MATHS

BOOKS - NAGEEN MATHS (HINGLISH)

BINOMIAL THEOREM

Example

1. Using binomial theorem, write down the expansions of the following: $(2x + 3y)^5$

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2. Expand $(3x - 2y)^6$ with the help ob binomial theorm.

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3. Simplify with the help of binomial theorm.

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4. (iii) Find an approximate value of $(0.99)^5$ using the first three terms of its expansion.

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5. Using binomial theorem, prove that $(101)^{50} > 100^{50} + 99^{50}$.

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

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7. Prove that $\sum_{r=0}^{n} {}^nC_r.4^r = 5^n$

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8. If $\left(1-x+x^2\right)^4 = 1+P_1x+P_2x^2+P_3x^3+\ldots+P_8x^8$, then prove that : $P_2+P_4+P_6+P_8 = 40$ and $P_1+P_3+P_5+P_7 = -40$.

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9. If o be the sum of odd terms and E that of even terms in the expansion of $(x+a)^n$ prove that: $O^2 - E^2 = \left(x^2 - a^2\right)^n$ (ii) $4OE = (x+a)^{2n} - (x-a)^{2n}$ (iii) $2\left(O^2 + E^2\right) = (x+a)^{2n} + (x-a)^{2n}$

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10. Find the 8th term in the expansion of $\left(\frac{2x}{3} - \frac{3}{5x}\right)^{12}$

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11. 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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12. Find the 15th term in the expansion of $(\sqrt{x} - \sqrt{y})^{17}$

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

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14. Find the middle term in the expansion of $\left(1 + 2x + x^2\right)^{10}$

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15. Find the 4th term from the end in the expansion of $(1-3x)^{10}$

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16. Show that the middle term in the expansion of $(1+x)^{2n} is \frac{(1.3.5(2n-1))}{n!} 2^n x^n, where n$ is a positive integer.

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17. how that the coefficient of (r+1) th in the expansion of $(1+x)^{n+1}$ is equal to the sum of the coefficients of the r th and (r+1) th term in the expansion of $(1+x)^n$

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18. If in any binomial expansion a, b, c and d be the 6th, 7th, 8th and 9th terms respectively, prove that $\frac{b^2 - ac}{c^2 - bd} = \frac{4a}{3c}$

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19. Find the coefficient of x^6 in the expansion of $\left(2x^3 - \frac{1}{3x^3}\right)^{10}$

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20. Find the coefficient of x^7 in the expansion of $\left(2x^2 - \frac{1}{x}\right)^{20}$

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21. Find the coefficient of x^{-25} in the expansion of $\left(\frac{x^2}{2} - \frac{3}{x^3}\right)^{15}$

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22. Find the coefficient of $x^6.y^3$ in the expansion of $(2x + y)^9$

A. 4756

B. 5476

C. 5376

D. 4786

Answer: C

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23. Find the constant term in the expansion of $\left(2x^4 - \frac{1}{3x^7}\right)^{11}$

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24. Find the terms independent of x in the expansion of $\left(\sqrt{x} + \frac{1}{3x^2}\right)^{10}$

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25. Find the term in the expansion of $\left(2x^2 - \frac{3}{x}\right)^{11}$ Which contains x^6

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26. If the coefficient of x^2 and x^3 are equal in the expansion of $(3+ax)^9$, then find the value of 'a'

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27. If m and n are positive integers, then prove that the coefficients of x^m and x^n are equal in the expansion of $(1+x)^{m+n}$

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28. Find the coefficient of x^5 in the product $(1+2x)^6(1-x)^7$ using binomial theorem.

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29. If the coefficients of a^{r-1}, $a^r and\, a^{r+1}$ in the binomial expansion of $(1+a)^n$ are in A.P., prove that $n^2 - on(4r+1) + 4r^2 - 2 = 0.$

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30. Evaluate :

$1 + {}^{15}C_1 + {}^{15}C_2 + {}^{15}C_3 + \ldots\ldots + {}^{15}C_{15}$

A. 2^{14}

B. 2^{15}

C. 2^{16}

D. 2^{13}

Answer: B

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31. If $(1+x)^n = C_0 + C_1.\, x + C_2.\, x^2 + C_3.\, x^3 + ... + C_n.\, x^n$, then prove that $C_0 + 2C_1 + 4C_2 + 6C_3 + ... + 2n.\, C_n = 1 + n \cdot 2^n$

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32. If $C_0, C_1, C_2..., C_n$, denote the binomial coefficients in the expansion of $(1+x)^n$, then $\frac{C_1}{2} + \frac{C_3}{4} + \frac{C_5}{6} + ...$ is equal to

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33. If C_0, C_1, C_2â€¦â€¦C_n are the binomial coefficient in the expansion of $(1+x)^n$ then prove that:

$$C_0^2 + C_1^2 + C_2^2 + \text{â€¦â€¦}. . + C_n^2 = \frac{|\underline{2n}}{|\underline{n}|\underline{n}}$$

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34. if$C_0C_1C_2$, â€¦â€¦C_n are the binomial coefficients in the expansion of $(1+x)^n$ then prove that:

$$C_0C_2 + C_1C_3 + C_2C_4 + \text{â€¦â€¦} + C_{n-2}C_n = \frac{|\underline{2n}}{|\underline{n-2}|\underline{n+2}}$$

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35. Expand $(2x+y)^5$ with the help of binomial theorem

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36. Expand $(3x - 2y)^6$ with the help ob binomial theorm.

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37. Simplify with the help of binomial theorm.

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41. Prove that $\sum_{r=0}^{n} {}^{n}C_r . 4^r = 5^n$

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42.

