



MATHS

BOOKS - MODERN PUBLISHERS MATHS (HINGLISH)

PERMUTATIONS AND COMBINATIONS

Illustrative Examples

1. Find $\frac{7!}{5!}$.



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2. Compute $(4!)(2!)$. Is $(4!)(2!) = 8!$?

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3. When $n = 5$ and $r = 2$, find the values of:

(i) $\frac{n!}{r!}$

(ii) $\frac{n!}{r!(n-r)!}$

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4. Prove that $(n!)^2 \leq n^n$. $(n!) < (2n)!$ for all positive integers n .

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5. Prove that $(n! + 1)$ is not divisible by any natural number between 2 and n .

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6. Prove that $33!$ is divisible by 2^{15} . what is the largest integer n such that $33!$ is divisible by 2^n .

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7. A lady wants to select one cotton saree and one polyester saree from a textile shop. If there are 10 cotton varieties and 12 polyester varieties, in how many ways can she choose the two sarees ?

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8. How many three digit numbers can be formed without using the digits 0,2,3,4,5 and 6?

A. 120

B. 60

C. 24

D. 64

Answer: C



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

A. 10

B. 25

C. 13

D. 12

Answer: A



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10. How many numbers are there between 100 and 1000 such that every digit is either 2 or 9?

A. 16

B. 8

C. 6

D. 32

Answer: B



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11. In a class there are 30 boys and 18 girls. The teacher wants to select one boy and one girls. The teacher wants to select one boy and one girls to represent the class for a quiliz competition. In how many ways can the teacher make this selection ?



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12. How many 3 letter code combinations are possible using the first 10 letters of English alphabets if no letter can be repeated.

A. 1000

B. 810

C. 720

D. 729

Answer: C



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13. In how many ways can five people be seated in a car with two people in the front seat and three in the rear, if two particular persons out of the five cannot drive?



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14. There are 5 multiple choice questions in an examination. How many sequences of answers are possible, if each question has 4 choices?

A. 5^4

B. 4^5

C. 20

D. 9

Answer: B



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15. Find the number of different signals that can be generated by arranging at least 2 flags in order (one below the other) on a vertical staff, if five different flags are available.



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16. Find the value of 4P_3 .



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17. Find the value of n such that

(i) ${}^n P_5 = 42 \times {}^n P_3, n > 4$ (ii) $\frac{{}^n P_4}{{}^{n-1} P_4} = \frac{5}{3}, n > 4.$

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18. If

$r < s \leq n$ then prove that ${}^n P_s$ is divisible by ${}^n P_r$.

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19. Prove that :

(i) ${}^n P_r = {}^{n-1} P_{r+r} {}^{n-1} P_{r-1}$

(ii) ${}^n P_r = n {}^{n-1} P_{r-1}$

(iii) ${}^n P_r = (n - r + 1) {}^n P_{r-1},$

for all natural numbers n and r for which the symbols are defined.

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20. If P_m stands for ${}^m P_m$, then prove that:
 $1 + 1 \cdot P_1 + 2 \cdot P_2 + 3 \cdot P_3 + \dots + n \cdot P_n = (n + 1)!$

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21. Find the number of permutations of n things taken r at a time in which two particular things :

(i) always occur

(ii) never occur.

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22. In how many ways can 6 different rings be worn in 4 fingers of the hand?



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23. How many natural numbers less than 1,000 can be formed with digits 1,2,3,4 and 5 if (i) no digit is repeated (ii) repetition of digits is allowed ?



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24. There are 3 prizes to be distributed amongst 6 students.

In how many ways can it be done when :

(i) no student gets more than one prize.

(ii) there is no restriction as to the number of prizes any student gets

(iii) no student gets all the prizes ?

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25. Evaluate $^{10}C_4$.

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26. Verify that $2^7 C_4 = {}^8 C_4$.

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27. If ${}^n C_7 = {}^n C_5$, find ${}^n C_4$.



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28. Prove that :

$${}^2C_1 + {}^3C_1 + {}^4C_1 = {}^3C_2 + {}^4C_2.$$



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29. Prove that $\sum_{r=0}^5 {}^5C_r = 32.$



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30. Prove that: ${}^{2n}C_n = \frac{2^n [1 \cdot 3 \cdot 5 \cdot (2n - 1)]}{n!}$



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31. Find 'n', if ${}^{2n}C_1$, ${}^{2n}C_2$ and ${}^{2n}C_3$ are in A.P.

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32. In how many ways can 10 things be equally divided :

(i) between two persons

(ii) into two heaps ?

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33. A man has 6 friends. In how many ways can he invite one or more of his friends to a party ?

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34. From 4 mangoes, 5 oranges and 6 apples, how many selections can be made by taking at least one of them?



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35. A number lock on a suitcase has three wheels each labelled with ten digits 0 to 9. If opening of the lock is a particular sequence of three digits with no repeats, how many such sequences will be possible? Also, find the number of unsuccessful attempts to open the lock.



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36. A customer forgets a four digit code for an Automatic Teler Machine (ATM) in a bank. However, he remembers that

this code consists of digits 2, 3, 6 and 9. Find the largest possible number of trials necessary to obtain the correct code.

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37. A person is to walk from P to Q. However, he is restricted to walk only to the right of P or upward to, P but not necessarily in the order shown in the adjoining figure. Determine the number of paths, available to the person from P to Q.

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Frequently Asked Questions

1. How many numbers greater than 56000 and formed by using the digits 4, 5, 6, 7, 8, no digit being repeated in any number?

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2. Find the sum of all the numbers that can be formed with the digits 2, 3, 4, 5 taken all at a time.

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3. The number of natural numbers smaller than 10^4 of which all digits are different, is

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4. How many 6-digit telephone numbers can be constructed with digits 0,1,2,3,4,5,6,7,8,9 if each number starts with 35 and no digit appears more than once?

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5. There are 6 candidates contesting for a certain office in a municipal election. In how many ways can their names be listed on a ballot paper?

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6. How many words, with or without meanings, can be formed using all the letters of the word 'EQUAL', using each

letter exactly once ?

A. $5!$

B. $5(5!)$

C. 24

D. None

Answer: A



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7. In how many ways can 9 examination papers arranged so the best and the worst papers are never together?



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8. The letters of the word 'RANDOM' are written in all possible orders and these words are written out as in dictionary. Find the rank of the word 'RANDOM'.

