MATHS

BOOKS - A N EXCEL PUBLICATION

BINOMIAL THEOREM

Question Bank

1. Evaluate $\left(2+\sqrt{3}\right)^{7}+\left(2-\sqrt{3}\right)^{7}$

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2. Using binomial theorem evaluate $(0.99)^{5}+(1.01)^{5}$

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3. Write the middle term in the expansion of the following,

$$\left(x+\frac{2}{\sqrt{x}}\right)^{17}$$

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4. Find the term independent of x in the following expansion.

$$\left(x-\frac{1}{x}\right)^{12}$$

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

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6. The first term in the expansion of $(1+ax)^n$ in ascending powers of x are $1+12x+64x^2$, find n and a.

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7. If $C_0, C_1, C_2 \ldots C_n$ denote the coefficients in the binomial expansion of $(1+x)^n$, prove that $C_0 + 3C_1 + 5C_2 + \ldots + (2n+1)C_n = (n+1)2^n$

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8. Expand the following expressions $(1+2x)^5$

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9. Expand the following expressions $\left(\frac{2}{x} + \frac{x}{2}\right)^5$

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10. Expand the following expressions $(2x-3)^6$

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11. Expand $\left(\frac{x}{3}+\frac{1}{x}\right)^5$

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

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13. Using Binomial theorem evaluate the following $(96)^3$

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14. Using Binomial theorem evaluate the following $(102)^5$

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15. Using Binomial theorem evaluate the following $(101)^4$

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16. Using Binomial theorem evaluate the following $(99)^5$

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

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18. 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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19. Find $(x+1)^6+(x-1)^6$. Hence, or otherwise evaluate $\left(\sqrt{2}+1\right)^6+\left(\sqrt{2}-1\right)^6$

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20. Show that $9^{n+1}-8n-9$ is divisible by 64.

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

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

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23. Find the coefficient of a^5b^7 in the

expansion of $(a-2b)^{12}$

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

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

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

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27. Find the $13^{t}h$ term in the expansion of

$$\left(9x - \frac{1}{3\sqrt{x}}\right)^{18}$$

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28. Write the middle term in the expansion of the following,

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

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

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

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31. 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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32. 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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33. Find the positive value of m for which the coefficient of x^2 in the expansion of $(1+x)^m$ is 6.

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34. Consider the expansion of $\left(3x - \frac{x^3}{6}\right)^8$ Find the general term in the expansion

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35. Consider the expansion of $\left(3x - \frac{x^3}{6}\right)^8$ How many terms are there in the expansion?

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36. Consider the expansion of $\left(3x - \frac{x^3}{6}\right)^8$ Find the middle term in the expansion.

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37. Find the coefficient of middle term in the expansion of $(1 + a)^8$

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38. Find the coefficient of the middle term in the expansion of $(1+a)^7$

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39. Consider $\left(\sqrt{2}+3^{1/5}\right)^{10}$ Find the $r+1^{th}$ terms in the expansion of the given expression

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40. Consider $\left(\sqrt{2}+3^{1/5}\right)^{10}$ If the $r+1^{th}$ term is rational , find r. Hence , find the sum of the rational terms in the expansion of $\left(\sqrt{2}+3^{1/5}\right)^{10}$

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41. Write the first three terms in the expansion of $(1+ax)^n, n \in N$

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42. If the first three terms in the expansion of $(1+ax)^n$ are 1,6x and $16x^2$, find a and n

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43. If t_r denotes the r^{th} term in the expansion of $\left(x+\frac{1}{x}\right)^{23}$,find t_{12} and t_{13} Hence ,prove that $x^2 t_{13} = t_{12}$

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44. Let c_r denote the binomial coefficient ${}^nC_r$ Write the factorial formula for c_r

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45. Prove that $\frac{{}^nC_r}{{}^nC_{r-1}} = \frac{n-r+1}{r}$

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46. Let c_r denote the binomial coefficient ${}^nC_r$ Hence, show that $\frac{C_1}{C_0} + 2\frac{C_2}{C_1} + 3.\ \frac{C_3}{C_2} + \ldots + n.\ \frac{C_n}{C_{n-1}} = \frac{n(n+1)}{2}$

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47. Given that ${}^nC_r = {}^nC_{n-r}$or $C_r = C_{n-r}$ Prove that $aC_0 + (a+b)C_1 + \ldots + (a+nb)C_n = (2a+nb)2^{n-1}$ Hence, prove that $C_0 + 4C_1 + 7C_2 + \ldots + (3n+1)C_n = (3n+2)2^{n-1}$

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48. Given that ${}^nC_r = {}^nC_{n-r}$or $C_r = C_{n-r}$ Prove that $aC_0 + (a+b)C_1 + \ldots + (a+nb)C_n = (2a+nb)2^{n-1}$ Hence, prove that $C_0 + 5C_1 + 9C_2 + \ldots + (4n+1)C_n = (4n+2)2^{n-1}$

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49. What is the $(r+1)^{th}$ term in the expansion of $(3x+2y)^8$?