$If\left(1-x+x^2\right)^4=1+P_1x+P_2x^2+P_3x^3+\ldots\ldots+P_8x^8,$

then prove that :

$P_2+P_4+_6+P_8=40$ and $P_1+P_3+P_5+P_7=-40$

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43. If o be the sum of odd terms and E that of even terms in the expansion of $(x+a)^n$ prove that:

$O^2-E^2=\left(x^2-a^2\right)^n$ (ii) $4OE=(x+a)^{2n}-(x-a)^{2n}$

(iii) $2\left(O^2+E^2\right)=(x+a)^{2n}+(x-a)^{2n}$

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44. Find the 8th term in the expansion of $\left(\frac{2x}{3}-\frac{3}{5x}\right)^{12}$

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45. 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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46. Find the 15th term in the expansion of $(\sqrt{x} - \sqrt{y})^{17}$

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

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48. Find the middle term in the expansion of $\left(1+2x+x^2\right)^{10}$

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49. Find the 4th term from the end in the expansion of $(1-3x)^{10}$

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50. Show that the middle term in the expansion of $(1+x)^{2n}$ is $\frac{1.3.5.\dot{2n-1}}{n!}2nx^n 2nx^n$, where n is a positive integer.

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51. how that the coefficient of (r+1) th in the expansion of $(1+x)^{n+1}$ is equal to the sum of the coefficients of the r th and (r+1) th term in the expansion of $(1+x)^n$

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52. If in any binomial expansion a, b, c and d be the 6th, 7th, 8th and 9th terms respectively, prove that $\frac{b^2-ac}{c^2-bd}=\frac{4a}{3c}$

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53. Find the coefficient of x^6 in the expansion of $\left(2x^3-\frac{1}{3x^3}\right)^{10}$

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54. Find the coefficient of x^7 in the expansion of $\left(2x^2 - \frac{1}{x}\right)^{20}$

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55. Find the coefficient of x^{-25} in the expansion of $\left(\frac{x^2}{2} - \frac{3}{x^3}\right)^{15}$

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56. Find the coefficient of x^6y^3 in the expansion of $(x + 2y)^9$.

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57. Find the constant term in the expansion of $\left(2x^4 = \frac{1}{3x^7}\right)^{11}$

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

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59. Prove that there is no term involving x^6 in the expansion of $\left(2x^2 - \frac{3}{x}\right)^{11}$, where $\neq 0$.

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60. If the coefficients of $x^2 and\, x^3$ in the expansion o $(3+ax)^9$ are the same, then the value of a is $-\frac{7}{9}$ b. $-\frac{9}{7}$ c. $\frac{7}{9}$ d. $\frac{9}{7}$

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61. In the binomial expansion of $(1+a)^{m+n}$, prove that the coefficient of $a^m and\, a^n$ are equal.

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62. Find the coefficient of x^5 in the product $(1+2x)^6(1-x)^7$ using binomial theorem.

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63. If the coefficients of a^{r-1}, $a^r and\, a^{r+1}$ in the binomial expansion of $(1+a)^n$ are in A.P., prove that $n^2 - on(4r+1) + 4r^2 - 2 = 0.$

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64. Evaluate :

$1 + {}^{15}C_1 + {}^{15}C_2 + {}^{15}C_3 + \ldots\ldots + {}^{15}C_{15}$

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65.

if $(1+x)^n = C_0 + C_1.\, x + C_2.\, x^2 + C_3.\, x^3 + \ldots\ldots + C_n.\, x^n,$

then prove that

$C_0 + 2C_1 + 4C_2 + 6C_3 + \ldots\ldots + 2n.\, C_n = 1 + n.2^n$

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66. If $C_0, C_1, C_2, \ldots C_n$ are the binomial coefficients in the expansion of $(1+x)^n$ then prove that:

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

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67. If C_0, C_1, C_2â€¦â€¦C_n are the binomial coefficient in the expansion of $(1+x)^n$ then prove that:

$$C_0^2 + C_1^2 + C_2^2 + \text{â€¦â€¦}. . + C_n^2 = \frac{|\underline{2n}}{|\underline{n}|\underline{n}}$$

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68. if$C_0C_1C_2$, â€¦â€¦C_n are the binomial coefficients in the expansion of $(1+x)^n$ then prove that:

$$C_0C_2 + C_1C_3 + C_2C_4 + \text{â€¦â€¦} + C_{n-2}C_n = \frac{\lfloor 2n}{\lfloor n-2 \lfloor n+2}$$

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Exercise 8 A

1. Expand using binomial theorem:

$(i)(1-2x)^4$ $(ii)(x+2y)^5$

$(iii)\left(x-\frac{1}{x}\right)^6$ $(iv)\left(\frac{2x}{3}=\frac{3}{2x}\right)^5$

$(v)\left(x^2+\frac{2}{x}\right)^6$ $(vi)\left(1+\frac{1}{x^2}\right)^4$

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2. Evaluate using binomial theorem:

$(i)\left(\sqrt{2}+1\right)^{6}+\left(\sqrt{2}-1\right)^{6}$

$(ii)\left(\sqrt{5}+\sqrt{2}\right)^{4}-\left(\sqrt{5}-\sqrt{2}\right)^{4}$

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3. Expand $(a+b)^{6}-(a-b)^{6}$. Hence find the value of $\left(\sqrt{2}+1\right)^{6}-\left(\sqrt{2}-1\right)^{6}$.

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4. If $x=\sqrt{5}+\sqrt{3}$ and $y=\sqrt{5}-\sqrt{3}$, then $x^{4}-y^{4}$

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5. Find the values of the following using binomial theorem:

$(i) 49^4$ $(ii) (1.1)^4$

$(iii) 101^3$ $(iv) (0.9)^5$

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6. By using binomial theorem find which number is greater $(1.2)^{3000}$ or 600?

