MATHS

JEE (MAIN AND ADVANCED MATHEMATICS) FOR BOARD AND COMPETITIVE EXAMS

BINOMIAL THEOREM

Example

1. What is the fifth entry of row 7 of pascal's triangle?

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2. By using pascles's triangle expand $(2x + 3y)^4$.

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3. Expand $(2x + 5y)^5$

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4. Expand: $\left(\frac{x^2}{2} - \frac{y^2}{3}\right)^6$

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5. Using binomial theorem expand $\left(x^2 + \frac{1}{x^2}\right)^4$

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6. Expand $\left(x^3 - \frac{1}{x^2}\right)^7$

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7. Expand: $\left(x - \frac{1}{y}\right)^{11}, y \neq 0$

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8. Using binomial theorem find

(i) $(101)^5$

(ii) 51^6

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9. Evaluate the followings using binomial theorem

(i) $(999)^4$

(ii) $(49)^5$

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10. Using binomial theorem, prove that $8^n - 7n$ always leaves remainder 1 when divided by 49.

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11. Find $(x+a)^3 - (x-a)^3$. Hence evaluate $\left(\sqrt{5}+\sqrt{4}\right)^3 - \left(\sqrt{5}-\sqrt{4}\right)^3$

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12. Find $(x+a)^5 + (x-a)^5$. Hence, evaluate $\left(\sqrt{6}+\sqrt{7}\right)^5 + \left(\sqrt{6}-\sqrt{7}\right)^5$

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13. In the expansion of $\left(x - \frac{3}{x^2}\right)^{30}$, find the 5^{th} term.

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14. Find the 13^{th} term in the expansion of $\left(9x - \frac{1}{3\sqrt{x}}\right)^{18}, x \neq 0$

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15. Find the fourth term from the end in the expansion of $\left(\frac{3x}{5} - \frac{5}{6x}\right)^{9}, x \neq 0$

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16. Find the containing x^3 in the expansion of $\left(2y - x^{\frac{1}{2}}\right)^{10}$

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17. Find the middle term inn

(i) $\left(\frac{2y^2}{3} + \frac{3}{2y^2}\right)^{9}, y \neq 0$

(ii) $\left(4x^2+9y^2+12xy\right)^n$

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18. If the coefficients of three consecutive terms in the expansion of $(1+x)^n$ are in the ratio 1:7:42, then find the value of n.

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19. Find the coefficient of x^4 in the product $(1+2x)^4(2-x)^5$ by using binomial theorem.

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20. Find the term independent of a in the expansion of $\left(a^{\frac{1}{3}}+\frac{1}{2a^{\frac{1}{3}}}\right)^{18}, a>0.$

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21. Evaluate:

(i) $.^{12}C_1 + .^{12}C_2 + .^{12}C_3 + \ldots + .^{12}C_{12}$

(ii) $.^{19}C_3 + .^{19}C_5 + .^{19}C_7 + \ldots + ^{19}C_{19}.$

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22. Find the sum

$2. .^{10}C_0 + \frac{2^2}{2}.^{10}C_1 + \frac{2^3}{3}.^{10}C_2 + \frac{2^4}{4}.^{10}C_3 + \ldots. + \frac{2^{11}}{11}.^{10}C_{10}.$

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23. Find numbercally the greatest term in

the expansion of $(2 = 3x)^9$, when $x = 3/2$

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24. Show that , if the greatest term in the expansion of $(1+x)^{2n}$ has also the greatest coefficient

then x lies between $\frac{n}{n+1}$ and $\frac{n+1}{n}$

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25. (i) Find the coefficient of $x^3y^4z^2t^5$ in the expansion of $(x-y+z-t)^{14}$.

(ii) Find the coefficient of $x^{10}y^{12}z^8$ in the expansion of $(xy+yz+zx)^{15}$

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26. Find the coefficient of x^4 in the expansion of $\left(2-x+3x^2\right)^6$.

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27. If $(1+px)^n = 1+8x+24x^2+\ldots$, then find $\frac{p-n}{p+n}$

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28. If the expansion of $\left(y^{1/2}+x^{1/3}\right)^{54}$, the number of terms free from radical sign (number of rational terms) are independent where |x| and |y| have no common factor except 1 annd x,y $\neq$ Q, is

(1) 9

(2) 8

(3) 10

(4) 11.

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29. The ratio of 4^{th} term and 5^{th} term in the expansion of $\left(x+\frac{\sin x}{x}\right)^6$ is $\frac{16}{3\pi^2}$, then x is equal to

(1) $\frac{\pi}{2}$

(2) $-\frac{\pi}{2}$

(3) $\frac{\pi}{3}$

(4) Both (1) & (2)

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30. The coefficient of x^{20} in

$\left(1+3x+3x^2+x^3\right)^{20}$,I s

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31. The sum of the last eitht coefficients in the

expansion of $(1+x)^{15}$, is

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32. If $\left(9+4\sqrt{5}\right)^n = p+\beta$, where n and p are positive integers and β is a positive proper fraction, prrove that $(1-\beta)(p+\beta)=1$ and p is an odd integer.

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33. (i) Find the coefficeint of x^{-1} in the expansion of $(1+x)^n\left(1+\frac{1}{x}\right)^n$

(ii) Find the term inependent of x in the expansion of $\left(x^{\frac{2}{3}}+4x^{\frac{1}{3}}+4\right)^5\left[\frac{1}{x^{\frac{1}{3}}-1}+\frac{1}{x^{\frac{2}{3}}+x^{\frac{1}{3}}+1}\right]^{-9}$

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34. The value of $\sum_{r=1}^{10} r.\frac{{}^nC_r}{{}^nC_{r-1}}$ is equal to

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35. Find the greatest value of the term independent of x in the expansion of $\left(x\sin\alpha+\frac{\cos\alpha}{x}\right)^{10}$, where $\alpha\in R$.

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36. Find (i) the last digit, (ii) the last two digits, and (iii) the last three digits of 17^{256}.

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Illustration

1. Expand $(2x + 7)^5$ by using binomial theorem

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Try Yourself

1. What is the last entry of any row of pascle's triangle?

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2. What is the 6th sicth entry in row 5 of pascle's triangle?

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3. Expand (i) $\left(\frac{x}{3}+3\frac{y}{2}\right)^5$,(ii) $\left(x^2+\frac{2}{x}\right)^4$ using pascle's triangle.

