



MATHS

BOOKS - ARIHANT MATHS

PERMUTATIONS AND COMBINATIONS

Examples

1. A hall has 12 gates. In how many ways can a man enter the hall through one gate and come out through a different gate?



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2. There are three stations A,B and C five routes for going from station A to station B and four routes for going from station B to station C. find number of different ways through which a person can go from A to C via B.



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3. There are 25 students in a class in which 15 boys and 10 girls. The class teacher select either a boy or girl for monitor of the class. In how many ways the class teacher can make this selection?



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4. There are 4 students for physics, 6 students for chemistry and 7 students of mathematics gold medal. In how many ways one of these gold medals be awarded?

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5. Find n , if $(n + 2)! = 60 \times (n - 1)!$

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6. Evaluate $\sum_{r=1}^n r \times r!$

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7. Find the remainder when $\sum_{r=1}^n r!$ is divided by 15, if $n \geq 5$.

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8. Find the exponent of 3 in 100!.

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9. Prove that 33! is divisible by 2^{19} and what is the largest integer n such that 33! is divisible by 2^n ?

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10. Find the number of zeros at the end of 100!.



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11. For how many positive integral values of n does $n!$ end with precisely 25 zeros?



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12. Find the exponent of 80 in $200!$.



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13. Find the numbers of positive integers from 1 to 1000, which are divisible by at least 2, 3, or 5.



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14. If $(56)P_{r+6} : (54)P_{r+3} = 30800 : 1$, find r

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15. If ${}^{n+5}P_{n+1} = \frac{{}^{11(n-1)}P_n}{2}$, ${}^{n+3}P_n$ then n is equal to.

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16. If ${}^{m+n}P_2 = 90$ and ${}^{m-n}P_2 = 30$, find the value of m and n is equal to.

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17. Find the value of r , if

(i) ${}^{11}P_r = 990$

(ii) ${}^8P_5 + 5 \cdot {}^8P_4 = {}^9P_r$

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18. Prove that

$$1 + 1 \cdot {}^1P_1 + 2 \cdot {}^2P_2 + 3 \cdot {}^3P_3 + \dots + n \cdot {}^nP_n = {}^{n+1}P_{n+1}.$$

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19. Find the number of permutations of the letters of the words 'DADDY DID A DEADLY DEED'.

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20. How many different signal can be giving using any number of flag from flag 4 of the different colour

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21. Find the total number of 9-digit numbers which have all different digits.

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22. A five digit number divisible by 3 is to be formed using the numerals 0, 1, 2, 3, 4 and 5, without repetition. The total number of ways this can be done, is

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23. A five digit number is formed by the digits 1,2,3,4,5 without repetition. Find the probability that the number formed is divisible by 4.

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24. Find the number of permutations of letters a, n, c, d, e, f, g taken all together if neither beg nor cad pattern appear.

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25. How many words can be formed with the letters of the word 'ARIHANT' by rearranging them?

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26. Find the number of permutations of the letters of the words 'DADDY DID A DEADLY DEED'.

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27. How many words can be formed with the letters of the word 'HIGH SCHOOL' by rearranging them?

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28. A child has four pocket and three marbles. In how many ways can the child put the marbles in its pocket?

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29. There are m men and n monkeys ($n > m$). If a man have any number of monkeys. In how many ways may every monkey have a master?

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30. How many four-digit numbers can be formed by using the digits 1, 2, 3, 4, 5, 6, 7 if at least one digit is repeated.

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31. In how many ways can 4 prizes be distributed among 5 students, if no student gets all the prizes?

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32. Find the number of n digit numbers, which contain the digits 2 and 7, but not the digits 0, 1, 8, 9.

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33. Find out how many distinct three-digit numbers can be formed using all the digits of 1, 2, and 3.

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34. Find the number of permutations that can be had from the letters of the word 'OMEGA'

(i) O and A occupying end places.

(ii) E being always in the middle.



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35. In how many ways can the letters of the word 'INSURANCE' be arranged, so that the vowels are never separate?



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36. How many words can be formed with the letters of the word 'PATALIPUTRA' without changing the relative positions of vowels and consonants?



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37. Find the number of permutations that can be had from the letters of the word 'OMEGA' (i) O and A occupying end places. (ii) E being always in the middle.



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38. Find the number of ways in which 12 different beads can be arranged to form a necklace.



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39. Consider 21 different pearls on a necklace. How many ways can the pearls be placed in on this necklace such that 3 specific pearls always remain together?

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40. In how many ways can 24 persons be seated round a table, if there are 13 sets?

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41. Find the number of ways in which three americans, two british, one chinese, one dutch and one egyptiann can sit on a round table so that persons of the same nationality are separated.



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42. In how many different ways can five boys and five girls form a circle such that the boys and girls alternate?



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43. 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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44. How many necklace of 12 beads, each can be made from 18 beads of various colours?

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45. If ${}^{15}C_{3r} = {}^{15}C_{r+3}$, find ${}^r C_2$.

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46. If ${}^n C_9 = {}^n C_7$, find n.

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47. Prove that

$$\binom{n}{r} + 2\binom{n}{r-1} + \binom{n}{r-2} = \binom{n+2}{r}$$

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48. If ${}^{2n}C_3 : {}^nC_3 = 11 : 1$, find the value of n .

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49. If ${}^{n+1}C_{r+1} : {}^nC_r : {}^{n-1}C_{r-1} = 11 : 6 : 3$, find the values of n and r .

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50. If ${}^n C_r = 84$, ${}^n C_{r-1} = 36$ and ${}^n C_{r+1} = 126$, then find the value of n .

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51. The number of 24! Is divisible by

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52. Evaluate P(8,7)

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53. solve the value of ${}^n C_5 = {}^n C_3$



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54. In the next world cup of cricket there will be 12 teams, divided equally in two groups. Teams of each group will play a match against each other. From each group 3 top teams will qualify for the next round. In this round each team will play against other once. Each of the four top teams of this round will play a match against the other three. Two top teams of this round will go to the final round, where they will play the best of three matches. The minimum number of matches in the next world cup will be



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55. 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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56. How many different selections of 6 books can be made from 11 different books, if

(i) two particular books are always selected.

(ii) two particular books are never selected?

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57. A person tries to form as many different parties as he can, out of his 20 friends. Each party should consist of the

same number. How many friends should be invited at a time?

In how many of these parties would the same friends be found?



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58. Mohan has 8 friends, in how many ways he invite one or more of them to dinner?



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59. A question paper consists of two sections having respectively, 3 and 5 questions. The following note is given on the paper "it is not necessary to attempt all the

questions one questions from each section is compulsory".

In how many ways can candidate select the questions?



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60. A student is allowed to select at most n books from a collection of $(2n+1)$ books. If the total number of ways in which a student selects at least one book is 63. then n equals to -



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61. There are three books of physics, four of chemistry and five of mathematics. How many different collections can be made such that each collection consists of

(i) one book of each subject

(ii) atleast one book of each subject.

(iii) atleast one book of mathematics.



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62. Find the total number of selections of at least one red ball from a bag containing 4 red balls and 5 black balls, balls of the same colour being identical.



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63. There are p copies each of n different books. Find the number of ways in which a nonempty selection can be made from them.



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64. There are 4 oranges, 5 apples and 6 mangoes in a fruit basket. In how manyways can a person make a selection of fruits from among the fruits in the basket?



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65. Find the number of ways in which onee or more letters can be selected from the letter.

AAAAA BBBB CCC DD EFG.



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66. Find the number of proper factors of the number 38808.

Also, find sum of all these divisors.

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67. The number of even proper divisors of 1008

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68. Find the total number of proper factors of the number 35700.

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69. If $N = 10800$, find the (i) the number of divisors of the form $4m + 2$, (ii) the number of divisors which are multiple of 10 (iii) the number of divisors which are multiple of 15.

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70. Find the number of divisors of the number $N = 2^3 \cdot 3^5 \cdot 5^7 \cdot 7^9$ which are perfect squares.

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71. In how many ways the number 10800 can be resolved as a product of two factors?

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72. In how many ways the number 18900 can be split in two factors which are relatively prime or co prime

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73. In how many ways can 52 cards be distributed (i) Equally among 4 players and , (ii) Equally into 4 groups ?

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74. In how many ways can 12 different balls be divided between 2 boys, one receiving 5 and the other 7 balls? Also, in how many ways can these 12 balls be divided into groups of 5,4 and 3 balls, respectively?



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75. Find the number of ways to give 16 different things to three persons A, B, C so that B gets 1 more than A and C gets 2 more than B.



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76. In how many ways can 9 different books be distributed among three students if each receives atleast 2 books?



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77. In how many ways 5 identical balls can be distributed into 3 different boxes so that no box remains empty?

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78. In how many ways 5 different balls can be distributed into 3 boxes so that no box remains empty?

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79. In how many ways can 9 different books be distributed among three students if each receives atleast 2 books?

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80. Let $n(A) = 5$ and $n(B) = 3$ then find the number of injective functions and onto functions from A to B

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81. In how many ways 5 different balls can be arranged into 3 different boxes so that no box remains empty?

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82. Four boys picked 30 apples. The number of ways in which they can divide them if all the apples are identical is

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83. Find the number of solutions of $x + y + z + w = 20$ under the following conditions:(i) zero values of x,y,z,w are included.

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84. Find the number of integral solutions of equation $x + y + z + t = 29$, when $x \geq 1$, $y \geq 2$, $z \geq 3$ and $t \geq 0$

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85. The number of solutions to the system of equations $x_1 + x_2 + x_3 + x_4 + x_5 = 20$ and $x_1 + x_2 = 15$ when $x_k \geq 0$

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86. The number of non negative integral solutions of $3x + y + z = 24$ is

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87. If 11 members of a committee sit at a round table so that the president and secretary always sit together, then the number of arrangements, is

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88. In how many ways in which an examiner can assign 30 marks to 8 questions, giving not less than 2 marks to any

question.



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89. A bag has contains 23 balls in which 7 are identical . Then number of ways of selecting 12 balls from bag.



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90. A person writes letters to six friends and addresses the corresponding envelopes. In how many ways can the letters be placed in the envelopes so that all of them are in a wrong envelope



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91. In how many ways the sum of upper faces of four distinct dices can be six.

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92. In an examination, the maximum marks for each of the three papers are 50. Maximum marks for the fourth paper are 100. Find the number of ways in which the candidate can score 60% marks in aggregate.

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93. Find the coefficient of α^6 in the product
 $(1 + \alpha + \alpha^2)(1 + \alpha + \alpha^2)(1 + \alpha + \alpha^2 + \alpha^3)$
 $(1 + \alpha)(1 + \alpha)(1 + \alpha)$.



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94. Find the slope of line having point (2,3) and (5,6)



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95. Find the number of (i) combinations. (ii) permutations of four letters taken from the word EXAMINATIONS.



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96. Find the number of non-negative integral solutions of

$$x_1 + x_2 + x_3 + 4x_4 = 20.$$



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97. Find the number of positive unequal integral solutions of the equation $x + y + z + w = 20$.

