



MATHS

BOOKS - A N EXCEL PUBLICATION

PERMUTATIONS AND COMBINATIONS

Question Bank

1. If a child can draw two kinds of faces and three kinds of hats, how many cartoons can the child produce?



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2. How many four letter words can be made from the two letters A and B ?



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3. How many 3 digit odd numbers can be formed by using the digits 1,2,3,4,5,6 when the repetition of digits is not allowed?



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4. How many 3 digit odd numbers can be formed by using the digits 1,2,3,4,5,6 when the repetition of digits is allowed?

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5. How many words (with or without meaning) of three distinct letters of the English alphabets are there?

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6. In how many ways can the following prizes be given away to a class of 30 students, first and second in Mathematics, first and second in Physics, first in Chemistry and first in English?



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7. How many odd numbers less than 1000 can be formed by using the digit 0,2,5,7 when the repetition of digits is allowed?



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8. How many 3-digit numbers can be formed from the digits 1,2,3,4 and 5 assuming that repetition of the digits is allowed?



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9. How many 3-digit numbers can be formed from the digits 1,2,3,4 and 5 assuming that repetition of the digits is not allowed



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10. How many 3-digit even numbers can be formed from the digits 1,2,3,4,5, 6 if .the digits can be repeated?



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11. How many 4-letter code can be formed using the first 10 letters of the English alphabet, if no letter can be repeated?



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12. How many 5-digit telephone numbers can be constructed using the digits 0 to 9 if each number starts with 67 and no digit appears more than once?



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13. A coin is tossed 3 times and the outcomes are recorded. How many possible outcomes are there?



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14. Given 5 flags of different colours. How many different signals can be generated if each signal requires the use of 2 flags, one below the other?

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15. Evaluate $8!$

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16. Evaluate $4! - 3!$

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17. Is $3! + 4! = 7!$?



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18. Compute $\frac{8!}{6! \times 2!}$



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19. If $\frac{1}{6!} + \frac{1}{7!} = \frac{x}{8!}$, find x .



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20. Evaluate $\frac{n!}{(n-r)!}$ $n = 6, r = 2$



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21. Evaluate $\frac{n!}{(n-r)!}$ $n = 9, r = 5$



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22. Find n if ${}^3P_4 = {}^{n-1}P_5$



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23. Find r , if ${}^5P_r = 2 \times {}^6P_{r-1}$



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24. In how many different ways can the letters of the word HEXAGON be permuted?



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25. In how many ways 4 boys and 3 girls be seated in a row of 7 chairs if the boys and girls are to be seated alternately and the boys occupy odd places.





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26. Find the number of all five digit numbers with distinct digits.



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27. How many words can be formed out of the letters of the word “TRIANGLE”? How many of these will begin with T and end in E?



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28. In how many ways can the letters of the word “PENCIL” be arranged, so that N is always next to E?



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29. In how many ways can 9 examination papers be arranged so that the best and the worst papers never come together?



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30. In how many ways can 5 boys be seated at a round table?



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31. In how many ways can 7 beads of different colours form a necklace?



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32. If all the permutations of the word ‘AGAIN’ are arranged in a dictionary order, what is the 50^{th}

word?



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33. In how many ways can 5 men and 4 women be seated at a round table if each woman is to be between two men?



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34. If 20 persons were invited for a party, in how many ways can they and the host be seated at a circular table? In how many of these ways will two

particular persons be seated on either side of the host?



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35. How many 3-digit numbers can be formed by using the digits 1 to 9 if no digit is repeated?



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36. How many 4 digit numbers are there with no digit repeated?



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37. How many 3-digit even numbers can be made using the digits 1,2,3,4,6,7 if no digit is repeated?



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38. Find the number of 4-digit numbers that can be formed using the digits 1,2,3,4,5 if no digit is repeated. How many of these will be even?



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39. From a committee of 8 persons, in how many ways can we choose a chairman and a vice chairman, assuming one person can't hold more than one position?



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40. Find the value of n such that

$$(n - 1)P_3 : nP_4 = 1 : 9$$



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41. Find r , if ${}^5P_r = 2 \times {}^6P_{r-1}$



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42. Find the value of r if

$${}^5P_r = {}^6P_{r-1}$$



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43. How many 8 letter words, with or without meaning, can be formed using the word EQUATION, using each letter exactly once?