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4. Expand $\left(2x^2+4y^2\right)^6$ using pascals triangle.

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5. Expand (i) $\left(x+\frac{1}{x}\right)^7$, (ii) $\left(x^2+\frac{2}{x}\right)^4$ using binomial theorem.

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6. Expand (i) $\left(\frac{2x}{3}-\frac{3}{2x}\right)^6$, (ii) $\left(\frac{2}{x}-\frac{x}{2}\right)^5$

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7. Byusing binomial theorem evaluate (i) $(101)^3$, (ii) $(47)^4$

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8. Byusing binomial theorem evaluate (i) $(107)^5$, (ii) $(55)^3$

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9. Using bionomial theorem, show that $(9^n - 8n - 1)$ is always divisible by 64.

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10. With the help of bionomial expansion, show that $(4^n - 3n)$ is always leaves remainder 1, when divided by 9.

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11. Find $(1+x)^4+(1-x)^4$. Hence evaluate $\left(\sqrt{2}+1\right)^4+\left(\sqrt{2}-1\right)^4$

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12. Find $(1+x)^6-(1-x)^6$. Hence evaluate $\left(1+\sqrt{3}\right)^6-\left(1-\sqrt{3}\right)^6$

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13. Find the fifth expansion of $\left(\frac{a}{3}-3b\right)^7$

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14. Find the fifth expansion of $\left(2x^2-\frac{1}{3x^2}\right)^{10}$

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15. Write down the general term in the expansion of $\left(x^2 - y^3\right)^6$.

(ii) Determine 4^{th} term from the end in the expansion of $\left(\frac{x^3}{2} - \frac{2}{x^2}\right)^9, x \neq 0$

(iii) Find the coefficient of x^{-2} in the expansion of $\left(x + \frac{1}{x^3}\right)^{11}, x \neq 0$

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16. Find the middle term in the expansion of $\left(1 + 3x + 3x^2 + x^3\right)^{2n}$

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17. If in the expansion of $(1 + x)^{15}$, the coefficients of $(r + 3)^{th} and\ (r - 1)^{th}$ terms are equal then the value of r is a. 5 b. 6 c. 4 d. 3

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18. Evaluate the following: $\left(x+\sqrt{x^2-1}\right)^6+\left(x-\sqrt{x^2-1}\right)^6$

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19. if $(1+a)^n = .^nC_0 + .^nC_1 a + \ + .^nC_2 a^2 + \ldots \ + .^nC_n a^n$, then prove that

$$\frac{.^nC_1}{.^nC_0} + \frac{2(.^nC_2)}{.^nC_1} + \frac{3(.^nC_3)}{.^nC_2} + \ldots + \frac{n(.^nC_n)}{.^nC_{n-1}} = \text{Sum of first n natural numbers.}$$

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20. If $(1+a)^n = .^nC_0 + .^nC_1 a + .^nC_2 a^2 + \ldots + .^nC_n a^n$, then prove that

$.^nC_1 + 2.^nC_2 + 3.^n 3C_3 + \ldots + n.^nC_n = n.2^{n-1}$.

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Assignment Section A

1. A binomial is

A. An expression of second degree

B. A polynomial

C. An expression containing only two terms

D. An expression containing more than two terms

Answer: 3

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2. The expansion $(a+x)^n = .^n c_0 a^n + ^n c_1 a^{n-1} x + \ldots\ldots\ldots\ldots + .^n c_n x^n$ is valid when n is

A. An integer

B. A rational number

C. An irrational number

D. A natural number

Answer: 4

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3. If the coefficient of rth term and $(r+1)^{th}$ term in the expansion of $(1+x)^{20}$ are in ratio $1:2$, then r is equal to

A. 6

B. 7

C. 8

D. 9

Answer: 2

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4. When n is any postive integer,the expansion $(x+a)^n = .^n c_0 x^n$ + $.^n c_1 x^{n-1} a$ + ... + $.^n c_n a^n$ is valid only when

A. $|x| < 1$

B. $|x| > 1$

C. $|x| < 1$ and $|a| < 1$

D. x and a are any two numbers

Answer: 4

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5. If n is a positive integer, then the number of terms in the expansion of $(x+a)^n$ is

A. n+1

B. n-1

C. n

D. n^2

Answer: 1

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6. The term independent of x in the expansion of $\left(2x + \frac{1}{3x}\right)^6$ is

A. 160/9

B. 80/9

C. 160/27

D. 80/3

Answer: 3

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7. The 6th term of expansion of $\left(x - \frac{1}{x}\right)^{10}$ is

A. $.^{10} c_6 x^6$

B. $.^{10} c_5$

C. $(-(10) c_5)$

D. $\left(-^{10} c_6 x^6 \right)$

Answer: 3

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8. The number of the terms which are not similar in the expansion of $(L + M + N)^6$

A. 7

B. 42

C. 28

D. 21

Answer: 3

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9. The exponent of x occuring in the 7th term of the expansion of $\left(\frac{ax}{2} - \frac{8}{bx}\right)^9$ is

A. 3

B. -3

C. 5

D. -5

Answer: 2

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10. The term containing a^3b^4 in the expansion of $(a - 2b)^7$ is

A. 3^{rd}

B. 4^{th}

C. 5^{th}

D. 6^{th}

Answer: 3

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11. The coefficient of the term independent of x in the expansion of $\left(x - \frac{3}{x^2}\right)^{18}$ is

A. $.^{18}c_6 0$

B. $.^{18}c_6 3^6$

C. $.^{18}c_{12}$

D. $.^{18}c_6 3^{12}$

Answer: 2

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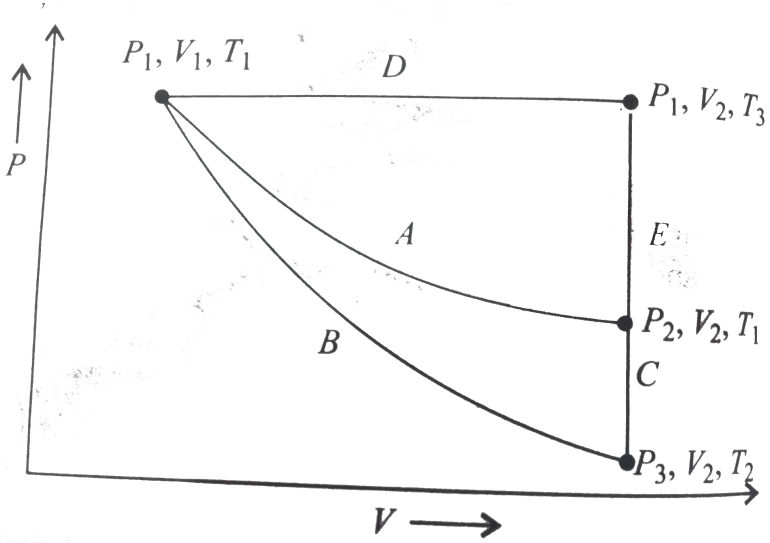
12. For an ideal gas, an illustration of three different paths A, $(B + C)$ and $(D + E)$ from an initial state P_1, V_1, T_1 to a final state P_2, V_2, T_1 is shown in the given figure.



