MATHS

BOOKS - ML KHANNA

BINOMIAL THEOREM AND MATHEMATICAL INDUCTION

Problem Set 1 Multiple Choice Questions

1. Find the term independent of x in $\left(\frac{3}{2}x^2 - \frac{1}{3x}\right)^9$

A. $\frac{5}{27}$

B. $\frac{7}{18}$

C. $\frac{8}{27}$

D. $\frac{1}{24}$

Answer: b

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2. The term independent of x in the expansion of $\left[\sqrt{\left(\frac{x}{3}\right)}+\sqrt{\left(\frac{3}{2x^2}\right)}\right]^{10}$ is

A. none

B. ${}^{10}C_1$

C. $5/12$

D. 1

Answer: a

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3. If T_r be the term independent of x in $\left(x^3-\frac{3}{x^2}\right)^{15}$ then r is

A. 6

B. 7

C. 8

D. 10

Answer: d

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4. The term independent of x in the expansion of $\left(x^2 - 1/3x\right)^9$ is equal to

A. $28/81$

B. $28/243$

C. $-28/243$

D. $-28/81$

Answer: b

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5. The term independent of x in $\left(\frac{1}{2}x^{1/3}+x^{-1/5}\right)^8$ is

A. 11

B. 10

C. 8

D. 7

Answer: d

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6. Find the coefficients of $x^{32}andx^{-7}$ in the expansion of $\left(x^4-\frac{1}{x^3}\right)^{15}$.

A. -455

B. -105

C. 455

D. 105

Answer: a

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7. Total number of terms that are dependent on the value of x, in the expansion of $\left(x^2 - 2 + \frac{1}{x^2}\right)^n$ is equal to

A. n

B. 2n

C. $(2n + 1)$

D. none

Answer: b

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8. The number of real negavitve terms in the binomial expansion of $(1 + ix)^{4n-2}, n \in N, n > 0, I = \sqrt{-1},$ is

A. n

B. $n+1$

C. $n-1$

D. 2n

Answer: a

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9. If x is positive, the first negative term in the expansion of $(1+x)^{27/5} is (|x|<1)\ 5thterm$ b. $8thterm$ c. $6thterm$ d. $7thterm$

A. T_7

B. T_5

C. T_8

D. T_6

Answer: c

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10. The coefficient of the term independent of y in the expansion of $\left(\frac{y+1}{y^{2/3}-y^{1/3}+1}-\frac{y-1}{y-y^{1/2}}\right)^{10}$ is

A. 70

B. 105

C. 210

D. 112

Answer: c

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11. If the rth term in the expansion of $\left(\frac{x}{3}-\frac{2}{x^2}\right)^{10}$ contains x^4, then r is equal to

A. 2

B. 3

C. 4

D. 5

Answer: b

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12. If the fourth term in the expansion of $\left(ax+\frac{1}{x}\right)is\frac{5}{2},$ then find the values of $a\ and\ n.$

A. $1/2, 6$

B. 1, 3

C. $1/2, 3$

D. cannot be found

Answer: a

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13. If the second term in the expansion of $\left(\sqrt[13]{a}+\frac{a}{\sqrt{a^{-1}}}\right)^{n}$ is $14a^{5/2}$ then value of $\frac{{}^{n}C_{3}}{{}^{n}C_{2}}$ is

A. 12

B. 6

C. 4

D. 3

Answer: c

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14. If the last term of $\left(2^{1/3}-\frac{1}{\sqrt{2}}\right)^{n}$ is $\left(\frac{1}{3.9^{1/3}}\right)^{\log_3 8}$, then the 5th term from the beginning is

A. ${}^{10}C_{6}$

B. $\frac{1}{2}{}^{10}C_4$

C. $2^{10}C_4$

D. none

Answer: a

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15. Find the term in $\left(\frac{a}{\sqrt{b}}3+\sqrt{\frac{b}{a3}}\right)^{21}$ which has the same power of $aandb$.

A. 9th

B. 10th

C. 8th

D. 6th

Answer: b

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16. 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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17. The coefficient of x^4 in the expansion of $\left(1+x+x^2+x^3\right)^n$ is

A. ${}^nC_4$

B. ${}^nC_4+{}^nC_2$

C. ${}^nC_4+{}^nC_1+{}^nC_4.{}^nC_2$

D. ${}^nC_4 + {}^nC_2 + {}^nC_1 . {}^nC_2$

Answer: d

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18. The coefficient of x^{10} in the expanion of $\left(1 + x^2 - x^3\right)^8$, is

A. 528

B. 506

C. 496

D. 476

Answer: d

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19. The coefficient of x20 in the expansion of $\left(1+x^2\right)^{40} \cdot \left(x^2+2+\frac{1}{x^2}\right)^{-5}$ is :

A. ${}^{30}C_{10}$

B. 1

C. ${}^{30}C_{25}$

D. none

Answer: c

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20. The coefficient of x^8y^{10} in the expansion of $(x+y)^{18}$ is ${}^{18}C_8$ b. ${}^{18}P_{10}$ c. 2^{18} d. none of these

A. 2^{18}

B. ${}^{18}P_{10}$

C. ${}^{18}C_8$

D. none

Answer: c

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21. The coefficient of x^3 in the expansion of $\left(1-x+x^2\right)^5$ is

A. -20

B. -30

C. -50

D. 10

Answer: b

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22. The coefficient of x^{10} in the expanion of $\left(1+x^2-x^3\right)^8$, is

A. 528

B. 506

C. 496

D. 476

Answer: d

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23. If $\theta=\left\{\frac{3^{2n}}{8}\right\}$, where {x} = Fractional part of x then the value of $\sec^{-1}(8\theta)$ is

A. π

B. 2π

C. 3π

D. 0

Answer: d

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24. The coefficients of x^{13} in the expansion of $(1-x)^5\left(1+x+x^2+x^3\right)^4$, is

A. 4

B. -4

C. 0

D. none

Answer: a

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25. The coefficient of x^{53} in the expansion $\sum_{m=0}^{100} \hat{}\ (100)C_m(x-3)^{100-m}2^m$ is $\hat{}\ 100C_{47}$ b. $\hat{}\ 100C_{53}$ c. $-^{100}C_{53}$ d. none of these

A. $^{100}C_{47}$

B. $^{100}C_{53}$

C. $-^{100}C_{53}$

D. $-^{100}C_{100}$

Answer: c

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26. If $\left(1+2x+x^2\right)^n = \sum_{r=0}^{2n} a_r x^r, then a = \quad (\hat{}\ nC_2)^2$ b. $\hat{}\ nC_r \hat{}\ nC_{r+1}$ c. $\hat{}\ 2nC_r$ d. $\hat{}\ 2nC_{r+1}$

A. $(^nC_r)^2$

B. ${}^nC_r \quad {}^nC_{r+1}$

C. ${}^{2n}C_r$

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

Answer: c

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27. In the expansion of $\left(x^4 - \frac{1}{x^3}\right)^{15}$ the coefficient of x^{39} is

A. 1365

B. -1365

C. 455

D. -455

Answer: d

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28. The coefficient of x^n in the expansion of

$(1 - 9x + 20x^2)^{-1}$ is

A. $5^n - 4^n$

B. $5^{n+1} - 4^{n+1}$

C. $5^{n-1} - 4^{n-1}$

D. none

Answer: b

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29. The coefficient of x^n in the expansion of $\frac{1}{(1-ax)(1-bx)}$ is :

A. $\frac{a^n - b^n}{b - a}$

B. $\frac{a^{n+1} - b^{n+1}}{b - a}$

C. $\frac{b^{n+1} - a^{n+1}}{b - a}$

D. $\frac{b^n - a^n}{b - a}$

Answer: c

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30. 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: c

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31. For natural numbers m, n if $(1-y)^m(1+y)^n = 1 + a_1y + a_2y^2 + \ldots\ldots$ and $a_1 = a_2 = 10$, then (m, n) is :

A. (35, 20)

B. (45, 35)

C. (35, 45)

D. (20, 45)

Answer: c

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32. Which of the following expansion will have term containing x^3

