MATHS

BOOKS - PREMIERS PUBLISHERS

COMBINATORICS AND MATHEMATICAL INDUCTION

Worked Example

1. A question paper has two parts A and B. Part A has 4 questions and B has 3 questions. One question from either part has to be selected. In how many different ways can this selection be made?

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2. If there are 3 routes from city A to city B and if there are 4 routes from city B to city C. A man wants to travel from A to B and then to C what are

the total number of ways of travelling from A to C.

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3. A hall has 9 doors. A person can enter the hall through any one of the 9 doors and come out through a different doors?

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4. In a shop. I found 80 shirts and 70 pants. I can choose only one item. In how many ways can I choose either a shirt or a pant?

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5. Mr. Vivek wants to buy a flat in an apartment which consists of 4 blocks, each block consists of 4 floors. In each floor there are 6 flats. In how many ways Vivek can make his choice of the flat.

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6. Given four flags of different colours, how many different signals can be generated if each signal requires to use of 3 flags. One below the other ?

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

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8. Architha wants to buy one silk saree, one cotton saree and one nylon saree from a textile shop which has 7 different silk saree, 6 different cotton sarccs and 5 different nylon sarees. In how many ways can she select the sarees?

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9. Find the total number of outcomes where 6 coins are tossed once.

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10. 10 students compete in a race. In how many ways first two prizes be given?

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11. How many strings of length 5 can be formed out of the letters of the word VIJAY taking all the letters at a time without repetition?

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12. How many strings of length 6 can be formed using the letter of the word FRIEND if (i) either starts with F or ends with D (ii) neither starts with F nor ends with D.

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13. How many different numbers of six digits can be formed from the digits 0,4, 5,7, 8, 9 with , repetition of digits is not allowed.

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14. In how many Ways 6 different balls can be distributed among 4 boxes.

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15. In how many - 4 different balls can be distributed among 6 boxes.

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16. How many odd numbers less than 1000 can be formed by using the digits 0, 3, 5, 7 when repetition of digits are not allowed.

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17. Find the value of

$Q = \frac{\lfloor 6}{\lfloor 3}$

Watch Video Solution

18. Find the value of

Q $4! \times 2!$

Watch Video Solution

19. Find the value of

Q (8!)' x(3!) '/ (9!)`

Watch Video Solution

20. Find the value of

Q 6!-4!

Watch Video Solution

21. Evaluate $\frac{\lfloor 5}{\lfloor 3} - \frac{\lfloor 5}{\lfloor 2 \times \lfloor 3}$

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22. Evaluate $\frac{\lfloor n}{\lfloor r \lfloor (n-r)}$ given that n=8, r=5.

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23. If $\frac{\lfloor 9}{\lfloor (9-r)}$=3024, find r.

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24. If $\frac{\lfloor n}{\lfloor (n-r)}$=360, find n.

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25. What is the unit digit of the sum $\lfloor 3 + \lfloor 4 + \ldots. + \lfloor 25$?

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26. If $\frac{\lfloor 7}{\lfloor n} = 42$ Find n.

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27. If $\frac{1}{\lfloor 6} + \frac{1}{\lfloor 7} = \frac{64}{\lfloor n}$ find n.

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28. If (n + 2)! = 56 n! Find n.

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29. Evaluate

Q ${}^{5}P_{3}$

Watch Video Solution

30. Evaluate

Q ${}^{6}P_{5}$

Watch Video Solution

31. Evaluate

Q ${}^{4}P_{1}$

Watch Video Solution

32. Evaluate

Q ${}^{3}P_{3}$

Watch Video Solution

33. If $(n+3)P_5 = 56^{n+1}P_3$ find n.

Watch Video Solution

34. Show that ${}^{7}P_5 + 5(7)P_4 = 8P_5$

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35. How many 'letter strings' can be formed using the letters of the word

HIGHER such that

Q the strings ends with H.

Watch Video Solution

36. How many 'letter strings' can be formed using the letters of the word HIGHER such that

Q the strings ends with H.

Watch Video Solution

37. How many 'letter strings' can be formed using the letters of the word HIGHER such that

Q the strings starts with G and ends with E.

Watch Video Solution

38. If ${}^{n-1}P_3 : {}^{n}P_4 = 1:9$ find n.

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39. How many numbers are there between 500 and 1000 which have exactly one of their digits as 8.

Watch Video Solution

40. Four digit numbers are formed from the digits = [4 = 1, 2, 4, 5, 7, 8 (without repetition of digits).

Q How many numbers can be formed.

Watch Video Solution

41. Four digit numbers are formed from the digits = [4 = 24 2, 5,6, 7, 8 (without repetition of digits).

Q How many of there are odd.

View Text Solution

42. Four digit numbers are formed from the digits = [4 = 24 2, 5,6, 7, 8 (without repetition of digits).

Q How many of there are exactly divisible by 7.

View Text Solution

43. A family of 4 brothers and 3 sisters is to be arranged in a row for a photograph, in how many ways can they be seated if

Q all the sisters sit together.

Watch Video Solution

44. A family of 4 brothers and 3 sisters is to be arranged in a row for a photograph. In how many ways can they be seated if

Q all the sisters are not together.

Watch Video Solution

45. A family of 4 brothers and 3 sisters is to be arranged in a row for a photograph. In how many ways can they be seated if

Q No two brothers are together.

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46. If the letters of the word THARUN are permuted in all possible ways and the words thus formed are arranged in the dictionary (alphabetical) order. Find the rank of the word THARUN.

Watch Video Solution

47. There are 5 books on Mathematics, 4 books on Physics and 3 books on Chemistry. In how many ways can these books be arranged in a shelf if books of same subject should.be together.

Watch Video Solution

48. 7 girls wants to take a photograph by sitting in a row. One particular girls wants only the centre seat. In how many ways they can be seated if her request was considered.