Path Arepresents a reversible isothermal expansion form P_1, V_1 to P_2, V_2 , Path $(B + C)$ represents a reversible adiabatic expansion (B) from $P_1, V_1, T_1 \rightarrow P_3, V_2, T_2$ followed by reversible heating the gas at constant volume $(C)$from P_3, V_2, T_2 to P_2, V_2, T_1. Path $(D + E)$ represents a reversible expansion at constant pressure $P_1(D)$ from P_1, V_1, T_1 to P_1, V_2, T_3 followed by a reversible cooling at constant volume $V_2(E)$ from $P_1, V_2, T_3 \rightarrow P_2, V_2, T_1$.

What is q_{rev}, for path A?

A. $-7920x^{-4}$

B. $7920x^{4}$

C. $7920x^{-4}$

D. $-7920x^{4}$

Answer: 3

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13. If $pandq$ are positive, then prove that the coefficients of $x^{p}andx^{q}$ in the expansion of $(1+x)^{p+q}$ will be equal.

A. Unequal

B. Equal

C. reciprocal of each other

D. Assitive inverse of each other

Answer: 2

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14. The number of terms in expansion of $\left\{(a+4b)^3(a-4b)^3\right\}^2$ is

A. 7

B. 6

C. 8

D. 32

Answer: 1

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15. If r^{th} term in the expansion of $\left(x^2+\frac{1}{x}\right)^{12}$ is independent of x, then r is equal to

A. 9

B. 8

C. 10

D. 7

Answer: 1

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16. Find the number of nonzero terms in the expansion of $\left(1+3\sqrt{2}x\right)^9+\left(1-3\sqrt{2}x\right)^9$.

A. 10

B. 5

C. 9

D. 6

Answer: 2

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17. In the expansion of $\left(2+\frac{1}{3x}\right)^n$, the cofficient of x^{-7} and x^{-8} are equal to

A. 51

B. 52

C. 55

D. 56

Answer: 3

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18. In in the expansion of $(1+px)^q$, q belongs to N, the coefficients of x and x^2 are 12 and 60 respectively then p and q are

A. 2,6

B. 6,2

C.

D.

Answer: 1

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19. The expansion of $\left(x^{\alpha}+\frac{1}{x^{\beta}}\right)^{n}$ has constant term, if

A. $n\alpha$ is divisible by $n+\beta$

B. $n\beta$ is divisible by $n+\alpha$

C. $n\alpha$ is divisible by $\alpha+\beta$

D. n is divisible by $\alpha+\beta$

Answer: 3

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20. The number of rational terms in the expansion of $\left((25)^{\frac{1}{3}}+\frac{1}{(25)^{\frac{1}{3}}}\right)^{20}$ is

A. 2

B. 7

C. 6

D. 19

Answer: 2

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21. The number of zeros at the end of $(101)^{11}-1$ is

A. 8

B. 4

C. 6

D. 2

Answer: 4

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22. In the expantion of $(1+kx)^4$ the cofficient of x^3 is 32, then the value of k is equal to

A. 2

B. 4

C. 8

D. 1

Answer: 1

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23. In the expansion of $\left(3+\frac{x}{2}\right)^n$ the coefficients of x^7 and x^8 are equal, then the value of n is equal to

A. 44

B. 48

C. 41

D. 55

Answer: 4

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24. $\sqrt{5}\left\{\left(\sqrt{5}+1\right)^{50}-\left(\sqrt{5}-1\right)^{50}\right\}$

A. An irrational number

B. 0

C. A natural number

D. A prime number

Answer: 3

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25. In expansion of $(x+a)^5$, $T_2 : T_3 = 1:3$, then $x:a$ is equal to

A. 1 : 2

B. 2 : 1

C. 2 : 3

D. 3 : 2

Answer: 3

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26. If the coefficient of x^7 in $\left[ax^2 + \left(\frac{1}{b}x\right)\right]^{11}$ equals the coefficient of x^{-7} in $\left[ax - \left(\frac{1}{bx^2}\right)\right]^{11}$ then a and b satisfy the relation

A. 0

B. 1

C. -1

D. 2

Answer: 2

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27. The middle term in the expansioin of $(1+x)^{2n}$ is

A. $.^{2n}c_n x^n$

B. $.^{2n}c_{n-1}x^{n+1}$

C. $.^{2n}c_{n+1}x^{n-1}$

D. $.^{2n}c_{n-1}x^n$

Answer: 1

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28. Cofficient of x^{12} in the expansion of $\left(1+x^2\right)^{50}\left(x+\frac{1}{x}\right)^{-10}$

A. 41

B. 40

C. 43

D. 44

Answer: 2

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29. The number of terms in expansion of $\left(x^2+18x+81\right)^{15}$ is

A. 15

B. 16

C. 30

D. 31

Answer: 4

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30. The term independent of x in the expanion of $\left(\sqrt[6]{x} - \frac{2}{\sqrt[3]{x}}\right)^{18}$ is

A. $.^{18}C_8 2^{12}$

B. $.^{18}C_6 2^6$

C. $.^{18}C_6 2^8$

D. $.^{18}C_8 2^8$

Answer: 2

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31. The middle terms in the expansion of $(1+x)^{2n+1}$ is (are)