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98. In how many ways can 15 identical blankets be distributed among six beggars such that everyone gets at least one blanket and two particular beggars get equal blankets and another three particular beggars get equal blankets.

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99. Find the number of positive integral solutions of the inequality $3x + y + z \leq 30$.

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100. In how many ways can we get a sum greater than 15 by throwing six distinct dice?

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101. In how many ways can we get a sum of at most 17 by throwing six distinct dice ? In how many ways can we get a sum greater than 17 ?

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102. Find the total number of positive integral solutions for (x, y, z) such that $xyz = 24$. Also find out the total number of integral solutions.

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103. There are 10 points in a plane out of these points no three are in the same straight line except 4 points which are collinear. How many

(i) straight lines

(ii) triangles

(iii) quadrilateral, by joining them?

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104. If ${}^{n+5}P_{n+1} = \frac{11(n-1)}{2} {}^{n+3}P_n$ then n is equal to.



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105. The interior angles of regular polygon measure 150° each. The each number of diagonals of the polygon is



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106. In a polygon the number of diagonals 77. Find the number of sides of the polygon.



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107. If n lines are drawn in a plane such that no two of them are parallel and no three of them are concurrent, such that these lines divide the plane in 67 parts, then find number of different points at which these lines will cut.

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108. Find number of rectangles in a chessboard, which are not a square.

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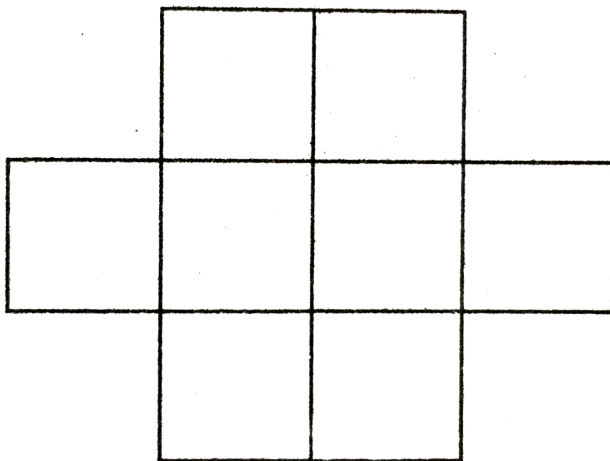
109. Find the number of rectangles excluding squares from a rectangle of size 9×6 .

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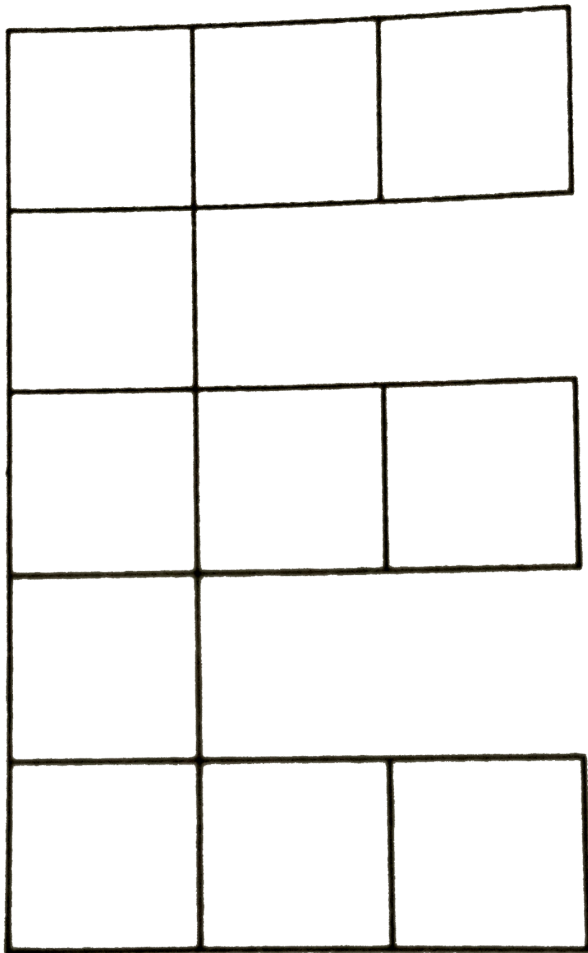
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110. Six X 's have to be placed in the squares of the figure below, such that each row contains atleast one X. in how many different ways can this be done?



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111. In how many ways the letters of the word DIPESH can be placed in the squares of the adjoining figure so that no row remains empty?



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112. If the letters of the word are arranged as in dictionary, find the rank of the following words.(0) RAJU(ii) AIRTEL(ii) UMANG

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113. If letters of the word are arranged as in dictionary, find the rank of the following words.(i) INDIA (ii) SURITI (ii) DOCOMO

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114. There are 10 candidates for an examination out of which 4 are appearing in Mathematics and remaining 6 are appearing indifferent subjects. In how many ways can they be seated in a row so that no two Mathematics candidates are together?

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115. find the volume of a cylinder with radius 7 cm and height 7cm

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116. Find the numbers of ways in which 5 girls and 5 boys can be arranged in a row if no two boys are together.



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117. Find the number of ways in which 5 girls and 5 boys can be arranged in a row if boys and girls are alternative.



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118. Find the number of permutations and combinations if $n = 12$ and $r = 2$.



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119. A is a set containing n elements. A subset P of A is chosen. The set A is reconstructed by replacing the elements

of P . A subset of A is again chosen. Find the number of ways of choosing P and Q ,

so that

(i) $P \cap Q$ contains exactly r elements.

(ii) $P \cap Q$ contains exactly 2 elements.

(iii) $P \cap Q = \phi$



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120. The sum of the digits in the unit place of all numbers formed with the help of 3,4,5,6 taken all at a time is



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121. Find the sum of all five digit numbers ,that can be formed using the digits 1, 2, 3, 4 and 5 (repetition of digits not allowed)



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122. Number of words of 4 letters that can be formed with the letters of the word IIT JEE, is

A. 42

B. 82

C. 102

D. 142

Answer: C



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123. Let y be an element of the set $A = \{1, 2, 3, 4, 5, 6, 10, 15, 30\}$ and x_1, x_2, x_3 be integers such that $x_1x_2x_3 = y$, then the number of positive integral solutions of $x_1x_2x_3 = y$ is

A. 27

B. 64

C. 81

D. 256

Answer: B



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124. The number of positive integer solutions of $a+b+c=60$, where a is a factor of b and c , is

A. 184

B. 200

C. 144

D. 270

Answer: C



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125. The number of times the digit 3 will be written when listing the integers from 1 to 1000, is

A. 269

B. 271

C. 300

D. 302

Answer: C



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126. The number of points having position vector $a\hat{i} + b\hat{j} + c\hat{k}$, where $1 \leq a, b, c \leq 5$ and $a, b, c \in N$, such that $2^a + 3^b + 5^c$ is a multiple of 4 is

A. 70

B. 140

C. 210

D. 280

Answer: A



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127. Number of positive unequal integral solutions of the equation $x + y + z = 12$ is

A. 21

B. 42

C. 63

D. 84

Answer: B



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128. 12 boys and 2 girls are to be seated in a row such that there are at least 3 boys between the 2 girls. The number of ways this can be done is $\lambda \times 12!$. The value of λ is

A. 55

B. 110

C. 20

D. 45

Answer: B



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129. A is a set containing n elements. A subset P of A is chosen. The set A is reconstructed by replacing the elements of P . A subset Q of A is again chosen, the number of ways of choosing so that $(P \cup Q)$ is a proper subset of A , is

A. 3^n

B. 4^n

C. $4^n - 2^n$

D. $4^n - 3^n$

Answer: D



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130. The sum of the first n odd number is :

A. 14

B. 17

C. 23

D. 29

Answer: A



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131. If the number of ways of selecting n cards out of unlimited number of cards bearing the number 0,9,3, so that they cannot be used to write the number 903 is 96, then n is equal to

A. 3

B. 4

C. 5

D. 6

Answer: C



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132. In a plane there two families of lines : $y=x+r$, $y=-x+r$, where $r \in \{0, 1, 2, 3, 4\}$. The number of the squares of the diagonal of length 2 formed by these lines is ____.

A. 9

B. 16

$$C. \frac{3}{2} \cdot {}^4C_2$$

$$D. 5C_2 + {}^3P_2$$

Answer: A:C

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133. Number of ways in which three numbers in A.P. can be selected from $1, 2, 3, \dots, n$ is a. $\left(\frac{n-1}{2}\right)^2$ if n is even b. $\left(\frac{n-2}{4}\right)$ if n is even c. $\left(\frac{n-1}{4}\right)^2$ if n is odd d. none of these

A. $\left(\frac{n-1}{2}\right)^2$, if n is even

B. $\frac{n(n-2)}{4}$, if n is even

C. $\frac{(n-1)^2}{4}$, if n is odd

D. $\frac{n(n+1)}{2}$, if n is odd.

Answer: B::C



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134. If n objects are arranged in a row, then the number of ways of selecting three of these objects so that no two of them are next to each other is

A. ${}^{n-2}C_3$

B. ${}^{n-3}C_3 + {}^{n-3}C_2$

C. $\frac{(n-2)(n-3)(n-4)}{6}$

D. nC_2

Answer: A::B::C



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135. Given that the divisors of $n = 3^p \cdot 5^q \cdot 7^r$ are of the form $4\lambda + 1$, $\lambda \geq 0$. Then,

- A. $p+r$ is always even
- B. $p+q+r$ is even or odd
- C. q can be any integer
- D. if p is even, then r is odd

Answer: A::B::C



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136. Number of ways in which 15 identical coins can be put into 6 different bags

(i) is coefficient of x^{15} in $x^6(1 + x + x^2 + \dots \infty)^6$, if no bag remains empty

(ii) is coefficient of x^{15} in $(1 - x)^{-6}$

(iii) is same as number of the integral solutions of

(iv) is same as number of non-negative integral solutions of

$$\sum_{i=1}^6 x_i = 15$$

A. is coefficient of x^{15} in $x^6(1 + x + x^2 + \dots \infty)^6$, if no bag remains empty

B. is coefficient of x^{15} in $(1 - x)^{-6}$

C. is same as number of the integral solutions of

$$a + b + c + d + e + f = 15$$

D. is same as number of non-negative integral solutions

$$\text{of } \sum_{i=1}^6 x_i = 15$$

Answer: A::B::D



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137. All the letters of the word 'AGAIN' be arranged and the words thus formed are known as 'Simple Words'. If a vowel appears in between two similar letters, the number of simple words is

A. 12

B. 6

C. 36

Answer: B



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138. All the letters of the word 'AGAIN' be arranged and the words thus formed are known as 'Simple Words'. Further two new types of words are defined as follows:

(i) Smart word: all the letters of the word 'AGAIN' are being used, but vowels can be repeated as many times as we need.

(ii) Dull word: All the letters of the word 'AGAIN' are being used, but consonants can be repeated as many times as we need.

Q. Number of 7 letter smart words is a. 1500 b. 1050 c. 1005
d. 150

A. 1500

B. 1050

C. 1005

D. 150

Answer: B



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139. All the letters of the word 'AGAIN' be arranged and the words thus formed are known as 'Simple Words'. Further two new types of words are defined as follows:

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(ii) Dull word: All the letters of the word 'AGAIN' are being

used, but consonants can be repeated as many times as we need.