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49. Find the number of ways of arranging the letters of the word ANAND.

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50. Find the number of ways of arranging the letters of the word MATHEMATICS so that the relative position of vowels and consonants A are not changed.

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51. How many numbers can be formed using the digits 2, 3,4, 5, 2,4, 5, 5 such that even digits occupy even places.

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52. If the different permutations of all letters of the word BANANA are listed as in a dictionary how many strings are there in this list before the word starting with B .

Watch Video Solution

53. Find the sum of all 3 digit numbers that can be formed using the digits 1,2, 3, 5, 6.

View Text Solution

54. If the letters of the word HEELLI are permuted in all possible ways and arranged in dictionary order. Find the rank of this word.

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55. Evaluate the following:

Q $^{20}C_2$

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56. Evaluate the following:

Q $^{25}C_2$

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57. Evaluate the following:

Q $^{100}C_1$

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58. Evaluate the following:

Q $^{45}C_{45}$

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59. Verify the property $^{n}C_{r} = \frac{n}{r}{}^{n-1}C_{r-1}$ where n=6 and r=3.

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60. If $^{n}P_{r} = 7920$ and $^{n}C_{r} = 330$, find n and r.

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61. If $^{n}C_{4} = 330$ find n.

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62. Prove that ${}^{25}C_2 + \sum_{r=0}^{4} {}^{29-r}C_1 = 435$

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63. If $\frac{{}^{n+2}C_7}{{}^{n-1}P_4} = \frac{11}{42}$, find n.

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64. If ${}^{n}C_4 = {}^{n}C_6$ find ${}^{12}C_n$.

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65. If ${}^{15}C_r : {}^{15}C_{r-1} = 3:5$, find r.

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66. The product of r consecutive positive integers is divisible by

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67. A student has to choose 3 subjects out of Maths, Physics, Chemistry, Biology and Computer Science. Find the total possible number of ways of choosing.

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68. A question papers has 12 questions consisting Part A having 8 questions and the rest in Part B. A student has to answer the questions from each Part. In how many ways one can select the questions.

View Text Solution

69. In a class of 15 students first, second, third prizes are to be given for academic performance and then 3 more arc to be selected to participate in sports. In how many ways this can be done.

View Text Solution

70. In a shelf there are 12 books, 4 books are to be Selected for reading with a condition

Q two particular books should always be selected.

Watch Video Solution

71. In a shelf there are 12 books, 4 books are to be Selected for reading with a condition

Q two particular books should always be not selected.

Watch Video Solution

72. In a shelf there are 12 books, 4 books are to be Selected for reading with a condition

Q without any restrictions

Watch Video Solution

73. How many triangles can be formed by joining the vertices of a hexagon? How many diagonals are there for hexagon?

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74. In a class of 10 boys and 6 girls, a team of 8 has to be formed with atleast 4 boys and atleast 4 girls with the condition that two girls are always included in the team. In how many ways the selection can be made?

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75. How many triangles can be obtained by joining 10 points five of which are collinear.

Watch Video Solution

76. A candidate is required to answer 6 questions out of 10 questions given in two parts having 5 questions each. He is not permitted to answer more than 4 questions from either part. In how many ways can he choose the questions.

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77. Out of 6 consonants and 4 vowels, how many strings of 3 consonants and 2 vowels can be formed ?

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78. From a basket which has 10 oranges, one is rotten. We choose 3 oranges simultaneously. Find the number of ways in which we select only good oranges.

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79. Prove by mathematical induction $n^2 + n$ is even.

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80. By the principal of mathematic induction, prove that, for $n \geq 1$

$$1.2 + 2.3 + 3.4 + \ldots + n.(n+1) = \frac{n(n+1)(n+2)}{3}$$

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81. Prove that $4n^2 - 1$ is an odd number for all $n \in N$

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82. Prove by mathematical induction 4 + 8 + 12 +... 4n = 2n(n + 1).

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83. Prove by mathematical induction 5 + 8 + 11 + ...+ (3n-+2)=$\frac{1}{2}$n(3n + 7).

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84. Show that $5^{2n} - 1$ is divisible for all $n \in N$ by 24.

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85. Prove by mathematical induction 2.5 + 3.6 + 4.7 + ...(n+1)(n+4)= $\frac{2n^3 + 18n^2 + 40n}{6}$

Watch Video Solution

86. Show that n(n + 1) (n + 2) is divisible by 6 where n is a natural number.

Watch Video Solution

87. Prove by mathematical induction

$$\frac{1}{3}+\frac{1}{3^2}+\frac{1}{3^3}+\ldots+\frac{1}{3^n}=\frac{1}{2}\left(1-\frac{1}{3^n}\right)$$

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88. Prove that $x^n - y^n$ is divisible by x - y for all positive integers n.

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89. Show that $10^{2n} - 1$ is divisible by 11 for all $n \in N$.

Watch Video Solution

90. Prove by mathematical induction

$$\frac{1}{1.2}+\frac{1}{2.3}+\ldots+\frac{1}{(n)(n+1)}=\frac{n}{(n+1)}$$

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Exercise 4 1

1. A person went to a restaurant for dinner. In the menu card, the person saw 10 Indian and 7 Chinese food items. In how many ways the person can select either an Indian or a Chinese food ?

Watch Video Solution

2. There are 3 types of toy car and 2 types of toy train are available in a shop. Find the number of ways a baby can buy a toy car and a toy train ?

Watch Video Solution

3. How many two - digit numbers can be formed using 1,2,3,4,5 without repetition of digits ?

Watch Video Solution

4. There persons enter into a conference hall in which there are 10 seats. In how many ways they can take their seats ?

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5. In how many ways 5 persons can be seated in a row ?

