

MATHS

BOOKS - V PUBLICATION

BINOMIAL THEOREM

Questionbank

1. Write the expansion of $\left(x^2 + \frac{3}{x}\right)^4$



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2. Using binomial theorem evaluate $(98)^5$.



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3. Which is larger $(1.01)^{1000000}$ or 10, 000?



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



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5. Expand $(1 - 2x)^5$



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



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



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



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



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



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



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



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13. Using Binomial theorem evaluate 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. Find $(a + b)^4 - (a - b)^4$.Hence evaluate $(\sqrt{3} + \sqrt{2})^4 - (\sqrt{3} - \sqrt{2})^4$



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



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



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18. Prove that $\sum_{r=0}^n 3^r \binom{n}{r} = 4^n$



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19. Find the value of 'a' if the 17^{th} term and 18^{th} term in the expansion of $(2 + a)^{50}$ are equal.



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20. Show that the middle term in the $(1 + x)^{2n}$ expansion is $\frac{1.3.5 \dots (2n - 1)}{n!} 2^n x^n$



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



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22. The second, 'third and fourth terms in the binomial expansion $(x + a)^n$ are 240,720 and 1080, respectively. Find x , a and n .



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



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



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26. Find the general term in the expansion of

$$(x^2 - y)^6.$$



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27. Find the general term in the expansion of

$$(x^2 - yx)^{12}, x \neq 0$$



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



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29. Find the 13th term in the expansion of

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



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30. Find the middle term in the expansion of

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



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31. Find the middle term in the expansion of

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



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



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33. 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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34. 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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35. 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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36. Find the term independent of x in the expansion of $\left(\frac{3x^2}{2} - \frac{1}{3x}\right)^6$



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37. If the coefficients of a^{r-1} , a^r and a^{r+1} in the expansion of $(1+a)^n$ are in arithmetic progression, prove that

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



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



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



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40. Find the r^{th} term from the end in the expansion of $(x + a)^n$.



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

$$\left(\sqrt[3]{x} + \frac{1}{2\sqrt[3]{x}} \right)^{18}$$



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42. If the coefficients of $(r - 5)^{th}$ and $(2r - 1)^{th}$ terms in the expansion of $(1 + x)^{34}$ are equal, find r .



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



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



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



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48. Find the value of

$$(a^2 + \sqrt{a^2 - 1})^4 + (a^2 - \sqrt{a^2 - 1})^4$$



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



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50. Expand using Binomial theorem

$$\left(1 + \frac{x}{2} - \frac{2}{x}\right)^4, x \neq 0$$



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51. Find the expansion of $(3x^2 - 2ax + 3a^2)^3$

using Binomial theorem



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52. i) Using Binomial theorem find an expansion of $(1 + x)^n$

ii) Obtain the expansion for $\left(x^2 + \frac{2}{x}\right)^4$ where $x \neq 0$



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53. Using binomial theorem expand

$$\left(\sqrt{\frac{x}{a}} - \sqrt{\frac{a}{x}}\right)^6.$$



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54. Using binomial theorem, prove that $3^{3n} - 26n - 1$ is divisible by 676, where $n \in \mathbb{N}$



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



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56. Find the 11th term from the end in the expansion of $\left(2x - \frac{1}{x^2}\right)^{25}$



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



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58. 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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59. Find the middle term in the expansion of

$$\left(\frac{a}{x} + bx\right)^{12}.$$



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60. 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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61. In the expansion of $(1 + x)^{43}$, the coefficients of $(2r + 1)^{th}$ and $(r + 2)^{th}$ terms are equal, find r .



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



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63. Show that the coefficient of middle term in the expansion of $(1 + a)^8$ is equal to the sum of co-efficients of middle terms in the expansion of $(1 + a)^7$



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64. i) Which is the general term in the expansion of $(a + b)^n$

ii) Find the number of terms in the expansion of

$$\left[\frac{x}{3} + 9y \right]^{70}$$



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65. i) Which is the $(r + 1)^{th}$ term in the expansion of $(a + b)^n$

ii) Which is the $(r + 1)^{th}$ term in the expansion of $\left(\frac{3}{2}x^2 - \frac{1}{3x}\right)^6$?

iii) Find the term independent of x in the expansion of $\left(\frac{3}{2}x^2 - \frac{1}{3x}\right)^6$



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66. Let c_r denote the binomial coefficient ${}^n C_r$

Hence, show that

$$\frac{C_1}{C_0} + 2 \frac{C_2}{C_1} + 3 \frac{C_3}{C_2} + \dots + n \frac{C_n}{C_{n-1}} = \frac{n(n+1)}{2}$$



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67. Using the expansion in simplify

$$(a + b)^6 + (a - b)^6$$



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68. Expand the following by using binomial theorem

$$(i) \left(-3x - \frac{1}{3x} \right)^3$$

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



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69. 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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70. The first three terms in the expansion of $(1 + ax)^n$ are $1, 12x, 64x^2$. Find n and a .



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



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

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



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73. Show that the middle term in the $(1 + x)^{2n}$ expansion is $\frac{1.3.5\dots(2n-1)}{n!} 2^n x^n$



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



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