Q. Number of 7 letter smart words is a. 1500 b. 1050 c. 1005
d. 150

A. 402

B. 420

C. 840

D. 42

Answer: B



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140. Consider a polygon of sides ' n ' which satisfies the equation $3 \cdot {}^n P_4 = {}^{n-1} P_5$

Rajdhani express travelling from Delhi to Mumbai has n station enroute. Number of ways in which a train can be stopped at 3 stations

A. 20

B. 35

C. 56

D. 84

Answer: D



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141. Consider a polygon of sides 'n' which satisfies the equation $3 \cdot {}^n P_4 = {}^{n-1} P_5$.

Q. Number of quadrilaterals thatn can be formed using the

vertices of a polygon of sides 'n' if exactly 1 side of the quadrilateral in common with side of the n-gon, is

A. 96

B. 100

C. 150

D. 156

Answer: C



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142. Consider a polygon of sides 'n' which satisfies the equation $3 \cdot {}^n P_4 = {}^{n-1} P_5$.

Q. Number of quadrilaterals that can be made using the vertices of the polygon of sides 'n' if exactly two adjacent

sides of the quadrilateral are common to the sides of the n-gon is

- A. 50
- B. 60
- C. 70
- D. 80

Answer: A



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143. Consider the number $N = 2016$. Find the Number of cyphers at the end of ${}^N C_{N/2}$ is

- A. 0

B. 1

C. 2

D. 3

Answer: C



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144. Consider the number $N = 2016$. Find the Sum of the even divisors of the number N .

A. a) 6552

B. 6448

C. 6048

D. 5733

Answer: B

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145. If ${}^{43}C_{r-6} = {}^{43}C_{3r+1}$ then the value of r is

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146. If λ be the number of 3-digit numbers are of the form xyz with $x < y$, $z \leq y$ and $x \neq 0$, the value of $\frac{\lambda}{30}$ is

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147. Match the following:

Match the following :

(a) Fluorine

(i) Metalloid

(b) Neon

(ii) Halogen

(c) Sodium

(iii) Noble gas

(d) Arsenic

(iv) Alkali metal



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148. Statement-1: Number of rectangles on a chessboard is

$$.{}^8C_2 \times .{}^8C_2.$$

Statement-2: To form a rectangle, we have to select any two of the horizontal lines and any two of the vertical lines.

A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1

- B. Statement-1 is true, statement-2 is true, statement-2 is not a correct explanation for statement-1
- C. Statement-1 is true, statement-2 is false
- D. Statement-1 is false, statement-2 is true

Answer: d

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149.

Statement-1:

If

$f: \{a_1, a_2, a_3, a_4, a_5\} \rightarrow \{a_1, a_2, a_3, a_4, a_5\}$, f is onto and

$f(x) \neq x$ for each $x \in \{a_1, a_2, a_3, a_4, a_5\}$, is equal to 44.

Statement-2: The number of derangement for n objects is

$$n! \sum_{r=0}^n \frac{(-1)^r}{r!}.$$

- A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1
- B. Statement-1 is true, statement-2 is true, statement-2 is not a correct explanation for statement-1
- C. Statement-1 is true, statement-2 is false
- D. Statement-1 is false, statement-2 is true

Answer: a

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150. Solve the inequality

$$(x + 3)(3x - 2)^5(7 - x)^3(5x + 8)^2 \geq 0$$

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151. Find the sum to n terms of the series $1^2 + 3^2 + 5^2 + \dots$ upto n terms .

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152. Find the negative terms of the sequence

$$X_n = \frac{{}^{n+4}P_4}{P_{n+2}} - \frac{143}{4P_n}$$

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153. What is the number of integers between -4 and 1

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154. 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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155. 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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156. A team of ten is to be formed from 6 male doctors and 10 nurses of whom 5 are male and 5 are female. In how many ways can this be done, if the team must have atleast 4 doctors and atleast 4 nurses with atleast 2 male nurses and at least 2 female nurses?

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157. A number of four different digits is formed with the help of the digits 1,2,3,4,5,6,7 in all possible ways. How many such numbers can be formed?

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158. India and South Africa play One Day International Series until one team wins 4 matches. No match ends in a draw. Find in how many ways series can be won ?

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159. Let n and k be positive integers such that $n \geq K(K + 1)/2$. Find the number of solutions $(x_1, x_2, x_3, \dots, x_k)$ $x_1 \geq 1, x_2 \geq 2, \dots, X_k \geq k$, all integers satisfying the condition $x_1 + x_2 + x_3 + \dots X_k = n$.

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160. Can you find an even number greater than 4 which cannot be expressed as a sum of two odd numbers ?



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161. How many different numbers which are smaller than 2×10^8 and are divisible by 3, can be written by means of the digits 0,1 and 2?



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162. There are n straight lines in a plane such that n_1 of them are parallel in one direction, n_2 are parallel in different direction and so on, n_k are parallel in another direction such that $n_1 + n_2 + \dots + n_k = n$. Also, no three of the given lines meet at a point. prove that the total

number of points of intersection is $\frac{1}{2} \left\{ n^2 - \sum_{r=1}^k n_r^2 \right\}$.



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163. There are p intermediate stations on a railway line from one terminus to another. In how many ways a train can stop at 3 of these intermediate stations if no two of those stopping stations are to be consecutive?



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164. How many different seven digit numbers are there, the sum of whose digits is even?



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165. In an examination, there are three multiple choice questions and each question has four choices. Number of ways in which a student can fail to get all answers correct, is

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166. Find the number of triangles whose angular points are at the angular points of a given polygon of n sides, but none of whose sides are the sides of the polygon.

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167. Find n , if $(n + 2)! = 60 \times (n - 1)!$

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Jee Type Solved Examples Single Matching Type Questions

1. Solve the quadratic equation $2x^2 + 3x - 6 = 0$ using the formula

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Exercise For Session 1

1. There are three routes: air, rail and road for going from Chennai to Hyderabad. But from Hyderabad to Vikarabad, there are two routes, rail and road. The number of routes from Chennai to Vikarabad via Hyderabad is:

A. (a) 4

B. (b) 5

C. (c) 6

D. (d) 7

Answer: C



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2. There are 6 books on mathematics, 4 books on physics and 5 books on chemistry in a book shop. The number of ways can a student purchase either a book on mathematics or a book on chemistry, is

A. 10

B. 11

C. 8

D. 15

Answer: B



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3. If a , b and c are three consecutive positive integers such that $\frac{1}{a!} + \frac{1}{b!} = \frac{\lambda}{c!}$ then find the value of root under lambda .

A. a

B. b

C. c

D. $a+b+c$

Answer: C



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4. If $n!$, $3 \times n!$ and $(n+1)!$ are in G P, then $n!$, $5 \times n!$ and $(n+1)!$ are in

A. i) AP

B. ii) GP

C. iii) HP

D. iv) AGP

Answer: A



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5. Sum of the series $\sum_{r=1}^n (r^2 + 1)r!$ is

A. $(n + 1)!$

B. $(n + 2)! - 1$

C. $n \cdot (n + 1)!$

D. $n \cdot (n + 2)!$

Answer: C



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6. If the roots of equation $a x^2 + bx + c = 0$ are equal and have opposite signs, then which one of the following

statements is correct?

A. (a) $b = 0$

B. (b) $a = 0$

C. (c) $c = 0$

D. (d) None of this

Answer: B



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7. Find the number of naughts standing at the end of $125!$.

a) 29

b) 30

c) 31

c) 32

A. 29

B. 30

C. 31

D. 32

Answer: C



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8. Find the exponent of 3 in $100!$.

A. 24

B. 25

C. 47

D. 48

Answer: C



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9. The number $24!$ is divisible by

A. 6^{24}

B. 24^6

C. 12^{12}

D. 48^5

Answer: B



Watch Video Solution

10. The last non-zero number at the end of $20!$ is ?

a) 2

b) 4

c) 6

d) 8

A. 2

B. 4

C. 6

D. 8

Answer: B



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11. The number of prime numbers among the numbers $105! + 2, 105! + 3, 105! + 4, \dots, 105! + 104, 105! + 105,$ is

(a) 31 (b) 32 (c) 33 (d) None of these

A. 31

B. 32

C. 33

D. None of these

Answer: D



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1. If ${}^n P_5 = 20 \cdot {}^n P_3$, find the value of n .

A. 4

B. 8

C. 6

D. 7

Answer: B



Watch Video Solution

2. If ${}^9 P_5 + 5 {}^9 P_4 = {}^{10} P_r$, then r equals

A. 3

B. 4

C. 5

D. 6

Answer: C



Watch Video Solution

3. If ${}^{m+n}P_2 = 56$ and ${}^{m-n}P_3 = 24$, then $\frac{{}^mP_3}{{}^nP_2}$ equals

A. 20

B. 40

C. 60

D. 80

Answer: C



Watch Video Solution

4. If ${}^{2n+1}P_{n-1} : {}^{2n-1}P_n = 7:10$, then ${}^n P_3$ equals

A. 60

B. 24

C. 120

D. 6

Answer: D



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5. If five seats are vacant in a train, the number of ways three passengers can sit is:

a) 10

b) 20

c) 30

d) 60

A. (a) 10

B. (b) 20

C. (c) 30

D. (d) 60

Answer: D



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6. If a denotes the number of permutations of $(x + 2)$ things taken all at a time, b the number of permutations of x

things taken 11 at a time and c the number of permutations of $x - 11$ things taken all at a time such that $a = 182bc$, find the value of x .

a) 10

b) 12

c) 15

d) 18

A. 10

B. 12

C. 15

D. 18

Answer: B



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7. The number of nine nonzero digits such that all the digits in the first four places are less than the digit in the middle and all the digits in the last four places are greater than that in the middle is

a. $2(4!)$

b. $3(7!) / 2$

c. $2(7!)$

d. ${}^4P_4 \times {}^4P_4$

A. 48

B. 7560

C. 10080

D. 696

Answer: D

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8. Total number of words that can be formed using all letters of the word "DIPESH" that neither begins with 'I' nor ends with 'D' is equal to

A. 504

B. 480

C. 624

D. 969

Answer: A

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9. The number of all five digit numbers which are divisible by 4 that can be formed from the digits 0,1,2,3,4 (without repetition) is a. 36 b. 30 c. 34 d. None of these

A. 36

B. 30

C. 34

D. None of these

Answer: B



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10. How many words can be formed with the letters of the word MATHEMATICS by rearranging them.