A. $.^{2n+1} c_n x^n$ and $.^{2n+1} c_{n+1} x^{n+1}$

B. $.^{2n+1} c_{n-1} x^{n+1}$ and $.^{2n+1} c_{n+1} x^{n+1}$

C. $\hat{} (2n+1) c_n x^n$ only

D. $.^{2n+1} c_{n+1} x^{n+1}$ only

Answer: 1

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32. $(1.003)^4$ is nearby equal to

A. 1.012

B. 1.0012

C. 0.988

D. 1.003

Answer: 1

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33. The nubmber of non - zeroes terns in the expansion of $\left(1+\sqrt{5}\right)^6+\left(\sqrt{5}-1\right)^6$ is

A. 3

B. 4

C. 5

D. 0

Answer: 2

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34. The number of non -zeroes terms in the expansion of $\left(\sqrt{7}+1\right)^{75}-\left(\sqrt{7}-1\right)^{75}$ is

A. 36

B. 37

C. 38

D. 39

Answer: 3

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35. The number of terms in the expansion if $(a+b+c)^{12}$ is

A. 90

B. 91

C. 81

D. 80

Answer: 2

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36. Two consecutive terms in the expansion of $(3+2x)^{74}$ have equal coefficients then term are (A) $30 \text{ and } 31$ (B) 38 and 39 (C) 31 and 32 (D) 37 and 38

A. $7^{th} \text{ and } 8^{th}$

B. $11^{th} \text{ and } 12(th)$

C. $30^{th} \text{ and } 31^{th}$

D. $31^{th} \text{ and } 32^{th}$

Answer: 3

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37. If the coefficients of rth, (r+ 1)th and (r + 2)th terms in the expansion of $(1+x)^{1/4}$ are in AP, then r is /are

A. 5 or 9

B. 4 or 7

C. 3 or 8

D. 6or 10

Answer: 1

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38. Cofficient of $x^3y^{10}z^5$ in expansion of $(xy+yz+zx)^6$ is

A. 20

B. 120

C. 30

D. 60

Answer: 4

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39. The ratio of coefficients x^3 and x^4 in the expansion of $(1+x)^{12}$ is

A. 4 : 9

B. 1 : 3

C. 2: 3

D. 1: 9

Answer: 1

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40. Given the integers $r > 1, n > 2$ and coefficients of $(3r)$ th and $(r+2)$ th terms in the expansion of $(1+x)^{2n}$ are equal, then

A. n=2r

B. n=3r

C. n=2r+1

D. n=r

Answer: 1

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41. Find the coefficient of x^5 in the expansion of $\left(1+x^2\right)^5(1+x)^4$.

A. 61

B. 59

C. 0

D. 60

Answer: 4

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42. If $(r+1)^{th}$ term in the expasnion of $\left(\frac{a^3}{3}-\frac{2}{a^2}\right)^{10}$ contains a^{20} then the value of r is equal to

A. 3

B. 2

C. 4

D. 1

Answer: 2

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43. Find n and x in the expansion of $(1+x)^n$, if the fifth term is four times the fourth term and the fourth term is 6 times the third term.

A. 11,2

B. 2,11

C. 3,12

D. 12,3

Answer: 1

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44. Cofficients of x^6y^3 in the expansion of $(x+y)^9$ is

A. 36

B. 16

C. 84

D. 100

Answer: 3

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45. The number of terms in the expansion of $\left(4x^2+9y^2+12xy\right)^6$ is

A. 2

B. 12

C. 13

D. 26

Answer: 3

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46. The middle term in the expansioin of $\left(2x - \frac{1}{3}x\right)^{10}$ is

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47. The coefficient of the term independent of x in the expansion of $\left(ax + \frac{b}{x}\right)^{14}$ is $14!a^7b^7$ b. $\frac{14!}{7!}a^7b^7$ c. $\frac{14!}{(7!)^2}a^7b^7$ d. $\frac{14!}{(7!)^3}a^7b^7$

A. . $^{14}C_5a^9b^5$

B. . $^{14}C_6a^8b^6$

C. . $^{14}C_7a^7b^7$

D. . $^{14}C_8a^6b^8$

Answer: 3

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48. Find the middle term in the expansion of $\left(x - \frac{1}{2x}\right)^{12}$

A. $\frac{1}{5}$

B. $\frac{2}{5}$

C. $\frac{231}{16}$

D. $\frac{1}{16}$

Answer: 3

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49. The value of $.^{13}C_7 + .^{13}C_8 + .^{13}C_9 + .^{13}C_{10} + .^{13}C_{11} + .^{13}C_{12} + .^{13}C_{13}$ is equal to

A. 2^{12}

B. 2^{11}

C. $\frac{2^{13}+1}{2}$

D. $\frac{2^{13}-1}{2}$

Answer: 1

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50. For all natural number of n, $2^{2n}.3^{2n}-1-35n$ is divisible by

A. $(35)^3$

B. $(35)^2$

C. $(35)^4$

D. $(35)^5$

Answer: 2

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Assignment Section B

1. In the binomial expansion of $(a-b)^n, n \geq 5$ the sum of the 5th and 6th term is zero , then find $\frac{a}{b}$

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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2. about to only mathematics

A. 51

B. 101

C. 202

D. 50

Answer: A

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3. about to only mathematics

A. 1120

B. 2110

C. 1210

D. 2210

Answer: A

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4. If the sum of coefficients in the expansion of $(x-2y+3z)^n$ is 128, then find the greatest coefficient in the expansion of $(1+x)^n$.

A. 30

B. 40

C. 28

D. 35

Answer: D

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5. If the coefficient of 2nd, 3rd and 4th terms in the expansion of $(1+x)^{2n}$ are in A.P., show that $2n^2-9n+7=0$.

A. $2n^2-9n+7=0$

B. $2n^2+5n+7=0$

C. $n^2-9n+7=0$

D. $n^2 + 9n - 7 = 0$

Answer: A

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6. $\sum_{r=0}^{n-1} \frac{{}^nC_r}{{}^nC_r + {}^nC_{r+1}}$ is equal to

A. $\frac{n}{2}$

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

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

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

Answer: A

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7. Find the numerically grates term in the expansion of $3-5x^{15} when x=1/5.$

A. 6th

B. 5th

C. 5th & 6th

D. 4th & 5th

Answer: D

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8. In the expansion of $\left(y^{1/5}+x^{1/10}\right)^{55}$, the number of terms free of radical sign are

A. 5

B. 6

C. 50

D. 56

Answer: B

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9. Consider the following statements

S_1: The total of terms in $\left(x^2+2x+4\right)^{10}$ is 21

S_2 : The coefficient of x^{10} in $\left(x^2+\frac{1}{x}\right)^{20}$ is $.^{20}C_{10}$.

