CBSE Class 11 Maths Notes Chapter 7: Certain chapters consistently present challenges for students. One of the maths chapters is Permutations and Combinations. For this reason, it is advised that students review our Permutation and Combination Class 11 Notes. You've come to the correct spot if that's what you want to accomplish. We shall cover every important topic covered in this chapter in the CBSE Class 11 Maths Notes Chapter 7.

Let's begin with the fundamentals. The CBSE Class 11 Maths Notes Chapter 7PDF explains that combination and permutation are ways to express a set of items. For practice or review, you can also choose to download the Permutation and Combination Notes in PDF format.

CBSE Class 11 Maths Notes Chapter 7 Overview

Key ideas are explained in detail in the Permutations and Combinations Class 11 Notes for CBSE Maths Chapter 7. Students obtain important knowledge about the traits and qualities of combinations and permutations. Better retention is ensured by the well-organized framework, which makes revision more efficient.

Enriching the subject's comprehension are real-life applications and practical examples. In order to achieve academic success, these notes are crucial for building a strong foundation in permutations and combinations. These notes, which have been shown to be beneficial, greatly aid kids in succeeding academically. Get the free PDF download to fully understand this important chapter.

CBSE Class 11 Maths Notes Chapter 7

What are Permutations and Combinations?

The various configurations that can be made for a given set of data are defined by permutations and combinations. To accomplish this, either build subsets or choose the objects within a set. Permutation, according to the precise definitions, is the process of choosing items or data from a particular group. Conversely, the combination refers to the arrangement of the data representation.

In the subject of mathematics, both of these ideas are essential. We shall delve into the subject and examine its several facets in these Permutations and Combinations Class 11 Notes.

Another way to define permutation is the phenomena of rearranging data elements that were previously present in a different order. Looking at mathematics as a whole, it is simple to conclude that permuting occurs in practically every aspect of the science. Permuting is frequently more prevalent when someone wishes to think about arranging data in a different way. This is carried out on a certain limited set.

Combination is basically a way to choose things from a group. The order of selection is not thought to have any major implications in this practice. One can also compute the total number of combinations on their own. Remembering that this is only applicable in lesser circumstances might be beneficial.

The combination of n items taken k at a time is another definition of combination. There should be no repetition of this. The terms "k-selection" or "k-combination with repetition" are typically used when referring to combinations where repetition is permitted.

Permutation and Combination Notes, Class 11, are recommended reading for all students as they can help them achieve the best grades in their studies. Numerous formulas also pertain to the ideas of permutation and combination. Nonetheless, there are two important formulas that are typically applied.

Difference Between Permutation and Combination

With the aid of these notes on permutation and combination, readers should now be able to comprehend the fundamental meaning of these concepts. For this reason, it's necessary to examine how these two ideas differ from one another.

In addition, we have developed a table that includes all the information pertaining to the distinction between combination and permutation in order to aid students in understanding this subject. Below is a mention of that table.

Permutation	Combination
It refers to the task of arranging digits, people, alphabets, colours, numbers, and letters	It is the selection of food, menu, clothes, teams, subjects, and other objects
An example of permutation is to pick a team captain, picture, or shortstop from a group	An example of combinations includes picking any three team members from a group
Deciding on your two favourite colours in a particular order from a colour brochure	Selecting any two colours from a colour brochure
Picking winners for the first, second, and third place	Picking any three winners for an award

Fundamental Principles of Counting

- **Fundamental principle of multiplication**

Three separate events will occur concurrently in m×n×p ways if the first event happens in m different ways, the second event happens in n different ways, and the third event occurs in p different ways.

Fundamental principle of addition

Either of the two jobs can be completed in (m+n) ways if the first job can be completed independently in m ways and the second job can be completed independently in n ways.