A. $\frac{11!}{2!2!}$

B. $\frac{11!}{2!}$

C. $\frac{11!}{2!2!2!}$

D. $11!$

Answer: C



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11. Six identical coins are arranged in a row. The total number of ways in which the number of heads is equal to the number of tails is

A. 9

B. 20

C. 40

D. 120

Answer: B



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12. A train time table must be compiled for various days of the week, so that two trains twice a day depart for three days, one train daily for two days, and three trains once a day for two days. How many different time tables can be compiled? a. 140 b. 210 c. 133 d. 72

A. 140

B. 210

C. 133

D. 72

Answer: B



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13. Five persons entered the lift cabin on the ground floor of a 8 floor house. Suppose each of them can leave the cabin independently at any floor beginning with the first. The total number of ways in which each of the five person can leave the cabin at any one of the 7 floor, is

(a) 5^7 (b) 7^5 (c) 35 (d) 2520

A. 5^7

B. 7^5

C. 35

D. 2520

Answer: B



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14. Four die are rolled. The number of ways in which atleast one die shows 3, is

A. 625

B. 671

C. 1256

D. 1296

Answer: B



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15. The number of four-digit numbers that can be made with the digits 1, 2, 3, 4, and 5 in which at least two digits are identical is a. $4^5 - 5!$ b. 505 c. 600 d. none of these

A. $4^5 - 5!$

B. 505

C. 600

D. 120

Answer: B



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16. There are unlimited number of identical balls of three different colours. How many arrangements of atmost 7 balls in a row can be made by using them?

(a) 2187 (b) 343 (c) 399 (d) 3279

A. 2187

B. 343

C. 399

D. 3279

Answer: D



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Exercise For Session 3

1. How many words can be formed from the letters of the word 'COURTESY' whose first letter is C and the last letter is Y?

- A. $6!$
- B. $8!$
- C. $2(6)!$
- D. $2(7)!$

Answer: A



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2. The number of words of that can be made by writing down the letters of the word CALCULATE such that each word starts and ends with a consonant, is

A. $\frac{3}{2}(7)!$

B. $2(7)!$

C. $\frac{5}{2}(7)!$

D. $3(7)!$

Answer: C



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3. The number of words which can be formed from the letters of the word "MAXIMUM" if two consonants cannot

occur together?

A. $4!$

B. $3! \times 4!$

C. $3!$

D. $\frac{4!}{3!}$

Answer: A



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4. All the letters of the word EAMCET are arranged in all possible ways. The number such arrangements in which no two vowels are adjacent to each other is

A. i) 54

B. ii) 72

C. iii) 114

D. iv) 360

Answer: B



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5. How many words can be formed with the letters of the word 'DELHI' if E and H never occur together?

A. i) 6

B. ii) 72

C. iii) 24

D. iv) 60

Answer: C



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6. In how many ways can 5 boys and 3 girls sit in a row so that no two girls are together ?

A. $5! \times 3!$

B. ${}^4 P_3 \times 5!$

C. ${}^6 P_3 \times 5!$

D. ${}^5 P_3 \times 3!$

Answer: C



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7. There are n numbered seats around a round table. Total number of ways in which n_1 ($n_1 < n$) persons can sit around the round table, is equal to

A. ${}^n C_{n_1}$

B. ${}^n P_{n_1}$

C. ${}^n C_{n_1 - 1}$

D. ${}^n P_{n_1 - 1}$

Answer: B



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8. In how many ways 7 men and 7 women can be seated around a round table such that no two women can sit

together

A. $7!$

B. $7! \times 6!$

C. $(6!)^2$

D. $(7!)^2$

Answer: B



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9. Find number of ways that 8 beads of different colors be strung as a necklace.

A. 2520

B. 2880

C. 4320

D. 5040

Answer: A



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10. A committee of 11 members sits at a round table. In how many ways can they be seated if the 'President' and the 'Secretary' choose to sit together?

A. $9! \times 2$

B. $10!$

C. $10! \times 2$

D. $11!$

Answer: A



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11. In how many ways can 15 members of a council sit along a circular table, when the secretary is to sit on one side of the chairman and the deputy secretary on the other side?

A. $12! \times 2$

B. 24

C. $15! \times 2$

D. 30

Answer: A



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Exercise For Session 4

1. If ${}^{43}C_{r-6} = {}^{43}C_{3r+1}$ then the value of r is

- A. 6
- B. 8
- C. 10
- D. 12

Answer: D



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2. If ${}^n C_0 + {}^n C_1 + {}^n C_2 + \dots + {}^n C_n = 1023$, then $n =$

A. 18

B. 20

C. 22

D. 24

Answer: B



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3. If ${}^{20}C_{n+1} = {}^n C_{16}$, then the value of n is

A. 7

B. 10

C. 13

D. None of these

Answer: D



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4. The value of expression ${}^{47}C_4 + \sum_{j=1}^5 {}^{(52+j)}C_3$ is equal to

A. ${}^{47}C_6$

B. ${}^{52}C_5$

C. ${}^{52}C_4$

D. None of these

Answer: C



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5. If ${}^n C_3 + {}^n C_4 > {}^{n+1} C_3$, then.

A. $n > 6$

B. $n < 6$

C. $n > 7$

D. $n < 7$

Answer: A



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6. The solution set ${}^{10} C_{x-1} > 2 \cdot {}^{10} C_x$ is

A. $\{1,2,3\}$

B. $\{4,5,6\}$

C. {8,9,10}

D. {9,10,11}

Answer: C



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7. if ${}^{2n}C_2 : {}^nC_2 = 9:2$ and ${}^nC_r = 10$, then r is equal to

A. 2

B. 3

C. 4

D. 5

Answer: A



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8. If ${}^{2n}C_3 : {}^nC_2 = 44 : 3$, for which of the following value of r , the value of nC_r will be 15.

A. $r=3$

B. $r=4$

C. $r=5$

D. $r=6$

Answer: B



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9. If ${}^n P_r = {}^n P_{r+1}$ and ${}^n C_r = {}^n C_{r-1}$, then the value of $n + r$ is.

A. 2

B. 3

C. 4

D. 5

Answer: B



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10. If ${}^n P_r = 840$, ${}^n C_r = 35$, then find $n =$

A. 1

B. 3

C. 5

D. 7

Answer: D



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11. If ${}^n P_3 + {}^n C_{n-2} = 14n$, the value of n is

A. 5

B. 6

C. 8

D. 10

Answer: A



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12. There are 12 volleyball players in all in a college, out of which a team of 9 players is to be formed. The captain always remains the same, then in how many ways can the team be formed ?

A. 36

B. 99

C. 108

D. 165

Answer: D

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13. In how many ways can a team 11 players be formed out of 25 players, if 6 out of them are always to be included and 5 always to be excluded

A. 2002

B. 2008

C. 2020

D. 8002

Answer: A

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14. A man has 10 friends. In how many ways he can invite one or more of them to a party?

A. $10!$

B. 2^{10}

C. $10! - 1$

D. $2^{10} - 1$

Answer: D



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15. In an examinations there are three multiple choice questions and each questions has 4 choices. Find the

number of ways in which a student can fail to get all answer correct.

A. 11

B. 12

C. 27

D. 63

Answer: D



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16. In an election, the number of candidates is one greater than the persons to be elected. If a voter can vote in 254 ways, the number of candidates is

A. 6

B. 7

C. 8

D. 10

Answer: C



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17. Find the number of groups that can be made from 5 different green balls, 4 different blue balls and 3 different red balls, if at least 1 green and 1 blue ball is to be included.

A. 3700

B. 3720

C. 4340

D. None of these

Answer: B



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18. A person is permitted to select at least one and at most n coins from a collection of $(2n+1)$ distinct coins. If the total number of ways in which he can select coins is 255, then find the value of n .

A. 4

B. 8

C. 16

D. 32

Answer: A



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Exercise For Session 5

1. There are 4 oranges, 5 apples and 6 mangoes in a fruit basket and all fruits of the same kind are identical. In how many ways can a person make a selection of fruits from among the fruits in the basket?

A. 124

B. 125

C. 210

D. 168

Answer: C



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2. In a city no two persons have identical set of teeth and there is no person without a tooth. Also no person has more than 32 teeth. If we disregard the shape and size of tooth and consider only the positioning of the teeth, the maximum population of the city is

A. $(a)2^{32}$

B. $(b)(32)^2 - 1$

C. $(c)2^{32} - 1$

D. $(d)2^{31}$

Answer: C



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3. If $a_1, a_2, a_3, \dots, a_{n+1}$ be $(n + 1)$ different prime numbers, then the number of different factors (other than 1) of $a_1^m \cdot a_2 \cdot a_3 \dots a_{n+1}$, is

A. $(a) m + 1$

B. $(b) (m + 1)2^n$

C. $(c) m \cdot 2^n + 1$

D. (d) None of these

Answer: D



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4. Find the total number of proper factors of the number 35700.

A. 34

B. 35

C. 36

D. 37

Answer: A



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5. The sum of the divisors of $2^5 \times 3^4 \times 5^2$, is

A. $3^2 \cdot 7^1 \cdot 11^2$

B. $3^2 \cdot 7^1 \cdot 11^2 \cdot 31$

C. $3 \cdot 7 \cdot 11 \cdot 31$

D. None of these

Answer: B



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6. The number of odd proper divisors of

$3^p \cdot 6^q \cdot 15^r$, $\forall p, q, r, \in N$, is

A. (a) $(p+q+1)(q+r+1)(r+1)$

B. (b) $(p+q+1)(q+r+1)(r+1)-2$

C. (c) $(p+q)(q+r)r-2$

D. (d) $(p+q)(q+r)r$

Answer: B

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7. The number of odd proper divisors of $3^p \cdot 6^q \cdot 15^r$, $\forall p, q, r, \in N$, is

A. $(p + 1)(q + 1)(r + 1) - 2$

B. $(p + 1)(q + 1)(r + 1) - 1$

C. $(p + q + r + 1)(r + 1) - 2$

D. $(p + q + r + 1)(r + 1) - 1$

Answer: D



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8. The number of proper divisors of 1800, which are also divisible by 10, are: a. 18 b. 27 c. 34 d. 43

A. 18

B. 27

C. 34

D. 43

Answer: A



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9. Total number of divisors of 480 that are of the form $4n+2$, $n \geq 0$, is equal to

A. 2

B. 3

C. 4

D. 5

Answer: C



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10. Total number of divisors of $N = 2^5 \cdot 3^4 \cdot 5^{10} \cdot 7^6$ that are of the form $4n + 2$, $n \geq 1$, is equal to

A. 54

B. 55

C. 384

D. 385

Answer: C



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11. Total number of divisors of $n = 3^5 \cdot 5^7 \cdot 7^9$ that are in the form of $4\lambda + 1$; $\lambda \geq 0$ is equal to

A. 15

B. 30

C. 120

D. 240

Answer: D



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12. In how many ways 12 different books can be distributed equally among 3 persons?

