MATHS

BOOKS - MODERN PUBLICATION

BINOMIAL THEOREM

Example

1. Find the number of terms in the expansion of the following :

$(2x + 3y)^8$.

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2. Find the number of terms in the expansion of the following :

$(2x - 3y + 4z)^n$.

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3. Find the number of terms in the expansion of the following :

$\left[(2x+y)^8-(2x-y)^8\right]$.

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4. The number of integer terms in the expansion of $\left(5^{1/2}+7^{1/8}\right)^{1024}$ is

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5. Expand the following :

$(1-2x)^5$.

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6. Expand the following :

$\left(\frac{x}{3}+\frac{1}{x}\right)^5, x \neq 0.$

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7. Expand the following :

$(1 - x + x^2)^4$.

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8. Write the general term in the expansion of $(x^2 - y)^6$.

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9. Determine the value of x in the expansion of

$(x + x^{\log_{10} x})^5$, if the third term in the expansion is 1000000

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

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11. Find n, if the ratio of the fifth term from the beginning to the fifth term from the end in the expansion of $\left(\sqrt[4]{2}+\frac{1}{\sqrt[4]{3}}\right)^n$ is $\sqrt{6}:1$.

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12. If a 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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13. Using Binomial Theorem, evaluate each of the following:$(99)^5$.

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

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15. Show that $(101)^{50} > (100)^{50} + (99)^{50}$.

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

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18. Find the (n+ 1)th term from the end in the expansion of $\left(x-\frac{1}{x}\right)^{3n}$.

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19. If t_r is the rth term is the expansion of $(1+a)^n$, in ascending powers of a, prove that : $r(r+1)t_{r+2}=(n-r+1)(n-r)a^2t_r$.

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20. Write the middle term in the expansion of :

$\left(x-\frac{1}{2y}\right)^{10}$.

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21. Write the middle term in the expansion of :

$(1+x)^{2n}$, where n is a positive integer.

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22. Determine the two middle terms in the expansion of : $\left(x^2+a^2\right)^5$.

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

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24. Find the term containing x^3, if any, in $\left(3x-\frac{1}{2x}\right)^8$.

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25. Find the coefficient of x^5 in the expansion of : $(1+x)^{21}+(1+x)^{22}+\ldots\ldots\ldots+(1+x)^{30}$.

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

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27. The sum of the coefficients of the first three terms of the expansion $\left(x-\frac{3}{x^2}\right)^m$, $x \neq 0$, m being a natural number, is 559. Find the term in the expansion containing x^3.

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

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29. Show 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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30. For what value of m, the coefficients of $(2m+1)^{th}$ and $(4m+5)^{th}$ terms in the expansion of $(1+x)^{10}$ are equal ?

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

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32. Find the term independent of x in the expansion of $\left(\sqrt[3]{x}+\frac{1}{2\sqrt[3]{x}}\right)^{18}$

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33. Find the term independent of x in the expansion of : $\left(\frac{x+1}{x^{2/3}-x^{1/3}+1}-\frac{x-1}{x-x^{1/2}}\right)^{10}$.

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34. If the 2nd , 3nd and 4th terms in the

expansion of $(x+y)^n$ are 240 , 720 and 1080

respansion find x , y and n .

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35. The coefficients of the $(r-1)^{th}$, r^{th} and $(r+1)^{th}$ terms in the expansion of $(x+1)^n$ are in the ratio $1:3:5$. find n and r.

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36. If the coefficents of pth, (p + 1(th and (p+ 2)th terms in expansion of $(1+x)^n$ are in AP , then

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37. Find the greatest term in the expansion of $(3x+4y)^{28}$, when x = 6, y = 3.

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38. Prove that the number of all subsets of a finite set of n element is 2^n.

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39. Evaluate : ${}^{10}C_1 + {}^{10}C_2 + {}^{10}C_3 \ldots\ldots {}^{10}C_{10}$.

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40. Evaluate : $\sum_{r=1}^{n} {}^{n}C_r 2^r$.

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

$C_0 + 2C_1 + \ldots\ldots\ldots + 2^n C_n = 3^n$.

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

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

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

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

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

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

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

prove that $\frac{C_1}{C_0} + 2\frac{C_2}{C_1} + 3\frac{C_2}{C_2} + \ldots + n\frac{C_n}{C_{n-1}} = \frac{n(n+1)}{2}$

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46. Prove that

$${}^nC_0 + 3^n C_1 + 5^n C_2 + \ldots\ldots . + (2n+1)^n C_n = (n+1)2^n.$$

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47. If $(1+x)^n = {}^nC_0 + {}^nC_1 x + {}^nC_2 x^2 + \ldots\ldots\ldots + {}^nC_n x^n$, prove that : ${}^nC_1 - 2^n C_2 + 3^n C_3 - \ldots\ldots + (-1)^{n-1} n^n C_n = 0.$

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48. If $(1+x)^n = C_0 + C_1 x + C_2 x^2 + \ldots\ldots\ldots + C_n x^n$, find the values of $C_0^2 + C_1^2 + C_2^2 + \ldots . + C_n^2.$

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49. If $(1+x)^n = C_0 + C_1 x + C_2 x^2 + \ldots\ldots C_n x^n$ prove the following : $C_0 C_n + C_1 C_{n-1} + C_2 C_{n-2} + \ldots . + C_n C_0 = \frac{(2n!)}{(n!)^2}.$

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50. If $(1+x)^n = C_0 + C_1 x + C_2 x^2 + \ldots\ldots\ldots + C_n x^n$, find the values of $C_0^2 + C_1^2 + C_2^2 + \ldots . + C_n^2.$

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51. If $(1+x)^n = C_0 + C_1 x + C_2 x^2 + \ldots\ldots C_n x^n$ prove that : $C_0 + 2C_1 + \ldots\ldots\ldots + 2^n C_n = 3^n$.