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6. A mobile has a pass code of distinct digits. What is the maximum number of attempts one makes to retrieve the pass code ?

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7. Given four flags of different colours, how many different signals can be generated if each signal requires to use of 3 flags. One below the other ?

Watch Video Solution

8. Four children are running a race .

(i) In how many ways can the first two places be filled ?

(ii) In how many different ways could they finish the race ?

Watch Video Solution

9. Four children are running a race .

(i) In how many ways can the first two places be filled ?

(ii) In how many different ways could they finish the race ?

Watch Video Solution

10. Count the number of three - digit numbers which can be formed from the digits 2,4,6,8, if

(i) repetitions of digits is allowed ?

(ii) repetitions of digits is not allowed ?

Watch Video Solution

11. Count the number of three - digit numbers which can be formed from the digits 2,4,6,8, if

(i) repetitions of digits is allowed ?

(ii) repetitions of digits is not allowed ?

Watch Video Solution

12. How many three - digit numbers are there with 3 in the unit place ?

(i) With repetition (ii) without repetition

Watch Video Solution

13. How many three - digit numbers are there with 3 in the unit place ?

(i) With repetition (ii) without repetition

Watch Video Solution

14. How many numbers are three between 100 and 500 with the digits 0,1,2,3,4,5, ? If

(i) repetition of digits allowed

(ii) the repetition of digits is not allowed ?

Watch Video Solution

15. How many numbers are three between 100 and 500 with the digits 0,1,2,3,4,5, ? If

(i) repetition of digits allowed

(ii) the repetition of digits is not allowed ?

Watch Video Solution

16. How many three-digit odd numbers can be formed by using the digits 0,1,2,3,4,5 ? If

(i) the repetition of digits is not allowed

(ii) the repetition of digits is allowed

Watch Video Solution

17. How many three-digit odd numbers can be formed by using the digits 0,1,2,3,4,5 ? If

(i) the repetition of digits is not allowed

(ii) the repetition of digits is allowed

Watch Video Solution

18. Count the numbers between 999 and 10,000 subject to the condition that there are .

(i) no restriction .

(ii) no digit is repeated .

(iii) at least one of the digits is repeated .

Watch Video Solution

19. Count the numbers between 999 and 10,000 subject to the condition that there are .

(i) no restriction .

(ii) no digit is repeated .

(iii) at least one of the digits is repeated .

Watch Video Solution

20. Count the numbers between 999 and 10,000 subject to the condition that there are .

(i) no restriction .

(ii) no digit is repeated .

(iii) at least one of the digits is repeated .

Watch Video Solution

21. How many three- digit numbers, which are divisible by 5, can be formed using the digits 0,1,2,3,4, 5 if

(i) repetition of digits are not allowed ?

(ii) repetition of digits are allowed ?

Watch Video Solution

22. How many three- digit numbers, which are divisible by 5, can be formed using the digits 0,1,2,3,4, 5 if

(i) repetition of digits are not allowed ?

(ii) repetition of digits are allowed ?

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23. To travel from a place A to place B, there are two different bus routes B_1, B_2 , two different train routes T_1, T_2 and one air route A_1 . From

place B to place C there is one bus route say B_1 two different train routes say T_1, T_2 and one air route A_1 . Find the number of routes of commuting from place A to place C via place B without using similar mode of transportation.

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24. How many numbers are there between 1 and 1000 (both inclusive) which are divisible neither by 2 nor by 5 ?

Watch Video Solution

25. How many strings can be formed using the letters of the word LOTUS if the word .

(i) either starts with L or ends with S.

(ii) neither starts with L nor ends with S ?

Watch Video Solution

26. How many strings can be formed using the letters of the word LOTUS if the word .

(i) either starts with L or ends with S.

(ii) neither starts with L nor ends with S ?

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27. (i) Count the total number of ways of answering 6 objective type questions , each question having 4 choices.

(ii) In how many ways 10 pigeons can be placed in 3 different pigeon holes ?

(iii) Find the number of ways of distributing 12 distance prizes to 10 students ?

Watch Video Solution

28. (i) Count the total number of ways of answering 6 objective type questions , each question having 4 choices.

(ii) In how many ways 10 pigeons can be placed in 3 different pigeon holes ?

(iii) Find the number of ways of distributing 12 distance prizes to 10 students ?

Watch Video Solution

29. (i) Count the total number of ways of answering 6 objective type questions , each question having 4 choices.

(ii) In how many ways 10 pigeons can be placed in 3 different pigeon holes ?

(iii) Find the number of ways of distributing 12 distance prizes to 10 students ?

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30. Find the value of

Q 6!

Watch Video Solution

31. Find the value of

6!

(ii) 4 ! + 5 !

(iii) 3! - 2!

(iv) 3! $\times$ 4!

(v) $\frac{12!}{9! \times 3!}$ (vi) $\frac{(n+3)!}{(n+1)!}$

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32. Find the value of

Q 3!-2!

Watch Video Solution

33. Find the value of

Q $3! \times 4!$

Watch Video Solution

34. Find the value of

Q $\frac{12!}{9! \times 3!}$

Watch Video Solution

35. Find the value of

Q $\frac{(n+3)!}{(n+1)!}$

Watch Video Solution

36. Evaluate $\frac{n!}{r!(n-r)!}$ when

(i) n = 6, r= 2

(ii) n = 10 , r = 3

(iii) for any n with r = 2

Watch Video Solution

37. Evaluate $\frac{n!}{r!(n-r)!}$ when

(i) n = 6, r= 2

(ii) n = 10 , r = 3

(iii) for any n with r = 2

Watch Video Solution

38. Evaluate $\frac{n!}{r!(n-r)!}$ when

(i) n = 6, r= 2

(ii) n = 10 , r = 3

(iii) for any n with r = 2

Watch Video Solution

39. Find the value of n if

(i) $(n+1)! = 20(n-1)!$

(ii) $\frac{1}{8!} + \frac{1}{9!} = \frac{n}{10!}$

Watch Video Solution

40. Find the value of n if

(i) $(n+1)!=20(n-1)!$

(ii) $\frac{1}{8!}+\frac{1}{9!}=\frac{n}{10!}$

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Exercise 4 2

1. If $.^{n-1}P_3 : P_4 = 1, 10$ find n.

Watch Video Solution

2. IF $.^{10}P_{r-1} = 2 \times 6P_{r^2}$ find r

Watch Video Solution

3. Suppose 8 people enter an event in a swimming meet. In how many ways could the gold, silver and bronze prizes be awarded?