A. $\left(x^{-1/5} + 2x^{3/5}\right)^{25}$

B. $\left(x^{3/5} + 2x^{-1/5}\right)^{24}$

C. $\left(x^{3/5} - 2x^{-1/5}\right)^{23}$

D. $\left(x^{3/5}+2x^{-1/5}\right)^{22}$

Answer: a

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33. If there is a term containing x^{2r} in $\left(x+\frac{1}{x^2}\right)^{n-3}$, then

A. n-2r is a positive integral multiple of 3

B. n-2r is even

C. n-2r is add

D. none of these

Answer: a

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34. If the sum of the coefficients in the expansion of

$(1+2x)^n$ is 6561 , the greatest term in the expansion for $x=1/2$, is

A. 4th

B. 5th

C. 6th

D. none

Answer: b

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35. Coefficient of $\frac{1}{x}$ in the expansion of $(1+x)^n(1+1/x)^n$ is

A. $n!/[(n-1)!.(n+1)!]$

B. $2n!/[(n-1)!.(n+1)]$

C. $n!/[(2n-1)!.(2n+1)!]$

D. $2n!/[(2n-1)!(2n+1)!]$

Answer: b

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36. The coefficient of x^n in the expansion of $(1+x)(1-x)^n$ is

A. $n-1$

B. $(-1)^n(1-n)$

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

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

Answer: b

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

A. equal

B. equal with opposite signs

C. reciprocals to each other

D. none of these

Answer: a

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38. If (2r + 3)th and (r-1)th terms in the expansion of $(1+x)^{15}$ have equal coefficients, then r =

A. 3

B. 4

C. 5

D. 6

Answer: c

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39. The coefficient of the middle term in the binomial expansion in powers of x of $(1+\alpha x)^4$ and of $(1-\alpha x)^6$ is the same, if α equals $-\frac{5}{3}$ b. $\frac{10}{3}$ c. $-\frac{3}{10}$ d. $\frac{3}{5}$

A. $-\frac{5}{3}$

B. $\frac{10}{3}$

C. $-\frac{3}{10}$

D. $\frac{3}{5}$

Answer: c

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40. Given positive integers $r>1, n>2$ and that the coefficient of $(3rd)thand(r+2)th$ terms in the binomial expansion of $(1+x)^{2n}$ are equal. Then $n=2r$ b. $n=2r+1$ c. $n=3r$ d. none of these

A. 3r

B. $3r - 1$

C. $3r + 1$

D. 2r

Answer: d

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41. $\left(2 + \frac{x}{3}\right)^n$ if the coefficient of x^7 and x^8 is same then find value of n

A. 56

B. 55

C. 45

D. 15

Answer: b

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42. If the coefficient of x^7 in $\left[ax^2 + (1/bx)\right]^{11}$ is equal to coefficient of x^{-7} in $\left[ax - \left(1/bx^2\right)\right]^{11}$ then ab =

A. 1

B. 2

C. 3

D. 4

Answer: a

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43. In the binomial expansion of $(a-b)^n$, $n \geq 5$, the sum of the 5^{th} and 6^{th} terms is zero. Then, a/b equals

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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44. If the coefficients of rth and $(r+1)th$ terms in the expansion of $(3+7x)^{29}$ are equal, then r equals a. 15 b. 21 c. 14 d. none of these

A. 15

B. 21

C. 14

D. none of these

Answer: b

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45. The greatest integer less than or equal to $\left(\sqrt{3}+1\right)^6$ is

A. 208

B. 104

C. 416

D. None of these

Answer: d

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46. 7^9+9^7 is divisible by

A. 16

B. 24

C. 64

D. 72

Answer: c

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47. If the coefficients of x^3 and x^4 in the expansion of $(1+ax+bx^2)(1-2x)^{18}$ in powers of x are both zero, then (a, b) is equal to (1) $\left(16, \frac{251}{3}\right)$ (3) $\left(14, \frac{251}{3}\right)$ (2) $\left(14, \frac{272}{3}\right)$ (4) $\left(16, \frac{272}{3}\right)$

A. $\left(16, \frac{272}{3}\right)$

B. $\left(4, \frac{44}{3}\right)$

C. $\left(\frac{1}{16}, \frac{88}{3}\right)$

D. none of these

Answer: a

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48. If the term independent of x in the expansion of $(2+5x+ax^3)\left(\frac{3}{2}x^2-\frac{1}{3x}\right)^9$ is 1, then a is equal to

A. 3

B. 4

C. 5

D. -6

Answer: d

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49. The 14^{th} term from the end in the expansion of $\left(\sqrt{x}-s\sqrt{y}\right)^{17}$, is

A. ${}^{17}C_5x^6\left(-\sqrt{y}\right)^5$

B. ${}^{17}C_6\left(\sqrt{x}\right)^{11}y^3$

C. ${}^{17}C_4x^{13/2}y^2$

D. none of these

Answer: c

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50. If the ratio of 7th term from the beginning to the seventh term from the end in the expansion of $\left(\sqrt[3]{2}+\frac{1}{\sqrt[3]{3}}\right)^n$ is $\frac{1}{6}$ then n is

A. 9

B. 6

C. 12

D. none of these

Answer: a

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51. If the third term in the expansion of $\left[x + x^{\log_{10} x}\right]^5$ is 10^6, then x may be

A. 1

B. 10

C. $10^{-5/2}$

D. 10^2

Answer: b,c

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52. If the fourth term in the binomial expansion of $\left[\sqrt{x^{\frac{1}{1+\log_{10} x}}} + x^{\frac{1}{12}}\right]^6$ is equal to 200 and $x > 1$, then the value of x is

A. $10^{\sqrt{2}}$

B. 10

C. 10^4

D. none of these

Answer: b

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53. If the third term in the expansion of $\left(\frac{1}{x} + {}_{\mathrm{x}}(\log)_{10x}\right)^5$ is 1000, then find x.

A. 100

B. 10

C. 1

D. $1/\sqrt{10}$

Answer: a

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54. If $T_9 = 495$ in the binomial expansion of $\left(\frac{1}{x^2} + \frac{x}{2}\log_2 x\right)^{12}$ then x is equal to

A. 1

B. an integer > 1

C. fraction

D. none of these

Answer: b,c

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55. If the 6th term in the expansion of $\left(\frac{1}{x^{\frac{8}{3}}} + x^2(\log)_{10}x\right)^8$ is 5600, then x equals 1 b. $(\log)_e 10$ c. 10 d. x does not exist

A. 1

B. $\log_e 10$

C. 10

D. x does not exist

Answer: c

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56. If the 6th term in the expansion of the binomial

$$\left[\sqrt{2^{\log\left(10-3^{x}\right)}}+\sqrt[5]{2^{(x-2)\log 3}}\right]^{m}$$

is equal to 21 and it is known that the bonomial coefficients of the 2nd, 3rd and 4th terms in the expansion represent respectively the first, third and fifth terms of an A.P. (the symbol log stands for logarithm to the base 10), then x =

A. 0

B. 1

C. 2

D. 3

Answer: a,c

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57. 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

B. 3

C. 2

D. 1

Answer: c,d

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58. If the ninth term in the expansion of $\left[3^{\log_3 \sqrt{25^{x-1}+7}} + 3^{-1/8 \log_3 \left(5^{x-1}+1\right)}\right]^{10}$ is equal to 180 and $x > 1$ then x is equal to

A. $\log_e 15$

B. $\log_5 15$

C. $\log_{10} 15$

D. none

Answer: b

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59. Coefficient of x^{50} in the expansion of $(1+x)^{41}\left(1-x+x^2\right)^{40}$ is

A. 20

B. 30

C. 0

D. none

Answer: c

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60. The middle term in the expansion of $(x/2+2)^8$ is 1120, then $x \in R$ is equal to a. -2 b. 3 c. -3 d. 2

A. 2

B. 3

C. -2

D. -3

Answer: a,c

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61. The coefficient of middle term in the expansion of $(1+x)^{10}$ is

A. $10!/5!6!$

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

C. $10!/5!.7!$

D. none of these

Answer: b

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62. If the coefficient of the middle term in the expansion of $(1+x)^{2n+2} is \alpha$ and the coefficients of middle terms in the expansion of $(1+x)^{2n+1}$ are β and γ then relate α, $\beta and \gamma$.

