  after simplification

A. 202

B. 101

C. 51

D. 50

**Answer: C**



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53. In the expansion of  $(1 + x)^{50}$ , find the sum of coefficients of odd powers of  $x$ .

A.  $2^{26}$

B.  $2^{49}$

C.  $2^{50}$

D.  $2^{51}$

**Answer: B**



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54.  $1.3 + 2.3^2 + 3.3^3 + \dots + n.3^n = \frac{(2n - 1)3^{n+1} + 3}{4}$

A.  $n, 2$

B.  $n, 3$

C.  $n + 1, 2$

D.  $n + 1, 3$

**Answer: D**



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55. If  $\left|z - \frac{4}{z}\right| = 2$ , then the maximum value of  $|Z|$  is equal to (1)  $\sqrt{3} + 1$   
(2)  $\sqrt{5} + 1$  (3) 2 (4)  $2 + \sqrt{2}$

A.  $1 + \sqrt{3}$

B.  $1 + \sqrt{5}$

C.  $1 - \sqrt{5}$

D.  $\sqrt{5} - 1$

**Answer: B**



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56. If  $n \in \mathbb{N}$ , then  $121^n - 25^n + 1900^n - (-4)^n$  is divisible by

A. 1904

B. 2000

C. 2002

D. 2006

**Answer: B**



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57. In the expansion of  $(1 + x)^{43}$ , the co-efficients of  $(2r + 1)th$  and  $(r + 2)th$  terms are equal. Find  $r$ .

A. 5

B. 14

C. 21

D. 22

**Answer: B**



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58. If the coefficients of  $a^m$  and  $a^n$  in the expansion of  $(1 + a)^{m+n}$  are  $\alpha$  and  $\beta$  then which one of the following is correct ?

A.  $\alpha = 2\beta$

B.  $\alpha = \beta$

C.  $2\alpha = \beta$

D.  $\alpha = (m + n)\beta$

**Answer: B**



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**59.** What is the number of non-zero terms in the expansion of  $(1 + 2\sqrt{3}x)^{11} + (1 - 2\sqrt{3}x)^{11}$  (after simplification)?

A. 4

B. 5

C. 6

D. 11

**Answer: C**

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60. What is  $C(n, r) + 2C(n, r - 1) + C(n, r - 2)$  equal to?

A.  $C(n + 1, r)$

B.  $C(n - 1, r + 1)$

C.  $C(n, r + 1)$

D.  $C(n + 2, r)$

**Answer: D**

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61. What is the coefficient of the middle term in the binomial expansion of

$(2 + 3x)^4$ ?

A. 6

B. 12



C. 108

D. 216

**Answer: D**



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**62.** Let the coefficient of the middle term of the binomial expansion of  $(1 + x)^{2n}$  be  $\alpha$  and those of two middle terms of the binomial expansion of  $(1 + x)^{2n-1}$  be  $\beta$  and  $\gamma$ . Which one of the following relations is correct ?

A.  $\alpha > \beta + \gamma$

B.  $\alpha < \beta + \gamma$

C.  $\alpha = \beta + \gamma$

D.  $\alpha = \beta\gamma$

**Answer: C**



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63. If  $C(20, n + 2) = C(20, n - 2)$  then  $n =$

- A. 8
- B. 10
- C. 12
- D. 16

**Answer: B**



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64. What is the number of terms in the expansion of

$$\left[ (2x - 3y)^2 (2x + 3y)^2 \right]^2 ?$$

- A. 4
- B. 5

C. 8

D. 16

**Answer: B**



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65. In the expansion of  $(1 + ax)^n$ , the first three terms are respectively 1,  $12x$  and  $64x^2$ . What is  $n$  equal to ?

A. 6

B. 9

C. 10

D. 12

**Answer: B**



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