S_3: The middle term in the expansion of $(1+x)^{12}$ is $.^{12}C_6x^6$

S_4: If the coefficients of fifth and ninth term in the expansion of $(1+x)^n$ are same, then n=12

Now identify the correct combination of true statements.

A. S_1, S_2, S_3, S_4

B. S_1, S_2 only

C. S_2, S_3 only

D. S_1, S_4 only

Answer: A

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10. If $(1+x)^n = \sum_{r=0}^{n} C_r x^r$, $\left(1+\frac{C_1}{C_0}\right)\left(1+\frac{C_2}{C_1}\right)\ldots\left(1+\frac{C_n}{C_{n-1}}\right)$ is equal to

A. $\frac{n^{n-1}}{(n+1)!}$

B. $\frac{(n+1)^{n+1}}{(n+1)!}$

C. $\frac{(n+1)^n}{n!}$

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

Answer: C

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11. $\frac{C_1}{C_0} + \frac{2.\,C_2}{C_1} + \frac{3.\,C_3}{C_2} + \ldots + \frac{20.\,C_{20}}{C_{19}} =$

A. 180

B. 210

C. 240

D. 280

Answer: B

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12. Find the term independent of x in the expansion of $\left(1+x+2x^3\right)\left[\left(3x^2/2\right)-(1/3)\right]^9$

A. 25/54

B. 17/54

C. $1/6$

D. $-17/54$

Answer: B

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13. If in the expansion of $(1+x)^m(1-x)^n$, the coefficients of x and x^2 are 3 and - 6 respectively, the value of m and n are

A. 6

B. 9

C. 12

D. 24

Answer: B

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14. the value of x , for which the 6th term in the expansions of $\left[2^{\log}\_2\sqrt{9^{(x-1)}+7}+\frac{1}{2^{\frac{1}{5}}(\log)_2\left(3^{r-1}+1\right)}\right] is 84$, is equal to a. 4 b. 3 c. 2 d. 1

A. 4 or 3

B. 3 or 1

C. 2 or 1

D. 1

Answer: C

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15. If $\left(1-x^3\right)^n = \sum_{r=0}^{n} a_r x^r (1-x)^{3n-2r}$, then the value of a_r, where $n \in N$ is

A. $.^n C_r \cdot 3^r$

B. $.^n C_{3r}$

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

D. $.^n C_r 2^r$

Answer: A

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16. Let $\left(1+x^2\right)^2(1+x)^n=\sum_{k=0}^{n+4} a_k x^k$. If a_1, a_2 and a_3 are in arithmetic progression, then the possible value/values of n is/are a. 5 b. 4 c. 3 d. 2

A. 2,3,4

B. 5,6,7

C. 8,9,10

D. $-1, 4, 6$

Answer: A

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17. The coefficient of x^{1007} in the expansion $(1+x)^{2006}+x(1+x)^{2005}+x^2(1+x)^{2004}x^3(1+x)^{2003}+\ldots..+x^{2006}$ is

A. $.^{2006}C_{1007}$

B. $.^{2006}C_{1006}$

C. $.^{2007}C_{1006}$

D. $.^{2007}C_{1007}$

Answer: D

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18. $\sum_{r=0}^{n}(-1)^r.^nC_r\left[\frac{1}{2^r}+\frac{3^r}{2^{2r}}+\frac{7^r}{2^{3r}}+\frac{15^r}{2^{4r}}+\ldots m \text{ terms}\right]=$

A. $\frac{2^{mn}-1}{2^{mn}(2^n-1)}$

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

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

D. $\frac{2^{mn}+1}{2^n-1}$

Answer: A

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19. In the expansion of $(x+a)^n$ the sum of even terms is E and that of odd terms is O, them O^2+E^2 is equal to

A. $\left(x^2+a^2\right)^n$

B. $\left(2x^2-a^2\right)^n$

C. $\left(x^2-a^2\right)^{2n}$

D. $\left(x^2+a^2\right)^{2n}$

Answer: B

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20. The sum of the last eight coefficients in the expansion of $(1+x)^{16}$ is equal to

A. 2^{15}

B. 2^{14}

C. $2^{15} - \frac{1}{2} \cdot \frac{16!}{(8!)^2}$

D. 2^{16}

Answer: C

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21. The coefficient fo $x^3y^4x^5$ in the expansion of $(xy + yz + zx)^6$, is

A. 60

B. 120

C. 6!

D. 0

Answer: A

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22. In the expansion of $(3x + 2y - z)^8$, the coefficients of $x^2y^3z^3$ is

A. 10084

B. -40320

C. 20160

D. -43280

Answer: B

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23. If n is ann integer greater than 1, then

$a - {}^n C_1(a-1) + .{}^n C_2(a-2) - \ldots + (-1)^n(a-n) =$

A. a

B. 0

C. a^2

D. 2^n

Answer: B

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24. $\frac{C_0}{1} + \frac{C_1}{2} + \frac{C_2}{3} + \ldots. + \frac{C_{100}}{101}$ equals

A. $\frac{2^{101}}{101}$

B. $\frac{2^{101} - 1}{101}$

C. $\frac{3^{101}}{101}$

D. $\frac{3^{101} - 1}{101}$

Answer: B

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25. $2C_0 + \frac{2^2}{2}C_1 + \frac{2^3}{3}C_2 + \ldots\ldots\ldots\ldots + \frac{2^{11}}{11}C_{10} = ?$

A. $\frac{3^{11}}{11}$

B. $\frac{3^{11}+1}{11}$

C. $\frac{3^{11}-1}{11}$

D. $\frac{3^{10}-1}{10}$

Answer: C

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26. The coefficient of x^n in the polynomial $\left(x+{}^{2n+1}C_0\right)\left(X+{}^{2n+1}C_1\right)\left(x+{}^{2n+1}C_2\right).....\left(X+{}^{2n+1}C_n\right)$ is