A. $p+q=r$

B. $p+r=q$

C. $p=q+r$

D. none

Answer: c

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63. 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. $\frac{1.3.5...(2n-1)}{n!} 2^n x^n$

Answer: a,d

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64. 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. 9

B. 10

C. 5

D. 15

Answer: c

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65. The expression

$\left[x+\left(x^3-1\right)^{\frac{1}{2}}\right]^5+\left[x-\left(x^3-1\right)^{\frac{1}{2}}\right]^5$ is a polynomial of degree

A. 5

B. 6

C. 7

D. 8

Answer: c

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66. The expression $\frac{1}{\sqrt{3x+1}}\left[\left(\frac{1+\sqrt{3x+1}}{2}\right)^7-\left(\frac{1-\sqrt{3x+1}}{2}\right)^7\right]$ is a polynomial in x of degree eual to

A. 7

B. 5

C. 4

D. 3

Answer: d

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67. If

$$\frac{1}{\sqrt{4x+1}}\left\{\left(\frac{1+\sqrt{4x+1}}{2}\right)^n-\left(\frac{1-\sqrt{4x+1}}{2}\right)^n\right\}=a_0+a_1x$$

then find the possible value of n.

A. 11

B. 9

C. 10

D. none of these

Answer: a

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68. The expression

$$\left(\sqrt{2x^2+1}+\sqrt{2x^2-1}\right)^6\left(\frac{2}{\left(\sqrt{2x^2+1}+\sqrt{2x^2-1}\right)^{\square}}\right)^6$$

is

polynomial of degree 6 b. 8 c. 10 d. 12

A. 8

B. 7

C. 6

D. 5

Answer: c

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69. Sum of coefficients in the expansion of $(x+2y+z)^{10}$ is

A. 2^{10}

B. 3^{10}

C. 1

D. none of these

Answer: d

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70. If the sum of the coefficient in the expansion of $\left(\alpha^2 x^2 - 2\alpha x + 1\right)^{51}$ vanishes, then find the value ofα

A. 2

B. -1

C. 1

D. -2

Answer: c

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71. In the expansion of $\left(\frac{1}{x} + 2x\right)^n$ the sum of binomial coefficients is 6561, then the constant terin is

A. $2^4 . {}^6C_4$

B. $16 . {}^8C_4$

C. ${}^8C_4$

D. none

Answer: b

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72. If the sum of the coefficients in the expansion of $\left(1-3x+10x^2\right)isa$ and if the sum of the coefficients in the expansion of $\left(1+x^2\right)^n isb,$ then $a=3b$ b. $a=b^3$ c. $b=a^3$ d. none of these

A. A=3B

B. $A=B^3$

C. $B=A^3$

D. none of these

Answer: b

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73. If the sum of the coefficients in the expansion of $\left(\lambda x^2 - 2x + 1\right)^{37}$ is equal to the sum of the coefficients in the expansion of $(x - \lambda y)^{37}$, then $\lambda =$

A. 0

B. 1

C. may be any real number

D. no such value exists

Answer: b

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74. If the sum of the coefficients in the expansion of $(x + y)^n$ is 4096, then the greatest coefficient in the expansion is _____.

A. 1594

B. 792

C. 924

D. none of these

Answer: c

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75. The sum of the coefficients of even power of x in the expansion of $\left(1+x+x^2+x^3\right)is\ 256$ b. 128 c. 512 d. 64

A. 420

B. 512

C. 624

D. none

Answer: b

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76. The sum of the binomial coefficients of the expansion $\left(x+\frac{1}{x}\right)^n$ is equal to 256. The term independent of x is

A. T_3

B. T_4

C. T_5

D. none

Answer: c

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77. If the expansion of $\left(x-\frac{1}{x^2}\right)^{2n}$ contains a term independent of x, then n is a multiple of

A. 2

B. 3

C. 4

D. 5

Answer: b

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78. In the expansion of $(1+x)^{50}$, the sum of the coefficient of odd powers of x is :

A. 0

B. 2^{49}

C. 2^{50}

D. 2^{51}

Answer: b

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79. The digit at unit place in the number $17^{1995} + 11^{1995} - 7^{1995}$ is

A. 0

B. 1

C. 2

D. 3

Answer: b

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80. If $T_0, T_1, T_2, , T_n$ represent the terms in the expansion of $(x + a)^n$, then find the value of $(T_0 - T_2 + T_4 -)^2 + (T_1 - T_3 + T_5 -)^2 n \in N.$

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

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

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

D. none of these

Answer: b

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81. If $\left(1+x-2x^2\right)^6 = 1 + a_1x + a_2x^{12} + \ + a_{12}x^{12}$, then find the value of $a_2 + a_4 + a_6 + \ + a_{12}$.

A. 32

B. 63

C. 64

D. none of these

Answer: d

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82. If $\left(1-x+x^2\right)^n = a_0 + a_1x + a_2x^2 + \ + a_{2n}x^{2n}$, find the value of $a_0 + a_2 + a_4 + \ + a_{2n}$.

A. $\frac{3^n+1}{2}$

B. $\frac{3^n-1}{2}$

C. $\frac{1-3^n}{2}$

D. $3^n+\frac{1}{2}$

Answer: a

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83. Let $\left(1+x+2x^2\right)^{20}=a_0+a_1x+a_2x^2+\ldots+a_{40}x^{40}$ then $a_1+a_3+a_5+\ldots+a_{39}$ is equal to

A. $2^{19}\left(2^{20}-21\right)$

B. $2^{20}\left(2^{19}-19\right)$

C. $2^{19}\left(2^{20}+21\right)$

D. none of these

Answer: a

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84. If $\left(1+2x+3x^2\right)^{10}=a_0+a_1x+a_2x^2+\ldots\ldots+a_{20}x^{20}$, then a_1 equals :

A. 10

B. 20

C. 210

D. none

Answer: b

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

A. 202

B. 51

C. 50

D. none of these

Answer: b

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86. The number of terms in the expansion of $(1+x)^{101}\left(1+x^2-x\right)^{100}$ in powers of x is:

A. 101

B. 202

C. 301

D. 302

Answer: b

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87. The number of terms in the expansion of $(x+y+z)^n$ is

A. $n+1$

B. $n+3$

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

D. none of these

Answer: c

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88. The number of terms in the expansion of $(x+y+x)^{10}$, is

A. 11

B. 33

C. 66

D. none of these

Answer: c

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89. If the number of terms in the expansion of $(x - 2y + 3z)^n$ is 45, then n =

A. 7

B. 8

C. 9

D. none of these

Answer: b

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90. The number of terms in the expansion of $\left(1 + 2x + x^2\right)^{20}$ is 40

A. 20

B. 21

C. 40

D. 41

Answer: d

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91. The approximate value of $(7.995)^{1/3}$ correct to four decimal places , is

A. 1.9995

B. 1.9996

C. 1.9990

D. 1.9991

Answer: b

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92. Find the value of

$$\frac{18^3 + 7^3 + 3 \times 18 \times 7 \times 25}{3^6 + 6 \times 243 \times 2 + 15 \times 18 \times 4 + 20 \times 27 \times 8 + 15 \times 9 \times 16 + 6 \times 3 \times}$$

A. 1

B. 5

C. 25

D. 100

Answer: a

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93. The positive integer which is just greater than $(1 + 0.0001)^{1000}$ is equal to

A. 3

B. 4

C. 5

D. 2

Answer: d

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94. The greatest integer which divides the number $(101)^{100} - 1$ is equal to

A. 10^2

B. 10^3

C. 10^4

D. 10^5

Answer: c

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95. For $1 \leq r \leq n$, the value of ${}^{n}C_{r} + {}^{n-1}C_{r} + {}^{n-2}C_{r} + \ldots + {}^{r}C_{r}$ is

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

B. ${}^{n+1}C_{r}$

C. ${}^{n+1}C_{r+1}$

D. none of these

Answer: c

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96. The coefficient of $x^{r}[0 \leq r \leq (n-1)]$ in lthe expansion of $(x+3)^{n-1} + (x+3)^{n-2}(x+2) + (x+3)^{n-3}(x+2)^{2} + + (x+2)^{n-1}$ is ˆ $nC_{r}(3^{r} - 2^{n})$ b. ˆ $nC_{r}\left(3^{n-r} - 2^{n-r}\right)$ c. ˆ $nC_{r}\left(3^{r} + 2^{n-r}\right)$ d. none of these