A. $\frac{12!}{(4!)^3}$

B. $\frac{12!}{(3!)^4}$

C. $\frac{12!}{(4!)^4}$

D. $\frac{12!}{(3!)^3}$

Answer: A





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13. Number of ways in which 12 different things can be distributed in 3 groups, is

A. $\frac{12!}{(4!)^3}$

B. $\frac{12!}{3!(4!)^3}$

C. $\frac{12!}{4!(3!)^2}$

D. $\frac{12!}{(3!)^4}$

Answer: B



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14. Number of ways in which 12 different things can be divided among five persons so that they can get 2,2,2,3,3 things respectively is

A. $A. \frac{12!}{(3!)^2(2!)^3}$

B. $B. \frac{12!5!}{(3!)^2(2!)^3}$

C. $C. \frac{12!}{(3!)^3(2!)^4}$

D. $D. \frac{12!5!}{(3!)^2(2!)^4}$

Answer: C



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15. Number of ways in which 12 different things can be divided among five persons so that they can get 2,2,2,3,3

things respectively is

A. $\frac{12!}{(3!)^2(2!)^3}$

B. $\frac{12!5!}{(3!)^2(2!)^3}$

C. $\frac{12!}{(3!)^2(2!)^4}$

D. $\frac{12!5!}{(3!)^2(2!)^4}$

Answer: B



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16. The total number of ways in which $2n$ persons can be divided into n couples is a. $\frac{2n!}{n!n!}$ b. $\frac{2n!}{(2!)^3}$ c. $\frac{2n!}{n!(2!)^n}$ d.

none of these

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

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

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

D. None of these

Answer: C



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17. n different toys have to be distributed among n children.

Find the number of ways in which these toys can be distributed so that exactly one child gets no toy.

A. $n!$

B. $n! \cdot {}^n C_2$

C. $(n - 1)! \cdot {}^n C_2$

D. $n! \cdot {}^{n-1}C_2$

Answer: B



Watch Video Solution

18. In how many ways can 8 different books be distributed among 3 students if each receives at least 2 books?

- A. 490
- B. 980
- C. 2940
- D. 5880

Answer: C



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Exercise For Session 6

1. If number of ways in which 7 different balls can be distributed into 4 boxes, so that no box remains empty is 48λ , the value of λ is

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2. If number of ways in which 7 different balls can be distributed into 4 boxes, so that no box remains empty is 48λ , the value of λ is

A. 231

B. 331

C. 175

D. 531

Answer: C



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3. If number of ways in which 7 identical balls can be distributed into 4 boxes, so that no box remains empty is 4λ , the value of λ is

A. 5

B. 7

C. 9

D. 11

Answer: A



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4. Number of non-negative integral solutions of the equation $a+b+c=6$ is a. 28 b. 32 c. 36 d. 56

A. 28

B. 32

C. 36

D. 56

Answer: A



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5. The number of integral solutions of $x + y + z = 0$ with $x \geq -5, y \geq -5, z \geq -5$ is a. 134 b. 136 c. 138 d. 140

A. 272

B. 136

C. 138

D. 120

Answer: B



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6. If a, b and c are integers and $a \geq 1, b \geq 2$ and $c \geq 3$. If $a + b + c = 15$, the number of possible solutions of the equation is

A. 55

B. 66

C. 45

D. None of these

Answer: A



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7. Number of integral solutions of

$$2x + y + z = 10 \quad (x \geq 0, y \geq 0, Z \geq 0) \text{ is}$$

A. 18

B. 27

C. 36

D. 51

Answer: C



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8. A person writes letters to six friends and addresses the corresponding envelopes. In how many ways can the letters be placed in the envelopes so that all of them are in a wrong envelope

A. 719

B. 265

C. 454

D. None of these

Answer: C



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9. The number of selections of four letters from the letters of the word ASSASSINATION is

A. 72

B. 71

C. 66

D. 52

Answer: A



Watch Video Solution

10. Find the number of solutions of $4\{x\} = x + [x]$.

A. 20

B. 22

C. 23

D. None of these

Answer: D



Watch Video Solution

11. If $a, b,$ and c are positive integers such that $a+b+c \leq 8$, the number of possible values of the ordered triplet (a,b,c) is

A. 84

B. 56

C. 83

D. None of these

Answer: B



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12. The total number of positive integral solution of $15 < x_1 + x_2 + x_3 \leq 20$ is equal to

a. 685

b. 785

c. 1125

d. none of these

A. 685

B. 785

C. 1125

D. None of these

Answer: A



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13. Find the sum of all 2 digits no. which when divided by 9, it leaves a remainder 3?



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14. There are 12 points in a plane in which 6 are collinear. Number of different straight lines that can be drawn by joining them, is a.51 b.52 c.132 d.18

A. 51

B. 52

C. 132

D. 18

Answer: B

15. 4 points out of 11 points in a plane are collinear. Number of different triangles that can be drawn by joining them, is a. 165 b. 161 c. 152 d. 159

A. 165

B. 161

C. 152

D. 159

Answer: B



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16. The number of triangles that can be formed with 10 points as vertices n of them being collinear, is 10. Then n is a.

3 b. 4 c. 5 d. 6

A. 3

B. 4

C. 5

D. 6

Answer: C



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17. ABCD is a convex quadrilateral and 3, 4, 5, and 6 points are marked on the sides AB, BC, CD, and DA, respectively. The number of triangles with vertices on different sides is

A. 270

B. 220

C. 282

D. None of these

Answer: D

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18. There are 10 points in a plane of which no three points are collinear and four points are concyclic. The number of different circles that can be drawn through at least three points of these points is

A. 116

B. 120

C. 117

D. None of these

Answer: C



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19. 4 points out of 8 points in a plane are collinear. Number of different quadrilateral that can be formed by joining them is

A. 56

B. 60

C. 76

D. 53

Answer: D



Watch Video Solution

20. There are $2n$ points in a plane in which m are collinear.

Number of quadrilaterals formed by joining these lines: a. is

equal to ${}^{2n}C_4 - {}^mC_4$ b. is greater than ${}^{2n}C_4 - {}^mC_4$ c. is

less than ${}^{2n}C_4 - {}^mC_4$ d. None of these

A. is equal to ${}^{2n}C_4 - {}^mC_4$

B. is greater than ${}^{2n}C_4 - {}^mC_4$

C. is less than ${}^{2n}C_4 - {}^mC_4$

D. None of these

Answer: C

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21. In a polygon the number of diagonals is 54. The number of sides of the polygon, is A. 10 B. 12 C. 9 D. None of these

A. 10

B. 12

C. 9

D. None of these

Answer: B

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22. In a polygon, no three diagonals are concurrent. If the total number of points of intersection of diagonals interior to the polygon is 70, then the number of diagonals of the polygon is

A. 20

B. 28

C. 8

D. None of these

Answer: A



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23. If n lines are drawn in a plane such that no two of them are parallel and no three of them are concurrent, then find number of different points at which these lines will cut.

A. $\sum_{k=1}^{n-1} k$

B. $n(n - 1)$

C. n^2

D. None of these

Answer: A



Watch Video Solution

24. Six straight lines are in a plane such that no two are parallel & no three are concurrent. The number of parts in

which these lines divide the plane will be

A. 15

B. 22

C. 29

D. 36

Answer: B



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25. The parallelogram is cut by two sets of m lines parallel to its sides. The numbers parallelogram thus formed, is

A. $({}^m C_2)^2$

B. $({}^{m+1} C_2)^2$

C. $({}^{m+2}C_2)^2$

D. None of these

Answer: C

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26. The number of rectangles excluding squares from a rectangle of size 11×8 is 48λ , then the value of λ is

A. 13

B. 23

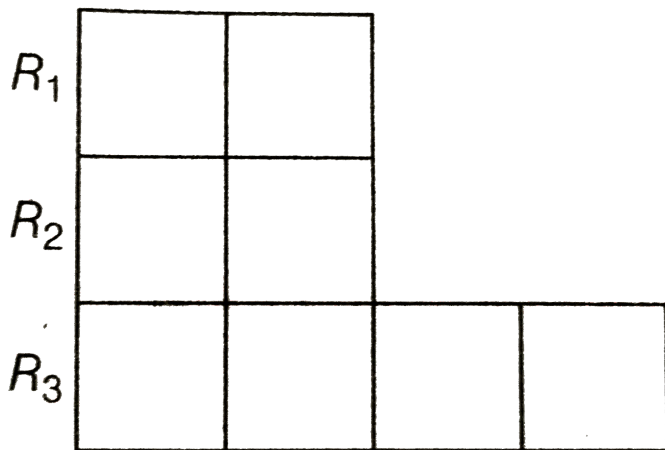
C. 43

D. 53

Answer: C

 Watch Video Solution

27. The number of ways the letters of the word PERSON can be placed in the squares of the figure shown so that no row remain empty is



A. $24 \times 6!$

B. $26 \times 6!$

C. $26 \times 7!$

D. $27 \times 7!$

Answer: B



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Exercise For Session 7

1. The letters of the word 'DELHI' are arranged in all possible ways as in a dictionary, the rank of the word 'DELHI' is

A. 3

B. 5

C. 6

D. 7

Answer: B



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2. The letters of the word "KANPUR" are arranged in all possible ways as in a dictionary, the rank of the word 'KANPUR' from last is

A. 121

B. 122

C. 598

D. 599

Answer: D



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3. The letters of the word "MUMBAI" are arranged in all possible ways as in a dictionary, the rank of the word 'MUMBAI' is

A. 297

B. 295

C. 299

D. 301

Answer: A



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4. The letters of the word "CHENNAI" are arranged in all possible ways as in a dictionary, then rank of the word "CHENNAI" from last is

- A. 2016
- B. 2017
- C. 2018
- D. 2019

Answer: C



[Watch Video Solution](#)

5. If all the letters of the word 'AGAIN' be arranged as in a dictionary, then fiftieth word is

A. NAAGI

B. NAGAI

C. NAAIG

D. NAIAG

Answer: C



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Exercise Single Option Correct Type Questions

1. A lady gives a dinner party to 5 guests to be selected from nine friends. The number of ways of forming the party of 5, given that two of the friends will not attend the party together, is

A. 56

B. 126

C. 91

D. None of these

Answer: C



Watch Video Solution

2. If a, b, c and d are odd natural numbers such that $a+b+c+d=20$, the number of values of the ordered quadruplet (a, b, c, d) is

A. 165

B. 455

C. 310

D. None of these

Answer: A



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3. If $l = \text{LCM of } 8!, 10! \text{ and } 12!$ and $h = \text{HCF of } 8!, 10!$ and $12!$ then $\frac{l}{h}$ is equal to

A. 132

B. 11800

C. 11880

D. None of these

Answer: C



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4. The number of positive integers satisfying the inequality

$$C(n + 1, n - 2) - C(n + 1, n - 1) \leq 100 \text{ is}$$

A. 9

B. 8

C. 5

D. None of these

Answer: B



Watch Video Solution

5. The number of ways in which a score of 11 can be made from a throw by three persons, each throwing a single die once, is

A. 45

B. 18

C. 27

D. 68

Answer: C



Watch Video Solution

6. The number of positive integers with the property that they can be expressed as the sum of the cubes of 2 positive

integers in two different ways is

A. 1

B. 100

C. infinite

D. 0

Answer: C

 [Watch Video Solution](#)

7. In a plane there are 37 straight lines, of which 13 passes through the point A and 11 passes through point B. Besides, no three lines passes through one point no line passes through both points A and B and no two are parallel, then find the number of points of intersection of the straight line.