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9. The Principal wants to arrange 5 students on the platform such that the boy SALIM occupies the second position and such that the girl. SITA is always adjacent to the girl RITA. How many such arrangements are possible?

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10. Six candidates are called for interview to fill four posts in an office. Assuming that each candidate is fit for each post,

determine the number of ways in which i. first and second posts can be filled. ii. First three posts can be filled. iii. All the four posts can be filled.



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11. Three married couples are to be seated in a row having six seats in a cinema hall. If spouses are to be seated next to each other, in how many ways can they be seated? Find also the number of ways of their seating if all the ladies sit together.



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12. How many signals can be made by hoisting 5 flags of different colours ?



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

(i) exactly 3 girls?

(ii) at least 3 girls

(ii) almost 3 girls?



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14. What is the number of ways of choosing 4 cards from a pack of 52 playing cards? In how many of these (i) four cards are of the same suit, (ii) four cards belong to four different suits, (iii) are face cards, (iv) two are red cards and two are bla

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15. 21.A student has to answer 10 questions, choosing at least 4 from each of part A and B. If there are 6 questions in part A and 7 in part B. In how many ways can the student choose 10 questions?

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16. A cricket team of 11 players is to be selected from 16 players including 5 bowlers and 2 wicketkeepers. In how many ways can a team be selected so as to consist of exactly 3 bowlers and 1 wicketkeeper?



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17. A person wishes to make up as many different parties as he can out of his 16 friends such that each party consists of the same number of persons. How many friends should be invite ?



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18. In a village, there are 87 families of which 52 families have at most 2 children. In a rural development programme, 20 families are to be helped chosen for assistance, of which at least 18 families must have at most 2 children. In how many ways can the choice be made?

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19. If m parallel lines in a plane are intersected by a family of n parallel lines, the number of parallelograms that can be formed is a. $\frac{1}{4}mn(m-1)(n-1)$ b. $\frac{1}{4}mn(m-1)(n-1)$ c. $\frac{1}{4}m^2n^2$ d. none of these

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Questions From Ncert Exemplar

1. In a class there are 27 boys and 14 girls. The teacher wants to select 1 boy and 1 girl to represent the class in a function. In how many ways can the teacher make this selection?



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2. In how many ways can 5 children be arranged in a line such that two particular children of them are always together



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3. There are 10 persons named $P_1, P_2, P_3, \dots, P_{10}$. Out of 10 persons, 5 persons are to be arranged in a line such that in each arrangement P_1 must occur whereas P_4 and P_5 do not occur. Find the number of such possible arrangements.

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4. If ${}^nC_{r-1} = 36$, ${}^nC_r = 84$ and ${}^nC_{r+1} = 126$, then find the value of rC_2 .

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Exercise 7 A Short Answer Type Questions

1. Compute the following

(i) $5!$

(ii) $7!$



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2. Compute the following

(i) $7! - 5!$

(ii) $4! - 3!$

(iii) $\frac{9! - 8!}{7!}$



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3. Compute the following

(i) $2 \times 6! - 3 \times 5!$

(ii) $3 \times 4! + 7 \times 4!$

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4. Compute $\frac{12!}{(10)!(2)!}$.

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5. Compute $\frac{20!}{18!(20 - 18)}$.

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6. Convert the following into factorials :

(i) 2.4.6.8.10

(ii) 4.5.6.7.8.9.10.11.

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7. (i) Compute $2! + 3!$. Is $2! + 3 \neq 5!$?

(ii) Compute $\frac{8!}{4!}$. Is $\frac{8!}{4!} = 2!$?

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8. Evaluate $(n - r)!$, when :

(i) $n = 6, r = 2$

(ii) $n = 9, r = 5$

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

(i) $n = 10, r = 4$

(ii) $r = 1$

(iii) $r = 2.$

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

(i) $n = 6, r = 2$

(ii) $n = 7, r = 4$

(iii) $n = 15, r = 12.$

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11. Find the L.C.M. of 3!, 4! And 5!.

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12. (i) If $\frac{1}{9!} + \frac{1}{10!} = \frac{n}{11!}$, find n.

(ii) If $\frac{1}{8!} + \frac{1}{9!} = \frac{x}{10!}$, find x.

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13. Prove that: $n!(n + 2) = n! + (n + 1)!$

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14. (i) If $(n + 1) \neq 12[(n - 1)!]$, find n

(ii) If $(n + 2) \neq 60[(n - 1)!]$, find n

(iii) If $(n + 2) \neq (2550)(n!)$, find n .

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15. If $\frac{n!}{2!(n - 2)!}$ and $\frac{n!}{4!(n - 4)!}$ are in the ratio 2 : 1, find the value of n .

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16. Prove that

$$\frac{n!}{r!(n - r)!} + \frac{n!}{(r - 1)!(n - r + 1)!} = \frac{(n + 1)!}{r!(n - r + 1)!}$$

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17. Prove that there are exactly 4 ! Numbers between 1000 and 10000 that contain the digits 1, 3, 5 and 7.



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18. Show that 2^{16} divides $32 !$. Find the highest power of 2 that divides $32 !$.



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Exercise 7 B Short Answer Type Questions

1. There are five colleges in a city. In how many ways can a man send 3 of his sons to a college, if no two of his sons are to read in the same college ?

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2. John wants to go abroad by ship and return by air. He has a choice of 6 different ships to go and 4 airlines. To return. In how many ways can he perform his journey ?

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3. There are 5 routes from A to B and 3 routes from place B to place C. Find how many different routes are there from A

to C via B.



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4. If there are 20 steamers plying between places A and B, in how many ways could the round trip from A be made if the return was made on :

(i) the same steamer

(ii) a different steamer ?



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5. In how many ways can 5 ladies draw water from 5 taps, assuming that no tap remains unused?



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6. In how many ways can 3 people be seated in a row containing 7 seats?

A. 120

B. 280

C. 420

D. 210

Answer: D



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7. A sample of 3 bulbs is tested. A bulb is labelled 'G' if it is good and 'D' if it defective. Find the number of all the

possible outcomes.



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8. Six pictures are to be arranged from left to right on a wall of an art gallery for display. How many arrangements are possible ?