A. ${}^{n}C_{r}(3^{r} - 2^{n})$

B. ${}^{n}C_{r}\left(3^{n-r}-2^{n-r}\right)$

C. ${}^{n}C_{r}\left(3^{r}+2^{n-r}\right)^{l}$

D. none of these

Answer: b

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97. The coefficient of x^{6} in the expansion of $(1+x)^{21}+(1+x)^{22}+\ldots+(1+x)^{30}$ is

A. ${}^{51}C_{6}$

B. ${}^{9}C_{6}$

C. ${}^{31}C_{7}-{}^{21}C_{7}$

D. ${}^{30}C_{6}+{}^{20}C_{6}$

Answer: c

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98. Coefficient of t^{24} in $\left(1+t^2\right)^{12}\left(1+t^{12}\right)\left(1+t^{24}\right)$ is :

A. ${}^{12}C_6+3$

B. ${}^{12}C_6$

C. ${}^{12}C_6+1$

D. ${}^{12}C_6+2$

Answer: d

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99. The coefficient of x^8 in the expansion of $1+(1+x)+(1+x)^2+\ldots+(1+x)^n(n\geq 8)$ is

A. 1

B. 2

C. ${}^{n+1}C_{n-8}$

D. ${}^{n}C_{n-8}$

Answer: c

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100. Find the remainder when 5^{99} is divided by 13.

A. 6

B. 8

C. 9

D. 10

Answer: b

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101. The remainder when 2^{2003} is divided by 17 is

A. 8

B. 4

C. 2

D. none

Answer: a

Watch Video Solution

102. The remainder when 2^{2003} is divided by 17 is

A. 8

B. 4

C. 2

D. none

Answer: a

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103. If $x + y = 1,$ prove that $\sum_{r=0}^{n} \hat{} \; nC_r x^r y^{n-r}.$

A. 1

B. n

C. nx

D. ny

Answer: c

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104. If $x + y = 1,$ then $\sum_{r=0}^{n} r^{2n} C_r x^r y^{n-r}$ equals.

A. nxy

B. nx (x + yn)

C. nx(nx+y)

D. none of these

Answer: c

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

A. 6

B. 4

C. 3

D. 2

Answer: b,c,d

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106. 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: c

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107. If the number of terms free from radicals in the expansion of $\left(7^{\frac{1}{3}}+11^{\frac{1}{9}}\right)^{6561}$ is k, then the value of $\frac{k}{100}$ is equal to

A. 715

B. 725

C. 730

D. 750

Answer: c

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108. The number of integral terms in the expansion of $\left(\sqrt{3}+\sqrt[8]{5}\right)^{256}$ is

A. 32

B. 33

C. 34

D. 35

Answer: b

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109. The number of terms in the expansion of $\left(\sqrt{5}+11^{1/4}\right)^{124}$ which are integers is

A. 30

B. 31

C. 32

D. 0

Answer: c

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110. Find the number of integral terms in the expansion of $\left(5^{\frac{1}{2}}+7^{\frac{1}{8}}\right)^{1024}$.

A. 128

B. 129

C. 130

D. 131

Answer: b

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111. Find the number of terms which are free from radical signs in the expansion of $\left(y^{1/5}+x^{1/10}\right)^{55}$.

A. 6

B. 7

C. 8

D. none

Answer: a

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112. The sum of the rational terms in the expansion of $\left(\sqrt{2}+\sqrt[5]{3}\right)^{10}$ is

A. 41

B. 230

C. 520

D. none

Answer: a

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113. The coefficient of x^n in the expansion of $(1+x)^{2n}$ and $(1+x)^{2n-1}$ are in the ratio

A. $1:2$

B. $1:3$

C. $3:1$

D. $2:1$

Answer: d

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114. The sum of the series $\sum_{r=0}^{10} .^{20}C_r$ is $2^{19} + \frac{.^{20}C_{10}}{2}$

A. 2^{10}

B. 2^{19}

C. $2^{19} + \frac{1}{2}{}^{20}C_{10}$

D. $2^{19} - \frac{1}{2}{}^{20}C_{10}$

Answer: c

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115. Let $\left(\frac{2x^2+x+2}{x}\right)^n = \sum_{r=m}^{r=t} a_r x^r$, then answer the following.

(a) The value of m and t are ...

(b) The value of $\sum_{r=m}^{r=t} a_r =$ ...

(c) The value of $a_t =$ ...

(d) The value of $a_m =$ ...

(e) If $a_p = a_q$, then $p+q =$ ...

$$E = \left[1+2\left(x+\frac{1}{x}\right)\right]^n = \sum_{r=m}^{r=t} a_r x^r,$$

where $r = (m, m+1, ..., t)$

$$E = C_0 + C_1.2\left(x+\frac{1}{x}\right) + C_2\left[2\left(x+\frac{1}{x}\right)\right]^2 + ... + C_n\left[2\left(x+\frac{1}{x}\right)\right]^n$$

$$= \sum_{r=m}^{t} a_r x^r$$

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Problem Set 1 True And False

1. The ratio of the coefficient of x^{10} in $\left(1-x^2\right)^{10}$ and the term independent of x in $\left(x-\frac{2}{x}\right)^{10}$ is 1:32.

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2. The coefficient of (r + 1)th term in the expansion of $(1+x)^{n+1}$ is equal to the sum of the coefficients of rth and (r + 1)th terms in the expansion of $(1+x)^n$.

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3. Prove that he coefficient of x^n in the expansion of $(1+x)^{2n}$ is twice the coefficient of x^n in the expansion of $(1+x)^{2n-1}$

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4. In the expansion of $(x+a)^n$ if the sum of odd terms is P and the sum of even terms is Q, tehn $P^2-Q^2=\left(x^2-a^2\right)^n$ $4PQ=(x+a)^{2n}-(x-a)^{2n}$ $2\left(P^2+Q^2\right)=(x+a)^{2n}+(x-a)^{2n}$ none of these

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Problem Set 1 Fill In The Blanks

1. Find the coefficient of x^5 in the expansion of $\left(1+x^2\right)^5 1+\dot{x}^4 is 60.$

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2. If $\left(1+x+x^2\right)^{6n}=a_0+a_1x+a_2x^2+\ldots\ldots,$ then

$a_2+a_4+a_6+$ ..... = ...

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3. Larger of $99^{50}+100^{50}$ and 101^{50} is .....

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Problem Set 2 Multiple Choice Questions

1. If T_2/T_3 in the expansion of $(a+b)^n$ and T_3/T_4 in the expansion of $(a+b)^{n+3}$ are equal, then n =

A. 3

B. 4

C. 5

D. 6

Answer: c

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2. If $C_0, C_1, C_2, \ldots C_{15}$ are the binomial coefficients in the expansion of $(1+x)^{15}$, then

$$\frac{C_1}{C_0} + 2\frac{C_2}{C_1} + 3\frac{C_3}{C_2} + \ldots + 15\frac{C_{15}}{C_{14}} =$$

A. 120

B. 130

C. 140

D. 150

Answer: a

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3. If $C_r = {}^nC_r$, then the value of

$$2\left(\frac{C_1}{C_0} + 2\frac{C_2}{C_1} + 3\frac{C_3}{C_2} + \ldots + n.\ \frac{C_n}{C_{n-1}}\right) \text{ is}$$

A. $n(n-1)$

B. $n(n+1)$

C. $n^2 - 1$

D. $n^2 + 1$

Answer: b

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4. In the expansion of $(1+x)^n$ the binomial coefficients of three consecutive terms are respectively 220, 495 and 792, then the value of n =

A. 10

B. 11

C. 12

D. 13

Answer: a

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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. 5

B. 6

C. 7

D. none

Answer: a

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6. If the 21st and 22nd terms in the expansion of $(1-x)^{44}$ are equal, then x =

A. $7/8$

B. $-7/8$

C. $8/7$

D. $-8/7$

Answer: b

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7. If the coefficients of rth, $(r+1)th, and (r+2)th$ terms in the expansion of $(1+x)^{14}$ are in A.P., then r is/are a. 5 b. 11 c. 10 d. 9

A. 5

B. 7

C. 9

D. 11

Answer: a,c

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8. If in the expansion of $(1+x)^n$ the coefficients of 14th, 15th and 16th terms are in A.P. then n=` (A) 12 (B) 23 (C) 27 (D) 34

A. 23

B. 24

C. 32

D. 34

Answer: a,d

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9. If the coefficients of rth, (r + 1)th and (r +2)th terms in the expansion $(1+x)^n$ are in A, P., then

A. $n^2 + n(4r+1) + 4r^2 - 2 = 0$

B. $n^2 + n(4r+1) + 4r^2 + 2 = 0$

C. $(n-2r)^2 = n+2$

D. $(n+2r)^2 = n+2$

Answer: c

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10. 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.