Some Basic Arrangements and Selections

- **Permutations –** It is the linear arrangements of distinct objects taken some or all at a time. The number of arrangements possible is called the permutations. If we have two positive integers r and n such that $l \leq r \leq n$, then the total number of arrangements or permutations possible for n distinct items taken r at a time is mathematically given by,
$${}^{n}P_{r} = \frac{n!}{(n-r)!}.$$
- **Combinations –** If we have to select combinations of items from a given set of items such that the order or arrangement doesn't matter, then we use combinations. Such that to find the number of ways of selecting r objects from a set of n objects, then mathematically it is given by,
$${}^{n}C_{r} = \frac{n!}{r!\,(n-r)!}$$

Geometric Applications Of ${}^{n}C_{r}$:

- If there are n non-parallel and non-concurrent lines, then the number of points of intersections is given by ${}^{n}C_{2}$. Similarly, having n points, the number of lines will be ${}^{n}C_{2}$ such that no three points are collinear.
- If in n number of points, there are m collinear, then number of straight lines is given by ${}^{n}C_{2} - {}^{m}C_{2} + 1$.
- If a polygon has n number of vertices such that no three are collinear, then the number of diagonals can be given by ${}^{n}C_{2} - n = \frac{n\,(n-3)}{2}$.
- If we have n points such that no three are collinear, then the number of triangles that can be formed is given by ${}^{n}C_{3}$.
- If we have n points out of which m are collinear, then the number of triangles that can be formed is given by ${}^{n}C_{3} - {}^{m}C_{3}$.
- A polygon having n vertices, then the number of triangles that can be formed such that no side of the triangle is common to that of the side of the polygon is given by ${}^{n}C_{3} - {}^{n}C_{1} - \left({}^{n}C_{1} \times {}^{n-4}C_{1}\right)$.
- Number of parallelograms that can be formed from two sets of parallel lines such that one set have n parallel lines and other set have m parallel lines is given by ${}^{n}C_{2} \times {}^{m}C_{2}$.
- Number of squares that can be formed from two sets of equally spaced parallel lines such that one set have n parallel lines and other set have m parallel lines is given by $\sum^{m-1}{}_{r-1}\,(m-r)\,(n-r)\,;(m<n)$.

Permutations Under Certain Conditions

The total number of arrangements or permutations taken r at a time from a set of n different objects;

- When we always have to include a particular object in every arrangement is ${}^{n-1}C_{r-1} \times r!$.
- When we don't have to include a particular object in any arrangement it is ${}^{n-1}C_{r} \times r!$.

Division Of Objects Into Groups

- **Division Of Items Into Groups Of Unequal Sizes -**
  i. A set of $(m+n)$ distinct objects can be divided into two unequal groups containing m and n objects is given by $\frac{(m+n)!}{m!n!}$.
  ii. A set of $(m+n+p)$ distinct objects can be divided into three unequal groups containing m, n and p objects is given by ${}^{m+n+p}C_m . {}^{n+p}C_m = \frac{(m+n+p)!}{m!n!p!}$.
  iii. A set of $(m+n+p)$ distinct objects can be divided into three persons in the groups containing m, n and p objects is
  $= (\text{No. of ways to divide}) \times (\text{No. of groups})!$
  $= \frac{(m+n+p)!}{m!n!p!} \times 3!$.

- **Divisions Of Objects Into Groups Of Equal Sizes –**
  i. We can divide mn distinct objects equally into m groups with n objects in each of them without considering any order in $\left(\frac{(mn)!}{(n!)^m}\right)\frac{1}{m!}$ ways.
  ii. We can divide mn distinct objects equally into m groups with n objects in each of them considering the order in $\left(\left(\frac{(mn)!}{(n!)^m}\right)\frac{1}{m!}\right)m! = \frac{(mn)!}{(n!)^m}$ ways.