A. (a)$n.2^{n-1}$

B. (b)2^{2n}

C. (c)$n.2^{n+1}$

D. (d)$(n+1)2^n$

Answer: D

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27. If C_r stands for $.^n C_r = \frac{n!}{r!n-r!}$ and $\sum_{r=1}^{n} r.C_r^2 = \lambda$ for $n \geq 2$, then λ is divisible by

A. $3(n-1)$

B. $n+1$

C. $n(2n-1)$

D. n^2+1

Answer: C

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28. If $a_n = \sum_{r=0}^{n} \frac{1}{{}^nC_r}$, find the value of $\sum_{r=0}^{n} \frac{r}{{}^nC_r}$

A. nk

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

C. $(n-1)k$

D. $\frac{nk}{3}$

Answer: B

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29. If $x+y=1$, prove that $\sum_{r=0}^{n} r.^{n} C_r x^r y^{n-r} = nx.$

A. nxy

B. nx(x+yn)

C. n(nx+y)

D. 1

Answer: C

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30. $\sum_{r=1}^{n} r(.^{n}C_{r} - .^{n}C_{r-1})$ is equal to

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

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

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

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

Answer: C

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31. The expression

$^{n}C_{r} + 4.\,^{n}C_{r-1} + 6.\,^{n}C_{r-2} + 4.\,^{n}C_{r-3} + {}^{n}C_{r-4}$

A. $\begin{pmatrix} n+4 \\ r+4 \end{pmatrix}$

B. $\begin{pmatrix} n+4 \\ r \end{pmatrix}$

C. $\begin{pmatrix} n+3 \\ r-1 \end{pmatrix}$

D. $\left(\frac{n+4}{r+3}\right)$

Answer: A

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32. If $\sum_{k=0}^{n}\left(k^2+k+1\right)k!=(2007).2007!$, then value of n is

A. 2007

B. 2006

C. 2008

D. 2005

Answer: B

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33. Let $R = \left(5\sqrt{5} + 11\right)^{2n+1} and f = R - [R] where []$ denotes the greatest integer function, prove that $Rf = 4^{2n+1}$

A. 4^{2n+1}

B. 4^{2n}

C. 4^{2n-1}

D. 4^{-2n}

Answer: A

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34. Find the coefficient of x^4 in the expansion of $\left(1 + x + x^2 + x^3\right)^{11}$.

A. 900

B. 909

C. 990

D. 999

Answer: C

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Assignment Section C Objective Type Question More Than One Correct Answer

1. For a positive integer n, if the expanison of $\left(\frac{5}{x^2}+x^4\right)$ has a term independent of x, then n can be

A. 18

B. 21

C. 27

D. 99

Answer: A::B::C::D

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2. The positive value of $'a'$ so that the coefficient of x^5 is equal to that of x^{15} in the expansion $\left(x^2+\frac{a}{x^3}\right)^{10}$ is

A. $\frac{1}{2\sqrt{3}}$

B. $\frac{1}{\sqrt{3}}$

C. $\frac{\sqrt{3}}{6}$

D. $\frac{1}{3}$

Answer: A::C

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

A. 3.6^{10}

B. 6^{11}

C. $2^{10}.3^{11}$

D. $2^{11}.3^{10}$

Answer: A::C

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4. The term independent of x in the expansion of $\left(2x - \frac{1}{x}\right)^{10}$ is

A. -3

B. 0

C. $.^{n}P_{k}$, where kgtn

D. $.^{n}C_{r}$ where rgtn

Answer: B::C::D

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5. If the secound, third and fourth terms in the expansion

of $(x+y)^n$ are 135 , 30 and 10/3 respectively , then

A. x=3

B. $y=\frac{1}{3}$

C. $n=5$

D. n=7

Answer: A::B::C

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6. $\sum_{r=0}^{4}(-1)^{r16}C_r$ is divisible by :

A. 5

B. 7

C. 11

D. 13

Answer: A::B::C::D

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7. If $\left(1+2x+3x^2\right)^{10}=a_0+a_1x+a_2x^2+a_3x^3+\ldots+a_{20}x^{20}$, then

A. $a_1=20$

B. $a_2=210$

C. $a_4=8085$

D. $a_{20}=2^2.3^7.7$

Answer: A::B::C

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8. The maximum value of $.^nC_r$ is obtained when r is equal to

A. $\frac{n}{3}$

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

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

D. $\frac{n}{2}$

Answer: C::D

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9. $(.^{n}C_0)^2 + (.^{n}C_1)^2 + (.^{n}C_2)^2 + \ldots + (.^{n}C_n)^2$ equals

A. $.^{2n}C_n$

B. $\frac{(2n-1)!}{((n-1)!)^2}\left(\frac{2}{n}\right)$

C. $(n!)^2$

D. $\left(.^{2n}C_n\right)^2$

Answer: A::B

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10. Given that the 4th term in the expansion of $[2+(3x/8)]^{10}$ has the maximum numerical value. Then find the range of value of x.

A. $\left(2, \frac{64}{21}\right)$

B. $\left(-\frac{60}{23}, -2\right)$

C. $\left(-\frac{64}{21}, -2\right)$

D. $\left(2, -\frac{60}{23}\right)$

Answer: A::C

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11. $(.^n C_0)^2 + (.^n C_1)^2 + (.^n C_2)^2 + \ldots + (.^n C_n)^2$ equals

A. 0 if n is odd

B. $(-1)^n$ if n is odd

C. $(-1)^{n/2}.^n C_{n/2}$ if n is even

D. $(-1)^{n-1}.{}^{n}C_{n-1}$ if n is even

Answer: A::C

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12. The number 101^{100} -1 is divisible by

A. 10^2

B. 10^3

C. 10^4

D. 10^5

Answer: A::B::C

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13. If n is a positive integer and $\left(3\sqrt{3}+5\right)^{2n+1}=\alpha+\beta$ where α is an integer and $0<\beta<1$, then

A. l is an ven integer

B. $(l+f)f$ is divisible by 2^{2n+1}

C. The integer just less than $\left(3\sqrt{3}+5\right)^{2n+1}$ is

D. l is divisible by 10

Answer: A::B::D

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14. If $\left(1+2x+x^2\right)^n=\sum_{r=0}^{2n}a_r x^r$, then $a_r=$

A. $a_r=a_{2n-r},$ for $0\leq r\leq 2n$

B. $a_0+a_1+\ldots+a_{n-1}=\frac{1}{2}(3^n-a_n)$

C. $a_0^2-a_1^2+a_2^2-a_3^2+\ldots.+2_{2n}^2=a_n$

D. $a_0 + a_2 + \ldots + a_{2n} = \frac{1}{2}(3^n + 1)$

Answer: A::B::C::D

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15. Which of the following is/are correct?