A. 60

B. 70

C. 55

D. none of these

Answer: c

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11. If the coefficients of second, third and fourth terms in the expansion of $(1+x)^{2n}$ are in A.P., then

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

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

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

D. none of these

Answer: b

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12. Let n be positive integer. If the coefficients of 2nd, 3rd and 4th terms in the expansion of $(1+x)^n$ are in A.P., then the value of n is

A. 2

B. 5

C. 7

D. 9

Answer: c

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13. If the coefficient of the middle term in the expansion of $(1+x)^{2n+2} is \alpha$ and the coefficients of middle terms in the expansion of $(1+x)^{2n+1}$ are β and γ then relate $\alpha, \beta and \gamma$.

A. $a+b=c$

B. $a+c=b$

C. $a=b+c$

D. $a+b+c=0$

Answer: c

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14. If a_1, a_2, a_3, a_4 be the coefficient of four consecutive terms in the expansion of $(1+x)^n$, then prove that: $\frac{a_1}{a_1+a_2}+\frac{a_3}{a_3+a_4}=\frac{2a_2}{a_2+a_3}$.

A. $\frac{a_2}{a_2+a_3}$

B. $\frac{1}{2}\frac{a_2}{a_2+a_3}$

C. $\frac{2a_2}{a_2+a_3}$

D. $\frac{2a_3}{a_2+a_3}$

Answer: c

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15. The greatest coefficient in the expansion of $(1+x)^{10}$, is

A. $10!/5!.6!$

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

C. $10!/5!.7!$

D. None of these

Answer: b

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16. The greatest coefficient in the expansion of $(1+x)^{2n+2}$ is

A. $\frac{(2n)!}{(n!)^2}$

B. $\frac{(2n+2)!}{\{(n+1)!\}^2}$

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

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

Answer: b

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17. 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, 8

B. 11, 12

C. 30, 31

D. none

Answer: c

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18. Find the largest term in the expansion of $(3+2x)^{50}$, $where x = 1/5$.

A. 5th

B. 51st

C. 7th

D. 6th

Answer: c

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19. Find the greatest term in the expansion of $\sqrt{3}\left(1+\frac{1}{\sqrt{3}}\right)^{20}$.

A. $\frac{25840}{9}$

B. $\frac{24840}{9}$

C. $\frac{26840}{9}$

D. none of these

Answer: a

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

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

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

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

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

Answer: d

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Problem Set 2 True And False

1. Any three consecutive binomial coefficients in the expansion of $(1+x)^n$ can be in (i) G.P. (ii) H.P.

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Problem Set 3 Multiple Choice Questions

1. Using binomial theorem, prove that $\left(2^{3n}-7n-1\right)$ is divisible by 49, where n $\in$ N.

A. 36

B. 49

C. 69

D. none

Answer: b

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2. The remainder when $6^n - 5n$ is divided by 25, is

A. 1

B. 2

C. 3

D. 7

Answer: a

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3. If $\theta = \left\{\frac{3^{2n}}{8}\right\}$, where {x} = Fractional part of x then the value of $\sec^{-1}(8\theta)$ is

A. π

B. 2π

C. 3π

D. 0

Answer: d

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4. $3^{2n+2} - 8n - 9$ is divisible by

A. 36

B. 49

C. 64

D. none

Answer: c

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5. 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. None

Answer: a

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6. If $P = \left(6\sqrt{6} + 14\right)^{2n+1}$ and $f = P - [P]$, where [ ] denotes the greatest integer function, then Pf equals

A. 20^n

B. 20^{2n}

C. 20^{2n-1}

D. none of these

Answer: D

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7. If $\left(3\sqrt{3} + 5\right)^7 = P + F$, where P is an integer and F is a proper fraction, then $F.(P + F)$ is equal to

A. 3^7

B. 2^6

C. 3^6

D. 2^7

Answer: d

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

A. 196

B. 197

C. 198

D. none

Answer: b

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9. If $\left(5+2\sqrt{6}\right)^n = I + f$, where $I \in N$, $n \in$ N and $0 \leq f \leq 1$, then I equals

A. $\frac{1}{f} - f$

B. $\frac{1}{1+f} - f$

C. $\frac{1}{1-f} - f$

D. $\frac{1}{1-f} + f$

Answer: C

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10. If $R = \left(7+4\sqrt{3}\right)^{2n} = I + f$, where $I \in N$ and $0 < f < 1$, then $R(1-f)$ equals

A. $\left(7-4\sqrt{3}\right)^{2n}$

B. $\frac{1}{\left(7+4\sqrt{3}\right)^{2n}}$

C. 1

D. none of these

Answer: c

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11. If n is a positive integer and $\left(5\sqrt{5}+11\right)^{2n+1}=I+f$

where I is an integer and $0<f<1$, then

A. I is an even integer

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

C. I is divisible by 22.

D. None

Answer: a,b,c

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12. Find the coefficients of x^{50} in the expression $(1+x)^{1000}+2x(1+x)^{999}+3x^2(1+x)^{998}+\ +1001x^{1000}$.

A. ${}^{1000}C_{50}$

B. ${}^{1001}C_{50}$

C. ${}^{1002}C_{50}$

D. ${}^{1000}C_{51}$

Answer: c

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Problem Set 4 Multiple Choice Questions

1. 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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2. $C_0 - \frac{C_1}{2} + \frac{C_2}{3} - \frac{C_3}{4} + \ldots. =$

A. 0

B. 2^{n-1}

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

D. none of these

Answer: c

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3. If $(1+x)^{15} = C_0 + C_1 x + C_2 x^2 + \ + C_{15} x^{15}$, then find the su of $C_1 + 2C_3 + 3C_4 + \ + 14C_{15}$.

A. 64329

B. 212993

C. 503146

D. none

Answer: b

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4. If $(1+x)^n = C_0 + C_1 x + C_2 x^2 + \ldots + C_n x^n$, then $C_0 + 3C_1 + 5C_2 + \ldots. \ + (2n+1)C_n =$

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

B. $n.2^n$

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

D. none

Answer: c

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5. $\sum_{r=1}^{n} r.\ {}^{2n}C_r =$

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

B. 2^{2n-1}

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

D. none

Answer: a

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6. ${}^{16}C_1 - 2^{16}C_2 + 3^{16}C_3 \ldots - 16^{16}C_{16} =$

A. 2^{15}

B. $2^{16}-1$

C. 0

D. None

Answer: c

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7. $\frac{1}{n!}+\frac{1}{2!(n-2)!}+\frac{1}{4!(n-4)!}+\ldots$ is equal to

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

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

C. $\frac{2^{n}}{n!}$

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

Answer: b

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8. $\sum_{r=1}^{n/2} \frac{1}{(2r-1)!(n+1-2r)!} =$

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

B. $\frac{2^n}{2.\, n!}$

C. $\frac{2^n}{n!}$

D. $\frac{2^n}{2.\, (n-1)!}$

Answer: b

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9. The value of ${}^{14}C_1 + {}^{14}C_3 + {}^{14}C_5 + \ldots + {}^{14}C_{11}$ is

A. $2^{14} - 1$

B. $2^{14} - 14$

C. 2^{12}

D. $2^{13} - 14$

Answer: d

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10. If $A = C_0 - C_2 + C_4 \ldots$ and $B = C_1 - C_3 + C_5 \ldots$ then $\frac{B}{A} =$

A. $\tan\frac{n\pi}{4}$

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

C. $\sec\frac{n\pi}{4}$

D. 1

Answer: a

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11. In the expansion of $(1+x)^{50}$, the sum of the coefficient of odd powers of x is :

A. 0

B. 2^{49}

C. 2^{50}

D. 2^{51}

Answer: b

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12. Find the sum of the coefficients of all the integral powers of x in the expansion of $\left(1+2\sqrt{x}\right)^{40}$.