Watch Video Solution

4. Three men have 4 coats, 5 waist coats and 6 caps. In how many ways can they wear them?

Watch Video Solution

5. Determine the number of permutations of the letters of the word SIMPLE if all are taken at a time ?

Watch Video Solution

6. A test consists of 10 multiple choice questions . In how many ways can the test be answered if

(i) Each question has four choices ?

(ii) The first four questions have three choices and the remaining have five choices ?

(iii) Question number n has n + 1 choices ?

Watch Video Solution

7. A test consists of 10 multiple choice questions . In how many ways can the test be answered if

(i) Each question has four choices ?

(ii) The first four questions have three choices and the remaining have five choices ?

(iii) Question number n has n + 1 choices ?

Watch Video Solution

8. A test consists of 10 multiple choice questions . In how many ways can the test be answered if

(i) Each question has four choices ?

(ii) The first four questions have three choices and the remaining have

five choices ?

(iii) Question number n has n + 1 choices ?

Watch Video Solution

9. A student appears in an objective test which contain 5 multiple choice questions. Each question has 4 choices out of which one correct answer.

(i) What is the maximum number of different answers can the students give ?

(ii) How will the answer change if each question may have more than one correct answers ?

Watch Video Solution

10. A student appears in an objective test which contain 5 multiple choice questions. Each question has 4 choices out of which one correct answer.

(i) What is the maximum number of different answers can the students give ?

(ii) How will the answer change if each question may have more than one correct answers ?

Watch Video Solution

11. How many strings can be formed from the letters of the word ARTICLE, so that vowels occupy the even places ?

Watch Video Solution

12. 8 woman and 6 man are standing in a line.

(i) How many arrangements are possible if any individual can stand in any position ?

(ii) In how may arrangements will be 6 men be standing next to one another ?

(iii) In how many arrangements will no two men be standing next to one another ?

Watch Video Solution

13. 8 woman and 6 man are standing in a line.

(i) How many arrangements are possible if any individual can stand in any position ?

(ii) In how may arrangements will be 6 men be standing next to one another ?

(iii) In how many arrangements will no two men be standing next to one another ?

Watch Video Solution

14. 8 woman and 6 man are standing in a line.

(i) How many arrangements are possible if any individual can stand in any position ?

(ii) In how may arrangements will be 6 men be standing next to one another ?

(iii) In how many arrangements will no two men be standing next to one another ?

Watch Video Solution

15. Find the distinct permutations of the letters or the word MISSISSIPPI ?

Watch Video Solution

16. How many ways can the product $a^2b^3c^4$ be expressed without exponents ?

Watch Video Solution

17. In how many ways 4 mathematics books , 3 physics books, 2 chemistry books and 1 biology book can be arranged on a shelf so that all books of the same subjects are together ?

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18. In how many ways can the letters of the word SUCCESS be arranged so that all S's are together ?

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19. A coin is tossed 8 times.

(i) How many different sequences of heads and tails are possible ?

(ii) How many different sequences containing six heads and two tails are possible ?

Watch Video Solution

20. A coin is tossed 8 times.

(i) How many different sequences of heads and tails are possible ?

(ii) How many different sequences containing six heads and two tails are possible ?

Watch Video Solution

21. How many strings are there using the letters of the word INTERMEDIATE, if

Q The vowels and consonants are alternative.

Watch Video Solution

22. How many strings are there using the letters of the word INTERMEDIATE, if

Q All the vowels are together.

Watch Video Solution

23. How many strings are there using the letters of the word INTERMEDIATE, if

Q Vowels are never together.

Watch Video Solution

24. How many strings are there using the letters of the word INTERMEDIATE, if

Q No two vowels are together.

View Text Solution

25. Each of the digits 1, 1, 2, 3, 3 and 4 is written to consonants. on a separate card. The six cards are then laid out in a row to form a 6-digit number.

Q How many distinct 6-digit numbers are there?

Watch Video Solution

26. Each of the digits 1, 1, 2, 3, 3 and 4 is written to consonants. on a separate card. The six cards are then laid out in a row to form a 6-digit number.

Q How many of these 6-digit numbers are even?

Watch Video Solution

27. Each of the digits 1, 1, 2, 3, 3 and 4 is written to consonants. on a separate card. The six cards are then laid out in a row to form a 6-digit number.

Q How many of these 6-digit numbers are divisible by 4?

View Text Solution

28. If the letters of the word GARDEN are permuted in all possible ways and the strings thus formed are arranged in the dictionary order, then find the ranks of the words

Q GARDEN

Watch Video Solution

29. If the letters of the word DANGER are permuted in all possible ways and the strings thus formed are arranged in the dictionary order, then

find the ranks of the words

Q DANGER

Watch Video Solution

30. Find the number of strings that can be made using all letters of the word THING. If these words are written as in a dictionary , what will be the 85^{th} string ?

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31. if the letters of the word FUNNY are permuted in all possible ways and the strings thus formed are arranged in the dictionary order, find the rank of the word FUNNY .