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44. How many words, with or without meaning that can be made from the letters of the word 'MONDAY', assuming that no letter is repeated if 4 letters are used at a time.

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45. How many words, with or without meaning that can be made from the letters of the word 'MONDAY', assuming that no letter is repeated if all letters are used at a time.

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46. How many words, with or without meaning that can be made from the letters of the word 'MONDAY', assuming that no letter is repeated if all letters are used but first letter is a vowel?

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47. How many permutations are there of the 11 letters in MISSISSIPPI all the l's not come together?

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48. In how many way can the letters of the word PERMUTATIONS be arranged if the words starts with P and ends with S.



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49. In how many ways can the letters of the word PERMUTATIONS be arranged in which vowels are all together



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50. In how many ways can the letters of the word 'PERMUTATIONS' be arranged if there are always 4 letters between P and S?



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51. Complete the following table

n	$n!$	$(n-1)!$	$(n-2)!$
4	----	----	----
5	----	----	----
6	----	----	----
7	----	----	----



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52. Given the digits 1,2,3 and 8 How many one digit numbers can be formed from the given digits?

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53. Given the digits 1,2,3 and 8 How many two digit numbers can be formed using the given digits?

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54. Given the digits 1,2,3 and 8 How many three digit numbers can be formed using the given digits?

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55. Given the digits 1,2,3 and 8 How many four digit numbers can be formed using the given digits?



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56. Given the digits 1,2,3 and 8 How many numbers can be formed from the given digits?



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57. Given the digits 1,2,3 and 8 If repetition of digits is not allowed, find the number of numbers which can be formed from the given digits



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58. How many 5-digit telephone numbers can be constructed using the digits 0 to 9 if each number starts with 67 and no digit appears more than once?



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59. Given the digits 0,1,2,3,4, 5,6,7, 8,9 Suppose Raju is asked to form 5 - digit telephone numbers using the given digits so that no digit appears more than once. If each number ends in 89, find the number of telephone numbers constructed by Raju



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60. Given the digits 3, 7, 6, 4 and 8. Seema is asked to form different numbers less than 1000 using the given digits If repetition of digits is not allowed, find the number of numbers formed by Seema



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61. Given the digits 3, 7, 6, 4 and 8. Seema is asked to form different numbers less than 1000 using the given digits. If repetition of digits is allowed, find the number of numbers formed by Seema



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62. Express $(x + 1)!$ in terms of $(x - 1)!$. Hence, solve the equation $(x + 1)! = 12(x - 1)!$



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63. Express $(2x + 1)!$ in terms of $(2x - 1)!$, $(x + 2)!$ in terms of $(x - 1)!$. Hence, solve the equation $\frac{(2x + 1)!}{(x + 2)!} \times \frac{(x - 1)!}{(2x - 1)!} = \frac{3}{5}$



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64. Write $(2n)! = 2n(2n - 1)(2n - 2) \dots 3.2.1$. Then combine the even factors and prove $(2n)! = 2^n \cdot n! \cdot [1.3.5 \dots (2n - 1)]$



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65. Write $(33)! = [32.16.8.4.2] \cdot [33.31.30 \dots 3.1]$ Hence, prove that $(33)!$ is divisible by 2^{15}



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66. Sumit goes to a movie. The cinema hall has two entrances and three exits. In How many ways can Sumit enter and exit from the hall?



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67. In a class there are 25 boys and 10 girls. The teacher wants to select 1 boy and 1 girl to represent the class in a function. In how many ways can the teacher make the selection



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68. Given that $p(n, r) = \frac{n!}{(n-r)!}$ What are the values of $P(5, r)$ and $P(6, r-1)$?



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69. If $5 \times 4P_r = 6 \times 5P_{r-1}$ find 'r'.



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70. Given that $P(n, r) = n(n - 1)(n - 2)\dots$ to r factors What are the values of $P(n, 4)$ and $P(n, 2)$?