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52. Prove that

$(C_0 + C_1)(C_1 + C_2)(C_2 + C_3)(C_3 + C_4)\ldots\ldots\ldots . (C_{n-1} + C_n) = \frac{C_0 C_1 C_2 \ldots . C_{n-1}(n+1)^n}{n!}$

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53. Evaluate : $2C_0 + \frac{2^2 C_1}{2} + \frac{2^3 C_2}{3} + \ldots\ldots . + \frac{2^{11} C_{10}}{11}$.

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54. A box contains two white balls, three black balls and four red balls. In how many ways can three balls be drawn from the box if at least one black ball is to be included in a draw ?

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55. Seven relatives of a man comprises four ladies and three gentlemen: his wife has also seven relatives-three of them are ladies and four gentlemen. In how many ways can they invite 3 ladies and 3 gentlemen at a dinner party so that there are three mans relatives and three wifes relatives?

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56. Eighteen guests have to be Seated, half on each side of a long table. Four particular guests desire to sit on one particular side and three others on the other side. Determine the number of ways in which the Seating arrangements can be made.

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57. A student is allowed to select atlest one an atmost n books from a collection of (2n+1) books. If the total number of ways in which he can select books is 63, find the value of n.

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58. Given p points in a plane, no three of which are collinear q of these Points, which are in the same straight line. Determine the number of (I) straight lines

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59. Find the number of r-subsets of the set S = {1, 2,.....,4} that do not contain a pair of consecutive integers.

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60. Using Permutation or otherwise, prove that $\frac{(n^2)!}{(n!)^2}$ is an integer, where n is a positive integer.

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61. Two planes P_1 and P_2 pass through origin. Two lines L_1 and L_2 also passing through origin are such that L_1 lies on P_1 but not on P_2,L_2 lies on P_2 but not on P_1. A,B, C are there points other than origin, then prove that the permutation [A', B', C'] of [A, B, C] exists. Such that: A lies on L_1, B lies on P_1 not on L_1, C does not lie on P_1 .

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62. Two planes P_1 and P_2 pass through origin. Two lines L_1 and L_2 also passingthrough origin are such that L_1 lies on P_1 but not on P_2,L_2 lies on P_2 but not on P_1. A,B, C are there points other than origin, then prove

that the permutation [A', B', C'] of [A, B, C] exists. Such that: A' lies on L_2, B' lies on P2 not on L_2, C' does not lies on P_2.

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

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64. If the coefficients of x, x^2 and x^3 in the binomial expansion of $(1+x)^{2n}$ are in A.P., prove that $2n^2 - 9n + 7 = 0$.

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65. Find the sum of coefficients in the expansion of the binomial $(5p - 4q)^n$, where n is a positive integer .

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66. Find the coefficient of x^{50} in the expression : $(1+x)^{1000} + 2x(1+x)^{999} + 3x^2(1+x)^{998} + \ldots + 1001x^{1000}$.

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Exercise

1. How many terms are there in the expansion of : $\left(\frac{2}{p} + \frac{p}{2}\right)^8$.

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2. How many terms are there in the expansion of : $(x^2 + y)^{16}$.

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3. How many terms are there in the expansion of :

$\left(1+2x+x^2\right)^{20}$.

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4. How many terms are there in the expansion of :

$\left(\sqrt{x}+\sqrt{y}\right)^{10}+\left(\sqrt{x}-\sqrt{y}\right)^{10}$.

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5. Expand the following :

$(x+y)^5$.

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6. Expand the following :

$(3x - 2y)^5$.

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7. Expand the following :

$(1 - x)^6$.

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8. Expand each of the following expressions:

$(2x - 3)^6$.

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9. Expand the following :

$(4x - 5y)^5$.

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10. Expand the following :

$(y^2 + 3x)^4$.

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11. Expand the following :

$(x^2 - y)^7$.

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12. Expand the following :

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

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13. Expand the following :

$(x^2 + 2y^3)^6$.

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14. Expand the following :

$(1 - x^2)^4$.

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15. Expand the following :

$\left(x + \frac{1}{x}\right)^2, x \neq 0.$

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16. Expand the following :

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

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17. Expand the following :

$\left(x^2+\frac{3}{x}\right)^4, x \neq 0.$

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18. Exapand: $\left(\frac{2}{x}-\frac{x}{2}\right)^5, x \neq 0$

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19. Expand the following :

$\left(x-\frac{1}{y}\right)^5, y \neq 0.$

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20. Expand the following :

$(1+x+x^2)^3$.

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21. Find the expnsion of $(3x^2-2ax+3a^2)^3$ using Binomial Theorem.

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22. Expand using binomial theorem $\left(1+\frac{x}{2}-\frac{2}{x}\right)^4, x \neq 0$

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23. Find the general term in the expansion of :

$(1-x^2)^{12}$.

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24. Find the general term in the expansion of :

$\left(x^2 - \frac{1}{x}\right)^{12}, x \neq 0.$

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25. Find the Values of :

$(\sqrt{3} + \sqrt{2})^3 + (\sqrt{3} - \sqrt{2})^3.$

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26. Find the Values of :

$(\sqrt{3} + \sqrt{2})^6 + (\sqrt{3} - \sqrt{2})^6.$

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27. Find the Values of :

$(\sqrt{3} + 1)^5 - (\sqrt{3} - 1)^5.$

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28. Use Binomial Theorem to find :

$(51)^6$.

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29. Use Binomial Theorem to find :

$(96)^3$.

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30. Use Binomial Theorem to find :

$(98)^5$.

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31. Use Binomial Theorem to find :

$(999)^5$.

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32. Using, Binomial theorem, evaluate $(101)^4$

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33. Use Binomial Theorem to find :

$(102)^5$.

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34. Use Binomial Theorem to find :

$(10.1)^4$.

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35. Use Binomial Theorem to find : $(1.02)^6$, correct to five decimal places.

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36. Use Binomial Theorem to indicate which is larger ? $(1.2)^{4000}$ or 800.

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37. Use Binomial Theorem to indicate which is larger :

$(1.01)^{1000000}$ or 10,000.