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7. Prove that $\Sigma_{r=0}^{n} {}^nC_r.3^r = 4^n$

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8. If n is a positive integer then find the number of terms in the expansion of $(x+y-2z)^n$

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9. Find the number of terms in the expansion of $\left(1+3x+3x^2+x^3\right)^{15}$

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10. If $\left(1+x+x^2\right)^n = 1+a_1x+a_2x^2+a_3x^3$ $+\hat{a}\in|\hat{a}\in|.\ .\ +a_{2n}.\ x^{2n}$ then prove that:

$(i) a_1+a_3+a_5+\hat{a}\in|.\ .\ +a_{2n-1} = \frac{3^n-1}{2}$

$(ii) a_2+a_4+a_6+\hat{a}\in|\hat{a}\in|+a_{2n} = \frac{3^n-1}{2}$

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11. By using binomial theorem prove that

$(i)\left(2^{3n}-7n-1\right)$ is divisible by 49 where n is a positive integer.

(ii)$\left(3^{3n}-26n-1\right)$ is divisible by 26^2 Where n is a positive integer.

(iii) $\left(6^n-5n\right)$ when divided by 25 leaves a remainder 1.

(iv) $\left(x^{2n}-y^{2n}\right)$ is divisible (x-y) , $n \in N$

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12. Expand using binomial theorem:

$(i)(1-2x)^4$ $(ii)(x+2y)^5$

$(iii)\left(x-\frac{1}{x}\right)^6$ $(iv)\left(\frac{2x}{3}=\frac{3}{2x}\right)^5$

$(v)\left(x^2+\frac{2}{x}\right)^6$ $(vi)\left(1+\frac{1}{x^2}\right)^4$

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13. Evaluate using binomial theorem:

$(i)\left(\sqrt{2}+1\right)^{6}+\left(\sqrt{2}-1\right)^{6}$

$(ii)\left(\sqrt{5}+\sqrt{2}\right)^{4}-\left(\sqrt{5}-\sqrt{2}\right)^{4}$

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14. Using binomial theorem, expand $\left\{(x+y)^{5}+(x-y)^{5}\right\}$. and hence find the value of $\left\{\left(\sqrt{2}+1\right)^{5}+\left(\sqrt{2}-1\right)^{5}\right\}$.

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15. Expand $(x+y)^{4}-(x-y)^{4}$. Hence find the value of $\left(3+\sqrt{5}\right)^{4}-\left(3-\sqrt{5}\right)^{4}$.

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16. Find the values of the following using binomial theorem:

$(i) 49^4$ $(ii) (1.1)^4$

$(iii) 101^3$ $(iv) (0.9)^5$

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17. By using binomial theorem find which number is greater $(1.2)^{3000}$ or 600?

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18. Prove that $\Sigma_{r=})^{nn}C_r.3^r = 4^n$

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19. If n is a positive integer then find the number of terms in the expansion of $(x+y-2z)^n$

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20. Find the number of terms in the expansion of $\left(1+3x+3x^2+x^3\right)^{15}$

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

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22. By using binomial theorem prove that

$(i)\left(2^{3n}-7n-1\right)$ is divisible by 49 where n is a positive integer.

(ii) $\left(3^{3n}-26n-1\right)$ is divisible by 26^2 Where n is a positive integer.

(iii) $\left(6^n-5n\right)$ when divided by 25 leaves a remainder 1.

(iv) $\left(x^{2n}-y^{2n}\right)$ is divisible (x-y) , $n \in N$

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Exercise 8 B

1. Find the 4^{th}term in the expansion of $(x-2y)^{12}$.

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2. Find the 7th term in the expansion of $\left(\frac{4x}{5} - \frac{5}{2x}\right)^9$.

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3. Find the 15th term in the expansion of $\left(2y - \frac{x}{2}\right)^{18}$

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4. Find the 10th term in the binomial expansion of $\left(2x^2 + \frac{1}{x}\right)^{12}$.

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5. Find the $(r+1)$th term in the expansion of $\left(\frac{x}{a}-\frac{a}{x}\right)^{2n}$

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6. Find the 7th term from the end in the expansion of $\left(x+\frac{1}{x}\right)^{11}$

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7. Find the 3rd term the end in the expansion of $(2-3x)^{8}$

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8. Find the 4th term from the end in the expansion of $\left(\frac{x}{2}-\frac{4}{x}\right)^{15}$

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9. Find the middle term in the following expansion:

$(i)\left(x^2-\frac{1}{x^2}\right)^{10}$ $(ii)\left(\frac{x}{a}+\frac{a}{x}\right)^{12}$ $(iii)\left(\frac{a}{x}+bx\right)^{2n}$

$(iv)\left(x-\frac{1}{x}\right)^{9}$ $(v)\left(1-3x+3x^2-x^3\right)^{6}$ $(vi)\left(x^2-a\right)^{11}$

$(vii)\left(2x-\frac{3}{x^2}\right)^{15}$

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10. If the coefficients of $(p+1)$th and $(P+3)$th terms in the expansion of $(1+x)^{2n}$ are equal then prove that n=p+1

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11. If the coefficients of the $(2r+4)th$, $(r+2)th$ term in the expansion of $(1+x)^{18}$ are equal, then the value of r is.

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12. If the coefficients of $(2r+1)th$ term and $(r+2)th$ term in the expansion of $(1+x)^{48}$ are equal,find r.

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13. Find a if 17th and 18th terms in the expansion of $(2+a)^{50}$ are equal.