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71. Given that $P(n, r) = n(n - 1)(n - 2)\dots$ to r factors If $P(n, 4) = 20 P(n, 2)$, find n



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72. Prove that ${}^9P_5 + 5^9P_4 = \frac{10!}{5!}$



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73. If ${}^9P_5 + 5^9P_4 = {}^{10}P_r$. prove that $r=5$



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74. Prove that ${}^{2n+1}P_{n-1} = \frac{(2n+1)!}{(n+2)!}$ and

$${}^{2n-1}P_n = \frac{(2n-1)!}{(n-1)!}$$



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75. if $\binom{2n+1}{n} p_{n-1} : \binom{2n-1}{n} p_n = 3:5$, prove that $n = 4$



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76. In how many ways 'n' objects can be arranged together in a line?



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77. For a group photograph, 3 boys and 2 girls stand in a line in all possible ways. How many

photos could be taken if each photo corresponds to each such arrangement



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78. Consider the word 'LOGARITHMS' How many distinct letters are there in the given word?



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79. Consider the word 'LOGARITHMS' How many 4 letter words, with or without meaning, can be

formed out of the letters of the given word if repetition is allowed



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80. Consider the word 'LOGARITHMS' How many 4 letter words, with or without meaning, can be formed out of the letters of the given word if repetition is not allowed



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81. Consider the word 'RESHMA' How many distinct letters are there in the given word?



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82. Consider the word 'RESHMA' How many vowels are there in the given word?



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83. Consider the word 'RESHMA' How many different words can be formed using the letters of the given

word so that the first letter is a vowel



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84. Consider the word 'RESHMA' How many different words can be formed using the letters of the given word so that the relative positions of the vowels and the consonants remain unaltered.



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85. Consider the word 'RESHMA' How many different words can be formed using the letters of the given

word so that the first letter is R and the last is A



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86. In a certain city, all telephone numbers have six digits How many telephone numbers are there with distinct digits?



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87. In a certain city, all telephone numbers have six digits If repetition of digits is possible, how many telephone numbers are there in the city.



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88. In a certain city, all telephone numbers have six digits How many telephone numbers are there with all digits distinct and which start with 41 or 42 or 46 or 62 or 64



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89. Suppose that words are formed by permuting all the letters of the word 'DHRONA' Find the numbers of words starting with A



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90. Suppose that words are formed by permuting all the letters of the word 'DHRONA' Find the number of words starting- with DA



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91. If the letters of the word DHRONA be permuted and arranged as in a dictionary, find the rank of the word.



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92. Find the number of arrangements of 6 boys and 5 girls in a row so that no two girls sit together.



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93. Find the number of arrangements of 6 boys and 5 girls in a row so that boys and girls occupy alternate positions



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94. Show that there are 300 numbers > 1000 and $< 10,000$ which can be formed with the six digits 0,1,2,3,4,5, each digit appearing not more than once in such a number



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95. Find the number of permutations of the letters of the word 'DADOO'



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96. Consider the word DADOO. How many end with O?



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97. Suppose that all the letters of the word 'HARYANA' are permuted and words are formed. How many different words can be formed?



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98. Suppose that all the letters of the word 'HARYANA' are permuted and words are formed. How many words are there which begin with H and end with N?



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99. Suppose that all the letters of the word 'HARYANA' are permuted and words are formed. In how many words H and N are together?



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100. Suppose that the different permutations of the word 'EXAMINATION' are listed as in a dictionary. How many permutations start with A?



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101. Suppose that the different permutations of the word 'EXAMINATION' are listed as in a dictionary. How many items are there in the list before the first word starting with E?



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102. Suppose that 4 prizes are distributed among 5 students Find the number of distributions so that no student gets more than one prize.



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103. Suppose that 4 prizes are distributed among 5 students Find the number of distributions so that a student may get any number of prizes.



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104. Suppose that 4 prizes are distributed among 5 students. Find the number of distributions so that no student gets all the prizes.



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105. There are 20 persons, among whom two are brothers. Find the number of arrangements of these persons in a row.



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106. There are 20 persons, among whom two are brothers. Find the number of arrangements of the given persons around a round table.



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107. There are 20 persons, among whom two are brothers. Find the number of ways in which we can arrange the 20 persons around a round table so that there is exactly one person between the two brothers.