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38. Find

3rd term in the expansion of $\left(3x - \frac{y^3}{6}\right)^4$.

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39. Find the third term in the expansion of :

$\left(x+\frac{2}{5}y\right)^4$.

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40. Thee fourth term in the expansion of $(x-2y)^{12}$ is:

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41. Find the fourth term in the expansion of :

$\left(\frac{4}{7}x-y^2\right)^5$.

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

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43. Find the 5th term from the end of $\left(\frac{x^3}{2}-\frac{2}{x^2}\right)^{12}, x \neq 0.$

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44. Find the 4th term from the end of $\left(\frac{4x}{5}-\frac{5}{2x}\right)^9, x \neq 0.$

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45. Find the rth term from the end in the expansion of $(x+a)^n$.

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46. Determine the value of x in the expansion of

$\left(x+x^{\log_{10} x}\right)^5$, if the third term in the expansion is 1000000

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47. For what value of x is the ninth term in the expansion of : $\left\{3^{\log_3 \sqrt{25^{x-1}+7}} + 3^{-\frac{1}{8}\log_3 (5^{x-1}+1)}\right\}^{10}$ is equal to 180.

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

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49. Write the middle term in the expansion of $\left(x + \frac{1}{x}\right)^4$.

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50. Find the middle term in the expansion of :

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

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51. Find the middle term in the expansion of :

$\left(\frac{1}{2}a + \frac{1}{3}b\right)^8$.

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52. Prove that the middle term in the expansion of $\left(2x + \frac{3}{x}\right)^{20}$ is 19.17.

13. 11. $3^{10}.2^{12}$.

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

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54. Find the middle terms in the expansion of :

$\left(\frac{x}{3} + 9y\right)^{10}$.

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55. Find the middle terms in the expansion of :

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

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56. Show that coefficient of the middle term of $(1+x)^{2n}$ is equal to the sum of the coefficients of two middle terms of $(1+x)^{2n-1}$.

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57. Write and simplify the term involving x^5 in the expansion of $\left(x-\frac{1}{x}\right)^{11}$.

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58. Determine the term involving x^3 in $(5-2x)^6$.

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59. Find the coefficient of x^{10} in the expansion of $\left(2x^2-\frac{3}{x}\right)^{11}, x \neq 0$

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60. Find the coefficient of the term involving x^{10} in the expansion of $\left(x^2-2\right)^{11}$.

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

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62. Find the coefficient of x^5 in $(x+3)^6$.

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63. Find the coefficient of x^8 in the expansion of $\left(x^2 - \frac{1}{x}\right)^{10}$

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64. 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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65. Show that coefficient of a^m and a^n in the expansion of $(1+a)^{m+n}$ are equal.

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66. Find 'a' if the coefficients of x^2 and x^3 in the expanion of $(3+ax)^9$ are equal.

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67. Find the value of r if the coefficients of (2r+4)th and (r - 2) th term in the expansion of $(1+x)^{18}$ are equal.

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

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69. Find the coefficient of a^4 in the expansion of the product $(1+2a)^4(2-a)^5$.

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70. In the binomial expansion $(a+b)^n$, the coefficients of fourth and thirteenth terms are equal to each other. Find n.

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71. In the binomial expansion of $(1+x)^{34}$, the coefficients of the (2r-1)th and the (r-5)th terms are equal. Find r.

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72. Which term is independent of x in the expansion of $\left(2x^2+\frac{1}{x}\right)^{12}$? And find its value.

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73. Write and simplify the term independent x in the expansion of $\left(x^2 - \frac{2}{x^3}\right)^5$. And find its value.

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74. Write and simplify the term independent of x in the expansion of $\left(x - \frac{1}{x}\right)^{12}$, where $x \neq 0$.

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75. Find the term independent of x, $x \neq 0$ in the expansion of :

$\left(x - \frac{1}{x}\right)^{14}$.

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76. Find the term independent of x in the

expansion of $\left(\frac{3}{2}x^2 - \frac{1}{3x}\right)^9$

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77. Find the term independent of x, $x \neq 0$ in the expansion of :

$\left(x^2 + \frac{3}{x}\right)^6$.

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78. Find the term independent of x, $x \neq 0$ in the expansion of :

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

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79. Write and simplify the coefficient of the term independent of x, in the expansion of $\left(x^3 - \frac{1}{x}\right)^{12}, x \neq 0.$

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80. Find the greatest term in $(x+y)^n$, when x=11, y=4, n = 30.

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81. Find the greatest term in $(1+4x)^8$, when $x = \frac{1}{3}$.

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82. 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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83. The first three terms in the expansion of a binomial are 1, 10 and 40. Find the expansion.

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84. The coefficients of three consecutive terms in the expansion of $(1+a)^n$ are in the ratio $1:7:42$. Find n

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85. The coefficients of three consecutive terms in the expansion of $(1+a)^n$ are in the ratio : 6: 33: 110. Find n.

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86. If the coefficients of 5th, 6th , and 7th terms in the expansion of $(1+x)^n$ are in A.P., then $n=$

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87. If the coefficients of x, x^2 and x^3 in the binomial expansion of $(1+x)^{2n}$ are in A.P., prove that $2n^2-9n+7=0$.

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88. If three successive coefficients in the expansion of $(1+x)^n$ are 28, 56 and 70, find n.

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89. In the expansion of $(x+a)^n$, the sums of the odd and the even terms are O and E respectively, prove that : $2\left(O^2+E^2\right)=(x+a)^{2n}+(x-a)^{2n}$.

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90. In the expansion of $(x+a)^n$, the sums of the odd and the even terms are O and E respectively, prove that : $4OE=(x+a)^{2n}-(x-a)^{2n}$.

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91. In the expansion of $(x+a)^n$, the sums of the odd and the even terms are O and E respectively, prove that : $O^2 - E^2 = \left(x^2 - a^2\right)^n$.

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

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93. Using Binomial theorem, prove that $6^n - 5n$ always leaves remainder 1 when divided by 25.