A. $3^{40}-1$

B. $\frac{1}{2}\left(3^{40}-1\right)$

C. $\frac{1}{2}\left(3^{40}+1\right)$

D. $3^{40}+1$

Answer: c

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13. The value of ${}^{13}C_2+{}^{13}C_3+{}^{13}C_4+\ldots+{}^{13}C_{13}$ is

A. $2^{13}-13$

B. $2^{13}-14$

C. an odd number $\neq 2^{13}-12$

D. an even number $\neq 2^{13}-14$

Answer: b

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14. The sum of last ten coefficients in the expansion of $(1+x)^{19}$ when expanded in ascending powers of x is

A. 2^{19}

B. 2^{18}

C. $2^{18} - {}^{19}C_1$

D. none

Answer: b

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15. If $S = \frac{1}{2}{}^{10}C_0 - {}^{10}C_1 + 2{}^{10}C_2 - 2^2 \quad {}^{10}C_3 \ldots + 2^9 \quad {}^{10}C_{10}$, then S is equal to

A. 0

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

C. $\frac{1}{2}3^{10}$

D. none

Answer: b

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16. 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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17. Let $(1+x)^n = \sum_{r=0}^{n} C_r x^r$ and ,

$$\frac{C_1}{C_0} + 2\frac{C_2}{C_1} + \frac{C_3}{C_2} + \ldots + n\frac{C_n}{C_{n-1}} = \frac{1}{k}n(n+1),$$

then the value of k, is

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

B. $n(n+1)$

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

D. $\frac{1}{12}n(n+1)$

Answer: c

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

A. 10 n

B. $9(n-4)$

C. $5(2n-9)$

D. none

Answer: c

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19. If P_n denotes the product of the binomial coefficients in the expansion of $(1+x)^n$, then $\frac{P_{n+1}}{P_n}$ equals

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

B. $\frac{n^n}{n!}$

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

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

Answer: a

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20. If $C_0, C_1, C_2, \ldots, C_n$ denote the binomial cefficients in the expansion of $(1+x)^n$, then $aC_0 + (a+b)C_1 + (a+2b)C_2 + \ldots + (a+nb)C_n = .$

A. $(2a+nb)2^n$

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

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

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

Answer: b

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21. If $C_0, C_1, C_2, \ldots . C_n$ denote the coefficients in the expansion of $(1+x)^n$, then the value of $\sum_{r=0}^{n}(r+1)C_r$ is

A. $n.2^n$

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

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

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

Answer: c

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22. Statement-1: $\sum_{r=0}^{n}(r+1)^{n}C_r = (n+2)2^{n-1}$

Statement -2: $\sum_{r=0}^{n}(r+1)^{n}C_r x^r = (1+x)^n + nx(1+x)^{n-1}$

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23. If $(1+x)^n = C_0 + C_1 x + C_2 x^2 + \ldots + C_n x^n,$ then $C_0 + 5C_1 + 9C_2 + \ldots + (4n+1)C_n =$

A. $n.2^n$

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

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

D. $(4n+1)2^n$

Answer: c

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24. If $(1+x)^n = \sum_{r=0}^{n} C_r x^r$ and $\sum_{r=0}^{n} \frac{C_r}{r+1} = k$ then the value of k is

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

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

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

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

Answer: b

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25. If $(1+x)^n = \sum_{r=0}^{n} \cdot C_r x^r$ and $\sum_{r=0}^{n} (-1)^r \frac{C_r}{(r+1)^2} = k \sum_{r=0}^{n} \frac{1}{r+1}$,

then k is equal to :

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

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

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

D. none

Answer: b

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26. The sum of the series

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

A. $-{}^{20}C_{10}$

B. $\frac{1}{2}{}^{20}C_{10}$

C. 0

D. $^{20}C_{10}$

Answer: b

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27. The sum to (n+1) terms of the series

$$\frac{C_0}{2} - \frac{C_1}{3} + \frac{C_2}{4} - \frac{C_3}{5} + \ldots \text{ is}$$

A. $\frac{1}{n+1}$

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

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

D. none of these

Answer: d

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28. If C_r stands for ${}^nC_r$, then the sum of first $(n+1)$ terms of the series $aC_0 - (a+d)C_1 + (a+2d)C_2 - (a+3d)C_3 + \ldots$ is

A. $a/2^n$

B. na

C. 0

D. none of these

Answer: c

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29. The value of the sum of the series $3.\ {}^nC_0 - 8\ {}^nC_1 + 13\ {}^nC_2 - 18\ {}^nC_3 +$ ..... upto $(n+1)$ terms is

A. 0

B. 3^n

C. 5^n

D. none of these

Answer: a

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30. If $(1+x)^n = C_0 + C_1 x + C_2 x^2 + \ldots + C_n x^n$

then ${C_0}^2 + {C_1}^2 + {C_2}^2 + \ldots + {C_n}^2$ is equal to

A. $\frac{(2n)!}{n!n!}$

B. $\frac{(2n)!}{2(n!)^2}$

C. 2^n

D. 2^{2n-2}

Answer: a

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31. If n is a positive integer and $C_k = {}^nC_k$, then the value of $\sum_{k=1}^{n} k^3 \left(\frac{C_k}{C_{k-1}}\right)^2$ is :

A. $\frac{n}{12}(n+1)(n+2)$

B. $\frac{n}{12}(n+1)^2(n+2)$

C. $\frac{n}{12}(n+1)(n+2)^2$

D. none of these

Answer: b

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32. The vaule of $\sum_{r=0}^{n-1} \left(\frac{C_r}{{}^nC_r + {}^nC_{r+1}}\right.$ is equal to

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

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

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

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

Answer: a

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33. $\sum_{r=0}^{n}(-1)^r \quad {}^nC_r \frac{1+rx}{1+nx}$ equals

A. 1

B. -1

C. n

D. 0

Answer: d

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34. If $n > 3$, then

$abC_0 - (a-1)(b-1)C_1 + (a-2)(b-2)C_2 - (a-3)(b-3)C_3 + \ldots +$

equals

A. $ab \times 2^n$

B. nab

C. ab

D. 0

Answer: d

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35. If C_r be the coefficients of x^r in $(1+x)^n$, then the value of $\sum_{r=0}^{n} (r+1)^2 C_r$, is

A. $(n+1)(n+4)2^{n-2}$

B. $(n+1)(n+4)2^{n-1}$

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

D. $(n+4)^2 2^{n-2}$

Answer: a

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36. If n is an odd natural number, then $\sum_{r=0}^{n} \frac{(-1)^r}{{}^nC_r}$ equals

A. 0

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

C. $\frac{n}{2^n}$

D. none of these

Answer: a

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

A. $(n-1)a_n$

B. na_n

C. $\frac{1}{2}na_n$

D. none

Answer: c

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38. With usual notations $C_0C_1 + C_1C_2 + \ldots + C_{n-1}C_n =$

A. $\frac{(2n)!}{(n-2)!(n+2)!}$

B. $\frac{(2n)!}{(n!)^2}$

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

D. none of these

Answer: c

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39. With usual notations

$C_0C_2 + C_1C_3 + C_2C_4 + \ldots + C_{n-2}C_n =$

A. $\frac{(2n)!}{(n!)^2}$

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

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

D. none

Answer: c

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40. With usual notations,

$C_0C_r + C_1C_{r+1} + C_2C_{r+2} + \ldots + C_{n-r}C_n =$

A. $\frac{(2n)!}{(n!)^2}$

B. $\frac{(2n)!}{(n-r)!(n+r)!}$

C. $\frac{(2n)!}{[(n-r)!]^2}$

D. none

Answer: b

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41. The coefficient of $x^n y^n$ in the expansion of