A. $\left(101^{50} - 99^{50}\right) < 100^{50}$

B. $(101)^{50} - 100^{50} > 99^{50}$

C. $(1000)^{1000} < (1001)^{999}$

D. $(1001)^{999} < (1000)^{1000}$

Answer: A::B::C

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Assignment Section D Objective Type Question Linked Comprehension Type Questions

1. If $S = 1! + 4! + 7! + 10! + \ldots + 400!,$ then

Q. The last two digits in the number S is divisible by

A. 4

B. 6

C. 5

D. 7

Answer: B

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2. If $S = 1! + 4! + 7! + 10! + \ldots + 400!,$ then

Q. The last two digits in the number S is divisible by

A. 13

B. 12

C. 11

D. 10

Answer: A

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3. If $S = 1! + 4! + 7! + 10! + \ldots + 400!,$ then Q. The last two digits in $(1! + 4! + 7!)!$ is

A. 1

B. 10

C. 0

D. None of these

Answer: C

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4. If $C_0, C_1, C_2, C_3, \ldots, C_n$ be binomial coefficients in the expansion of $(1+x)^n$, then

Q. The value of the expression $C_0 + 2C_1 + 3C_2 + \ldots. + (n+1)C_n$ is equal to

A. $2^{n-1}(n+1)$

B. $2^{n-1}(n+2)$

C. $2^n(n+2)$

D. None of these

Answer: B

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5. If $C_0, C_1, C_2, C_3, \ldots, C_n$ be binomial coefficients in the expansion of $(1+x)^n$, then

Q. The value of the expression $C_0 - 2C_1 + 3C_2 - \ldots. + (-1)^n(n+1)C_n$ is equal to

A. 0

B. $2^n(n+3)$

C. $2^{n-1}(n-2)$

D. None of these

Answer: A

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6. If $(1+x)^n = C_0 + C_1x + C_2x^2 + C_3x^3 + ... + C_nx^n$, n being even the value of

$C_0 = (C_0 + C_1) + (C_0 + C_1 + C_2) + ... + (C_0 + C_1 + C_2 + ... + C_n$

is equal to

A. $n.2^n$

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

C. $(n+2)2^n$

D. None of these

Answer: B

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7. Let n be a positive integer and

$$(1+x)^n = C_0 + C_1 x + C_2 x^2 + C_3 x^3 + \ldots + C_r x^r + \ldots + C_{n-1} x^{n-1} +$$

Where C_r stands for $.^n C_r$, then

Q. The values of $\sum_{r=0}^{n} \sum_{s=0}^{n} (C_r + C_S)$ is

A. $(n+1)2^{n+1}$

B. $n.2^n$

C. $(n+1)2^n$

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

Answer: A

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8. Let n be a positive integer and

$(1+x)^n + C_0 + C_1 x + C_2 x^2 + C_3 x^3 + \ldots + C_r x^r + \ldots + C_{n-1} x^{n-1} +$

Where C_r stands for $.^n C_r$, then

Q. The value of $\sum_{r=0}^{n} \sum_{s=0}^{n}, C_r, C_S$ is

A. 2^{2n}

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

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

D. $n(n-1).2^{n-2}$

Answer: A

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9. Let n is a rational number and x is a real number such that |x|lt1, then

$(1+x)^n = 1 + nx + \frac{n(n-1)x^2}{2!} + \frac{n(n-1)(n-2)}{3!}.\, x^3 + \ldots$ This can be used to find the sum of different series. Q. Sum of infinite series

$1 + \frac{2}{3} \cdot \frac{1}{2} + \frac{2}{3} \cdot \frac{5}{6} \cdot \frac{1}{2^2} + \frac{2}{3} \cdot \frac{5}{6} \cdot \frac{8}{9} \cdot \frac{1}{2^3} + \ldots \infty$ is

A. (a)$2^{1/3}$

B. (b)$4^{1/3}$

C. (c)$8^{1/3}$

D. (d)$4^{2/3}$

Answer: B

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10. Let n is a rational number and x is a real number such that |x|lt1, then

$$(1+x)^n = 1 + nx + \frac{n(n-1)x^2}{2!} + \frac{n(n-1)(n-2)}{3!}.\, x^3 + \ldots$$

This can be used to find the sm of different series.

Q. The sum of the series

$$1 + \frac{1}{3^2} + \frac{1\cdot 4}{1\cdot 2}\cdot\frac{1}{3^4} + \frac{1\cdot 4\cdot 7}{1\cdot 2\cdot 3}\cdot\frac{1}{3^6} + \ldots . \text{ is}$$

A. $\sqrt{\frac{3}{2}}$

B. $\left(\frac{3}{2}\right)^{1/3}$

C. $\sqrt{\frac{1}{3}}$

D. $\left(\frac{2}{3}\right)^{1/3}$

Answer: B

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Assignment Section E Objective Type Question Assertion Reson Type Questions

1. Statement-1: The number of distict term in the expansion of $(1+px)^{20}+(1-px)^{20}$ is 42.

Statement-2: Number of term in the expansion of $(1+x)^n$ is (n+1).

A. Statement-1 is True, statement-2 is true, statement-2 is a correct explanationn for statement-1

B. Statement-1 is true, statement-2 is true, statement-2 is NOT a correct explanation for statement-1

C. Statement-1 is true, statement-2 is false

D. Statement-1 is false, statement-2 is true

Answer: D

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2.

Statement-1: The coefficient of $a^3b^4c^3$ in the expansion of $(a-b+c)^{10}$ is $\frac{10!}{3!4!3!}$

Statement-2: The coefficient of $x^py^qz^r$ in the expansion of $(x+y+z)^n$ is $\frac{n!}{p!q!r!}$ for all integer n.

A. Statement-1 is True, statement-2 is true, statement-2 is a correct explanationn for statement-1

B.

C.

D.