A. 535

B. 601

C. 728

D. 963

Answer: A



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8. If a denotes the number of permutations of $(x + 2)$ things taken all at a time, b the number of permutations of x things taken 11 at a time and c the number of permutations of $x - 11$ things taken all at a time such that $a = 182bc$, find the value of x .

a) 10

b) 12

c) 15

d) 18

A. 15

B. 12

C. 10

D. 18

Answer: B



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9. The number of numbers less than 1000 than can be formed out of the digits 0,1,2,3,4 and 5, no digit being repeated, as

A. 130

B. 131

C. 156

D. 158

Answer: B



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10. If the permutations of a, b, c, d, e taken all together be written down in alphabetical order as in dictionary and numbered then the rank of the permutation debac, is

A. 90

B. 91

C. 92

D. 93

Answer: D



Watch Video Solution

11. On a railway there are 20 stations. The number of different tickets required in order that it may be possible to travel from every station to every station is

A. 210

B. 225

C. 196

D. 105

Answer: A



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12. State $\{ 2, 3, 4 \}$ is a subset of $\{ 1, 2, 3, 4, 5 \}$?



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13. The straight lines I_1, I_2, I_3 are parallel and lie in the same plane. A total number of m point are taken on I_1 , n points on I_2 , k points on I_3 . The maximum number of triangles formed with vertices at these points are

A. ${}^{m+n+k}C_3$

B. ${}^{m+n+k}C_3 - {}^mC_3 - {}^nC_3 - {}^kC_3$

C. ${}^m C_3 + {}^n C_3 + {}^k C_3$

D. None of these

Answer: B



Watch Video Solution

14. Let A be a set of n (≥ 3) distinct elements. The number of triplets (x, y, z) of the A elements in which at least two coordinates is equal to

A. ${}^n P_3$

B. $n^3 - {}^n P_3$

C. $3n^2 - 2n$

D. $3n^2(n - 1)$

Answer: B



Watch Video Solution

15. The total number of five-digit numbers of different digits in which the digit in the middle is the largest is a.

$\sum_{n=4}^9 {}^n P_4$ b. $33(3!)$ c. $30(3!)$ d. $\sum_{n=3}^8 n^n P_3$

A. $2^2 \cdot 3^2 \cdot 7^2$

B. $2^3 \cdot 3 \cdot 7^3$

C. $2^2 \cdot 3^3 \cdot 7^2$

D. $2^3 \cdot 3^2 \cdot 7^3$

Answer: C



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16. The total number of words that can be formed using all letters of the word 'RITESH' that neither begins with I nor ends with R, is

A. 504

B. 480

C. 600

D. 720

Answer: A



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17. A man has three friends. The number of ways he can invite one friend everyday for dinner on six successive nights so that no friend is invited more than three times is a. 640 b. 320 c. 420 d. 510

A. 360

B. 420

C. 170

D. 510

Answer: D



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18. The number of three digit numbers of the form xyz such that $x < y$, $z \leq y$ and $x \neq 0$, is

A. 240

B. 244

C. 276

D. 285

Answer: C



[Watch Video Solution](#)

19. The letters of the word 'MEERUT' are arranged in all possible ways as in a dictionary, then the rank of the word 'MEERUT' is

A. 119

B. 120

C. 121

D. 122

Answer: D



Watch Video Solution

20. Find the number of ways in which 10 candidates A_1, A_2, \dots, A_{10} can be ranked so that A_1 is always above A_2 ,

A. $10!$

B. $\frac{10!}{2}$

C. 9!

D. None of these

Answer: B



Watch Video Solution

21. Let A be the set of 4-digit numbers $a_1a_2a_3a_4$ where $a_1 > a_2 > a_3 > a_4$, then $n(A)$ is equal to

A. 126

B. 84

C. 210

D. None of these

Answer: C



Watch Video Solution

22. 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?

A. 15

B. 13

C. 12

D. 11

Answer: D



Watch Video Solution

23. Find the total number of positive integral solutions for (x,y,z) such that $xyz = 24$.

A. 30

B. 36

C. 90

D. 120

Answer: D



[Watch Video Solution](#)

24. ABCD is a convex quadrilateral and 3, 4, 5, and 6 points are marked on the sides AB, BC, CD, and DA, respectively. The

number of triangles with vertices on different sides is

A. 220

B. 270

C. 282

D. 342

Answer: D



Watch Video Solution

25. In how many ways can a team of 6 horses be selected out of a stud of 16, so that there shall always be three out of A B C A B C, but never A A, B B or C C together a. 840 b. 1260 c. 960 d. 720

A. 720

B. 840

C. 960

D. 1260

Answer: C



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26. The number of polynomials of the form $x^3 + ax^2 + bx + c$ that are divisible by $x^2 + 1$, where $a, b, c \in \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$, is

A. 10

B. 15

C. 5

D. 8

Answer: A



Watch Video Solution

27. Let $x_1, x_2, x_3, \dots, x_k$ be the divisors of positive integer ' n ' (including 1 and x). If $x_1 + x_2 + \dots + x_k = 75$, then

$\sum_{i=1}^k \frac{1}{x_i}$ is equal to:

A. (a) $\frac{k^2}{75}$

B. (b) $\frac{75}{k}$

C. (c) $\frac{n^2}{75}$

D. (d) $\frac{75}{n}$

Answer: D



View Text Solution

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

A. 35

B. 30

C. 50

D. 60

Answer: A



Watch Video Solution

29. Ten persons numbered 1, 2, ..., 10 play a chess tournament, each player against every other player exactly one game. It is known that no game ends in a draw. If w_1, w_2, \dots, w_{10} are the number of games won by players 1, 2, 3, ..., 10, respectively, and l_1, l_2, \dots, l_{10} are the number of games lost by the players 1, 2, ..., 10, respectively, then

A. $\sum w_i^2 + 81 = \sum l_i^2$

B. $\sum w_i^2 + 81 = \sum l_i^2$

C. $\sum w_i^2 = \sum l_i^2$

D. None of these

Answer: C



Watch Video Solution

30. In the next world cup of cricket there will be 12 teams, divided equally in two groups. Teams of each group will play a match against each other. From each group 3 top teams will qualify for the next round. In this round each team will play against other once. Each of the four top teams of this round will play a match against the other three. Two top teams of this round will go to the final round, where they will play the best of three matches. The minimum number of matches in the next world cup will be

A. 54 B. 53 C. 38 D. 37

B.

C.

D.

Answer: B



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Exercise More Than One Correct Option Type Questions

1. If $300! = 3^m \times$ an integer, then find the value of m .

A. $m=148$

B. $m=150$

C. It is equivalent to number of n is $150! = 2^{n-2} \times$ an integer

D. $m = .^{150} C_2$

Answer: A



Watch Video Solution

2. If $102! = 2^\alpha \cdot 3^\beta \cdot 5^\gamma \cdot 7^\delta \dots$, then

A. (a) $\alpha = 98$

B. (b) $\beta = 2\gamma + 1$

C. (c) $\alpha = 2\beta$

D. (d) $2\gamma = 3\delta$

Answer: A::B::C::D



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3. The number of ways of choosing triplet (x, y, z) such that

$z \geq \max \{x, y\}$ and $x, y, z \in \{1, 2, n, n + 1\}$ is a.

$${}^{n+1}C_3 + {}^{n+2}C_3 \quad \text{b.} \quad \frac{n(n+1)(2n+1)}{6} \quad \text{c.}$$

$$1^2 + 2^2 + \dots + n^2 \quad \text{d.} \quad 2({}^{n+2}C_3) - {}^{n+1}C_2$$

A. ${}^{n+1}C_3 + {}^{n+2}C_3$

B. $\frac{n(n+1)(2n+1)}{6}$

C. $1^2 + 2^2 + 3^2 + \dots + n^2$

D. $2({}^{n+2}C_3) - {}^{n+1}C_2$

Answer: A::B::C::D

 **Watch Video Solution**

4. Let n be 4-digit integer in which all the digits are different.

If x is the number of odd integers and y is the number of even integers, then

a. $x < y$

b. $x > y$

c. $x + y = 4500$

d. $|x - y| = 56$

A. $x < y$

B. $x > y$

C. $x + y = 4500$

D. $|x - y| = 56$

Answer: A::D



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5. Let $S = \{1, 2, 3, \dots, n\}$. If X denotes the set of all subsets of S containing exactly two elements, then the value

of $\sum_{A \in X} (\min. A)$ is given by

A. ${}^{n+1}C_3$

B. nC_3

C. $\frac{n(n^2 - 1)}{6}$

D. $\frac{n(n^2 - 3n + 2)}{6}$

Answer: A::C



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6. Let $p=2520$, x =number of divisors of p which are multiple of 6, y =number of divisors of p which are multiple of 9, then

A. $x=12$

B. $x=24$

C. $y=12$

D. $y=16$

Answer: B::D

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7. If n denotes the number of ways of selecting r objects of out of n distinct objects ($r \geq n$) with unlimited repetition but with each object included at least once in selection, then n is equal to

a. ${}^{r-1}C_{r-n}$ b. ${}^{r-1}C_n$ c. ${}^{r-1}C_{n-1}$ d. none of these

A. ${}^{r-1}C_{r-n}$

B. ${}^{r-1}C_n$

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

D. ${}^{r-1}C_{r-n-1}$

Answer: A::C



View Text Solution

8. There are three teams $x, x + 1$ and y childrens and total number of childrens in the teams is 24. if two childrens of the same team do not fight, then

A. (a) maximum number of fights is 190

B. (b) maximum number of fights is 191

C. (c) maximum number of fights occur when $x=7$

D. (d) maximum number of fights occur when $x=8$

Answer: B::C::D



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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?

A. $3 \mid (N - 1)$

B. $n \mid (N_1)$

C. $(n + 1) \mid (N - 1)$

D. $3n(n + 1) \mid (N - 1)$

Answer: A::B::C::D



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10. If $\alpha = x_1, x_2, x_3$ and $\beta = y_1, y_2, y_3$ be two three digit numbers, then the number of pairs of α and β that can be formed so that α can be subtracted from β without borrowing.

A. $2! \times 10! \times 10!$

B. $(45)(55)^2$

C. $3^2 \cdot 5^3 \cdot 11^2$

D. 136125

Answer: B::C::D



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Exercise Passage Based Questions

1. Find the value of $4!$



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2. Consider the Word $W = \text{TERRORIST}$.

Q. Number of arrangements of the word W , if R 's as well as T 's are separated, is

A. 11460

B. 10400

C. 12600

D. 9860

Answer: C



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3. Consider the Word W=TERRORIST.

Q. Number of arrangements of the word W, if R's as well as T's are separated, is

A. 9860

B. 1080

C. 10200

D. 11400

Answer: C



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4. How many 3 digit even numbers can be formed from the digits 1, 2 , 3, 4, 5 and 6 assuming that repetition of the digits is allowed .

A. 120

B. 96

C. 24

D. 420

Answer: C



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5. Different words are formed by arranging the letters of the word *SUCCESS*, The number of words in which C's are together but S's are separated, is

- A. 120
- B. 96
- C. 24
- D. 180

Answer: B



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6. Different words are formed by arranging the letters of the word *SUCCESS*, then find the total possible words .