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9. The digits, from $0 \rightarrow 9$ are written on 10 slips of paper (one digit on each slip) and placed in a box. If three of the slips are drawn and arranged, then the number of possible different arrangements is



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10. For a group photograph, 3 boys and 2 girls stand in a line in all possible ways. How many photos could be taken if each photo corresponds to each such arrangement ?

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11. 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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12. Given 7 flags of different colours, how many different signals can be generated if a signal requires the use of two

flags, one below the other?



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13. Find the number of different signals that can be made by arranging at least 3 flags in order on a vertical pole, if 6 different flags are available.



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14. How many numbers can be formed from the digits 1,2,3 and 9, if repetition of digits is not allowed?



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15. Kartar goes to a movie. The cinema hall has two entrances and three exits. In how many ways can Kartar enter and exit from the hall ?

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16. Find the number of different signals that can be generated by arranging at least 2 flags in order (one below the other) on a vertical staff, if five different flags are available.

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Exercise 7 B Long Answer Type Questions I

1. In a monthly test, the teacher decides that there will be three questions, one from each of Exercises 5, 6 and 7 of the text book. If there are 12 questions in Exercise 5, 18 in Exercise 6 and 9 in Exercise 7, in how many ways can the three questions be selected ?



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2. The students in a class are seated according to the marks in the previous examination. Once it so happens that four of these students get equal marks and therefore the same rank. To decide their seating arrangement, the teacher wants to write down all possible arrangements, one in each of separate bits of paper, in order to choose one of these by lots. How many bits of paper are required ?



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3. Eight children are to be seated on a bench.

(i) In how many ways can the children be seated ?

(ii) How many arrangements are possible if the youngest child sits at the left hand end of the bench ?

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

How many possible outcomes if the coin is tossed : Four times , Five times , n times ?

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5. A class consists of 40 girls and 60 boys. In how many ways can a president, vice president, treasurer and secretary be chosen if the treasurer must be a girl, the secretary must be a boy and a student may not hold more than one office?



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6. How many numbers are there between 100 and 1000 such that at least one of their digits is 7 ?

A. 900

B. 648

C. 252

D. 729

Answer: C



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7. A mint prepares metallic calendars specifying months, dates and days in the form of monthly sheets (one plate for each month). How many types of February calendars should it prepare to serve for all the possibilities in the future years?



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8. For a set of five true or false questions, no student has written the all correct answer and no two students have

given the same sequence of answers. What is the maximum number of students in the class for this to be possible?



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9. How many automobile license plates can be made, if each plate contains two different letters followed by three different digits ?



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10. The licence plates for vehicles registered in Delhi consist of 3 letters (of English alphabet) followed by 1,2,3 or 4 digits. The letter on the extreme right has to be 'D'. For the 1-digit number plates, the number 0 is not allowed. For other, the

digits and the letters, of course can repeat, but the numbers should be significant. Determine the possible number of licence plates.



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Exercise 7 C Short Answer Type Questions

1. Evaluate :

(i) ${}^{20}P_4$

(ii) ${}^{75}P_2$



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2. Find 'r' if :

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

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

$$(iii) {}^5P_r = {}^2P_{r-1}$$

$$(iv) {}^{10}P_{r+1} : {}^{11}P_r = 30 : 11.$$



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3. Find 'n' if :

$$(i) {}^{2n}P_3 = 100^n P_2$$

$$(ii) {}^nP_4 = 20 \times {}^nP_2$$



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4. Prove that :

(i) ${}^n P_n = 2^n P_{n-2}$

(ii) ${}^{10} P_3 = {}^9 P_3 + 3^9 P_2$.

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5. Show that ${}^n P_n = {}^n P_{n-1}$ for all natural numbers n.

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Exercise 7 D Short Answer Type Questions

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

A. 120

B. 96

C. 108

D. 48

Answer: C

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2. In how many ways can five children stand in a queue?

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3. How many different signals can be generated from 6 flags of different colours if each signal makes use of all the flags at

a time, placed one below the other?



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4. Seven songs are to be rendered in a programme. In how many different orders could they be rendered?



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5. There are 6 items in column A and 6 items in column B. A student is asked to match each item in column A with an item in column B. How many possible (correct or incorrect) answers are there to this questions?



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6. (i) How many three - digit numbers are there, with no digit repeated ?

(ii) How many four - digit numbers are there, with no digit repeated ?

(iii) How many natural numbers from 1 to 1000 have none of their digits repeated ?

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7. How many even numbers of three digits each can be made with the digits 1, 2, 3, 4, 5, 6 if : no digit is repeated.

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

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9. How many numbers lying between 100 and 1000 can be formed with the digits 0, 1, 2, 3, 4, 5, if the repetition of the digits is not allowed?

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10. How many 4-digit numbers can be formed by using the digits 1 to 9 if repetition of digits is not allowed?

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



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

A. 96

B. 72

C. 60

D. 120

Answer: D



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13. Ten horses are running a race. In how many ways can these horses come in the first, second and third place, assuming no ties?



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



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15. from a pool of 12 candidates in how many ways can we select president, vice-president, secretary and a treasurer if each of the 12 candidates can hold any office?

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16. Four letters E, K, S and V, one in each, were purchased from a plastic warehouse. How many ordered pairs of letters, to be used as initials, can be formed from them?

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Exercise 7 D Long Answer Type Questions I

1. How many natural numbers not exceeding 4321 can be formed with the digits 1, 2, 3 and 4 if the digits can repeat ?

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2. From the digits 1, 2, 3, 4, 5, 6 how many three - digit odd numbers can be formed when the repetition of the digits is not allowed ?

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3. How many of the natural numbers can be formed from the digits 2, 3, 5, 7, 9 ? How many of them are odd?

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4. How many 5-digit telephone numbers can be formed with the digits 0, 1, 2, 3,, 8, 9 if each number starts with 67 and no digit appears more than once ?

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

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6. Find the value of $\frac{n!}{(n-r)!}$, if $n = 10$ and $r = 3$.

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7. In how many ways can 6 boys and 5 girls be arranged for a group photograph if the girls are to sit on chairs in a row and the boys are to stand in a row behind them?

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8. Find the number of 4 letter words, with or without meaning, which can be formed out of the letters of the word ROSE, where the repetition of the letters is not allowed.

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9. The letters of the word TUESDAY are arranged in a line, each arrangement ending with letter S. How many different arrangements are possible ? How many of them start with letter D?

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10. How many three letter words can be made using the letters of the word ORIENTAL?