$[(1+x)(1+y)(x+y)]^n$, is

A. $\sum_{r=0}^{n} C_r$

B. $\sum_{r=0}^{n} C_r^2$

C. $\sum_{r=0}^{n} C_r^3$

D. none of these

Answer: c

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42. The coefficient of $x^r[0 \leq r \leq (n-1)]$ in lthe expansion of $(x+3)^{n-1} + (x+3)^{n-2}(x+2) + (x+3)^{n-3}(x+2)^2 + \ + (x+2)^{n-1}$ is ^ $nC_r(3^r - 2^n)$ b. ^ $nC_r\left(3^{n-r} - 2^{n-r}\right)$ c. ^ $nC_r\left(3^r + 2^{n-r}\right)$ d. none of these

A. ${}^nC_r(3^r - 2^r)$

B. ${}^nC_r\left(3^{n-r} - 2^{n-r}\right)$

C. ${}^nC_r\left(3^r + 2^{n-r}\right)$

D. none

Answer: b

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43. If m,n,r are positive integers such that r $<$ m,n, then

$^{m}C_{r} + {}^{m}C_{r-1}{}^{n}C_{1} + {}^{m}C_{r-2}{}^{n}C_{2} + \ldots + {}^{m}C_{1}{}^{n}C_{r-1} + {}^{n}C_{r}$ equals

A. $({}^{n}C_{r})^{2}$

B. ${}^{m+n}C_{r}$

C. ${}^{m+n}C_{r} + {}^{m}C_{r} + {}^{n}C_{r}$

D. none of these

Answer: b

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44. The sum $\sum_{i=0}^{m} {}^{10}C_{i} \times {}^{20}C_{m-i} (\text{where } {}^{p}C_{q} = 0 \text{ if } p < q)$

is maximum, when m is

A. 5

B. 10

C. 15

D. 20

Answer: c

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45. The value of of sum of the series ${}^{14}C_0 . {}^{15}C_1 + {}^{14}C_1 . {}^{15}C_2 + \ldots + {}^{14}C_{14} . {}^{15}C_{15}$ is

A. ${}^{29}C_{10}$

B. ${}^{29}C_{12}$

C. ${}^{29}C_{14}$

D. ${}^{29}C_{18}$

Answer: c

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46. The value of

$(300)(3010) - (301)(3011) + (302)(3012) + \ + (3020)(3030) =$

$\hat{}\ 60C20$ b. $\hat{}\ 30C10$ c. $\hat{}\ 60C30$ d. $\hat{}\ 40C30$

A. ${}^{40}C_{20}$

B. ${}^{30}C_{10}$

C. ${}^{60}C_{30}$

D. ${}^{40}C_{30}$

Answer: b

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47. If $C_r = \left({}^{101}C_r\right)$ then $E = \sum_{r=0}^{100} (-1)^r C_r C_{r+1}$

A. $\left({}^{100}C_{51}\right)$

B. $\left({}^{100}C_{50}\right)$

C. $\left({}^{101}C_{50}\right)$

D. $-\left({}^{100}C_{50}\right)$

Answer: c

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Problem Set 4 Assertion Reason

1. Let $S_1 = \sum_{j=1}^{10} j(j-1)^{10}C_j, S_2 = \sum_{j=1}^{10} j^{10}C_i(\text{andS})_3 = \sum_{j=1}^{10} j^{2}{}^{10}\text{C}_\text{j}.$

Statement-1: $S_3 = 55 \times 2^9$ Statement-2: $S_1 = 90 \times 2^8 and S_2 = 10 \times 2^8$.

(1) Statement-1 is true, Statement-2 is true; Statement-2 is not the correct explanation for Statement-1 (2) Statement-1 is true, Statement-2 is false (3) Statement-1 is false, Statement-2 is true (4) Statement-1 is true, Statement-2 is true; Statement-2 is the correct explanation for Statement-1

A. Statement-1 is true, Statement-2 is true, Statement-2 is not a correct explanation for Statement-1.

B. Statement-1 is true, Statement-2 is false.

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

D. Statement-1 is true, Statement-2 is true, Statement-2 is a correct explanation for Statement-1.

Answer: b

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Problem Set 4 True And False

1. Show $1^2.C_1 + 2^2.C_2 + 3^2.C_3 + \ldots + n^2.C_n = n(n+1)2^{n-2}$

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2. Show $C_0 - 2^2C_1 + 3^2C_2 + \ldots + (-1)^n(n+1)^2C_n = 0,$ where $n > 2$

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3. Prove that $\frac{.^nC_0}{1}+\frac{.^nC_2}{3}+\frac{.^nC_4}{5}+\frac{.^nC_6}{7}+\ldots..+=\frac{2^n}{n+1}$

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4. Find the sum of $\frac{1}{1!(n-1)!}+\frac{1}{3!(n-3)}=\frac{1}{5!(n-5)}+,$

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5. If $C_r={}^nC_r$, then $C_1+3C_3+5C_5+\ldots=2C_2+4C_4+6C_6+\ldots$

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6. The sum of odd coefficients in the expansion of $\left(1+2x-3x^2\right)^{1025}$ is an odd integer

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7. If $\left(1+x+x^2\right)^n = a_0 + a_1 x + a_2 x^2 + \ldots + a_{2n} x^{2n}$, then

(a) $a_0 - a_2 + a_4 - a_6 + \ldots = 0$, if in is odd

(b) $a_1 - a_3 + a_5 - a_7 + \ldots = 0$, if n is even

True or False

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8. If $(1+x)^n = C_0 + C_1 x + C_2 x^2 + \ + C_n x^n$, then show that the sum of the products of the coefficients taken two at a time, represented by `sumsum_(0lt=i

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9. If $(1+x)^n = C_0 + C_1 x + C_2 x^2 + \ldots + C_n x^n$, prove that

$C_0^2 - C_1^2 + C_2^2 - \ldots + (-1)^n \cdot C_n^2 = 0$ or

$(-1)^{n/2} \cdot \frac{n!}{(n/2)!(n/2)!}$, according as n is odd or even

Also , evaluate $C_0^2 + C_1^2 + C_2^2 - \ldots + (-1)^n \cdot C_n^2$ for n

` = 10 and n= 11 .

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10. The value of $C_0^2 - C_1^2 + C_2^2 - \ldots + (-1)^n C_n^2$ for n = 10 and n = 11, is -252 and 0.

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11. If $(1+x)^n = C_0 + C_1 x C_2 x^2 + \ldots + C_n x^n$, then the sum $C_0 + (C_0 + C_1) + \ldots + (C_0 + C_1 + \ldots + C_{n-1})$ is equal to

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Miscellaneous Exercise Matching Entries

1. Match the entries of List-A and List-B.

List-A	List-B
(a) The expansion $[x+(x^3-1)^{1/2}]^5+[x-(x^3-1)^{1/2}]^5$ is a polynomial of degree ...	1. 5, 9
(b) The number of terms free from radicals in the expansion of $[7^{1/2}+11^{1/9}]^{6561}$ is ...	2. 30, 31
(c) If the coefficients of T_r, T_{r+1}, T_{r+2} terms in the expansion of $(1+x)^{14}$ are in A.P., then $r=$	3. 7
(d) The two consecutive terms in the expansion of $(3+2x)^{74}$ whose coefficients are equal are ...	4. 730

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2. Match the entries of List-A and List-B.

List-A

If $(1+x)^n = C_0 + C_1 x + C_2 x^2 + \ldots + C_n x^n$, then

(a) $\left(1+\frac{C_1}{C_0}\right)\left(1+\frac{C_2}{C_1}\right)\ldots\left(1+\frac{C_n}{C_{n-1}}\right)$

(b) $\sum_{r=0}^{n}(r+1)C_r$

(c) $\sum_{r=0}^{n}(r+1)^2 C_r$

(d) $\sum_{r=0}^{n-1}\frac{{}^nC_r}{{}^nC_r+{}^nC_{r+1}}$

List-B

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

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3. Match the entries of List-A and List-B.