A. 42

B. 40

C. 420

D. 480

Answer: A



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7. Different words are being formed by arranging the letter of the word 'ARRANGE'

Q. The number of words in which the two R's are not together, is

A. 1260

B. 960

C. 900

D. 600

Answer: C

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8. The number of ways in which the letters of the word ARRANGE be arranged so that

(i) the two R's are never together,

(ii) the two A's are together but not two R's.

(iii) neither two A's nor two R's are together.

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9. Different words are being formed by arranging the letter of the word 'ARRANGE'

Q. The rank of the word 'ARRANGE' in the dictionary is

a. 340

b. 341

c. 342

d. 343

A. 340

B. 341

C. 342

D. 343

Answer: C



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10. Let $S(n)$ denotes the number of ordered pairs (x, y) satisfying $\frac{1}{x} + \frac{1}{y} = \frac{1}{n}$, $\forall, n \in N$, then find $S(10)$.

A. 3

B. 6

C. 9

D. 12

Answer: C



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11. Let $S(n)$ denotes the number of ordered pairs (x, y) satisfying $\frac{1}{x} + \frac{1}{y} = \frac{1}{n}$, $\forall, n \in N$, then find $S(10)$.

A. $S(3)+S(4)$

B. $S(5)+S(6)$

C. $S(8)+S(9)$

D. $S(1)+S(11)$

Answer: C



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12. Let (S) denotes the number of ordered pairs (x,y)

satisfying $\frac{1}{x} + \frac{1}{y} = \frac{1}{n}$, $x, y, n \in N$.

Q. $\sum_{r=1}^{10} S(r)$ equals

A. 47

B. 48

C. 49

D. 50

Answer: B



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13. Let $f(n)$ denotes the number of different ways, the positive integer n can be expressed as the sum of the 1's and 2's. for example, $f(4)=5$.

$$\text{i.e., } 4 = 1 + 1 + 1 + 1$$

$$= 1 + 1 + 2 = 1 + 2 + 1 = 2 + 1 + 1 = 2 + 2$$

Q. The number of solutions of the equation $f(n) = n$, where $n \in \mathbb{N}$ is

A. 376

B. 377

C. 321

D. 370

Answer: B



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14. Let $f(n)$ denotes the number of different ways, the positive integer n can be expressed as the sum of the 1's and 2's. for example, $f(4)=5$.

$$\text{i.e., } 4 = 1 + 1 + 1 + 1$$

$$= 1 + 1 + 2 = 1 + 2 + 1 = 2 + 1 + 1 = 2 + 2$$

Q. The number of solutions of the equation $f(n) = n$, where $n \in \mathbb{N}$ is

A. 1

B. 2

C. 3

D. 4

Answer: C



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15. Let $f(n)$ denotes the number of different ways, the positive integer n can be expressed as the sum of the 1's and 2's. for example, $f(4)=5$.

$$\text{i.e., } 4 = 1 + 1 + 1 + 1$$

$$= 1 + 1 + 2 = 1 + 2 + 1 = 2 + 1 + 1 = 2 + 2$$

Q. The number of solutions of the equation $f(n) = n$, where

$n \in \mathbb{N}$ is

A. 144

B. 360

C. 4320

D. 14400

Answer: D



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Exercise Single Integer Answer Type Questions

1. The ten's digit of $1! + 2! + 3! + \dots + 97!$ is



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2. The exponent of 7 in $100C_{50}$ is

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3. The radius of cylinder is 2.5 m it's height is 7m. than find the volume of cylinder.

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4. If the letters of the word are arranged as in a dictionary. M and n are the rank of the words BULBUL and NANNU respectively, then the value of $m-4n$ is

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5. An n -digit number is a positive number with exactly n digits. Nine hundred distinct n -digit numbers are to be formed using only the three digits 2, 5 and 7. Find the smallest value of n for which this is possible.

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6. If a, b, c are three natural numbers in AP such that $a + b + c = 21$ and if possible number of ordered triplet (a, b, c) is λ , then the value of $(\lambda - 5)$ is

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7. If 2λ is the number of ways of selecting 3 member subset of $\{1,2,3, \dots, 29\}$, so that the number form of a GP with integer common ratio, then find the value of λ

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8. In a certain test, there are n questions. In this test, 2^{n-k} students gave wrong answers to atleast k questions, where $k=1,2,3, \dots$. If the total number of wrong answers given in 127, then the value of n is

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9. If a seven-digit number made up of all distinct digits 8, 7, 6, 4, 2, *xandy* divisible by 3, then a. Maximum value of

b. c. $x - y$ is 9 f. Maximum value of g . h. $x+y$ is 12 k. Minimum value of $x y$ is 0 p. Minimum value of $x+y$ is 3

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10. There are five points A,B,C,D and E. no three points are collinear and no four are concyclic. If the line AB intersects of the circles drawn through the five points. The number of points of intersection on the line apart from A and B is

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Exercise Matching Type Questions

1. Match the following Column I to Column II

Column I		Column II	
(A)	${}^{n+4}C_{n+1} - {}^{n+3}C_n = 15(n+2)$, then n equals	(p)	19
(B)	$11 \cdot {}^n P_4 = 20 \cdot {}^{n-2} P_4$, then n equals	(q)	27
(C)	${}^{2n} C_3 = 11 \cdot {}^n C_3$, then n equals	(r)	16
(D)	${}^{n+2} C_8 : {}^{n-2} P_4 = 57 : 16$, then n equals	(s)	6



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2. If $A = \{ 3, 5, 7, 9, 11 \}$ and $B = \{ 7, 9, 11, 13 \}$ then find $A \cap B$



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Permutations And Combinations Exercise 5 Matching Type Questions

1. The area of a circle is 1386 cm^2 . Find the circumference of the circle.

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2. The middle term of A.P. 5, 12, 19, ...215 is

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3. Five balls are to be placed in three boxes in how many diff. ways can be placed the balls so that no box remain empty if

Column I		Column II	
(A)	balls are identical but boxes are different	(p)	2
(B)	balls are different but boxes are identical	(q)	25
(C)	balls as well as boxes are identical	(r)	50
(D)	balls as well as boxes are identical but boxes kept in a row	(s)	6



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Exercise Statement I And Ii Type Questions

1. Statement-1: The smallest positive integer n such that $n!$ can be expressed as a product of $n-3$ consecutive integers, is 6.

Statement-2: Product of three consecutive integers is divisible by 6.

- A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1
- B. Statement-1 is true, statement-2 is true, statement-2 is not a correct explanation for statement-1
- C. Statement-1 is true, statement-2 is false
- D. Statement-1 is false, statement-2 is true

Answer: B



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2. A number of four different digits is formed with the help of the digits 1,2,3,4,5,6,7 in all possible ways. How many such numbers can be formed?

- A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1
- B. Statement-1 is true, statement-2 is true, statement-2 is not a correct explanation for statement-1
- C. Statement-1 is true, statement-2 is false
- D. Statement-1 is false, statement-2 is true

Answer: C

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3. Statement-1: The number of divisors of $10!$ is 280.

Statement-2: $10! = 2^p \cdot 3^q \cdot 5^r \cdot 7^s$, where $p, q, r, s \in \mathbb{N}$.

- A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1
- B. Statement-1 is true, statement-2 is true, statement-2 is not a correct explanation for statement-1
- C. Statement-1 is true, statement-2 is false
- D. Statement-1 is false, statement-2 is true

Answer: D

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4. Statement-1: Number of permutations of 'n' dissimilar things taken 'n' at a time is $n!$.

Statement-2: If $n(A)=n(B)=n$, then the total number of functions from A to B are $n!$.

- A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1
- B. Statement-1 is true, statement-2 is true, statement-2 is not a correct explanation for statement-1
- C. Statement-1 is true, statement-2 is false
- D. Statement-1 is false, statement-2 is true

Answer: C



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5. Statement-1: If N the number of positive integral solutions of $x_1x_2x_3x_4 = 770$, then N is divisible by 4 distinct prime numbers.

Statement-2: Prime numbers are 2,3,5,7,11,13, ..

a. Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1

b. Statement-1 is true, statement-2 is true, statement-2 is not a correct explanation for statement-1

c. Statement-1 is true, statement-2 is false

d. Statement-1 is false, statement-2 is true

A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1

B. Statement-1 is true, statement-2 is true, statement-2 is not a correct explanation for statement-1

C. Statement-1 is true, statement-2 is false

D. Statement-1 is false, statement-2 is true

Answer: D

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6. Statement-1: The total number of ways in which three distinct numbers in AP, can be selected from the set $\{1, 2, 3, \dots, 21\}$, is equal to 100.

Statement-2: If a, b, c are in AP, then $a + c = 2b$.

A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1

- B. Statement-1 is true, statement-2 is true, statement-2 is not a correct explanation for statement-1
- C. Statement-1 is true, statement-2 is false
- D. Statement-1 is false, statement-2 is true

Answer: A



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7. Statement-1: the number of even divisors of the number $N=12600$ is 54.

Statement-2: $0, 2, 4, 6, 8, \dots$ Are even integers.

- A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1

- B. Statement-1 is true, statement-2 is true, statement-2 is not a correct explanation for statement-1
- C. Statement-1 is true, statement-2 is false
- D. Statement-1 is false, statement-2 is true

Answer: B

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8. Statement-1: A 5-digit number divisible by 3 is to be formed using the digits 0,1,2,3,4,5 without repetition, then the total number of ways this can be done is 216. Statement-2: A number is divisible by 3, if sum of its digits is divisible by 3.

- A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1
- B. Statement-1 is true, statement-2 is true, statement-2 is not a correct explanation for statement-1
- C. Statement-1 is true, statement-2 is false
- D. Statement-1 is false, statement-2 is true

Answer: A

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9. Statement-1: the sum of the diigits in the ten's place of all numbers formed with the help of 3,4,5,6 taken all at a time is 108.

Statement-2: The sum of the digits in the ten's place= The sum of the digits is the units's place.

- A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1
- B. Statement-1 is true, statement-2 is true, statement-2 is not a correct explanation for statement-1
- C. Statement-1 is true, statement-2 is false
- D. Statement-1 is false, statement-2 is true

Answer: A



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10. Statement-1: There are $p \geq 8$ points in space no four of which are in the same with exception of $q \geq 3$ points which are in the same plane, then the number of planes each containing three points is ${}^p C_3 - {}^q C_3$.

Statement-2: 3 non-collinear points always determine unique plane.

- A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1
- B. Statement-1 is true, statement-2 is true, statement-2 is not a correct explanation for statement-1
- C. Statement-1 is true, statement-2 is false
- D. Statement-1 is false, statement-2 is true

Answer: D



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11. Statement-1: the highest power of 3 in ${}^{50}C_{10}$ is 4.

Statement-2: If p is any prime number, then power of p in $n!$

is equal to $\left[\frac{n}{p} \right] + \left[\frac{n}{p^2} \right] + \left[\frac{n}{p^3} \right] + \dots$, where $[\cdot]$

denotes the greatest integer function.

a. Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1

b. Statement-1 is true, statement-2 is true, statement-2 is not a correct explanation for statement-1

c. Statement-1 is true, statement-2 is false

d. Statement-1 is false, statement-2 is true

A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1

- B. Statement-1 is true, statement-2 is true, statement-2 is not a correct explanation for statement-1
- C. Statement-1 is true, statement-2 is false
- D. Statement-1 is false, statement-2 is true

Answer: D

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12. Statement-1: A convex quindecagon has 90 diagonals.