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11. Find the number of different 8-letter arrangements that can be made from the letters of the word DAUGHTER so that

(i) all vowels occur together (ii) all vowels do not occur together.

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12. In how many ways can the letters of the word 'HEXAGON' be permuted? In how many words will the vowels be together?

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13. How many permutations can be made out of the letters of the word TRIANGLE ? How many of these will begin with T and end with E ?

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



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15. How many words can be formed out of the letters of the word 'ARTICLE' so that vowels may occupy even places ?

A. 144

B. 48

C. 36

D. 120

Answer: A



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16. In how many ways can 5 children be arranged in a line such that :

(i) two of them, Ram and Shyam are always together

(ii) two of them, Ram and Shyam are never together ?



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17. Four books, one each in Chemistry, Physics, Biology and Mathematics, are to be arranged in a shelf. In how many ways can this be done?



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18. How many different signals can be made with 6 given flags of different colours ?



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19. How many different 4-digit numbers can be formed from the digits 2,3,4 and 5 if each digit is used only once in a number ? Further, how many of these numbers i. end in a 4? ii. end in a 3? iii. End in a 3 or 6?



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20. How many numbers greater than 40000 can be formed using the digits 1,2,3,4 and 5 if each digit is used only once in each number?

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21. How many odd numbers greater than 80000 can be formed using the digits 2, 3, 4, 5 and 8 if each digit is used only once in a number ?

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Exercise 7 D Long Answer Type Questions li

1. A teacher wants to arrange 5 students on the platform such that the boy 'YUSUF' occupies the first position and the girls 'GEETA' and 'SEETA' are always together. How many such arrangements are possible ?

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2. When a group photograph is taken, all the seven teachers should be in the first row and all the twenty students should be in the second row. If the two corners of the second row are reserved for the two tallest students, interchangeable only between them, and if the middle seat of the front row is reserved for the Principal, how many arrangements are possible?

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3. In an examination hall there are four rows of chairs. Each row has 8 chairs one behind the other. There are two classes sitting for the examination with 16 students in each class. It is desired that in each row, all students belong to the same class and that no two adjacent rows are allotted to the same class. In how many ways can these 32 students be seated?



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Exercise 7 E Short Answer Type Questions

1. Find the number of permutations of 8 things, taken 3 at a time, in which 2 particular things are always :

(i) included (ii) excluded.



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2. Find the number of permutations of 12 things, taken 6 at a time, in which 3 particular things are :

(i) included (ii) excluded.



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3. Find the number of permutations of n things, taken r at a time, in which 3 particular things :

(i) always occur (ii) will never occur.



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4. How many 5-digit numbers can be formed by using the digits 5, 4, 3, 3, 0 ?

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5. (i) In how many ways can 3 prizes be given to 10 boys when a boy may receive any number of prizes ?

(ii) In how many ways can 4 prizes be given to 3 boys when a boy is eligible for all the prizes ?

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6. How many possible outcomes are there if a coin is tossed 5 times ?

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7. There are 10 true - false statements in a question paper.
How many sequences of answers are possible ?

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8. There are 4 candidates for the post of a lecturer in
Mathematics and one is to be selected by votes of 5 men.
What is the number of ways in which the votes can be given
?

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1. Evaluate

(i) ${}^{10}C_4 + {}^{10}C_5$

(ii) ${}^{13}C_6 + {}^{13}C_5$

(iii) ${}^{19}C_{17} + {}^{19}C_{18}$.

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2. Evaluate

(i) ${}^{61}C_{57} - {}^{60}C_{56}$

(ii) ${}^{31}C_{26} - {}^{30}C_{26}$

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3. ${}^8C_4 + {}^8C_3 = {}^9C_4$

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4. (i) If ${}^n C_8 = {}^n C_2$, find ${}^n C_2$.

(ii) If ${}^n C_{10} = {}^n C_{12}$, determine n and hence ${}^n C_5$.

(iii) If ${}^n C_9 = {}^n C_8$, find ${}^n C_{17}$.

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5. Verify that if $2 \times {}^7 C_4 = {}^{17} C_8$.

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6. Prove that $1 + {}^3 C_1 + {}^4 C_2 = {}^5 C_3$.

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7. (i) If ${}^{2n}C_3 : {}^nC_3 = 11 : 1$, find n .

(ii) If ${}^{2n}C_3 : {}^nC_2 = 12 : 1$, find n .

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8.

${}^nC_r : {}^nC_{r+1} = 1 : 2$ and ${}^nC_{r+1} : {}^nC_{r+2} = 2 : 3$, find n and r .

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9. If ${}^{n-1}C_r : {}^nC_r : {}^{n+1}C_r = 6 : 9 : 13$, find ' n ' and ' r '.

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10. Prove that ${}^n C_r + 2^n C_{r-1} + {}^n C_{r-2} = {}^{n+2} C_r$.

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11. Prove that ${}^n P_r = {}^n C_r \cdot {}^r P_r$.

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12. Prove that ${}^n C_r \cdot {}^r C_s = {}^n C_s \cdot {}^{n-s} C_{r-s}$

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13. Prove that the product of any 'k' consecutive integers is divisible by k !.

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14. In a certain city, all telephone numbers have six digits, the first two digits always being 41 or 42 or 46 or 62 or 64. How many telephone numbers have all six digits distinct ?

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

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16. Verify that ${}^nC_r = \frac{n}{r} {}^{n-1}C_{r-1}$ where $n = 6$ and $r = 3$.

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17. If nC_4 , nC_5 and nC_6 are in AP , then n is

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Exercise 7 | Short Answer Type Questions

1. In how many ways can a committee be selected from 15 persons if the committee is to have i. 3 members, ii. 13 members

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2. Find the number of diagonals of a :

(i) pentagon (ii) octagon.



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3. (i) If there are 12 persons in a party, and if each two of them shake hands with each other, how many handshakes happen ?

(ii) In a student's reunion meeting in a school, 16 students show up. Each shakes hands with each other exactly once. Determine the total number of handshakes.



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4. How many different committees each consistingg of 3 girls and 2 boys can be chosen from 7 girls and 5 boys?



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

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6. A bookshelf contains 7 different Mathematics textbooks and 5 different Physics textbooks. How many groups of 3 Mathematics and 3 physics textbooks can be selected?