List-A		List-B
(a) Sum of the coefficients in the expansion of $(x+2y+z)^{10}$ is	1.	$\frac{(n+1)(n+2)}{2}$
(b) The number of terms in the expansion of $(x+y+z)^n$ is	2.	50
(c) The number of irrational terms in the expansion of $(x^{1/5}+y^{1/16})^{55}$ is	3.	4^{10}

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Self Assessment Test

1. If the coefficient of r^{th} term, $(r+4)^{th}$ term are equal in the expansion of $(1+x)^{20}$, then the value of r will be

A. 6

B. 8

C. 9

D. 11

Answer: c

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2. The coefficient of x^4 in $\left(\frac{x}{2} - \frac{3}{x^2}\right)^{10}$ is :

A. $\frac{405}{256}$

B. $\frac{256}{405}$

C. $\frac{504}{256}$

D. 1

Answer: a

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3. The coefficient of x^{-7} in the expansion of $\left(ax - \frac{1}{bx^2}\right)^{11}$ will be

A. $\frac{461a^6}{b^3}$

B. $\frac{462a^5}{b^6}$

C. $\frac{462a^5}{b^6}$

D. None of these

Answer: D

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4. If the coefficient of x^7 and x^8 in $\left(2+\frac{x}{3}\right)^n$ are equal, then n is

A. 54

B. 55

C. 56

D. 58

Answer: b

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5. The coefficient of x^4 in the expansion of $\left(1+x+x^2+x^3\right)^n$ is

A. ${}^nC_4$

B. ${}^nC_4 + {}^nC_2$

C. ${}^nC_4 . {}^nC_2$

D. ${}^nC_2 + {}^nC_2 + {}^nC_1 . {}^nC_2$

Answer: d

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6. The greatest coefficient in the expansion of $(1+x)^{2n+1}$ is

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

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

C. $\frac{2n!}{(n!)^2}$

D. None of these

Answer: a

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7. The position of the term independent of x in the expansion of $\left(\sqrt{\frac{x}{3}}+\frac{3}{2x^2}\right)^{10}$ is .....

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

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

C. $\frac{3}{2}$

D. None of these

Answer: b

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8. In the expansion of $\left(x+\frac{2}{x^2}\right)^{15}$, the term independent of x is

A. ${}^{15}C_2.2^6$

B. ${}^{15}C_5.2^5$

C. $^{15}C_4.2^4$

D. None of these

Answer: b

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9. The term independent of x in the expansion of $\left(x^2 - \frac{1}{3x}\right)^9$ is

A. $\frac{28}{91}$

B. $\frac{28}{243}$

C. $\frac{27}{243}$

D. $-\frac{28}{243}$

Answer: b

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10. If $(1+x)^n = C_0 + C_1 x + C_2 x^2 + \ldots + C_n x^n$, prove that

$C_1 + 2C_2 + 3C_3 + \ldots + nC_n = n \cdot 2^{n-1}$

A. 2^n

B. $2^n - 1$

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

D. None of these

Answer: c

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11. If $C_0, C_1, C_2, \ldots\ldots, C_n$ are binomial coefficients, (where $C_r = .^n C_r$), then the value of $C_0 - C_1 + C_2 - C_3 + \ldots\ldots + (-1)^n C_n$ is equal to

A. 2^n

B. $2^n + 1$

C. 0

D. 2^{n-1}

Answer: c

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12. If $\left(1+x-2x^2\right)^6 = 1 + a_1 x + a_2 x^{12} + \ + a_{12} x^{12}$, then find the value of $a_2 + a_4 + a_6 + \ + a_{12}$.

A. 32

B. 63

C. 64

D. 31

Answer: d

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13. If $(1+x)^n = C_0 + C_1 x + C_2 x^2 + \ldots + C_n x^n$, prove that

$C_0 + 2C_1 + 3C_2 + \ldots + (n+1)C_n = (n+2)2^{n-1}$.

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

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

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

D. None of these

Answer: a

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14. The coefficient of x^n in the expansion of

$\left(1 - 9x + 20x^2\right)^{-1}$ is

A. $5^n - 4^n$

B. $5^{n+1} - 4^{n+1}$

C. $5^{n+1} + 4^{n+1}$

D. None of these

Answer: b

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15. The number of integer terms in the expansion of $\left(5^{1/2}+7^{1/6}\right)^{642}$ is

A. 105

B. 108

C. 106

D. 109

Answer: b

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16. Find the coefficient of x^5 in the expansion of $\left(1+x^2\right)^5 1+\dot{x}^4 is 60.$

A. 30

B. 40

C. 60

D. 50

Answer: C

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

The coefficient of x^{99} in the expansion of $(x-1)(x-2)(x-3).....(x-100)$ is

A. 5050

B. -5050

C. 5000

D. 5500

Answer: b

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18. If the coefficient of x^7 in $\left(ax^2 + \frac{1}{bx}\right)^{11}$ is equal to the coefficient of x^{-7} in $\left(ax - \frac{1}{bx^2}\right)$ then ab =

A. 1

B. 2

C. 3

D. 4

Answer: a

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19. The sum of the coefficeints of the polynominal $\left(1 + x - 3x^2\right)^{2163}$ is .....

A. 0

B. 1

C. -1

D. 2

Answer: c

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20. Sum of coefficients in the expansion of $(x+2y+z)^{10}$ is

A. 2^{10}

B. 3^{10}

C. 1

D. None of these

Answer: d

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21. The number of terms in the expansion of $(x+y+x)^{10}$, is

A. 11

B. 33

C. 66

D. None of these

Answer: c

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

A. 202

B. 51

C. 50

D. None of these

Answer: b

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23. The coefficient of middle term in the expansion of $(1+x)^{10}$ is

A. $10!/5!6!$

B. $10!/5!^2$

C. $10!/5!.7!$

D. None of these

Answer: b

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24. Coefficient of $\frac{1}{x}$ in the expansion of $(1+x)^n(1+1/x)^n$ is

A. $n!/[(n-1)!.(n+1)!]$

B. $2n!/[(n-1)!.(n+1)]$

C. $n!/[(2n-1)!.(2n+1)!]$

D. $2n!/[2n-1)!.(2n+1)!]$

Answer: b

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25. The coefficient of x^4 in $\left(\frac{x}{2}-\frac{3}{x^2}\right)^{10}$ is :

A. $\frac{405}{256}$

B. $\frac{504}{259}$

C. $\frac{450}{263}$

D. None of these

Answer: a

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26. The coefficient of y in the expansion of $\left(y^2 + c/y\right)^5$ is

A. 20c

B. 10c

C. $10c^3$

D. $20c^2$

Answer: c

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

A. equal

B. equal with opposite signs

C. reciprocals to each other

D. none of these

Answer: a

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28. Given positive integers $r > 1, n > 2$ and that the coefficient of $(3rd)thand(r+2)th$ terms in the binomial expansion of $(1+x)^{2n}$ are equal. Then $n = 2r$ b. $n = 2r+1$ c. $n = 3r$ d. none of these

A. $n = 2r$

B. $n = 3r$

C. $n = 2r+1$

D. None of these

Answer: a

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29. The term independent of x in $\left(x^2 - \frac{1}{x}\right)^9$ is

A. 1

B. -1

C. 48

D. None

Answer: d

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30. 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: c

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31. The term independent of x in $\left[\sqrt{\left(\frac{x}{3}\right)}+\sqrt{\left(\frac{3}{2x^2}\right)}\right]^{10}$ is

A. None

B. ${}^{10}C_1$

C. $\frac{5}{12}$

D. 1

Answer: a

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32. If the coefficients of x^7 and x^6 in $\left(2+\frac{x}{3}\right)^n$ are equal, then n is

A. 56

B. 55

C. 48

D. 15

Answer: c

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33. In the expansion of $(1+x)^{50}$, the sum of the coefficient of odd powers of x is :

A. 0

B. 2^{49}

C. 2^{50}

D. 2^{51}

Answer: b

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34. 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

A. $B_{10} - C_{10}$

B. $A_{10}\left(B_{10}^2 - C_{10}A_{10}\right)$

C. 0

D. $C_{10} - B_{10}$

Answer: d

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35. The term independent of 'x' in the expansion of $\left(\frac{x+1}{x^{2/3}-x^{1/3}+1} - \frac{x-1}{x-x^{1/2}}\right)^{10}$,where $x \in 0, 1$ is equal to_____.

A. 4

B. 120

C. 210

D. 310

Answer: c

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