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

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15. In n is a positive integer then prove that the coefficient of the middle term in the expansion of

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16. If 3rd, 4th, 5th terms in the expansion of $(a+x)^n$ be 84, 280 and 560, Find x, a and n.

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17. Find a, b and n in the expansion of $(a+b)^n$ if the first three terms of the expansion are 729, 7290 and 30375, respectively.

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18. If a. b, c and d are the coefficients of 2nd, 3rd, 4th and 5th terms respectively in the binomial expansion of $(1+x)^n$, then prove that $\frac{a}{a+b}+\frac{c}{c+d}=2\frac{b}{b+c}$

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19. 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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20. Find the 4^{th} term in the expansion of $(x-2y)^{12}$.

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21. Find the 7th term in the expansion of $\left(\frac{4x}{5}-\frac{5}{2x}\right)^9$.

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22. Find the 15th term in the expansion of $\left(2y - \frac{x}{2}\right)^{18}$

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23. (i) Find the 9th term in the expansion of $\left(\frac{x}{a} - \frac{2a}{x^2}\right)^{12}$ (ii) Find the 8th term in the expansion of $\left(2x^2 + \frac{1}{x}\right)^{12}$

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24. Find the $(r+1)$th term in the expansion of $\left(\frac{x}{a} - \frac{a}{x}\right)^{2n}$

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25. Find the 7th term from the end in the expansion of $\left(x+\frac{1}{x}\right)^{11}$

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26. Find the 3rd term the end in the expansion of $(2-3x)^{8}$

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27. Find the 4th term from the end in the expansion of $\left(\frac{x}{2}-\frac{4}{x}\right)^{15}$

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28. Find the middle term in the following expansion:

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$(iii)\left(\frac{a}{x}+bx\right)^{2n}$ $(iv)\left(x-\frac{1}{x}\right)^{9}$

$(v)\left(1-3x+3x^2-x^3\right)^{6}$

$(vi)\left(x^2-a\right)^{11}$ $(vii)\left(2x-\frac{3}{x^2}\right)^{15}$

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30. If the coefficients of the $(2r+4)th$, $(r+2)th$ term in the expansion of $(1+x)^{18}$ are equal, then the value of r is.

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31. if the coefficient of $(2r+1)$th term and $(r+2)$th term in the expansion of $(1+x)^{43}$ are equal then r=?

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32. Find a if 17th and 18th terms in the expansion of $(2+a)^{50}$ are equal.

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38. 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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Exercise 8 C

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

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2. Find the coefficient of x^{10} in the expansion of $\left(1 - x^2\right)^{10}$

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3. The coefficient of x^{-17} in the expansion of $\left(x^4 - \frac{1}{x^3}\right)^{15}$ is

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4. Find the coefficient of x^{40} in the expansion of $\left(1+2x+x^2\right)^{27}$.

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5. If 'n' is a positive integer then prove that the coefficient fo x^m in the expansion of $\left(x^2+\frac{1}{x}\right)^{2n}$ is :

$$\boxed{2n}\quad\boxed{\frac{4n-m}{3}}\cdot\boxed{\frac{2n+m}{3}}$$

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6. Find the term independent of x (constant term) in the following expansion:

$(i)\left(x^2-\frac{1}{3x}\right)^9$ $(ii)\left(x-\frac{1}{x}\right)^{10}$

$(iii)\left(3x-\frac{2}{x^2}\right)^{18}$ $(iv)\frac{1}{x^n}(1+x)^{2n}$

$(V)\left(3\sqrt{x}+\frac{1}{2(3\sqrt{x})}\right)^{18}$ $(vi)\left(\frac{3x^2}{2}-\frac{1}{3x}\right)^6$

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7. Prove that the constant term in the expansion of $\left(x+\frac{1}{x}\right)^{2n}$ is $\frac{1.3.5â€¦(2n-1)}{\lfloor n}.2^n$

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8. Find the coefficient of $a^5b^7 \in (a-2b)^{12}$

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9. Find the coefficient of $x^2 . y^7$ in the expansion of $(x + 2y)^9$

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

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11. Prove that the greatest coefficient in the expansion of $(1 + x)^{2n}$ is double the greatest coefficient in expansion $(1 + x)^{2n-1}$.

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12. Find a positive value of m for which the coefficient of x^2 in the expansion of $(1+x)^m$ is 6.

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13. The sum of the coefficients of x^{32} and x^{-17} in $\left(x^4 - \frac{1}{x^3}\right)^{15}$ is

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

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

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

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17. The coefficient of x^{-17} in the expansion of $\left(x^4 - \frac{1}{x^3}\right)^{15}$ is

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18. Find the coefficient of x^{40} in the expansion of $\left(1+2x+x^2\right)^{27}$.

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19. If 'n' is a positive integer then prove that the coefficient fo x^m in the expansion of $\left(x^2+\frac{1}{x}\right)^{2n}$ is :

$$\frac{\lfloor 2n}{\left\lfloor \frac{4n-m}{3} \cdot \left\lfloor \frac{2n+m}{3} \right.\right.}$$

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20. Find the term independent of x (constant term) in the following expansion:

$(i)\left(x^2-\frac{1}{3x}\right)^9$ $(ii)\left(x-\frac{1}{x}\right)^{10}$

$(iii)\left(3x-\frac{2}{x^2}\right)^{18}$ $(iv)\frac{1}{x^n}(1+x)^{2n}$

$(V)\left(3\sqrt{x}+\frac{1}{2(3\sqrt{x})}\right)^{18}$ $(vi)\left(\frac{3x^2}{2}-\frac{1}{3x}\right)^6$

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21. Prove that the term independent of x in the expansion of $\left(x+\frac{1}{x}\right)^{2n}$ is $\frac{1.3.5.....(2n-1)}{n!}.2^n$

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22. Find the coefficient of $a^5b^7 \in (a-2b)^{12}$

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23. Find the coefficient of $x^2.y^7$ in the expansion of $(x+2y)^9$

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

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25. prove that the 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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26. Find a positive value of m for which the coefficient of x^2 in the expansion of $(1+x)^m$ is 6.