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7. A boy has 3 library tickets and 8 books of his interest in the library. Of these 8, he does not want to borrow Mathematics Part II, unless Mathematics Part I is also

borrowed. In how many ways can he choose the three books to be borrowed ?

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8. Out of 7 consonants and 4 vowels, how many words can be made each containing 3 consonants and 2 vowels ?

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9. In an examination a student has to answer 4 questions out of 5 questions; questions 1 and 2 are however compulsory. Determine the number of ways in which the student can make the choice.

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10. In an examination, Yamini has to select 4 questions from each part. There are 6, 7 and 8 questions in Part I, Part II and Part III respectively. What is the number of possible combinations in which she can choose the questions ?

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11. If 20 lines are drawn in a plane such that no two of them are parallel and so three are concurrent, in how many points will they intersect each other?

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12. There are 15 points in a plane, no three of which are collinear. Find the number of triangles formed by joining them.

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13. A student is allowed to select at most n books from a collection of $(2n+1)$ books. The number of ways in which he can do this is 64 find the value of n .

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14. 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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Exercise 7 | Long Answer Type Questions I

1. In how many ways can a football team of 11 players be selected from 16 players? How many of these will i. include 2 particular players? ii. exclude 2 particular players?



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2. A committee of 3 members is to be formed out of 5 men and 2 women. Find the number of ways of selecting the committee if it is to consist of at least one women.

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3. A committee of 3 persons is to be constituted from a group of 2 men and 3 women. In how many ways can this be done? How many of these committees would consist of 1 man and 2 women?

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4. A group consists of 4 girls and 7 boys. In how many ways can a team of 5 members be selected if the team has (i) no girl ? (ii) at least one boy and one girl ? (iii) at least 3 girls ?

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5. In how many ways can 5 members forming a committee out of 10 be selected so that :

(i) two particular members must be included

(ii) two particular members must not be included ?

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6. A question paper has two parts, part A and part B, each containing 12 questions. If the student has to choose 7 questions from part A and 4 from part B, in how many ways can he choose the questions ?

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7. From a class of 12 boys and 10 girls, 10 students are to be chosen for a competition; at least including 4 boys and 4 girls. The 2 girls who won the prizes last year should be included. In how many ways can the selection be made?

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8. A bag contains 4 red, 3 white and 2 blue balls. Three balls are drawn at random out of the bag. Determine the number of ways of selecting at least one white ball in the selection.

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Exercise 7 J Short Answer Type Questions

1. In how many ways can 12 things be equally divided :

(i) between 2 persons (ii) into 2 heaps ?

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2. In how many ways can 18 different books be divided equally among three students ?

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3. The total number of ways of dividing 15 different things into groups of 8, 4 and 3 respectively is:

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4. A man has 7 friends. In how many ways can he invite one or more of them to a party?

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5. Anil has 8 friends. In how many ways can he invite one or more of his friends to a dinner?

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6. In how many ways can a student of XI choose 5 subjects out of 9 available subjects if two subjects, English (core) and Hindi (core) are compulsory.

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7. In an Examination, a candidate has to pass in each of the four subjects. In how many ways can he fail ?

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8. From 2 mangoes, 3 oranges and 4 apples, how many selections of fruits can be made by taking :

(i) at least one of them

(ii) at least one of each kind ?

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9. At an election, a voter may vote for any number of candidates not greater than the number to be chosen. There

are 7 candidates and 4 members are to be chosen. In how many ways can a person vote ?



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10. If m red balls and n white balls are placed in a row so that no two white balls are together, prove that if $m > n$, the total number of ways in which this can be done is ${}^{m+1}C_n$.



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Exercise 7 K Long Answer Type Questions I

1. Serial numbers for an item produced in a factory are to be made using two letters followed by four digits (0 to 9). If the letters are to be taken from six letters of English alphabet without repetition and the digits are also not repeated in a serial number, how many serial numbers are possible?

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2. A committee of 5 members is to be selected from among 6 boys and 5 girls. Determine the number of ways of selecting the committee if it is to consist of at least one boy and one girl.

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3. A biologist studying the genetic code is interested to know the number of possible arrangements of 12 molecules in a chain. The chain contains 4 different molecules represented by the initials A (for a Adenine), C (for Cytosine), G (for Guanine) and T (for Thymine) and 3 molecules of each kind. How many different such arrangements are possible?



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Objective Type Questions A Multiple Choice Questions

1. There are four bus routes between A and B, and three bus routes between B and C. A man can travel round trip in number of ways by bus from A to C via B. If he does not want to use a bus route more than once, in how many ways can he make round trip ?

A. 72

B. 144

C. 14

D. 19

Answer: A



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2. In how many ways can a committee consisting of 3 men and 2 women be formed from 7 men and 5 women ?

A. 45

B. 350

C. 4200

D. 230

Answer: B



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3. All the letters of the word 'EAMCOT' are arranged in different possible ways. The number of such arrangements in which no two vowels are adjacent to each other is :

A. 360

B. 144

C. 72

D. 54

Answer: B



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4. 10 different letters of an alphabet are given. Words with 5 letters are formed from these given letters then the numbers of words which have atleast one letter represent is:

A. 69760

B. 30240

C. 99748

D. 99784

Answer: A



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5. The number of signals that can be sent by 5 flags of different colours, taking one or more at a time is :

A. 63

B. 1956

C. 720

D. 21

Answer: B



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6. In an examination there are three multiple choice questions and each question has 4 choices. Number of ways in which a student can find to get all answers correct is :

A. 11

B. 12

C. 27

D. 63

Answer: D



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7. If $\frac{1}{9!} + \frac{1}{10!} = \frac{x}{11!}$ then $x =$

A. 10

B. 11

C. 121

D. 9

Answer: C



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8. L.C.M. of 3!, 4! And 5! Is :

A. 3!

B. 4!

C. 5!

D. 12!

Answer: C



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9. $7! - 5!$ is equal to :

A. $3!$

B. $4!$

C. $5!$

D. 41×120

Answer: D



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10. The value of $f(4) - f(3)$ is

A. 18

B. 16

C. 1

D. 12

Answer: A



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11. If $\frac{1}{8!} + \frac{1}{9!} = \frac{x}{10!}$, find x