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50. Using the $(r+1)^{th}$ term, find the 3rd,4th and 5th terms in the expansion of $(3x+2y)^8$

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51. find the middle term in the expansion of $(3x+2y)^8$

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52. Expand $(1+x)^4$, $(1-x)^3$ and $(1-x)^2$

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53. Expand $\left(1-x+x^2\right)^4$

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

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

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56. Consider the expansion of $\left(\frac{4x}{5}-\frac{5}{4x}\right)^8$ Find the $(r+1)^{th}$ term in the expansion

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57. Consider the expansion of $\left(\frac{4x}{5}-\frac{5}{4x}\right)^8$ Find the number of terms in the expansion

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58. Consider the expansion of $\left(\frac{4x}{5}-\frac{5}{4x}\right)^8$ The middle term in the expansion is ...{4th,5th,6th]

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59. Consider the expansion of $\left(\frac{4x}{5}-\frac{5}{4x}\right)^8$ Find the fourth term from the end in the expansion.

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60. Consider the expansion of $\left(3x^3+\frac{2}{x^2}\right)^{40}$ Find the general term in the expansion

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61. Consider the expansion of $\left(3x^3+\frac{2}{x^2}\right)^{40}$ Assuming the term containing x^{20} as the $(r+1)^{th}$ term, find the coefficient of x^{20} in the expansion of $\left(3x^3+\frac{2}{x^2}\right)^{40}$

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62. Consider the expansion of $\left(3x^2-\frac{1}{2x^3}\right)^{10}$ Find the $(r+1)^{th}$ term in the expansion

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

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64. Write the expansion of $(a-b)^n$, n is a positive integer

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65. Using the expansion in simplify $(a+b)^6 + (a-b)^6$

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66. Find the value of $(10.2)^6 + (9.8)^6$

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67. What are the coefficients of $(2r+1)^{th}$ and $(r+2)^{th}$ terms in the expansion of $(1+x)^{43}$?

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68. If these coefficients are equal , prove that r=14

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69. Consider the expansion of $(x+a)^n$ Find the $(r+1)^{th}$term in the expansion

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70. Consider the expansion of $(x+a)^n$ Find the 6th ,7th and 8th terms in the expansion

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71. Consider the expansion of $(x+a)^n$ If these are 112,7 and $\frac{1}{4}$ respectively, find x, a, n

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72. Expand $(1+ax)^n$ upto the third term if n is a positive integer

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73. If the first three terms in the expansion of $(1+ax)^n$ are $1, -21x$ and $216x^2$ respectively, prove that $a = -\frac{3}{7}$ and n=49.

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74. What is the coefficient of the $(r+1)^{th}$ term in the expansion of $(1+x)^n$?

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75. What is the coefficient of 5th, 6th and 7th terms in the expansion of $(1+x)^n$?

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76. If they are in A.P, find the possible values of n

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77. Expand 2^{3n} by writing $2^{3n} = (1+7)^n$

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

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79. prove the result $\hat{}\ (n+1)C_r = {}^n C_{r-1} + {}^n C_r$

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80. Prove that ${}^{n+1}C_{r+1} = \frac{n+1}{r+1}{}^n C_r$

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81. Prove that

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

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82. Prove that ${}^{n+1}C_{r+1} = \frac{n+1}{r+1}{}^n C_r$

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83. Prove that $C_0 + \frac{C_2}{3} + \frac{C_4}{5} + \ldots = \frac{2^n}{n+1}$

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84. Given that $\frac{C_r}{C_{r-1}} = \frac{n-r+1}{r}$ Evaluate $\frac{C_1}{C_0}, \frac{C_2}{C_1}$ and $\frac{C_3}{C_2}$

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85. Given that $\frac{C_r}{C_{r-1}} = \frac{n-r+1}{r}$ Prove that $\left(1+\frac{C_1}{C_0}\right)\left(1+\frac{C_2}{C_1}\right)\ldots\left(1+\frac{C_n}{C_{n-1}}\right) = \frac{(n+1)^n}{n!}$

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86. Given that $C_0 + C_1 x + C_2 x^2 + \ldots + C_n x^n = (1+x)^n$ prove that $C_0 + 5.\, C_1 + 5^2.\, C_2 + \ldots + 5^n.\, C_n = 6^n$

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87. Given that $C_0 + C_1 x + C_2 x^2 + .. + C_n x^n = (1+x)^n$ Prove that $C_1.2 + C_2.2^2 + ... + C_n.2^n = 3^n - 1$

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

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89. Find the coefficient of x^4 in the expansion of $\left(1-x^2\right)^n$

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90. What is the value of $C_0 + C_1 + C_2 + .. + C_n$?

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91. What is the value of $C_0 + C_2 + C_4 + \ldots.$?

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92. What is the value of $C_1 + C_3 + C_5 + \ldots$?

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93. Prove that $2C_0 + C_1 + 2C_2 + C_3 + 2C_4 + \ldots = 3.2^{n-1}$

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94. What is the coefficient of x^{n-2} in the expansion of $(1+x)(1+x)^n$?

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95. What is the coefficient of x^{n-2} in the expansion of $(1+x)^{2n}$?

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96. Prove that $C_0C_2 + C_1C_3 + \ldots + C_{n-2}C_n = {}^{2n}C_{n-2}$

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97. Given that $\frac{1}{r+1}{}^{n}C_r = \frac{1}{n+1}{}^{m+1}C_{r+1}$

Prove that $2^{10}C_0 + \frac{2^2}{2}{}^{10}C_1 + \frac{2^3}{3}{}^{10}C_2 + \ldots\ldots + \frac{2^{11}}{11}{}^{10}C_{10} = \frac{3^{11}-1}{11}$

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98. 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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99. Find a if the coefficients of x^2 and x^3 in the expansion of $(3+ax)^9$ are equal

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

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

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

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

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

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