Statement-2: Number of diagonals in a polygon is ${}^n C_2 - n$.

- A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1

- B. Statement-1 is true, statement-2 is true, statement-2 is not a correct explanation for statement-1
- C. Statement-1 is true, statement-2 is false
- D. Statement-1 is false, statement-2 is true

Answer: A

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Exercise Subjective Type Questions

1. Prove that

$${}^1P_1 + 2 \cdot {}^2P_2 + 3 \cdot {}^3P_3 + \dots + n \cdot {}^nP_n = {}^{n+1}P_{n+1} - 1$$

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2. Solve the equation $3^{x+1}C_2 + {}^2P_2x = 4^xP_2, x \in N$.

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3. Number of positive terms in the sequence

$$x_n = \frac{195}{4P_n} - \frac{n + 3p_3}{P_{n+1}}, n \in N \text{ (here } p_n = | \angle n)$$

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4. Prove that ${}^{n-1}C_3 + {}^{n-1}C_4 > {}^nC_3$ if $n > 7$.

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5. In how many ways can a mixed doubles game in tennis be arranged from 5 married couples, if no husband and wife play in the same game?

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6. In how many ways, we can choose two teams of mixed double for a tennis tournament from four couples such that if any couple participates, then it is in the same team?

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7. A family consists of a grandfather, 5 sons and daughters and 8 grand child. They are to be seated in a row for dinner. The grand children wish to occupy the 4 seats at each end

and the grandfather refuses to have a grandchild on either side of him. In how many ways can the family be made to sit?



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8. A tea party is arranged for 16 persons along two sides of a long table with 8 chairs on each side. Four persons wish to sit on one particular and two on the other side. In how many ways can they be seated?



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9. Every man who has lived on earth has made a certain number of handshakes. Prove that the number of men who have made an odd number of handshakes is even.





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10. A train is going from Cambridge to London stops at nine intermediate stations. Six persons enter the train during the journey with six different tickets. How many different sets of tickets they have had?



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



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12. A boat is to be manned by eight men, of whom 2 can only row on bow side and 1 can only row on stroke side; in how many ways can the crew be arranged?

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13. In how many different ways can a set A of $3n$ elements be partitioned into 3 subsets of equal number of elements? The subsets P, Q, R form a partition if $P \cup Q \cup R = A, P \cap Q = \varnothing, Q \cap R = \varnothing, R \cap P = \varnothing$.

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14. A square of n units is divided into n^2 squares each of area 1 sq unit. Find the number of ways in which 4 points

(out of $(n + 1)^2$ vertices of the squares) can be chosen so that they form the vertices of a square.

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15. How many sets of 2 and 3 (different) numbers can be formed by using numbers between 0 and 180 (both including) so that 60 is their average?

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16. There are n straight lines in a plane in which no two are parallel and no three pass through the same point. Their points of intersection are joined. Show that the number of fresh lines thus introduced is $\frac{1}{8}n(n - 1)(n - 2)(n - 3)$



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17. 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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Exercise Questions Asked In Previous 13 Years Exam

1. There is a rectangular sheet of dimension $(2m - 1) \times (2n - 1)$, (where $m > 0, n > 0$) It has been divided into square of unit area by drawing line perpendicular to the sides. Find the number of rectangles having sides of odd unit length.

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

B. $mn(m + 1)(n + 1)$

C. m^{m+n-2}

D. m^2n^2

Answer: D



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2. 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. 603

B. 602

C. 601

D. 600

Answer: C



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3. If r, s, t are prime numbers and p, q are the positive integers such that their LCM of p, q is $r^2 t^4 s^2$, then the numbers of ordered pair of (p, q) is (A) 252 (B) 254 (C) 225 (D) 224

A. 252

B. 254

C. 225

D. 224

Answer: D



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4. 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: C



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5. The letters of the word COCHIN are permuted and all the permutations are arranged in an alphabetical order in an English dictionary. The number of words that appear before the word COCHIN is a.360 b. 192 c. 96 d. 48

A. 360

B. 192

C. 96

D. 48

Answer: C



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6. The set $S = \{1, 2, 3, \dots, 12\}$ is to be partitioned into three sets A, B, C of equal size. Thus, $A \cup B \cup C = S, A \cap B = B \cap C = A \cap C = \varphi$. The number of ways to partition S is

A. $\frac{12!}{3!(4!)^3}$

B. $\frac{12!}{3!(3!)^4}$

C. $\frac{12!}{(4!)^3}$

D. $\frac{12!}{(4!)^4}$

Answer: C

7. Consider all possible permutations of the letters of the word ENDEANOEL. Match the statements/ expressions in column I with the statement/expressions in

Column I		Column II	
(A)	The number of permutations containing the word ENDEA is	(p)	$5!$
(B)	The number of permutations in which the letters E occurs in the first and the last positions, is	(q)	$2 \times 5!$
(C)	The number of permutations in which none of the letters D, L, N occurs in the last five positions, is	(r)	$7 \times 5!$
(D)	The number of permutations in which the letters A, E, O occur only in odd positions, is	(s)	$21 \times 5!$

8. The number of words can be formed with the letters of the word 'MATHEMATICS' by rearranging them, is

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

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

C. $7 \cdot \dots \cdot {}^6 C_4 \cdot \dots \cdot {}^8 C_4$

D. $8 \cdot \dots \cdot {}^6 C_4 \cdot \dots \cdot {}^7 C_4$

Answer: C



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9. In a shop, there are five types of ice-creams available. A child buys six ice-creams.

Statement-1: The number of different ways the child can buy

the six ice-creams is ${}^{10}C_5$.

Statement-2: The number of different ways the child can buy six ice-creams is equal to the number of different ways to arranging 6A's and 4B's in a row.

- A. Statement-1 is true, statement-2 is true, statement 2 is correct explanation for statement 1
- B. Statement-1 is true, statement-2 is true, statement-2 is not a correct explanation for statement-1
- C. Statement-1 is true, statement-2 is false
- D. Statement-1 is false, statement-2 is true

Answer: A



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10. The number of seven 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: C



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11. Three boys and two girls stand in a queue. The probability that the number of boys ahead of every girl is atleast one

more than the number of girls ahead of her, is

- A. at least 1000
- B. less than 500
- C. at least 500 but less than 750
- D. at least 750 but less than 1000

Answer: A

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12. There are two urns. Urn A has 3 distinct red balls and urn B has 9 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 (1) 36 (2) 66 (3) 108 (4) 3

A. 36

B. 66

C. 108

D. 3

Answer: C



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13. In how many ways 5 different balls can be distributed into 3 boxes so that no box remains empty?

A. Statement-1 is true, statement-2 is true, statement-2 is a correct explanation for statement-1

- B. Statement-1 is true, statement-2 is true, statement-2 is not a correct explanation for statement-1
- C. Statement-1 is true, statement-2 is false
- D. Statement-1 is false, statement-2 is true

Answer: A

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14. There are 10 points in a plane, out of these 6 are collinear.

The number of triangles formed by joining these points, is

- A. $N > 190$
- B. $N \leq 100$
- C. $100 < N \leq 140$

D. $140 < N \leq 190$

Answer: B



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15. The total number of ways in which 5 balls of different colours can be distributed among 3 persons so that each person gets at least one ball is

A. 75

B. 150

C. 210

D. 243

Answer: B



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16. Let n denote the number of all n -digit positive integers formed by the digits 0, 1 or both such that no consecutive digits in them are 0. Let b_n = the number of such n -digit integers ending with digit 1 and c_n = the number of such n -digit integers ending with digit 0. The value of b_6 , is

- A. 7
- B. 8
- C. 9
- D. 11

Answer: B



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17. Let a_n denote the number of all n -digit numbers formed by the digits 0,1 or both such that no consecutive digits in them are 0. Let b_n be the number of such n -digit integers ending with digit 1 and let c_n be the number of such n -digit integers ending with digit 0. Which of the following is correct ?

A. $a_{17} = a_{16} + a_{15}$

B. $c_{17} \neq c_{16} + c_{15}$

C. $b_{17} \neq b_{16} + c_{16}$

D. $a_{17} = c_{17} + b_{16}$

Answer: A



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18. Assuming the balls to be identical except for difference in colours, the number of ways in which one or more balls can be selected from 10 white, 9 green and 7 black balls is

A. 630

B. 879

C. 880

D. 629

Answer: B



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19. Let T_n be the number of all possible triangles formed by joining vertices of an n -sided regular polygon. If $T_{n+1} - T_n = 10$, then the value of n is (1) 5 (2) 10 (3) 8 (4) 7

A. 5

B. 10

C. 8

D. 7

Answer: A



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20. Consider the set of eight vector

$V = \{a\hat{i} + b\hat{j} + c\hat{k}; a, b, c \in \{-1, 1\}\}$. Three non-coplanar

vectors can be chosen from V is 2^p ways. Then p is _____.



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21. A coin is tossed 4 times and the outcomes are recorded .
how many possible outcomes are there?



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22. Let $n \geq 2$ be integer. Take n distinct points on a circle and join each pair of points by a line segment. Color the line segment joining every pair of adjacent points by blue and the rest by red. If the number of red and blue line segments are equal, then the value of n is



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23. Six cards and six envelopes are numbered 1, 2, 3, 4, 5, 6 and cards are to be placed in envelopes so that each envelope contains exactly one card and no card is placed in the envelope bearing the same number and moreover cards numbered 1 is always placed in envelope numbered 2. Then the number of ways it can be done is a. 264 b. 265 c. 53 d. 67

A. 264

B. 265

C. 53

D. 67

Answer: C



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24. The number of integers greater than 6,000 that can be formed, using the digits 3, 5, 6, 7 and 8, without repetition, is : (1) 216 (2) 192 (3) 120 (4) 72

A. 120

B. 72

C. 216

D. 192

Answer: D



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25. find the area of the rectangle whose sides are 3cm and 5cm



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26. If all the words (with or without meaning) having five letters, formed using the letters of the word SMALL and arranged as in a dictionary; then the position of the word SMALL is : (1) 46th (2) 59th (3) 52nd (4) 58th

A. 59th

B. 52nd

C. 58th

D. 64th

Answer: C



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27. A debate club consists of 6 girls and 4 boys. A team of 4 members is to be selected from this club including the selection of a captain (from among these 4 members) for the team. If the team has to include at most one boy, then the number of ways of selecting the team is

- A. 380
- B. 320
- C. 260
- D. 95

Answer: A



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28. A man X has 7 friends, 4 of them are ladies and 3 are men. His wife Y also has 7 friends, 3 of them are ladies and 4 are men. Assume X and Y have no common friends. Then the total number of ways in which X and Y together can throw a party inviting 3 ladies and 3 men, so that 3 friends of each of X and Y are in the party, is :

A. 484

B. 485

C. 468

D. 469

Answer: B



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