Answer: C

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3. Statement-1: If $\sum_{r=1}^{n} r^3 \left(\frac{.^n C_r}{.^n C_{r-1}} \right)^2 = 196$, then the sum of the coeficients of powerr of xin the expansion of the polynomial $\left(x - 3x^2 + x^3\right)^n$ is -1. Statement-2: $\frac{.^n C_r}{.^n C_{r-1}} = \frac{n - r + 1}{r} \forall n \in N \text{ and } r \in W.$

A. Statement-1 is True, statement-2 is true, statement-2 is a correct explanationn for statement-1

B.

C.

D.

Answer: D

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4. Statement-1 The number of terms in the expansion of

$\left(x+\frac{1}{x}+1\right)^n$ is $(2n+1)$

Statement-2 The number of terms in the expansion of

$(x_1+x_2+x_3+\ldots+x_m)^n$is $^{n+m-1}C_{m-1}$.

A. Statement-1 is True, statement-2 is true, statement-2 is a correct explanationn for statement-1

B.

C.

D.

Answer: B

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5. Statement-1:Sum of the coefficients of last 30 terms in the expansion of $(1+x)^{49}$. When expanded in ascending powers of x, is 2^{48}.

Statement-2: P^{th} term from the end in the expansion of $(x+y)^n$ is $(n-P+2)^{th}$ term from the beginninig.

A. Statement-1 is True, statement-2 is true, statement-2 is a correct explanationn for statement-1

B.

C.

D.

Answer: D

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6. Statement-1: In the expansion of $\left(\sqrt{5}+3^{1/5}\right)^{10}$, sum of integral terms is 3134.

Statement-2: $(x+y)^n = \sum_{r=0}^{n} .^n C_r \cdot x^{n-r} y^r.$

A. Statement-1 is True, statement-2 is true, statement-2 is a correct explanationn for statement-1

B. Statement-1 is True, statement-2 is true, statement-2 is not correct explanationn for statement-1

C. Statement-1 is True, statement-2 is true, statement-2 is false

D. Statement-1 is false, statement-2 is true, statement-2 is true

Answer: A

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Assignment Section G Objective Type Question Integer Answer Type Questions

1. If $f(m)=\sum_{i=0}^{m}\binom{30}{30-i}\binom{20}{m-i}$ where $\binom{p}{q}=.^{p}C_{q}$, then

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Assignment Section H Objective Type Question Multiple True False Type Questions

1. Statement-1: The integeral part of $\left(8+3\sqrt{7}\right)^{20}$ is even.

Statement-2: The sum of the last eight coefficients in the expansion of $(1+x)^{16}$ is 2^{15}.

Statement-3: if $R\left(5\sqrt{5}+11\right)^{2n+1}=[R]+F$, where [R] denotes the greatest integer in R, then $RF=2^{2n+1}$.

A. FFF

B. FFT

C. TFF

D. TFT

Answer: A

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2. Statement-1: The middle term of $\left(x+\frac{1}{x}\right)^{2n}$ can exceed $\frac{(2n)^n}{n!}$ for some value of x.

Statement-2: The coefficient of x^n in the expansion of $\left(1-2x+3x^2-4x^3+\ldots\right)^{-n}$ is $\frac{1\cdot 3\cdot 5\ldots(2n-1)}{n!}\cdot 2^n$.

Statement-3: The coefficient of x^5 in $\left(1+2x+3x^2+\ldots\right)^{-3/2}$ is 2.1.

A. TTF

B. FTT

C. FTF

D. FFF

Answer: B

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Assignment Section I Objective Type Question Subjective Type Questions

1. If

$(1+x)^{15}+C_0+C_1x+C_2x^2+C_3x^3+\ldots+C_{15}x^{15}$ and $(k=C_2+2C$

then the value of $\frac{k-993}{1000}$ is equal to_____

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2. If C_r stands for nC_r, then the sum of first $(n+1)$ terms of the series

$aC_0-(a+d)C_1+(a+2d)C_2-(a+3d)C_3+\ldots\ldots$, is

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3. In the expansion off

$(1+x)^{10}=.^{10}C_0+.^{10}C_1x+.^{10}C_2x^2+\ldots+.^{10}C_{10}x^{10}$, then value

of

$528\left[\frac{.^{10}C_0}{2}-\frac{.^{10}C_1}{3}+\frac{.^{10}C_2}{4}-\frac{.^{10}C_3}{5}+\ldots+\frac{.^{10}C_{10}}{12}\right]$ is equal

to_____.

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4. let $\sum_{r=0}^{2010} a_r x^r = \left(1 + x + x^2 + x^3 + x^4 + x^5\right)^{402}$ and $\sum_{r=0}^{2010} a_r = a$, then the value of $\left(\frac{\sum_{r=0}^{2010} r.\, a_r}{\sum_{r=0}^{2010} a_r}\right)$ is equal to____.

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5. Find $.^n C_1 - \frac{1}{2}.^n C_2 + \frac{1}{3}.^n C_3 - \ldots + (-1)^{n-1}\frac{1}{n}.^n C_n$

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6. Show that the HM of (2n+1)C_r and (2n+1)C_(r+1)$is\frac{2n+1}{n+1}$ times of $(2n)C_r$ Also show that $\sum_{r=1}^{2n-1} (-1)^{r-1} \cdot \frac{r}{2nC_r} = \frac{n}{n+1}$.

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7. Prove that the coefficient of x^3 in the expansion of $\left(1 + x + 2x^2\right)\left(2x^2 - \frac{1}{3x}\right)^9$ is $-\frac{224}{27}$.

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8. Given that the 4th term in the expansion of $[2+(3x/8)]^{10}$ has the maximum numerical value. Then find the range of value of x.

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Assignment Section J Objective Type Question Aakash Challengers Questions

1. For any natural number n, the number A given by $A = 2903^n - 803^n - 464^n + 261^n$ is divisible by

A. 7

B. 271

C. 1897

D. 13279

Answer: A::B::C

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2. The tens digit of $(81)^{100}(121)^{100} - 1$ is

A. 1

B. 0

C. 9

D. 8

Answer: B

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3. Prove the equality

$$1^2 + 2^2 + 3^2 \ldots + n^2 = .^{n+1}C_2 + 2\left(.^{n}C_2 + .^{n-1}C_2 \ldots + .^{2}C_2\right).$$

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4. Show that $3^{2008} + 4^{2009}$ can be written as a product of two positive integers each of which is larger than 2009^{182}.

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