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108. Suppose that 5 persons A, B, C, D and E sit around a circular table In how many of these arrangements. B and D sit next to each other

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109. Suppose that 5 persons A, B, C, D and E sit around a circular table In how many of the arrangements A and D do not sit next to each other.

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110. 10 persons are invited for a party In how many ways can they and the host be seated at a circular table?



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111. 10 persons are invited for a party. In how many ways will two particular persons are seated on either side of the host in a circular table?



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112. Evaluate the following ${}^{14}C_3$



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113. Evaluate the following ${}^{12}C_{10}$



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114. Evaluate the following ${}^{(n+1)}C_n$



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115. If ${}^n C_{10} = {}^n C_{12}$ find ${}^{23} C_n$



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116. If ${}^n P_r = 720$ and ${}^n C_r = 120$ find r



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117. It was found at a certain dinner meeting that after every member had shaken hand with every other members, 45 handshakes were interchanged. How many members were present at the meeting?



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118. In how many ways a committee of 5 members can be selected from 6 men and 5 women, consisting of 3 men and 2 women?

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119. If m parallel lines in plane are intersected by a family of n parallel lines, find the number of parallelogram formed.

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120. In how many ways can a cricket team of 11 of players be selected from 15 players?



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121. In how many ways can a cricket team of eleven be chosen out of a batch of 15 players if a particular player is always chosen



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122. In how many ways can a cricket team of eleven be chosen out of a batch of 15 players if a particular player is never chosen



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123. A question paper has two parts, part A and part B, each containing 10 questions. If the student has to choose 8 from part A and 5 from part B, in how many ways can he choose the questions?



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124. A committee of 6 is to be formed from 6 men and 4 women. In how many ways can this be done if the committee contains 2 women?



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125. A committee of 6 is to be formed from 6 men and 4 women. In how many ways can this be done if the committee contains at least 2 women?



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126. If ${}^n C_8 = {}^n C_2$ find ${}^n C_2$

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127. Determine n if ${}^{(2n)}C_3 : {}^n C_2 = 12:1$

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128. Determine n if ${}^{(2n)}C_3 : {}^n C_3 = 11:1$

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129. How many chords can be drawn through 21 points on a circle?





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130. In how many ways can a team of 3 boys and 3 girls be selected from 5 boys and 4 girls?



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131. Find the number of ways of selecting 9 balls from 6 red balls, 5 white balls and 5 blue balls if each selection consists of 3 balls of each colour.



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132. Determine the number of 5 card combinations out of a deck of 52 cards if there is exactly one ace in each combination.



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133. In how many ways can one select a cricket team of eleven from 17 players in which only 5 players can bowl if each cricket team of 11 must include exactly 4 bowlers?



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134. A bag contains 5 black and 6 red balls. Determine the number of ways in which 2 black and 3 red balls can be selected?



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135. In how-many ways can a student choose a programme of 5 courses if 9 courses are available and 2 specific courses are compulsory for every student?



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136. Prove that ${}^n C_r = {}^n C_{n-r}$



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137. If ${}^n C_{10} = {}^n C_{12}$ find ${}^{23} C_n$



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138. Find the value of ${}^{10} C_4$



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139. Show that ${}^{10}C_4 = {}^9C_4 + {}^9C_3$



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140. prove the result ${}^{n+1}C_r = {}^nC_{r-1} + {}^nC_r$



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141. Given that ${}^nC_r = \frac{n!}{r!(n-r)!}$ What are the values of ${}^{28}C_{2r}$ and ${}^{24}C_{2r-4}$



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142. Given that ${}^nC_r = \frac{n!}{r!(n-r)!}$ if

${}^{28}C_{2r} : {}^{24}C_{2r-4} = 225 : 11$ prove that $r = 7$



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143. Prove that $\frac{{}^nP_r}{{}^nC_r} = r!$



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144. If ${}^{28}P_r = 6 \cdot {}^{28}C_r$, prove that $r = 3$



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145. If $p(n,2)=272$, find n



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146. For the above n , if $(n,r) = 136$, find r