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27. The sum of the coefficients of x^{32} and x^{-17} in $\left(x^4 - \frac{1}{x^3}\right)^{15}$ is

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28. Find the coefficients of x^7 in $\left(ax^2+\frac{1}{bx}\right)^{11} and x^{-7} \in \left(a\frac{x^{-1}}{bx^2}\right)^{11}$ and find the relation between $a and b$ so that coefficients are equal.

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Exercise 8 D

1. Evaluate the following :

$(i) 1+.^{20}C_1+^{20}C_2+^{20}C_3+....+^{20}C_{19}+^{20}C_{20}$

$(ii)^{10}C_1+^{10}C_2+^{10}C_3+.....+^{10}C_9$

$(iii)^{25}C_1+^{25}C_3+^{25}C_5+.....+^{25}C_{25}$

$(iv)^{18}C_2+^{18}C_4+^{18}C_4+^{18}C_6+....+^{18}C_{18}$

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2. If $(1+x)^n = C_0 + C_1.\, x + C_2.\, x^2 + â€¦ + C_n.\, x^n.$ then prove that

$(i) C_0 + 2C_1 + 3C_2 + â€¦ + (n-1)C_n = (n+2).2^{n-1}$

$(ii) C_0 + 3C_1 + 5C_2 + \ldots + (2n+1)C_n = (n+1).2^n$

$(iii) C_0 + \frac{C_2}{3} + \frac{C_4}{5} + \ldots. + \frac{2^n}{n+1}$

$(iv) 2C_0 + \frac{2^2.\, C_1}{2} + \frac{2^3.\, C_2}{3} + \ldots + \frac{2^{n+1}.\, C_n}{n+1}$

$= \frac{3^{n+1}-1}{n+1}$

$(v)(C_0 + C_1)(C_1 + C_2)(C_2 + C_3).....(C_{n-1} + C_n)$

$= \frac{C_1 C_2 C_3 \ldots\ldots .\, C_n (n+1)^n}{\lfloor \underline{n} }$

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3. In $C_0, C_1 C_2 â€¦ C_n$ are the binomial coefficients in the expansion of $(1+x)^n$ then prove that :

$(i) C_0^2 - C_1^2 + C_2^2 - C_3^2 + â€¦ . \; + (-1)^n . C_n^2$

$$= \begin{cases} 0 & , \text{ if } n \text{ is odd} \\ \dfrac{(-1)^{n/2} \cdot \lfloor n}{\left(\left\lfloor \frac{n}{2} \right\rfloor\right)^2} & , \text{ if } n \text{ is even} \end{cases}$$

$(ii) C_0C_1 + C_1C_2 + C_2C_3 + ... + C_{n-1}C_n$

$$= \frac{\lfloor 2n}{\lfloor n-1 \lfloor n+1}$$

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4. Prove that:

$.^2 C_2 + ^3 C_2 + ^4 C_2 + â€¦. . + ^{n+1} C_2 = \frac{1}{6} n(n+1)(n+2)$

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5. Evaluate the following :

$(i) 1 + .^{20}C_1 + ^{20}C_2 + ^{20}C_3 + ... + ^{20}C_{19} + ^{20}C_{20}$

$(ii) ^{10}C_1 + ^{10}C_2 + ^{10}C_3 + ... + ^{10}C_9$

$(iii) ^{25}C_1 + ^{25}C_3 + ^{25}C_5 + ... + ^{25}C_{25}$

$(iv) ^{18}C_2 + ^{18}C_4 + ^{18}C_4 + ^{18}C_6 + ... + ^{18}C_{18}$

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6. If $(1+x)^n = C_0 + C_1.x + C_2.x^2 + ... + C_n.x^n.$ then prove that

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

$(ii) C_0 + 3C_1 + 5C_2 + ... + (2n+1)C_n = (n+1).2^n$

$(iii) C_0 + \frac{C_2}{3} + \frac{C_4}{5} + ... + \frac{2^n}{n+1}$

$(iv) 2C_0 + \frac{2^2.C_1}{2} + \frac{2^3.C_2}{3} + ... + \frac{2^{n+1}.C_n}{n+1}$

$$= \frac{3^{n+1} - 1}{n+1}$$

$$(v)(C_0 + C_1)(C_1 + C_2)(C_2 + C_3).....(C_{n-1} + C_n)$$

$$= \frac{C_1 C_2 C_3 ..... C_n (n+1)^n}{\lfloor \underline{n}}$$

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7. In $C_0, C_1 C_2 .... C_n$ are the binomial coefficients in the expansion of $(1+x)^n$ then prove that :

$$(i) C_0^2 - C_1^2 + C_2^2 - C_3^2 + ... + (-1)^n . C_n^2$$

$$= \begin{cases} 0 & , \text{ if } n \text{ is odd} \\ \dfrac{(-1)^{n/2} \cdot \lfloor \underline{n}}{\left(\left\lfloor \underline{\frac{n}{2}} \right\rfloor\right)^2} & , \text{ if } n \text{ is even} \end{cases}$$