A. 10

B. 20

C. 9

D. 100

Answer: D

12. The correct match of the following is :

Column - I	Column - II
(i) ${}^n C_r$	(a) $n!$
(ii) ${}^n C_0$	(b) 1
(iii) ${}^n P_r$	(c) $r! \cdot {}^n C_r$
(iv) ${}^n P_n$	(d) ${}^n C_{n-r}$

A. (i)-(d), (ii)-(b), (iii)-(c), (iv)-(a)

B. (i)-(a), (ii)-(b), (iii)-(c), (iv)-(d)

C. (i)-(b), (ii)-(c), (iii)-(d), (iv)-(a)

D. (i)-(d), (ii)-(b), (iii)-(a), (iv)-(c)

Answer: A

13. The correct match of the following is :

Column I	Column II
(i) $\binom{0}{r}$	(a) $\frac{\binom{n}{r}}{\binom{n-r}{r}}$
(ii) $\binom{n}{r}$	(b) 1
(iii) nC_r	(c) $1 \times 2 \times 3 \times \dots \times n$
(iv) nP_r	(d) $\frac{\binom{n}{r}}{\binom{r}{r} \binom{n-r}{r}}$

A. (i)-(b), (ii)-(c), (iii)-(d), (iv)-(a)

B. (i)-(d), (ii)-(a), (iii)-(c), (iv)-(b)

C. (i)-(c), (ii)-(b), (iii)-(a), (iv)-(d)

D. (i)-(a), (ii)-(d), (iii)-(c), (iv)-(b)

Answer: A



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14. $\frac{7!}{5!}$ is :

A. 7!

B. 2!

C. 42

D. 24

Answer: C



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15. The value of $|4 - |3|$ is :

A. 18

B. 16

C. 1

D. 12

Answer: A



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16. If ${}^n C_{12} = {}^n C_8$, then n is equal to

A. 12

B. 26

C. 6

D. 20

Answer: D

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17. The number of all numbers having 5 digits, with distinct digits, is :

A. 99999

B. $9 \times {}^9C_4$

C. ${}^{10}P_5$

D. 9P_4

Answer: B

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18. The number of words that can be formed by using all the letters of the word 'PROBLEM' only once is :

A. $5!$

B. $6!$

C. $7!$

D. $8!$

Answer: C



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19. Given five line segments of length 2, 3, 4, 5, 6 units. Then the number of triangles that can be formed by joining these lines is

A. ${}^5C_3 - 3$

B. 5C_3

C. ${}^5C_{3-1}$

D. ${}^5C_{3-2}$

Answer: A



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20. How many numbers greater than 10 lacs be formed from

2,3,0,3,4,2,3? 420 b. 360 c. 400 d. 300

A. 420

B. 360

C. 400

D. 300

Answer: B



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21. The remainder obtained when

$1! + 2! + 3! + \dots + 11!$ is divided by 12 is :

A. 9

B. 8

C. 7

D. 6

Answer: A



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22. The value of ${}^2P_1 + {}^3P_1 + \dots + {}^nP_1$ is equal to :

A. $\frac{n^2 - n + 2}{2}$

B. $\frac{n^2 + n + 2}{2}$

C. $\frac{n^2 + n - 1}{2}$

D. $\frac{n^2 + n - 2}{2}$

Answer: D



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23. How many four digit numbers abcd exist such that a is odd, b is divisible by 3, c is even and d is prime ?

A. 380

B. 360

C. 400

D. 526

Answer: C



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24. Out of 7 consonants and 4 vowels. how many words of 3 consonant and 2 vowels can be formed?

A. 24800

B. 25100

C. 25200

D. 25400

Answer: C



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25. The remainder obtained when

$1! + 2! + 3! + \dots + 11!$ is divided by 12 is :

A. 9

B. 8

C. 7

D. 6

Answer: A



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Objective Type Questions B Fill In The Blanks

1. If $n = 9$ and $r = 5$, then $(n - r)! = \dots\dots\dots$

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2. If $(n + 2)! = 2550n!$, then n

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3. If ${}^{11}P_r = {}^{12}P_{r-1}$, then $r = \dots\dots\dots$

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4. ${}^{25}C_{22} - {}^{24}C_{21} = \dots\dots\dots$

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5. If ${}^nC_2 = {}^nC_3$, then $n = \dots\dots\dots$

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6. (i) ${}^{50}C_{47} = \dots\dots\dots$

(ii) ${}^{15}C_{14} = \dots\dots\dots$

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7. If ${}^nC_7 = {}^nC_5$, then $C_4 = \dots\dots\dots$

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8. How many different teams of 7 players can be chosen from 10 players?

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9. The number of diagonals of a hexagon is

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10. If nC_4 , nC_5 and nC_6 are in AP , then n is

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Objective Type Questions C True False Questions

1. If $\frac{1}{9!} + \frac{1}{10!} = \frac{n}{11!}$, then $n = 121$.

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2. Is ${}^{10}P_3 = {}^9P_2 + 3^9P_3$?

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3. Is it *True* or *False*

$$1 + {}^3C_1 + {}^4C_2 = {}^5C_3.$$

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4. If ${}^n C_r {}^r C_5 = {}^n C_5 {}^{n+s} C_{r+s}$ find the value of s .

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5. Number of lines, which can be drawn through 6 points on a circle is 15.

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Objective Type Questions D Very Short Answer Type Questions

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

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2. If $\frac{1}{9!} + \frac{1}{10!} = \frac{x}{11!}$ then $x =$

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3. Evaluate the following :

(i) $4! - 3!$

(ii) $\frac{8!}{6!2!}$

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4. Evaluate $\frac{n!}{(n-r)!}$ when $n = 12$ and $r = 3$.

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5. Find the value of 'r' if ${}^5P_r = {}^6P_{r-1}$.

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6. Evaluate the following :

(i) 8P_5

(ii) ${}^{10}P_3$

(iii) ${}^{12}C_7$

(iv) 9C_0 .

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7. Find 'r' when :

(i) ${}^{10}P_r = 2^9 P_r$

(ii) ${}^{11}P_r = {}^{12}P_{r-1}$.

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8. Find 'n' if $2^5 P_3 = {}^n P_4$

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9. How many 3-digit even numbers can be formed from the digit 1,2,3,4,5,6, 9 if the digits can be repeated ?

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10. How many 3 digit numbers are there, with distinct digits, with each digit odd?



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11. Find n if ${}^n P_3 : {}^n P_4 = 1 : 9$.