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



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148. If $\frac{c(n, r)}{c(n, r + 1)} = \frac{1}{2}$ and $\frac{c(n, r + 1)}{c(n, r + 2)} = \frac{2}{3}$,

prove that $n = 14$ and $r = 4$



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149. Prove that ${}^n C_r + {}^n C_{r-1} = {}^{n+1} C_r$



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150. Prove that

$${}^n C_r + 4^n {}^n C_{r-1} + 6^n {}^n C_{r-2} + 4^n {}^n C_{r-3} + {}^n C_{r-4} = {}^{n+4} C_r$$



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151. Find the value of $5!$



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152. If $\frac{n!}{(n-2)!} = 56$, find the value of n



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153. Find the value of 6C_2



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154. If ${}^n C_{14} = {}^n C_{20}$ find the values of ${}^n C_{28}$ and ${}^n C_{32}$



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155. In how many ways can a cricket team of 11 of players be selected from 15 players?



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156. A cricket team consists of 15 players, out of it 5 are bowlers. In how many ways a team of 11 members can be formed with exactly 2 bowlers.



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157. A cricket team consists of 15 players, out of it 5 are bowlers. In how many ways a team of 11 members consisting of at least 2 bowlers can be formed.



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158. Determine the number of 5 card combinations out of a deck of 52 cards if there is exactly one ace in each combination.



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159. From a deck of 52 cards, 5 cards combination is taken out Find the number of combinations at which the combination has two aces.



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160. From a deck of 52 cards, 5 cards combination is taken out Find the number of combinations at which the combination has at least one ace.



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161. There are 8 men and 5 women How many committees can be formed if it consists of 4 men and 4 women?

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162. There are 8 men and 5 women How many committees of 5 men and 3 women can be formed if one particular woman is included in the committee

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163. There are 8 men and 5 women. How many committees consists of 5 men and 3 women can be formed if one particular man and one particular woman are included in the committee?



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164. Consider a group of 5 boys and 4 girls In how many ways 3 boys can be selected from the group?



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165. Consider a group of 5 boys and 4 girls. In how many ways 3 girls can be selected from the group?



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166. In how many different ways can a team of 3 boys and 3 girls be selected from 5 boys and 4 girls?



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167. In an examination a question paper consists of 12 questions divided into 2 parts I and II containing 5 and 7 questions respectively. A student is required to attempt 8 questions. In how many ways he can select 3 questions from part I and 5 questions from part II?



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168. In an examination a question paper consists of 12 questions divided into 2 parts I and II containing 5 and 7 questions respectively. A student is required to attempt 8 questions. In how many ways the

student can select 4 questions from part I and 4 questions from part II.



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169. In an examination a question paper consists of 12 questions divided into 2 parts I and II containing 5 and 7 questions respectively. A student is required to attempt 8 questions. In how many ways the student can select 5 questions from part I and 3 questions from part II.



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170. In an examination a question paper consists of 12 questions divided into 2 parts I and H containing 5 and 7 questions respectively. A student is required to attempt 8 questions. In how many ways the student can answer 8 questions by selecting at least 3 questions from each part.



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171. Suppose that in a party there are 15 persons In how many ways two persons can be selected?



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172. Suppose that in a party there are 15 persons. If each two of the 15 persons shake hands, with each other, how many handshakes happen in the party?



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173. Consider 12 points on a plane of which five are collinear. In how many ways can 3 points be selected out of 12?



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174. Consider 12 points on a plane of which five are collinear. In how many ways can 3 points be selected from the five collinear points?



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175. Consider 12 points on a plane of which five are collinear. How many triangles can be formed using the 12 points?



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176. Out of 18 points in a plane, no three are in the same line except 5 points which are collinear How many straight lines can be formed by joining the given points?



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177. Out of 18 points in a plane, no three are in the same line except 5 points which are collinear How many triangles can be formed by joining the given points.



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178. Find the number of diagonals formed in a decagon



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179. Find the number of triangles formed in a decagon



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180. A committee of 6 is to be formed from 6 men and 4 women. In how many ways can this be done if

the committee contains 2 women?



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181. Out of 6 boys and 4 girls, a committee of 6 is to be formed In how many ways the committee can be formed so that the committee contains at least 2 girls?