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32. Find the sum of all 4-digit numbers that can be formed using digits 1, 2, 3, 4, and 5 repetitions not allowed?

Watch Video Solution

33. Find the sum of all 4-digit numbers that can be formed using digits 0, 2, 5, 7, 8 without repetition?

Watch Video Solution

Exercise 4 3

1. If $.^{n}C_{12} = .^{n}C_{9}$ find $.^{21}C_{n}$

Watch Video Solution

2. If $.^{15}C_{2r-1} = .^{15}C_{2r+4}$ find r

Watch Video Solution

3. If $.^{n}P_{r}=720.$ If $.^{n}C_{r}=120$ find n, r

Watch Video Solution

4. Prove that $.^{15}C_{3}+2\times.^{15}C_{4}+.^{15}C_{5}=.^{17}C_{5}$

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5. Prove that $.^{35}C_{5}+\sum_{r=0}^{4^{(39-r)}}C_{4}=.^{40}C_{5}$

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6. If $.^{n+2}C_{8}:^{(n-2)}P_{4}=57:16$, find the value of n.

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7. Prove that $.^{2n}C_n = \frac{2^n \times 1 \times 3 \times \ldots (2n-1)}{n!}$

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8. Prove that if $1 \leq r \leq n$ then $n \times^{(n-1)} C_{r-1} = (n-r+1).^n C_{r-1}$

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9. A Kabaddi coach has 14 players ready to play. How many different teams of 7 players could the coach put on the court ?

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10. There are 15 persons in a party and if each 2 of then shakes hands with each other , how many handshakes happen in the party ?

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11. How many chords can be drawn through 20 points on a circle ?

Watch Video Solution

12. In a parking lot one hundred one year old cars, are parked. Out of them five are to be chosen at random for to check its pollution devices. How many differenet set of five cars can be chosen ?

Watch Video Solution

13. How many ways can a team of 3 boys, 2 girls and 1 transgender be selected from 5 boys , 4 girls and 2 transgenders ?

Watch Video Solution

14. Find the total number of subsets of a set with .

(i) 4 elements (ii) 5 elements

(iii) n elements

Watch Video Solution

15. Find the total number of subsets of a set with .

(i) 4 elements (ii) 5 elements

(iii) n elements

Watch Video Solution

16. Find the total number of subsets of a set with .

(i) 4 elements (ii) 5 elements

(iii) n elements

Watch Video Solution

17. A trust has 25 members .

(i) How many ways 3 officers can be selected ?

(ii) In how many ways can a president, Vice president and a Secretary be selected ?

Watch Video Solution

18. A trust has 25 members .

(i) How many ways 3 officers can be selected ?

(ii) In how many ways can a president, Vice president and a Secretary be selected ?

Watch Video Solution

19. How many ways a committee of six persons from 10 persons can be chosen along with a chair person and a secretary ?

Watch Video Solution

20. How many different selections of 5 books can be made from 12 different books if,

(i) Two particular books are always selected ?

(ii) Two particular books are never selected ?

Watch Video Solution

21. How many different selections of 5 books can be made from 12 different books if,

(i) Two particular books are always selected ?

(ii) Two particular books are never selected ?

Watch Video Solution

22. There are 5 teachers and 20 students. Out of them a committee of 2 teachers and 3 students is to be formed. Find the number of ways in which this can be done. Further find in hdw many of these committees.

Q a particular teacher is included?

Watch Video Solution

23. There are 5 teachers and 20 students. Out of them a committee of 2 teachers and 3 students is to be formed. Find the number of ways in which this can be done. Further find in hdw many of these committees.

Q a particular student is excluded?

Watch Video Solution

24. In an examination a student has a answer 5 questions, out of 9 questions in which 2 are compulsory . In how many ways a student can answer the questions ?

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25. Determine the number of 5 card combinations out of a deck of 52 cards if there is exactly three aces in each combination .

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26. Find the number of ways of forming a committee of 5 members out of 7 Indians and 5 Americans so that always Indians will be majority in the committee.

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27. A committee of 7 peoples has to be formed from 8 men and 4 women. In how many ways can this be done when the committee consists of

Q exactly 3 women

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28. A committee of 7 peoples has to be formed from 8 men and 4 women. In how many ways can this be done when the committee consists of

Q at least 3 women?

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29. A committee of 7 peoples has to be formed from 9 men and 4 women . In how many can this be done when then committee consists of

(i) exactly 3 women ?

(ii) at least 3 woman ?

(iii) at most 3 women ?

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30. 7 relatives of a man comprises 4 ladies and 3 gentlemen, his wife also has 7 relatives , 3 of them are ladies and 4 gentlemen. In how many ways can they invite a dinner party of 3 ladies and 3 gentlemen , so that there are 3 of man's relative and 3 of the wife ,s relatives ?

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31. A box contains two white balls, three black balls and four balls. In how many ways can three balls be drawn from the box, if atleast one black ball

is to be included in the draw ?

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32. Find the number of strings of 4 letters that can be formed with the letters of the word EXAMINATION.

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33. How many triangles can be formed by joining 15 points on the plane, in which no line joining any three points?

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34. How many triangles can be formed by 15 points , in which 7 of them lie on one line and the remaining 8 on another parallel line ?

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35. There are 11 points in a plane. No three of these lies in the same straight line except 4 points, which are collinear. Find ,

(i) the number of straight lines that can be obtained from the pairs of these points ?

(ii) the number of triangles that can be formed for which the points are their vertices ?

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36. There are 11 points in a plane. No three of these lies in the same straight line except 4 points, which are collinear. Find ,

(i) the number of straight lines that can be obtained from the pairs of these points ?

(ii) the number of triangles that can be formed for which the points are their vertices ?

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37. A polygon has 90 diagonals. Find the number of its sides ?