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94. Evaluate the following :

$^{12}C_0 + {}^{12}C_1 + {}^{12}C_2 + \ldots\ldots + {}^{12}C_{12}.$

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95. Evaluate the following :

$^{12}C_0 + {}^{12}C_2 + {}^{12}C_4 + {}^{12}C_{12}.$

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96. Evaluate the following :

$^{16}C_1 + {}^{16}C_3 + {}^{16}C_5 + \ldots\ldots + {}^{16}C_{15}.$

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97. Prove that $\sum_{r=0}^{n} 3^r {}^nC_r = 4^n.$

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98. Prove that

$^nC_0 + 3^n C_1 + 5^n C_2 + \ldots\ldots . + (2n+1)^n C_n = (n+1)2^n.$

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99. If $(1+x)^n = C_0 + C_1 x + C_2 x^2 + \ldots\ldots C_n x^n$ prove the following :

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

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100. If $(1+x)^n = C_0 + C_1 x + C_2 x^2 + \ldots\ldots C_n x^n$ prove the following :

$$\left(1+\frac{C_1}{C_0}\right)\left(1+\frac{C_2}{C_1}\right)\left(1+\frac{C_3}{C_2}\right)\ldots\left(1+\frac{C_n}{C_{n-1}}\right) = \frac{(n+1)^n}{n!}.$$

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101. If $(1+x)^n = C_0 + C_1 x + C_2 x^2 + \ldots\ldots C_n x^n$ prove the following :

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

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102. If $(1+x)^n = C_0 + C_1 x + C_2 x^2 + \ldots\ldots C_n x^n$ prove the following :

$$C_0 + \frac{1}{3}C_2 + \frac{1}{5}C_4 + \frac{1}{7}C_6 + \ldots\ldots\ldots = \frac{2^n}{n+1}.$$

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103. If $(1+x)^n = C_0 + C_1 x + C_2 x^2 + \ldots\ldots C_n x^n$ prove the following :

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

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104. If $(1+x)^n = C_0 + C_1 x + C_2 x^2 + \ldots\ldots C_n x^n$ prove the following :

$$2C_0 + 5C_1 + 8C_2 + \ldots + (3n+2)C_n = (3n+4)2^{n-1}.$$

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105. If $(1+x)^n = C_0 + C_1 x + C_2 x^2 + \ldots\ldots C_n x^n$ prove the following :

$$C_0C_n + C_1C_{n-1} + C_2C_{n-2} + \ldots . + C_nC_0 = \frac{(2n!)}{(n!)^2}.$$

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106. Prove that

$$C_0C_r + C_1C_{r+1} + C_2C_{r+2} + \ldots\ldots\ldots\ldots + c_{n-r}C_n = \frac{(2n)!}{(n-r)!(n+r)!}$$

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107. Find the coefficient of x^{n-r} in the expansion of $(x+1)^n(1+x)^n$.

Deduce that $C_0C_r + C_1C_{r-1} + \ldots\ldots + C_{n-r}C_n = \frac{(2n!)}{(n+r)!(n-r)!}$.

Watch Video Solution

108. Find the coefficient of x^4 in the expansion of $(1+x)^n(1-x)^n$.

Deduce that $C_2 = C_0C_4 - C_1C_3 + C_2C_2 - C_3C_1 + C_4C_0$.

Watch Video Solution

109. Write and simplify the term involving a^2b^5 in $(a-2b)^4(a+b)^3$.

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110. Expand using binomial theorem $\left(1+\frac{x}{2}-\frac{2}{x}\right)^4, x \neq 0$

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

Watch Video Solution

112. If 6th, 7th, 8th and 9th terms of $(x+y)^n$ are a, b,c and d respectively, then prove that : $\frac{b^2-ac}{c^2-bd}=\frac{4}{3}.\frac{a}{c}$.

Watch Video Solution

113. Find the coefficient of x^{10} in the expansion of : $\left(1+x+x^2+x^3+\ldots..+x^{10}\right)^4$.

Watch Video Solution

114. If k_r is the coefficient of y^{r-1} in the expansion of $(1+2y)^{10}$, in ascending powers of y, determine r when $\frac{k_{r+2}}{k_r}=4$.

Watch Video Solution

115. If x^p occurs in the expansion of $\left(x^2+\frac{1}{x}\right)^{2n}$, prove that its coefficient is : $\frac{(2n)!}{\left[\frac{1}{3}(4n-p)!\right]\left[\frac{1}{3}(2n+p)!\right]}$.

Watch Video Solution

116. Determine the term independent of x in the expansion of $\left(1+x+x^{-2}+x^{-3}\right)^{10}$.

Watch Video Solution

117. 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

118. If fourth term in the expansion of : $\left\{\sqrt{x^{\frac{1}{\log x+1}}}+x^{\frac{1}{12}}\right\}^6$ is equal to 200 and x > 1, find x.

Watch Video Solution

119. Find the value of x for which the sixth term of : $\left(\sqrt{2^{\log(10-3^x)}}+\sqrt[5]{2^{(x-2)\log 3}}\right)^n$ is equal to 21, if it is known that the binomial coefficient of the 2nd, 3rd and 4th term in the expansion represent respectively the 1st, 3rd and 5th term of an A.P. (the symbol log stands for logarithm to the base 10).

Watch Video Solution

120. If in the expansion of $(1-x)^{2n-1}$, the coefficient of x^r is denoted by a_r, then show that $a_{r-1} + a_{2n-r} = 0$.

Watch Video Solution

121. If C_1, C_2, C_3, C_4 are the coefficients of any four consecutive terms in the expansion of $(1+x)^n$, prove that : $\frac{C_1}{C_1+C_2} + \frac{C_3}{C_3+C_4} = \frac{2C_2}{C_2+C_3}$.

Watch Video Solution

122. For the expansion of $(1+x)^n = C_0 + C_1x + C_2x^2 + ... + C_nx^n$, show that C_j 's taken two at a time represented by $\Sigma C_{ij}, 0 \leq i \leq j \leq n$ is equal to $2^{2n-1} - \frac{(2n)!}{2(n!)^2}$.