$(ii) C_0C_1 + C_1C_2 + C_2C_3 + ... + C_{n-1}C_n$

$$= \frac{\lfloor 2n}{\lfloor n-1 \lfloor n+1}$$

View Text Solution

8. Prove that:

$$.^2C_2 + ^3C_2 + ^4C_2 + ... + ^{n+1}C_2 = \frac{1}{6}n(n+1)(n+2)$$

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Exercise 8 E

1. No. of terms in the expansion of $\left(1+3x+3x^2+x^3\right)^{10}$ is:

A. 31

B. 32

C. 10

D. 11

Answer: A

View Text Solution

2. Using $(x+1)^6+(x-1)^6$ evaluate $\left(\sqrt{2}+1\right)^6+\left(\sqrt{2}-1\right)^6$.

A. 184

B. 192

C. 198

D. 202

Answer: C

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3. 15th term in the expansion of $\left(\sqrt{2}-\sqrt{y}^{17}\right.$ is :

A. $860x^{3/2}y^{7}$

B. $680x^{7}y^{3/2}$

C. $680x^{3/2}y^{7}$

D. $860x^{3}y^{7/2}$

Answer: C

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4. If the coefficients of the $(n+1)^{th}$ term and the $(n+3)^{th}$ term in the expansion of $(1+x)^{20}$ are equal , then the value of n is 10 b. 8 c. 9 d. none of these

A. P

B. $P+1$

C. $P+2$

D. $P+3$

Answer: B

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5. In the expansion of $(2+a)^{50}$ the 17th and 18th terms are aqual . The value of a is :

A. $1/3$

B. $1/2$

C. 1

D. None of these

Answer: C

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6. Find the coefficient of x^{-25} in the expansion of $\left(\frac{x^2}{2}-\frac{3}{x^3}\right)^{15}$

A. $\frac{-1365}{16} \times 3^{11}$

B. $\frac{1365}{16} \times 3^{11}$

C. $\frac{-16}{1365} \times 3^{11}$

D. None of these

Answer: A

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7. The remainder left out when $8^{2n} - (62)^{2n+1}$ is divided by 9 is

A. 0

B. 2

C. 4

D. none of these

Answer: B

Watch Video Solution

8. No. of terms in the expansion of $(1+2x)^9+(1-2x)^9$ is :

A. 10

B. 9

C. 7

D. 20

Answer: D

Watch Video Solution

9. Find the middle term in the expansion of : $\left(x-\frac{1}{x}\right)^{10}$

A. 126

B. -126

C. -252

D. 252

Answer: C

Watch Video Solution

10. if the coefficient of $(2r+1)$th term and $(r+2)$th term in the expansion of $(1+x)^{43}$ are equal then r=?

A. 14

B. 30

C. 41

D. 42

Answer: A

Watch Video Solution

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

A. 31

B. 32

C. 10

D. 11

Answer: A

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12. Show that $\left(\sqrt{2}+1\right)^6+\left(\sqrt{2}-1\right)^6=198$

A. 184

B. 192

C. 198

D. 202

Answer: C

Watch Video Solution

13. 15th term in the expansion of $\left(\sqrt{2}-\sqrt{y}^{17}\right.$ is :

A. $860x^{3/2}y^{7}$

B. $680x^{7}y^{3/2}$

C. $680x^{3/2}y^{7}$

D. $860x^{3}y^{7/2}$

Answer: C

Watch Video Solution

14. If the coefficients of the $(n+1)^{th}$ term and the $(n+3)^{th}$ term in the expansion of $(1+x)^{20}$ are equal , then the value of n is 10 b. 8 c. 9 d. none of these

A. P

B. $P+1$

C. $P+2$

D. $P+3$

Answer: B

Watch Video Solution

15. Find a if 17th and 18th terms in the expansion of $(2+a)^{50}$ are equal.

A. $1/3$

B. $1/2$

C. 1

D. None of these

Answer: C

Watch Video Solution

16. Find the coefficient of x^{-25} in the expansion of $\left(\frac{x^2}{2}-\frac{3}{x^3}\right)^{15}$

A. $\frac{-1365}{16}\times 3^{11}$

B. $\frac{1365}{16}\times 3^{11}$

C. $\frac{-16}{1365}\times 3^{11}$

D. None of these

Answer: A

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17. The remainder left out when $8^{2n}(62)^{2n+1}$ is divided by 9 is

(1) 0 (2) 2 (3) 7 (4) 8

A. 0

B. 2

C. 4

D. none of these

Answer: B

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18. No. of terms in the expansion of $(1+2x)^9+(1-2x)^9$ is

:

A. 10

B. 9

C. 7

D. 5

Answer: D

Watch Video Solution

19. Find the middle term in the expansion of : $\left(x-\frac{1}{x}\right)^{10}$

A. 126

B. -126

C. -252

D. 252

Answer: C

Watch Video Solution

20. if the coefficient of $(2r+1)$th term and $(r+2)$th term in the expansion of $(1+x)^{43}$ are equal then r=?