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Exercise 4 4

1. By the principle of mathematical induction, prove that, for $n \geq 1$

$$1^3 + 2^3 + 3^3 + \ldots + n^3 = \left(\frac{n(n+1)}{2}\right)^2$$

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2. By the principle of mathematical induction, prove that, for $n \geq 1$

$$1^2 + 3^2 + 5^2 + \ldots + (2n-1)^2 = \left(\frac{n(2n-1)(2n+1)}{3}\right)$$

Watch Video Solution

3. Prove that the sun of first n' non-zero even numbers in $n^2 + n$

Watch Video Solution

4. By the principal of mathematic induction, prove that, for $n \geq 1$

$$1.2 + 2.3 + 3.4 + \ldots + n.(n+1) = \frac{n(n+1)(n+2)}{3}$$

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5. Using the mathematical induction, show that for any natural number,

$$n \geq 2, \left(1 - \frac{1}{2^2}\right)\left(1 - \frac{1}{3^2}\right)\left(1 - \frac{1}{4^2}\right)\ldots\left(1 - \frac{1}{n^2}\right) = \frac{n+1}{2n}$$

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6. Using the mathematical induction, show that for any natural number

$$n \geq 2, \frac{1}{1+2} + \frac{1}{1+2+3} + \frac{1}{1+2+3+4} + \ldots + \frac{1}{1+2+3+\ldots+n}$$

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7. Using the mathematical induction, show that for any natural number n,

$$\frac{1}{1.2.3}+\frac{1}{2.3.4}+\frac{1}{3.4.5}+\ldots+\frac{1}{n.(n+1).(n+2)}=\frac{n(n+3)}{4(n+1)(n+2)}$$

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8. Using the mathematical induction, show that for any natural number n,

$$\frac{1}{2.5}+\frac{1}{5.8}+\frac{1}{8.11}+\ldots+\frac{1}{(3n-1)(3n+2)}=\frac{n}{6n+4}$$

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9. Prove by the mathematical induction that

$$1!+(2\times 2!)+(3\times 3!)+\ldots+(nXn!)=(n+1)!-1$$

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10. Using the mathematical induction, show that for any natural numbern , $x^{2n}-y^{2n}$ is divisible by (x+y).e

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Watch Video Solution

11. By the principle of mathematic induction, prove that, for $n \geq 1$,

$1^2 + 2^2 + 3^2 + \ldots + n^2 > \frac{n^3}{3}$

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12. Use induction to prove that $n^3 - n + 3$, is divisible by 3, for all natural numbers n

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13. Use induction to prove that $5^{n+1} + 4 \times 6^n$ when divided by 20 leaves a remainder 9 for all natural numbers n .

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14. Use induction to prove that $10^n + 3 \times 4^{n+2} + 5$, is dvisible by 9, for all natural no. n.

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Exercise 4 5

1. The sum of the digits at the 10th place of all numbers formed with the help of 2,4,5,7 taken all at a time is

A. 432

B. 108

C. 36

D. 18

Answer: B

Watch Video Solution

2. In an examination there are three multiple choice questions and each question has 5 choices Number of ways in which a student can fail to get all answer correct is

A. 125

B. 124

C. 64

D. 63

Answer: B

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3. The number of ways in which of following prize be given to a class of 30 boys first and second in mathematics, first and second in physics, first in chemistry and first in English is

A. $30^4 \times 29^2$

B. $30^3 \times 29^3$

C. $30^2 \times 29^4$

D. 30×29^5

Answer: A

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4. The number of 5 digit numbers all digits of which are odd is

A. 25

B. 5^5

C. 5^6

D. 625

Answer: B

Watch Video Solution

5. In 3 fingers, the number of ways five rings can be worn in..... ways:

A. $4^3 - 1$

B. 3^4

C. 6^8

D. 6^4

Answer: B

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6. If $.^{n+5}P_{n+1} = \left(\frac{11(n-1)}{2}\right).^{n+3}P_n$ then the value of n are

A. 7 and 11

B. 6 and 7

C. 2 and 11

D. 2 and 6

Answer: B

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7. The product of r consecutive positive integers is divisible by

A. r!

B. (r-1)!

C. (r+1)!

D. r^r)

Answer: A

Watch Video Solution

8. The number of five digit telephone numbers having at least one of their digits repeated is

A. 90000

B. 10000

C. 30240

D. 69760

Answer: D

Watch Video Solution

9. If $.^{a^{2-a}}C_2 = a^{2-a}C_4$ then the value of a is

A. 2

B. 3

C. 4

D. 5

Answer: B

Watch Video Solution

10. There are 10 points in a plane and 4 of them are collinear. The number of straight lines joining any two points is

A. 45

B. 40

C. 39

D. 38

Answer: B

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11. The number of ways in which a host lady invite 8 people for a party of 8 out of 12 people of whom two do not want to attend the party together is

A. $2 \times {}^{11}C_7 + {}^{10}C_8$

B. ${}^{11}C_7 + {}^{10}C_8$

C. ${}^{12}C_8 - {}^{10}C_6$

D. ${}^{10}C_6 + 2!$

Answer: C

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12. The number of parallelograms that can be formed from a set of four parallel lines intersecting another set of three parallel lines.