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12. Four persons A, B, C and D are to be seated at a circular table. In how many ways can they be seated ?



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13. In how many ways can 6 beads of same colour form a necklace ?



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14. If ${}^{2n}C_3 : {}^n C_3 = 12:1$, find n .

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15. If ${}^n C_8 = {}^n C_9$, find the value of n .

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16. If ${}^{2n}C_1$, ${}^{2n}C_2$ and ${}^{2n}C_3$ are in A.P., find n .

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17. From a class of 32 students, 4 are to be chosen for a competition. In how many ways can this be done?

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18. The no. of ways can 5 sportsmen be selected from a group of 10 sportsmen is

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19. How many selection of 4 books can be made from 8 different books?

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20. A committee of 2 boys is to be selected from 4 boys. In how many ways can this be done ?

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21. Sudha wants to choose any 9 stamps from a set of 11 different stamps. How many different selections can she make?

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22. How many lines can be drawn through 6 points on a circle ?

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23. How many triangles can be drawn through n points on a circle ?

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24. A polygon has 44 diagonals , then the number of its sides is

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25. In how many ways can 12 things be equally divided among 4 persons ?

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1. How many 3-digit numbers can be formed from the digits 1,2,3,4 and 5 assuming that

(i) repetition of the digits is allowed?

(ii) repetition of the digits is not allowed?



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



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

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

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

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Ncert File Exercise 7 2

1. Solve:

(i) $8!$ (ii) $4! - 3!$

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2. Is $3! + 4 \neq 7!$?



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



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



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5. Evaluate $\frac{n!}{(n-r)!}$, when :

(i) $n = 6, r = 2$

(ii) $n = 9, r = 5$



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Ncert File Exercise 7 3

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



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



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3. How many 3-digit even numbers can be made using the digits 1,2,3,4,5,6,7 if no digits is repeated?

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

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

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6. Find n if ${}^{n-1}P_3 : {}^n P_4 = 1 : 9$.



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7. Find r if

(i) ${}^5 P_r = 2 \cdot {}^6 P_{r-1}$ (ii) ${}^5 P_r = {}^6 P_{r-1}$.



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



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9. How many words, with or without meaning can be made from the letters of the word MONDAY, assuming that no letter is repeated, if

(i) 4 letters are used at a time?

(ii) all letters are used at a time?

(iii) all letters are used but first letter is a vowel?

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10. In how many of the distinct permutations of the letters in MISSISSIPPI do the four Is not come together?

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11. In how many ways can the letters of the word PERMUTATIONS be arranged if the (i) words start with P and end with S, (ii) vowels are all together, (iii) there are always 4 letters between P and S?

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Ncert File Exercise 7 4

1. If ${}^n C_8 = {}^n C_2$, find ${}^n C_2$.

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2. Determine n if

(i) ${}^{2n} C_3 : {}^n C_3 = 12 : 1$

(ii) ${}^{2n}C_3 : {}^nC_3 = 11:1$



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



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



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

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

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



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



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Miscellaneous Exercise On Chapter 7

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

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

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

(i) exactly 3 girls?

(ii) at least 3 girls

(ii) almost 3 girls?



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4. If the different permutations of all the letters of the word EXAMINATION are listed as in a dictionary, how many words are there in this list before the first word starting with E?



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

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

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7. In an examination, a question paper consists of 12 questions divided into two parts i.e., Part I and Part II, containing 5 and 7 questions, respectively. A student is

required to attempt 8 questions in all, selecting at least 3 from each part. In

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

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9. It is required to seat 5 men and 3 women in a row so that the women occupy the even places. How many such arrangements are possible ?

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

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11. In how many ways can the letters of the word ASSASSINATION be arranged so that all the Ss are together?

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Exercise

1. Eight chairs are numbered 1 to 8. Two women and 3 men wish to occupy one chair each. First the women choose the chairs from amongst the chairs 1 to 4 and then men select from the remaining chairs. Find the total number of possible arrangements.

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2. If the letters of the word 'RACHIT' are arranged in all possible ways as listed in dictionary. Then, what is the rank of the word 'RACHIT' ?

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3. Out of 18 points in a plane, no three are in the same line except five points which are collinear. Find the number of lines that that can be formed joining the point.

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4. How many committee of five person with a chairperson can be selected from 12 persons ?

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5. Find the number of different words that can be formed from the letters of the word *TRIANGLE* so that no vowels are together.

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6. There are 10 persons named $P_1, P_2, P_3, \dots, P_{10}$. Out of 10 persons, 5 persons are to be arranged in a line such that in each arrangement P_1 must occur whereas P_4 and P_5 do not occur. Find the number of such possible arrangements.



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7. There are 10 lamps in a hall. Each one of them can be switched on independently. Find the number of ways in which the hall can be illuminated.



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8. What is ${}^n P_r$? Find the value of ${}^{10} P_2$

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9. Find the number of integers greatest than 7000 that can be formed with the digits 3, 5, 7, 8 and 9 where no digits are repeated.

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10. 18 mice were placed in two experimental groups and one control group, with all group equally large. In how many ways can the mice be placed into three groups ?

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11. A bag contains six white marbles and five red marbles. Find the number of ways in which four marbles can be drawn from the bag. If (i) they can be of any colour. (ii) two must be white and two red. (iii) they must all be of the same colour.

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12. In how many ways can a football team of 11 players be selected from 16 players? How many of these will i. include 2 particular players? ii. exclude 2 particular players?

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13. A group consists of 4 girls and 7 boys. In how many ways can a team of 5 members be selected if the team has :

(i) no girl ?

(ii) at least one boy and one girl ?

(iii) at least 3 girls ?

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Revision Exercise

1. Find the number of divisors of the number 36000.

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2. Prove that $33!$ is divisible by 2^{15} . what is the largest integer n such that $33!$ is divisible by 2^n .

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3. The maximum value of ${}^n C_r$ is obtained when r is equal to

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4. Find the number of ways in which the letters of the word ARRANGEMENT can be arranged so that the two A's and the two R's do not occur together.

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

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6. In how many ways can the letters of the word ASSASSINATION be arranged so that all the Ss are together?

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7. In how many different ways, the letters of the word 'ALGEBRA' can be arranged in a row if :

(i) the two A's are together ?

(ii) the two A's are not together ?