A. 14

B. 30

C. 41

D. 42

Answer: A

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Exercise 8 F

1. The coefficient x^5 in the expansion of $\left(2 - x + 3x^2\right)^6$ is

A. -5051

B. 4632

C. -4631

D. none of these

Answer: A

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2. If the sum of the coefficients in the expansion of $(a+b)^n$ is 4096, then the greatest coefficient in the expansion is 924 b. 792 c. 1594 d. none of these

A. 792

B. 924

C. 1048

D. 2096

Answer: B

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3. If the second, third and fourth in the expansion of $(x+y)^n$ are 135, 30 and $\frac{10}{3}$ respectively, then

A. 5

B. 6

C. 7

D. 9

Answer: A

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4. 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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5. If a. b, c and d are the coefficients of 2nd, 3rd, 4th and 5th terms respectively in the binomial expansion of $(1+x)^n$, then prove that $\frac{a}{a+b}+\frac{c}{c+d}=2\frac{b}{b+c}$

A. $\frac{b}{b+c}$

B. $\frac{b}{2(b+c)}$

C. $\frac{2b}{b+c}$

D. $\frac{2c}{b+c}$

Answer: C

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6. If the coefficients of x^7 and x^8 in the expansion of $\left[2+\frac{x}{3}\right]^n$ are equal, then the value of n is : (A) 15 (B) 45 (C) 55 (D) 56

A. 15

B. 45

C. 55

D. 60

Answer: C

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7. If A and B are the coefficients of x^n in the expansion $(1+x)^{2n}$ and $(1+x)^{2n-1}$ respectively, then

A. $A = B$

B. $2A = B$

C. $A = 2B$

D. None of these

Answer: C

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8. 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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9. if the coefficient of rth (r+1) th and (r+2)th terms in the expansion of $(1+x)^n$ are in A.P. then correct statements is :

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

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

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

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

Answer: A

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10. if the coefficients of x^5 and x^{15} in the expansion of $\left(x^2 + \frac{a}{x^3}\right)^{10}$ are equal then then the positive value of 'a' is:

A. $2\sqrt{3}$

B. 1

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

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

Answer: D

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11. The coefficient x^5 in the expansion of $\left(2-x+3x^2\right)^6$ is

A. -5051

B. 4632

C. -4631

D. none of these

Answer: A

Watch Video Solution

12. If the sum of the coefficients in the expansion of $(a+b)^n$ is 4096, then the greatest coefficient in the expansion is

A. 792

B. 924

C. 1048

D. 2096

Answer: B

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13. If the second, third and fourth in the expansion of $(x+y)^n$ are 135, 30 and $\frac{10}{3}$ respectively, then

A. 5

B. 6

C. 7

D. 9

Answer: A

Watch Video Solution

14. 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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15. if a,b,c and d are the coefficient of four consecutive terms in the expansion of $(1+x)^n$ then $\frac{a}{a+b}+\frac{C}{c+d}=?$

A. $\frac{b}{b+c}$

B. $\frac{b}{2(b+c)}$

C. $\frac{2b}{b+c}$

D. $\frac{2c}{b+c}$

Answer: C

Watch Video Solution

16. If the coefficients of x^7 and x^8 in the expansion of $\left[2+\frac{x}{3}\right]^n$ are equal, then the value of n is : (A) 15 (B) 45 (C) 55 (D) 56

A. 15

B. 45

C. 55

D. 60

Answer: C

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17. If A and B are the coefficients of x^n in the expansion $(1+x)^{2n}$ and $(1+x)^{2n-1}$ respectively, then

A. $A = B$

B. $2A = B$

C. $A = 2B$

D. None of these

Answer: C

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18. 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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19. If the coefficients of the rth, $(r+1)th$, $(r-2)th$ terms is the expansion of $(1+x)^{14}$ are in A.P, then the largest value of r is.

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

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

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

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

Answer: A

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20. if the coefficients of x^5 and x^{15} in the expansion of $\left(x^2 + \frac{a}{x^3}\right)^{10}$ are equal then then the positive value of 'a' is:

A. $2\sqrt{3}$

B. 1

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

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

Answer: D

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Exericse 8 1

1. Expand of the expression : $(1-2x)^5$

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2. $\left(\frac{2}{x}-\frac{x}{2}\right)^5$

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3. Expand $(2x - 3)^6$

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4. Expand of the expression : $\left(\frac{x}{3} + \frac{1}{x}\right)^5$

Watch Video Solution

5. $\left(x + \frac{1}{x}\right)^6$

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6. Using binomial theorem, evaluate : $(96)^3$

A. 887965

B. 88456

C. 883546

D. 884736

Answer: D

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7. Using binomial theorem, evaluate : $(102)^5$

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8. Using binomial theorem, evaluate : $(101)^4$

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9. Using binomial theorem, evaluate : $(99)^5$

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10. Using binomial theorem, indicate which number is larger $(1.1)^{10000}$ or 1000.

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11. Find $(a+b)^4-(a-b)^4$. Hence evaluate $\left(\sqrt{3}+\sqrt{2}\right)^4-\left(\sqrt{3}-\sqrt{2}\right)^4$

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12. Find $(x+1)^6+(x-1)^6$. hence, or otherwise evaluate $(\sqrt{2}+1)^6+(\sqrt{2}-1)^6$

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13. Show that $9^{n+1}-8n-9$is divisible by 64, whenever n is a positive integer.

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14. Prove that $\Sigma_{r=0}^{n}3^{rn}C_r=4^n$

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15. Expand of the expression : $(1-2x)^5$

Watch Video Solution

16. $\left(\frac{2}{x}-\frac{x}{2}\right)^5$

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17. Expand $(2x-3)^6$

Watch Video Solution

18. Expand of the expression : $\left(\frac{x}{3}+\frac{1}{x}\right)^5$

Watch Video Solution

19. $\left(x+\frac{1}{x}\right)^6$

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20. Using binomial theorem, evaluate : $(96)^3$

Watch Video Solution

21. Using binomial theorem, evaluate : $(102)^5$

Watch Video Solution

22. Using binomial theorem, evaluate : $(101)^4$

Watch Video Solution

23. Using binomial theorem, evaluate : $(99)^5$

Watch Video Solution

24. Using binomial theorem, indicate which number is larger $(1.1)^{10000}$ or 1000.

Watch Video Solution

25. Find $(a+b)^4-(a-b)^4$. Hence evaluate $(\sqrt{3}+\sqrt{2})^4-(\sqrt{3}-\sqrt{2})^4$

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26. Find $(x+1)^6 + (x-1)^6$. hence, or otherwise evaluate $(\sqrt{2}+1)^6 + (\sqrt{2}-1)^6$

Watch Video Solution

27. Show that $9^{n+1} - 8n - 9$is divisible by 64, whenever n is a positive integer.

Watch Video Solution

28. Prove that $\Sigma_{r=0}^{n} 3^{rn} C_r = 4^n$

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Exericse 8 2

1. Find the coefficient of $x^5 \in (x+3)^8$

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2. Find the coefficient of $a^5 b^7 \in (a-2b)^{12}$

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

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4. Write the general term in the expansion of $\left(x^2 - yx\right)^{12}, x \neq 0$

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5. Find the 4^{th} term in the expansion of $(x - 2y)^{12}$.