A. 6

B. 9

C. 12

D. 18

Answer: D

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13. Everybody in a room shakes hands with everybody else. The total number of shake hands is 66. The number of persons in the room is

A. 11

B. 12

C. 10

D. 6

Answer: B

Watch Video Solution

14. Number of sides of a polygon having 44 diagonals is

A. 4

B. 4!

C. 11

D. 22

Answer: C

Watch Video Solution

15. If 10 lines are drawn in a plane such that no two of them are parallel and no three are concurrent, then the total number of points of intersection are

A. 45

B. 40

C. 10!

D. 2^{10}

Answer: A

Watch Video Solution

16. In a plane are 10 points are there out of which 4 points are collinear, then the number of triangles formed is

A. 110

B. ${}^{10}C_3$

C. 120

D. 116

Answer: D

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17. In $.^{2n}C_3 \therefore^{n} C_3 = 11:1$ then n is

A. 5

B. 6

C. 11

D. 7

Answer: B

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18. . ${}^{(n-1)}C_r + {}^{(n-1)}C_{(r-1)}$ is

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

B. ${}^{n-1}C_r$

C. ${}^{n}C_r$

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

Answer: C

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19. The number of ways of choosing 5 cards out of a deck of 52 which include at least one king is

A. ${}^{52}C_5$

B. ${}^{48}C_5$

C. ${}^{52}C_5 + {}^{48}C_5$

D. ${}^{52}C_5 - {}^{48}C_5$

Answer: D

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20. The number of rectangles that a chessboard has

A. 81

B. 9^9

C. 1296

D. 6561

Answer: C

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21. The number of 10 digit number that can be written by using the digits 2 and 3 is

A. ${}^{10}C_2 + {}^{9}C_2$

B. 2^{10}

C. $2^{10} - 2$

D. 10!

Answer: B

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22. If P_r stands for ${}^{r}P_r$ then the sum of the series $1 + P_1 + 2 \times P_2 + 3 \times P_3 + \ldots + n \times P_n$ is:

A. P_{n+1}

B. $P_{n+1} - 1$

C. $P_{n+1}+1$

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

Answer:

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23. The product of first n odd natural numbers equals:

A. ${}^{2n}C_n \times {}^{n}P_n$

B. $\left(\frac{1}{2}\right)^n \times {}^{2n}C_n \times {}^{n}P_n$

C. $\left(\frac{1}{4}\right)^n \times {}^{2n}C_n \times {}^{2n}P_n$

D. ${}^{n}C_n \times {}^{n}C_n$

Answer: B

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24. If $''C_4, ''C_5, ''C_6$ are in AP then value of n is

A. 14

B. 11

C. 9

D. 5

Answer: A

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25. 1 +3 + 5 + 7 + ... 17 is equal to

A. 101

B. 81

C. 71

D. 61

Answer: B

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Problems For Practice Answer The Following Questions

1. How many three-digit odd numbers can be formed by using the digits 0,1,2,3,4,5 ? If

(i) the repetition of digits is not allowed

(ii) the repetition of digits is allowed

Watch Video Solution

2. How many three-digit odd numbers can be formed by using the digits 0,1,2,3,4,5 ? If

(i) the repetition of digits is not allowed

(ii) the repetition of digits is allowed

Watch Video Solution

3. Iff ${}^5P_r = {}^6P_{r-1}$ find r.

Watch Video Solution

4. If $\frac{\lfloor 9}{\lfloor (9-r)}$=3024, find r.

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5. A family of 4 brothers and 3 sisters is to be arranged in a row for a photograph, in how many ways can they be seated if

Q all the sisters sit together.

Watch Video Solution

6. A family of 4 brothers and 3 sisters is to be arranged in a row for a photograph. In how many ways can they be seated if

Q all the sisters are not together.

Watch Video Solution

7. If ${}^{15}C_r : {}^{15}C_{r-1} = 11:5$ find r.

Watch Video Solution

8. If ${}^{n}P_r = {}^{n}P_{r+1}$ and ${}^{n}C_r = {}^{n}C_{r-1}$ find n and r.

Watch Video Solution

9. A box contains 5 different red and 6 different . white balls. In how many ways 6 balls be selected so that are atleast 2 balls of each colour.

Watch Video Solution

10. By mathematical induction prove that 2^{3n}-1 is divisible by 7.

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11. By mathematical induction show that $7^{2n} + 16n - 1$ is divisible by 64.

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Problems For Practice Choose The Correct Option For The Following

1. 0! Is :

A. 1

B. 0

C. ∞

D. $-\infty$

Answer: A

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2. If n different objects are to placed in m places then the number of ways of placing is:

A. n^m

B. m^n

C. mn

D. m+n

Answer: B

Watch Video Solution

3. There are 5 bulbs in a room. Each one of them can be operated independently. Then the no. of ways in which the room is illuminated I is:

A. 10

B. 32

C. 31

D. 63

Answer: C

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4. If 7!/n!=7 then the value of n is:

A. 8

B. 720

C. 7

D. 6

Answer: D

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5. If n! + (n-1)! =144, then the value of n is :

A. 4

B. 5

C. 6

D. 10

Answer: B

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6. $Prove^{n}P_{r} = {}^{n-1}P_{r} + r.\ {}^{n-1}P_{r-1}$

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7. ${}^{7}C_{3} + {}^{7}C_{2} = {}^{x}C_{y}$ then x and y are:

A. x = 8,y = 3

B. x = 1,y = 2

C. x = 1,y=3

D. x=3,y=3

Answer: A

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8. If 5 parallel lines intersect another set of 4 , parallel lines (not parallel to the lines in the first set) then the no. of parallelograms formed in this lattice structure is:

A. 15

B. 20

C. 9

D. 60

Answer: D

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9. $1^2 + 2^2 + 3^2 + \ldots + 10^2$ is :

A. 385

B. 605

C. 285

D. none of these

Answer: A

Watch Video Solution

10. If ${}^{x^2-x}C_7 = {}^{x^2-x}C_5$ then x is :

A. 33

B. 4

C. 5

D. 6

Answer: B

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11. A photographer wants to take a photo of 3 students out of 6 students of whom two do not want to participate in photo. The no. of ways of taking photo is:

A. 125

B. 900

C. 13

D. 16

Answer: D

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12. In 3 fingers, the number of ways five rings can be worn in..... ways:

A. 125

B. 900

C. 13

D. 16

Answer: A

Watch Video Solution

13. There are 8 points in a plane, no three of them are collinear .The number of triangles that can be formed is:

A. 125

B. 900

C. 13

D. 56

Answer: D

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14. 10 students compete in a race. In how many ways first two prizes be given?