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182. Out of 6 boys and 4 girls, a committee of.6 is to be formed In how many ways the committee can be

formed so that the committee contains at the most 2 girls?



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183. Complete the following table

n, r	${}^n P_r$	$n!$
6, 3	----	----
4, 3	----	----
7, 2	----	----
8, 5	----	----



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184. Express the following in terms of factorials

4.5.6.7.8.9.10.11



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185. Express the following in terms of factorials

2.4.6.8.10



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186. Given the numbers 1,2,3,4,5. How many 5 digit numbers without repetition of digits can be formed

by using the above 5 digits?



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187. Given the numbers 1,2,3,4,5. How many 5 digit numbers can be formed by using the above digits if repetition is allowed?



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188. Given the numbers 1,2,3,4,5. How many 5 digit numbers greater than 24,000 can be formed if repetition is not allowed?

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189. Given the numbers 1,2,3,4,5. How many 5 digit numbers greater than 24,000 can be formed if repetition is not allowed?

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190. Given the numbers 1,2,3,4,5. How many 5 digit numbers in between 23,000 and 30,000 can be formed if repetition is not allowed?

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191. Consider the word 'INDEPENDENCE" Suppose all the letters of this word are arranged. Then match the following

Property of arrangement	Number of arrangements
Arrangements start with <i>P</i>	12600
Arrangements begin with <i>I</i> and end in <i>P</i>	138600
In the arrangements, the vowels come together	16800
In the arrangements, the vowels do not come together	13800 1646400



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192. A box contains 6 apples, 6 oranges and 7 mangoes. In how many ways two fruits can be selected from the box.



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193. A box contains 6 apples, 6 oranges and 7 mangoes. In how many different ways can one apple and two oranges be selected together



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194. A-box contains 6 apples, 6 oranges and 7 mangoes. In how many different ways a person can select three fruits from the box so that one is apple, one is orange and one is mango?



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195. A box contains 6 apples, 6 oranges and 7 mangoes. In how many different ways a person can select 4 fruits from the box so that two are apples and two are oranges.



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196. Match the following

Column A	Column B
${}^n C_8 = {}^n C_2$	$n = 5$
${}^{2n} C_3 : {}^n C_2 = 12 : 1$	$n = 45$
${}^{n-1} P_3 : {}^n P_4 = 1 : 9$	$n = 8$
${}^n C_{n-2} = 28$	$n = 10$
	$n = 9$



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197. How many words, with or without meaning, each of 2 vowels and 3 consonants can be formed from the letters of the word 'DAUGHTER'?



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198. How many words, with or without meaning, can be formed using all the letters of the word 'EQUATION' at a time so that the vowels and the consonants occur together?



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199. A committee of 7 has to be formed from 9 boys and 4 girls. In how many ways can this be done when the committee consists of exactly 3 girls?



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200. A committee of 7 has to be formed from 9 boys and 4 girls. In how many ways can this be done when the committee consists of at least 3 girls?



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201. A committee of 7 has to be formed from 9 boys and 4 girls. In how many ways can this be done when the committee consists of at most 3 girls.



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202. Suppose that the different permutations of the word 'EXAMINATION' are listed as in a dictionary. How many items are there in the list before the first word starting with E?



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203. How many 6-digit numbers can be formed from the digits 0,1,3,5,7 and 9 which are divisible by 10 and no digit is repeated?



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204. The English alphabet has 5 vowels and 21 consonants. How many words with two different vowels and 2 different consonants can be formed from the alphabet?



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205. In an examination, a question paper consists of 12 questions divided into two parts ie, part I and part II, containing 5 and 7 questions respectively. A student is required to attempt 8 questions in all, selecting at least 3 from each part. In how many ways can the student select the questions?



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206. Determine the number of 5-card combinations out of a deck of 52 cards if each selection of 5 cards has exactly one king.



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207. It is required to seat 5 men and 4 women in a row so that the women occupy the even places. How many such arrangements are possible?



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208. From a class of 25 students, 10 are to be chosen for an excursion party. There are 3 students who decide that either all of them will join or none of them will join. In how many ways can the excursion party be chosen?



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209. Consider the word ASSASSINATION.

How many different ways can be arranged so that the 4S's come together?



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