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8. Five girls and five boys are to be seated on a bench with the boys and girls alternating. Find the number of ways of their seating. In how many different ways could they sit around a circular table so that the boys and girls alternate ?

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9. We wish to select 6 persons from 8, but if the person A is chosen, then B must be chosen. In how many ways can the selections be made? 15 (b) 22 (c) 7 (d) None of these

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10. A mathematical club consists of 18 members. In how many ways can the members select a president, a vice-president, a secretary and a treasurer if a member can hold only one position at a time.

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11. There are 6 items in column A and 6 items in column B. A student is asked to match each item in column A with an item in column B. How many possible (correct or incorrect) answers are there to this questions?

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12. A code word is to consist of two distinct English alphabets followed by two distinct numbers from 1 to 9. For example, PA 31 is one such code word. How many different words are possible ? How many end in an odd number ?

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13. How many 4-letter words, with or without meaning, can be formed out of the letters in the word LOGARITHMS, if repetition of letters is not allowed ?

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



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15. In how many different ways can the word 'EATERANEATER' be arranged so that no two E's occur together.



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16. Three married couples are to be seated in a row having six seats in a cinema hall. If spouses are to be seated next to each other, in how many ways can they be seated? Find also the number of ways of their seating if all the ladies sit together.



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

(i) exactly 3 girls?

(ii) at least 3 girls

(ii) almost 3 girls?



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18. Determine the number of 5 card combinations out of a deck of 52 cards if at least one of the 5 cards has to be as king?



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19. Find the number of permutations of n different things taken r at a time such that two specific things occur together?

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20. A coin is tossed 5 times. Determine the number of ways in which 0 head (i.e. 0 head and 5 tails) can appear. Also find the number of ways in which 1 head (i.e. 1 head and 4 tails) can appear, and so on. Then complete the given table :

No. of heads : 0 1 2 3 4 5

No. of ways :

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21. A number of 18 guests have to be seated, half on each side of a long table. Four particular guests desire to sit on one particular side and three others on the other side. Determine the number of ways in which the sitting arrangements can be made.

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22. 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 he can select books is 63 find the value of n .

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Check Your Understanding

1. Can we define factorial of a negative integer ?

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2. Evaluate $\frac{n!}{(n-r)!}$ when $n = 7$ and $r = 2$

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3. Fill in the blanks :

$${}^n P_r = \dots\dots\dots .$$

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4. What is ${}^{n-1} P_r + {}^{n-1} P_{r-1}$?



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5. What is the number of ways in which n different objects can be arranged at a round table ?



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6. Fill in the blanks :

$${}^n C_r = \dots\dots\dots .$$



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7. What are ${}^n C_0$ and ${}^n C_n$?



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8. If ${}^n C_a = {}^n C_b$ then find n.

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9. Show ${}^n C_r = {}^n C_{n-r}$ and also give an example demonstrating this.

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10. What is ${}^n C_1 + {}^n C_2 + \dots + {}^n C_n$?

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1. How many different words can be formed by jumbling the letters of the word 'MISSISSIPPI' in which no two S are together ?

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

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

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

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

Answer: A



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2. From 6 different novels and 3 different dictionaries, 4 novels and 1 dictionary are to be selected and arranged in a

row on a shelf so that the dictionary is always in the middle.

Then the number of such arrangements is

A. less than 500

B. atleast 500 but less than 750

C. atleast 750 but less 750 but less than 1000

D. atleast 1000

Answer: D



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3. 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

A. 3

B. 36

C. 66

D. 108

Answer: D

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4. There are 10 points in a plane, out of which 6 are collinear.

If N is the number of triangles formed by joining these points, then :

A. $N \leq 100$

B. $100 < N < 140$

C. $140 < N \leq 190$

D. $N > 190$

Answer: A



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

A. 880

B. 629

C. 630

D. 879

Answer: D



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6. Let T_n be the number of all possible triangles formed by joining vertices of an n -sided regular polygon. If $T_{n+1} - T_n = 19$ then the value of n , is

A. 5

B. 10

C. 8

D. 7

Answer: A



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7. 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 :

A. 59th

B. 52nd

C. 58th

D. 46th

Answer: C



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8. 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. 468

B. 469

C. 484

D. 485

Answer: D



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9. From 6 different novels and 3 different dictionaries, 4 novels and 1 dictionary are to be selected and arranged in a row on a shelf so that the dictionary is always in the middle. Then the number of such arrangements 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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10. Consider three boxes, each containing 10 balls labelled 1, 2, ..., 10. Suppose one ball is randomly drawn from each of the boxes denoted by n_i , the label of the ball drawn from the i^{th} box, ($i = 1, 2, 3$). Then, the number of ways in which the balls can be chosen such that $n_1 < n_2 < n_3$ is

A. 240

B. 120

C. 164

D. 82

Answer: B



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11. A committee of 11 persons is to be made from 8 male and 5 female where m is number of ways of selecting at least 6 male and n is the number of ways of selecting at least 3 female, than :

A. $m = n = 78$

B. $m = n = 68$

C. $m + n = 68$

D. $m - n = 8$

Answer: A



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1. The number of signals that can be sent by 5 flags of different colours, taking one or more at a time is :

A. 63

B. 1956

C. 720

D. 21

Answer: b



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2. If $\frac{1}{9!} + \frac{1}{10!} = \frac{x}{11!}$ then $x =$

A. 10

B. 11

C. 121

D. 9

Answer: c

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3. Find n when ${}^{n-1}P_4 : {}^n P_5 = 1 : 9$, then $n = \dots\dots\dots$

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4. If ${}^n C_{10} = {}^n C_9$, find ${}^n C_{19}$.

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5. Number of diagonals for an octagon



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6. Show that 2^{16} divides $32!$. Find the highest power of 2 that divides $32!$.



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7. In how many ways 5 boys and 3 girls be seated in a row so that no two girls are together?



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8. If the different permutations of all the letter of the word EXAMINATION are listed as in a dictionary, how many words are there in this list before the first word starting with E?

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

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10. A committee of 3 persons is to be constituted from a group of 2 men and 3 women. In how many ways can this be

done ? How many of these committees would consist of 1 man and 2 women ?

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11. Evaluate $\frac{n!}{(n-r)!}$. when $n = 20$ and $r = 2$.

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12. Prove that the product of $2n$ consecutive negative integers is divisible by $(2n)!$

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