A. 125

B. 90

C. 13

D. 16

Answer: B

Watch Video Solution

15. How many lines can be drawn given six points of which 3 are collinear?

A. 125

B. 900

C. 13

D. 16

Answer: C

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16. Find the odd one out:

A. 72

B. 25

C. 39

D. 120

Answer: D

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17. Among the following, find which one cannot be no. of digonals of a polygon:

A. 2

B. 9

C. 5

D. 8

Answer: D

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18. Find the correct statement:

A. ${}^{n}P_{r} = \frac{n!}{(n-r)!r!}$

B. The no. of ways of arranging n unlike objects is (n - 1)!

C. Factoral of a natural number n is the sum of first n natural numbers.

D. n! = n (n - 1)! for any integer $n \geq 1$

Answer: D

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19. Find the correct statement:

A. The no. of ways of selecting a boy or a girl from a group of 10 boys and six girls is 16.

B. There are 3 routes from city A to city B and 4 routes from city B to city C. Then the no. of routes from city A to city C is 7.

C. The no. of strings of length 4 which can be formed using the letters of the word HEAR, without repetition of the letters is 10.

D. The no. of positive integer greater than 8000 and less than 9000 which are divisible by 5, (no digit is repeated) is 56.

Answer: A

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20. Find the incorrect statement:

A. $\frac{1}{7!}+\frac{1}{8!}=\frac{9}{8!}$

B. $\frac{(n+3)!}{(n+1)!}$ is (n+2)(n+3)

C. ${}^{n-1}P_{r-1}={}^{n\times n}P_r$

D. $\lfloor(0)=1$

Answer: C

Watch Video Solution

21. Find the incorrect statement:

A. If ${}^{10}P_r={}^{7}P_{r+2}$ then r=4

B. ${}^{n}P_n=\lfloor(n)$

C. The number of ways of arranging the letters of the word SARASA is 120.

D. ${}^{n}C_{r} = \frac{n!}{(n-r)!r!}$

Answer: C

Watch Video Solution

22. Find the correct statement:

A. $1! + (2 \times 2!) + (3 \times 3!) \ldots (10 \times 10!) = 11! + 1$

B. $\frac{{}^{n}P_{r}}{{}^{n}C_{r}} = r!$

C. The sum of first n positive odd numbers is n^3

D. The no. of diagonals of a polygon of n sides is ${}^{n}C_{2}$

Answer: B

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23. Find the incorrect statement:

A. ${}^{7}C_{r} + {}^{7}C_{r-1} = {}^{8}C_{r}$

B. ${}^{n}C_{r} = {}^{n}C_{n-r}$

C. ${}^{n}C_{0} = {}^{n}C_{n} = 0$

D. ${}^{10}C_{2} = 45$

Answer: C

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24. Assertion: 1+2 + 3 + ... n = $\frac{n(n+1)}{2}$

Reason: In a statement P(n), if P(l) is true and assuming P(k) and if we prove P(k + 1) is also true then P(n) is true for all value n, n is true integer

A. Using Reason we can prove Assertion

B. Using Reason we can not prove Assertion

C. Both Assertion and Reason are incorrect

D. Assertion is wrong while Reason is correct.

Answer: A

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25. Assertion: ${}^{24}C_4 + \sum_{r=0}^{3} {}^{27-r}C_3 = {}^{28}C_4$

Reason: ${}^{n}C_r + {}^{n}C_{r-1} = {}^{n+1}C_r$

A. Both Assertion and Reason are incorrect

B. Reason is incorrect Assertion is correct

C. Reason is correct, Assertion is incorrect

D. Using Reason we can prove Assertion

Answer: D

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26. $\lfloor(n) + \lfloor(n+1)$ is :

A. $\lfloor(n)(n+2)$

B. $\lfloor(n+2)$

C. $\lfloor(2n+1)$

D. none of these

Answer: A

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27. If ${}^{100}C_r = {}^{100}C_{3r}$ then r is:

A. 24

B. 25

C. 20

D. 50

Answer: B

Watch Video Solution

28. The number of diagonals of a decagon:

A. 10

B. 20

C. 35

D. 40

Answer: C

Watch Video Solution

29. If $.^{n}P_{r} = 720.$ If $.^{n}C_{r} = 120$ find n, r

A. 2

B. 4

C. 3

D. 5

Answer: C

Watch Video Solution

30. The numbe rof parallelogram formed if 5 parallel lines intersect with 4 other parallel lines is:

A. 10

B. 45

C. 30

D. 60

Answer: D

Watch Video Solution

31. Find the number of ways of arranging the letters of the word ANAND.

A. 30

B. 35

C. 40

D. 45

Answer: A

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32. If ${}^{n}P_{r} = k \times {}^{n-1}P_{r-1}$ what is k:

A. r

B. n

C. n+1

D. r+1

Answer: B

Watch Video Solution

33. The number of ways of selecting of 3 poets and 4 scientists is such that poets are in even places:

A. 12

B. 36

C. 72

D. 144

Answer: D

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34. (i) ${}^{100}C_2 = 4950$

(ii) $\lfloor(4) + \lfloor(5) = \lfloor(9)$

(iii) The no. of diagonals of a polygon of 10 sides is 35.

(iv) ${}^nC_r = {}^nC_{n+r}$

From the above find which pair is true.

A. (i) and (ii) are true

B. (ii) and (iii) are true

C. (i) and (iv) are true

D. (i) and (iii) are true

Answer: D

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