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6. 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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7. Find the middle term in the expansion of $\left(3 - \frac{x^3}{6}\right)^7$

Watch Video Solution

8. Find the middle term in the expansion of : $\left(\frac{x}{3}+9y\right)^{10}$

Watch Video Solution

9. In the binomial expansion of $(1+a)^{m+n}$, prove that the coefficient of $a^m and\ a^n$ are equal.

Watch Video Solution

10. The coefficient of the (r-1)th, rth and (r+1)th terms in the expansion of $(x+1)^n$ are in the ratio 1:3:5. Find both n and r

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11. prove that the 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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12. Find a positive value of m for which the coefficient of x^2 in the expansion of $(1+x)^m$ is 6.

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13. Find the coefficient of $x^5 \in (x+3)^8$

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14. Find the coefficient of $a^5b^7 \in (a-2b)^{12}$

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

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16. Write the general term in the expansion of $\left(x^2-yx\right)^{12}, x \neq 0$

Watch Video Solution

17. Find the 4^{th} term in the expansion of $(x-2y)^{12}$.

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18. 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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19. Find the middle term in the expansion of $\left(3 - \frac{x^3}{6}\right)^7$

Watch Video Solution

20. Find the middle term in the expansion of : $\left(\frac{x}{3} + 9y\right)^{10}$

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21. In the binomial expansion of $(1+a)^{m+n}$, prove that the coefficient of $a^m and\ a^n$ are equal.

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22. The coefficient of the (r-1)th, rth and (r+1)th terms in the expansion of $(x+1)^n$ are in the ratio 1:3:5. Find both n and r

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23. prove that the 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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24. Find a positive value of m for which the coefficient of x^2 in the expansion of $(1+x)^m$ is 6.

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Miscellaneous Exericse

1. Find a, b and n in the expansion of $(a+b)^n$ if the first three terms of the expansion are 729, 7290 and 30375, respectively.

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2. If the coefficients of $x^2 and\, x^3$ in the expansion o $(3+ax)^9$ are the same, then the value of a is $-\frac{7}{9}$ b. $-\frac{9}{7}$ c. $\frac{7}{9}$ d. $\frac{9}{7}$

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3. Find the coefficient of x^5 in the product $(1+2x)^6(1-x)^7$ using binomial theorem.

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4. If and b are distinct integers, prove that $a-b$ is a factor of a^n-b^n, whenever n is a positive integer.

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5. Evaluate $\left(\sqrt{3}+\sqrt{2}\right)^6-\left(\sqrt{3}-\sqrt{2}\right)^6$.

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6. Find the value of $\left(a^2+\sqrt{a^2-1}\right)^4+\left(a^2-\sqrt{a^2-1}\right)^4$.

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7. Find an approximation of $(0.99)^5$ using the first three terms of its expansion.

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8. Find n, if the ratio of the fifth term from the beginning to the fifth term from the end in the expansion of $\left(24+\frac{1}{34}\right)^n$ is $\sqrt{6}:1$.

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9. Expand using Binomial Theorem $\left(1+\frac{x}{2}-\frac{2}{x}\right)^4, x \neq 0.$

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10. Find the expansion of $\left(3x^2-2ax+3a^2\right)^3$ using binomial theorem.

Watch Video Solution

11. Find a, b and n in the expansion of $(a+b)^n$ if the first three terms of the expansion are 729, 7290 and 30375, respectively.

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12. If the coefficients of $x^2 and\, x^3$ in the expansion o $(3+ax)^9$ are the same, then the value of a is $-\frac{7}{9}$ b. $-\frac{9}{7}$ c. $\frac{7}{9}$ d. $\frac{9}{7}$

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13. Find the coefficient of x^5 in the product $(1+2x)^6(1-x)^7$ using binomial theorem.

Watch Video Solution

14. If and b are distinct integers, prove that $a-b$ is a factor of $a^n - b^n$, whenever n is a positive integer.

Watch Video Solution

15. Evaluate $\left(\sqrt{3}+\sqrt{2}\right)^{6}-\left(\sqrt{3}-\sqrt{2}\right)^{6}$.

Watch Video Solution

16. Find the value of $\left(a^{2}+\sqrt{a^{2}-1}\right)^{4}+\left(a^{2}-\sqrt{a^{2}-1}\right)^{4}$.

Watch Video Solution

17. Find an approximation of $(0.99)^{5}$ using the first three terms of its expansion.

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18. Find n, if the ratio of the fifth term from the beginning to the fifth term from the end in the expansion of $\left(24+\frac{1}{34}\right)^n$ is $\sqrt{6}:1$.

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19. Expand using Binomial Theorem $\left(1+\frac{x}{2}-\frac{2}{x}\right)^4, x \neq 0.$

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20. Find the expansion of $\left(3x^2-2ax+3a^2\right)^3$ using binomial theorem.

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