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123. $7! \div 5!$ is :

A. 7!

B. 2!

C. 42

D. 24

Answer:

Watch Video Solution

124. $3! + 4!$ is

A. 7!

B. 7

C. 12!

D. None of these.

Answer:

Watch Video Solution

125. $4! - 3!$ is :

A. 18

B. 1!

C. 16

D. None of these.

Answer:

Watch Video Solution

126. If n=7 and r= 5, then the value of ${}^{n}C_{r}$ is :

A. 21

B. 42

C. 35

D. 75

Answer:

Watch Video Solution

127. If n=5 and r= 3, then the value of ${}^{n}C_{r}$ is :

A. 20

B. 10

C. 15

D. 53

Answer:

Watch Video Solution

128. If n=8 and r= 3, then the value of ${}^{n}P_{r}$ is :

A. 140

B. 336

C. 40

D. 85

Answer:

Watch Video Solution

129. The value of $\frac{12!}{10!2!}$ is :

A. 42

B. 66

C. 76

D. 45

Answer:

Watch Video Solution

130. The value of $\frac{8!}{6! \times 2!}$ is :

A. 28

B. 42

C. 166

D. None

Answer:

Watch Video Solution

131. The value of $\frac{7!}{5!}$ is :

A. 42

B. 66

C. 55

D. 32

Answer:

Watch Video Solution

132. If ${}^{n}C_{r} = {}^{n}C_{s}$, then n is:

A. $r + s$

B. $r \times s$

C. $r - s$

D. $\frac{r}{s}$.

Answer:

Watch Video Solution

133. If ${}^nC_8 = {}^nC_9$, then n is:

A. 1

B. 17

C. 0

D. 10

Answer:

Watch Video Solution

134. The value of $\frac{7!}{5!}$ is :

A. 2!

B. 7

C. 42

D. 24

Answer:

Watch Video Solution

135. The value of ${}^{8}P_{7}$ is

A. 7!

B. 8!

C. 8

D. 15

Answer:

Watch Video Solution

136. The value of ${}^{15}C_{11} + {}^{15}C_{10}$ is equal to

A. $\frac{15}{11}$

B. $\frac{15}{10}$

C. $\frac{5}{11}$

D. $\frac{5}{10}$.

Answer:

Watch Video Solution

137. If ${}^{n}P_{4} = 5^{n}P_{3}$, then n is :

A. 8

B. 6

C. 7

D. 5

Answer:

Watch Video Solution

138. The value of ${}^{15}C_{11} + {}^{15}C_{10}$ is equal to

A. $\frac{15}{11}$

B. $\frac{15}{10}$

C. $\frac{5}{11}$

D. $\frac{5}{10}$.

Answer:

Watch Video Solution

139. The number of straight lines that can be drawn out of 10 points of which 7 are collinear is :

A. 22

B. 23

C. 24

D. 25

Answer:

Watch Video Solution

140. The number of diagonals that can be drawn by joining the vertices of an octagon is

A. 20

B. 28

C. 8

D. 16

Answer:

Watch Video Solution

141. The number of divisors of the number 56 excluding 1 and 56 is :

A. 8

B. 7

C. 6

D. None of these.

Answer:

Watch Video Solution

142. The number of 3-digit odd numbers, by using the digits 1,2,3,4,5,6 when the repetition of digits is allowed is :

A. 60

B. 108

C. 36

D. 3

Answer:

Watch Video Solution

143. There are 15 points in a plane, no three of which are in a st. line, except 6, all of which are in a st. line. The number of st. lines, which can be drawn by joining them is :

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

B. ${}^{15}C_2 - {}^{6}C_2$

C. ${}^{15}C_2 - {}^{6}C_2 - 1$

D. ${}^{15}C_2 - {}^{6}C_2 + 1.$

Answer:

Watch Video Solution

144. Number of triangles formed by joining 12 points, 7 of which are in the same straight line, is :

A. 185

B. 220

C. 792

D. None of these.

Answer:

Watch Video Solution

145. If 7 points out of 12 are in the same straight line, then the number of triangles formed is :

A. 19

B. 158

C. 185

D. 201

Answer:

Watch Video Solution

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

A. 50

B. 51

C. 202

D. None of these.

Answer:

Watch Video Solution

147. The coefficient of x^{17} in the expansion of : $(x-1)(x-2)(x-3).....(x-18)$ is :

A. 342

B. -171

C. $\frac{171}{2}$

D. 684

Answer:

Watch Video Solution

148. Let S_p and S_q be the coefficients of x^p and x^q respectively in $(1+x)^{p+q}$, then :

A. $S_p \neq S_q$

B. $S_p = \frac{p}{q} S_q$

C. $S_p = \frac{q}{p} S_q$.

D. $S_p = S_q$.

Answer:

Watch Video Solution

149. Find the coefficient of x^5 in the expansion of $(x+3)^6$ is :

A. 18

B. 6

C. 12

D. None of these.

Answer:

Watch Video Solution

150. If $x = \frac{1}{3}$, then the greatest term in the expansion of $(1+4x)^8$ is the :

A. 4th term

B. 5th term

C. 6th term

D. 3rd term.

Answer:

Watch Video Solution

151. The middle term in the expansion of $(1+x)^{2n}$ is :

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

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

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

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

Answer:

Watch Video Solution

152. The term independent of x in $\left(2x-\frac{1}{3x}\right)^6$ is :

A. $\frac{160}{9}$

B. $\frac{80}{9}$

C. $\frac{160}{27}$

D. $\frac{80}{3}$.

Answer:

Watch Video Solution

153. The coefficient of the term independent of x in $\left(2x - \frac{3}{x}\right)^6$ is :

A. 4320

B. 216

C. -216

D. -4320.

Answer:

Watch Video Solution

154. The fourth term in the binomial expansion of $\left(x^2 - \frac{1}{x^3}\right)^n$ is independent of x, when n is equal to:

A. 2

B. 3

C. 4

D. None of these.

Answer:

Watch Video Solution

155. In a binomial expansion $(1+x)^n$ is a positive integer, the coefficients of 5th, 6th and 7th terms are in A.P., then the value of n is :

A. 7

B. 5

C. 3

D. 10

Answer:

Watch Video Solution

156. If the three consecutive coefficients in the expansion of $(1+x)^n$ are in the ratio 1: 3 : 5, then the value of n is:

A. 6

B. 7

C. 8

D. 9

Answer:

Watch Video Solution

157. Let $(1+x)^n = C_0 + C_1 x + C_2 x^2 + \ldots . + C_n x^n$ and $\frac{C_1}{C_0} + 2\frac{C_2}{C_1} + 3\frac{C_3}{C_2} + \ldots . + n\frac{C_n}{C_{n-1}} = \frac{n(n+1)}{k}$. The value of k is:

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

B. 2

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

D. 3

Answer:

Watch Video Solution

158. In the expansion of $(x+a)^n$, the sums of the odd and the even terms are O and E respectively, prove that : $O^2 - E^2 = \left(x^2 - a^2\right)^n$.

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

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

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

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

Answer:

Watch Video Solution

159. The 5th term from the end in the expansion of $\left(\frac{x^3}{2}-\frac{2}{x}\right)^{12}$ is :

A. $\frac{7920}{x^4}$

B. $-\frac{7920}{x^4}$

C. $7920x^4$

D. $-7920x^4$.

Answer:

Watch Video Solution

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

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

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

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

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

Answer:

Watch Video Solution

161. The value of $C(47, 4) + \sum_{r=1}^{5} (52-r, 3)$ is:

A. C (52, 4)

B. C (51, 4)

C. C (52, 3)

D. C (51, 3).

Answer:

Watch Video Solution

162. $7^9 + 9^7$ is divisible by :

A. 128

B. 24

C. 64

D. 72

Answer:

Watch Video Solution

163. Find the term independent of x in the expansion of : $\left(\frac{x+1}{x^{2/3}-x^{1/3}+1}-\frac{x-1}{x-x^{1/2}}\right)^{10}$.

A. 210

B. 105

C. 70

D. 112

Answer:

Watch Video Solution

164. Product of any r consecutive natural numbers is always divisible by :

A. r!

B. (r+4)!

C. (r+ 1)!

D. (r+ 2) !.

Answer:

Watch Video Solution

165. If $C_0, C_1, C_2, \ldots\ldots . , C_n$ denote the coefficients in the expansion of $(1+x)^n$, then the value of : $C_1 + 2C_2 + 3C_3 + \ldots . + nC_n$ is :

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

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

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

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

Answer:

Watch Video Solution

166. A polygon has 44 diagonals. The number of the sides is :

A. 10

B. 11

C. 12

D. 13

Answer:

Watch Video Solution

167. Find 'a' if the coefficients of x^2 and x^3 in the expanion of $(3+ax)^9$ are equal.

A. $\frac{3}{7}$

B. $\frac{7}{3}$

C. $\frac{7}{9}$

D. $\frac{9}{7}$.

Answer:

Watch Video Solution

168. Using binomial theorem. the value of $(0.999)^3$,correct to 3 decimal places, is

A. 0.999

B. 0.998

C. 0.997

D. $0.995.$

Answer:

Watch Video Solution

169. The coefficient of x^n, where n is any positive integer, in the expansion of $\left(1+2x+3x^2+\ldots\to\infty\right)^{1/2}$ is:

A. 1

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

C. $2n+1$

D. $n+1$.

Answer:

Watch Video Solution

170. If ${}^{2n+1}P_{n-1} : {}^{2n-1}P_n = 3:5$ then the value of n equals :

A. 4

B. 3

C. 2

D. 1

Answer:

Watch Video Solution

171. If|x|<1, then the coefficient of x^6 in the expansion of $\left(1+x+x^2\right)^{-3}$ is:

A. 3

B. 6

C. 9

D. 12

Answer:

Watch Video Solution

172. ${}^{15}C_0.{}^5C_5+{}^{15}C_1.{}^5C_4+{}^{15}C_2.{}^5C_3+{}^{15}C_3.{}^5C_2+{}^{15}C_4.{}^5C_1$ equals :

A. $2^{20}-2^5$

B. $\frac{20!}{5!5!}$

C. $\frac{20!}{5!5!}-1$

D. $\frac{20!}{5!5!} - \frac{15!}{5!10!}$.

Answer:

Watch Video Solution

173. Every body in a room shakes hand with every body else. The total number of hand-shakes is 66. The number of persons in the room is

A. 10

B. 33

C. 24

D. 12

Answer:

Watch Video Solution

174. ${}^{15}C_8 + {}^{15}C_9 - {}^{15}C_6 - {}^{15}C_7$=

A. 1

B. 2

C. 0

D. None of these.

Answer:

Watch Video Solution

175. 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. 1

C. 3

D. 5

Answer:

Watch Video Solution

176. If 5^{99} is divided by 13, the remainder is

A. 8

B. 7

C. 9

D. 6

Answer:

Watch Video Solution

177. The total number of terms in the expansion of $(x+y)^{100}$ after simplification is :

A. 101

B. 50

C. 51

D. 202

Answer:

Watch Video Solution

178. If P_m stands for ${}^{m}P_m$, then : $1+1.\ P_1+2P_2+3P_3+\ldots\ldots\ldots+nP_n$ is equal to ,

A. n!

B. $(n+3)!$

C. $(n+2)!$

D. $(n+1)!$.

Answer:

Watch Video Solution

179. The number of positive integers satisfying the inequality ${}^{n+1}C_{n-2} - {}^{n+1}C_{n-1} \leq 50$ is :

A. 9

B. 8

C. 7

D. 6

Answer:

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180. The number of diagonals of a polygon of 20 sides is :

A. 210

B. 190

C. 180

D. 170

Answer:

Watch Video Solution

181. he number of ways in which 5 boys and 5 girls can be seated for a photograph so that no two girls sit next to each other is :

A. 6! 5!

B. $(5!)^2$

C. $\frac{10!}{5!}$

D. $\frac{10!}{(5!)^2}$.

Answer:

Watch Video Solution

182. $\frac{{}^8C_0}{6} - {}^8C_1 + {}^8C_2.6 - {}^8C_3.6^2 + ... + {}^8C_8.6^7 =$

A. 0

B. 6^7

C. 6^8

D. $\frac{5^8}{6}$.

Answer:

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183. What is the smallest natural number n such that n ! is divisible by 990 ?

A. 9

B. 11

C. 33

D. 99

Answer:

Watch Video Solution

184. What is the number of words formed from the letters of the word 'JOKE' so that the vowels and consonants alternate ?

A. 4

B. 8

C. 12

D. None of these.

Answer:

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

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

B. $\frac{19}{54}$

C. $\frac{1}{4}$

D. No such term exists in the expansion.

Answer:

Watch Video Solution

186. The number of ways in which 6 men and 5 women can sit at a round table if no two women are to sit together is given by :

A. 30

B. $5! \times 4!$

C. $7! \times 5!$

D. $6! \times 5!$.

Answer:

Watch Video Solution

187. A student is to answer 10 out of 13 questions in an examination such that he must choose at least 4 from the first five questions. The number of choices available to him is :

A. 196

B. 280

C. 346

D. 140

Answer:

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188. If ${}^{n}C_{r}$ denotes the number of combinations of n things taken r at a time, then the expression ${}^{n}C_{r+1} + {}^{n}C_{r-1} + 2 \times {}^{n}C_{r}$ equals :

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

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

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

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

Answer:

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

A. 33

B. 34

C. 35

D. 32

Answer:

Watch Video Solution

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

A. ${}^{12}C_0+3$

B. ${}^{12}C_6$

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

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

Answer:

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191. How many ways are there to arrange the letters in me word 'GARDEN' with the vowels in alphabetical order ?

A. 120

B. 240

C. 360

D. 480

Answer:

Watch Video Solution

192. If $\hat{} \ n-1C_r = \left(k^2-3\right)^n C_{r+1}, then k \in$

A. $(-\infty, -2)$

B. $(2, \infty)$

C. $[-\sqrt{3}, \sqrt{3}]$

D. $[\sqrt{3}, 2]$.

Answer:

Watch Video Solution

193. 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 :

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

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

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

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

Answer:

Watch Video Solution

194. Thr ciefficient of x^{n-2} in the polynomial $(x-1)(x-2)(x-3)....(x-n)$, is

A. $n-1$

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

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

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

Answer:

Watch Video Solution

195. If the letters of the word SACHIN are arranged in all possible ways and these words are written out as in dictionary, then the word SACHIN appears at serial number:

A. 600

B. 601

C. 602

D. 603

Answer:

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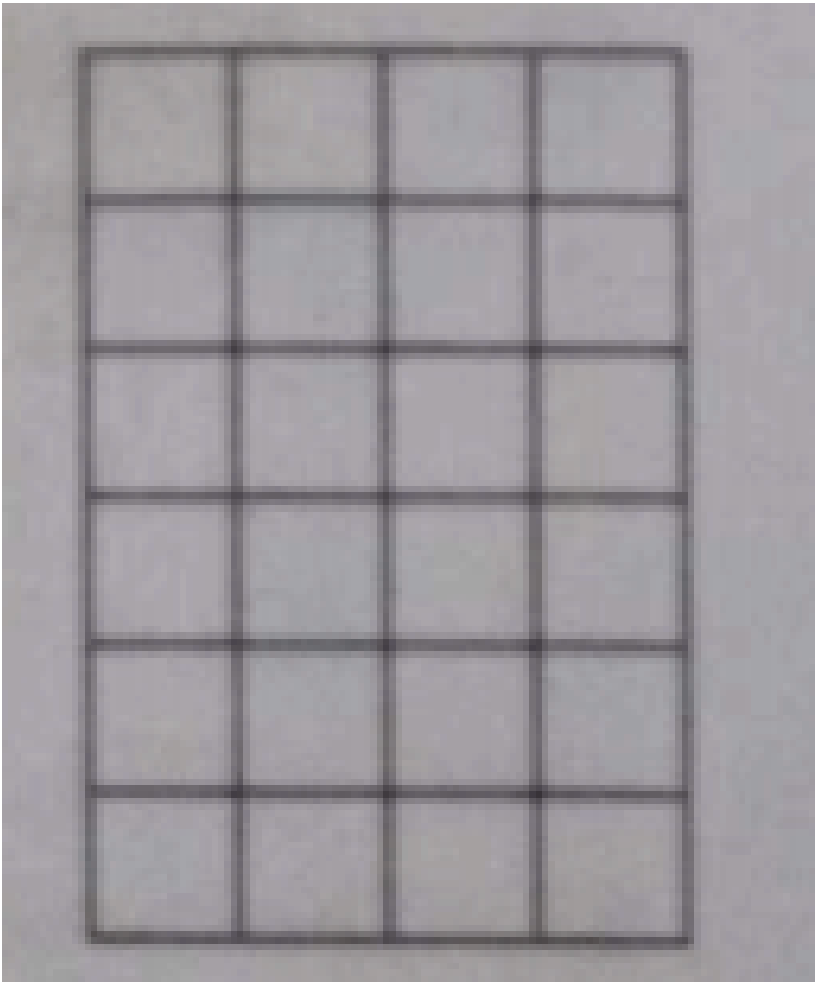
196. A rectangle with sides (2m-1) and (2n -1) is divided into squares of unit length by drawing parallel lines as shown in the diagram, then the

number of rectangles possible with odd side lengths is :



A. $(m+n-1)^2$

B. 4^{m+n-1}

C. m^2n^2

D. $m(m+1)n(n+1)$.

Answer:

Watch Video Solution

197. The value of ${}^{50}C_4 + \sum_{r=1}^{6} {}^{56-r}C_3$ is :

A. ${}^{55}C_3$

B. ${}^{55}C_4$

C. ${}^{56}C_4$

D. ${}^{56}C_3$.

Answer:

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198. 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 is equal to

A. a+b=1

B. a-b=1

C. ab=1

D. $\frac{a}{b} = 1.$

Answer:

Watch Video Solution

199. The value of $\binom{30}{0}\binom{30}{10} - \binom{30}{1}\binom{30}{11} + \binom{30}{2}\binom{30}{12} + \ldots + \binom{30}{20}\binom{30}{30}$

A. $\binom{30}{10}$

B. $\binom{30}{15}$

C. $\binom{60}{30}$

D. $\binom{31}{10}.$

Answer:

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200. At an election, a voter may vote for any number of candidates not greater than the number to be elected. There are 10 candidates and 4 are to be elected. The number of ways in which a voter may vote for at least one candidate is- (A) 5040 (B) 6210 (C) 385 (D) 1110

A. 5040

B. 6210

C. 385

D. 1110

Answer:

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201. For natural numbers $m, n,$ if $(1-y)^m(1+y)^n = 1 + a_1 y + a_2 y^2 + \ldots,$ and $a_1 = a_2 = 10,$ t

is

A. (20, 45)

B. (35, 20)

C. (45, 35)

D. (35, 45).

Answer:

Watch Video Solution

202. The letters of the word COCHIN are permuted and all the permutations are arranged in an alphabatical order as in english dictionary. The number of words that appear before the word COHIN is

A. 360

B. 192

C. 96

D. 48

Answer:

Watch Video Solution

203. The sum of series $.^{20}C_0 - ^{20}C_1 + ^{20}C_2 - ^{20}C_3 + ... + ^{20}C_{10}$ is

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

B. 0

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

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

Answer:

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

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

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

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

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

Answer:

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205. How many different words can be formed by jumbling the letters of the word 'MISSISSIPPI` in which no two S are together ?

A. $7.\ {}^6C_4.\ {}^8C_4$

B. $8.\ {}^6C_4.\ {}^7C_4$

C. $8.7.\ {}^8C_4$

D. $6.8.{}^{7}C_{4}$.

Answer:

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206. The number of 7-digit integers, with sum of the digits equal to 10 and formed by using the digits 1,2 and 3 only, is

A. 55

B. 66

C. 77

D. 88

Answer:

Watch Video Solution

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

A. 0

B. 2

C. 7

D. 8

Answer:

Watch Video Solution

208. From 6 different novels and 5 different dictionaries, 4 novels and 1 dictionary are to be selected and arranged in a row on a shelf so that the dictionary is always in the middle. Then the number of such arrangements is :

A. less than 500

B. at least 500 but less than 750

C. at least 750 but less than 1000

D. at least 1000.

Answer:

Watch Video Solution

209. There are two urns. Urn A has 4 distinct red balls and urn B has 5 distinct blue balls. From each urn (two balls are taken out at random and then transferred to the other. The number of ways in which this can be done is :

A. 60

B. 36

C. 66

D. 108

Answer:

Watch Video Solution

210. There are 10 points in a plane, out of these 6 are collinear. If N is the number of triangles formed by joining these points, then

A. $N \leq 100$

B. $100 < N < 140$

C. $140 < N \leq 190$

D. $N > 190.$

Answer:

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211. For r = 0 ,1,2,..., 10 , let A_r, B_r and C_r denote respectively , the coefficients of x^r in the expansion of $(1+x)^{10}$, $(1+x)^{20}$ and $(1+x)^{30}$, $\sum_{r=1}^{10} A_r(B_{10}B_r - C_{10}A_r)$ 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:

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212. The coefficient of x^7 in the expansion of $\left(1 - x - x^2 + x^3\right)^6$, is

A. 144

B. -132

C. -144

D. 132

Answer:

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213. Find the number of ways in which five identical balls can be distributed among ten boxes, if not more than one can go into a box.

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214. A committee of 12 is to be formed from nine women and eight men. In how many ways this can be done if at least five women have to be included in a committee ? In how many of these committees : the women are in majority ?

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215. A committee of 12 is to be formed from nine women and eight men. In how many ways this can be done if at least five women have to be included in a committee ? In how many of these committees : the men are in majority ?

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216. A question paper consists of two sections having respectively 3 and 4 questions. The following note is given on the question paper : "It is not necessary to attempt all the questions. One question from each part is compulsory.'" In how many ways Can a candidate select the questions ?

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

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218. Give that : $C_1 + 2C_2x + 3C_3x^2 + \ldots . + 2n.\, C_{2n}.\, x^{2n-1} = 2n(1+x)^{2n-1}$, where

$C_r = \frac{(2n)!}{r!(2n-r)!}$, r=0,1,2, ,2n , then prove that $C_1^2 - 2C_2^2 + 3C_3^2 - \ldots\ldots\ldots - 2nC_{2n}^2 = (-1)^n . nC_n$.

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219. Prove that $\sum_{r=1}^{k} (-3)^{r-1} . {}^{3n}C_{2r-1} = 0$, where $k = \frac{3n}{2}$ and n is an even integer.

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220. If $a_0, a_1, a_2, \ldots, a_{2n}$ are the coefficients in the expansion of $\left(1 + x + x^2\right)^n$ in ascending power of x show that $a_0^2 - a_1^2 + a_2^2 - \ldots + a_{2n}^2 = a_n$.

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221. Find the value of x for which the sixth term of : $\left(\sqrt{2^{\log(10-3^x)}} + \sqrt[5]{2^{(x-2)\log 3}}\right)^n$ is equal to 21, if it is known that the

binomial coefficient of the 2nd, 3rd and 4th term in the expansion represent respectively the 1st, 3rd and 5th term of an A.P. (the symbol log stands for logarithm to the base 10).

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