Permutations Of Alike Objects

- Total number of mutually distinguishable arrangements or permutations possible for $p+q=n$ objects among which p objects are of one kind and q are alike of second kind taken all at a time is given by $\frac{n!}{p!q!}$.
- Total number of mutually distinguishable arrangements or permutations possible for $p+q \neq n$ objects among which p objects are of one kind and q are alike of second kind and remaining all are distinct taken all at a time is given by $\frac{n!}{p!q!}$.
- Total number of mutually distinguishable arrangements or permutations possible for $p_1+p_2+p_3+\ldots\ldots+p_r=n$ objects such that, p_1 are alike of one kind; p_2 are alike of second kind;……; p_r are alike of r^{th} kind taken all at a time is given by $\frac{n!}{p_1!p_2!p_3!\ldots\ldots p_r!}$.
- If we have to arrange r things such that the repetitions are allowed. Furthermore, if $p_1, p_2, p_3, \ldots\ldots, p_r$ are integers such that it denotes the number of times respective objects occurs, then the total number of permutations of these r objects considering above condition is given by $\frac{(p_1+p_2+p_3+\ldots\ldots+p_r)!}{p_1!p_2!p_3!\ldots\ldots p_r!}$.

Distribution Of Alike Objects

- Suppose, we have to divide xn identical items among r persons, such that each person receives $0, 1, 2$ or more items until it is $\leq n$, then the number of ways it can be done can be given by ${}^{n+r-1}C_{r-1}$. In this distribution, blanks are allowed means a person may also get no items.
- Suppose, we have to divide n identical items among r persons, such that each person receives $1, 2, 3$ or more items until it is > 0 and $\leq n$, then the number of ways it can be done can be given by ${}^{n-1}C_{r-1}$. In this distribution, blanks are not allowed means a person has to get at least one item.
- Suppose, we have to divide n identical items among r groups, such that no group get less than k and more than m items such that $(m < k)$, then the number of ways it can be done is the coefficient of x^n in the expansion of $\left(x^m + x^{m+1} + \ldots. + x^k\right)^r$.

Number Of Integral Solutions Of Linear Equations And Inequation

Let us consider the equation $x_1 + x_2 + x_3 + x_4 + \ldots.. + x_r = n$, where $x_1, x_2, x_3, x_4, \ldots.., x_r$ and n are non-negative integers. We can interpret this equation as n identical objects to be divided into r groups.

- The total number of non-negative integral solutions of the equation $x_1 + x_2 + x_3 + x_4 + \ldots.. + x_r = n$ will be ${}^{n+r-1}C_{r-1}$.
- In the set of natural numbers N, the total number of solutions of the equation will be ${}^{n-1}C_{r-1}$.
- We can solve the equations of the form $x_1 + x_2 + x_3 + x_4 + \ldots.. + x_m \leq n$ by introducing an artificial or dummy variable x_{m+1} such that $x_{m+1} \geq 0$. It will convert the equation to $x_1 + x_2 + x_3 + x_4 + \ldots.. + x_m + x_{m+1} = n$ and then the number of solutions can be found out in the same way as given in above points.

Circular Permutations

- If we have n distinct objects, then the number of circular permutations possible is given by $(n-1)!$.
- If in circular permutations, we also consider the anti-clockwise and clockwise order as non-distinct, then the number of circular permutations can be given by $\frac{1}{2}\{(n-1)!\}$. This can be seen in the arrangement of beads in a necklace or flowers in a garland, etc.

Selection Of One Or More Objects

- If we have a group of n distinct items, then the number of ways in which we can select one or more items from that group is given by $2^n - 1$.
- If we have a group of n identical items, then the number of ways in which we can select r items from that group is always 1.
- If we have a group of n identical items, then the number of ways in which we can select zero or more items from that group is $n + 1$.
- If we have a group of $(p + q + r)$ items, such that p items are alike of one kind, q items are alike of second kind and r items are alike of third kind, then the number of ways in which we can select some or all out of given items is given by $[(p+1)(q+1)(r+1)] - 1$.
- If we have a group of $(p + q + r)$ items, such that p items are alike of one kind, q items are alike of second kind and r items are alike of third kind, then the number of ways in which we can select some or all out of given items is given by $[(p+1)(q+1)(r+1)] - 1$.
- If we have a group of $(p + q + r)$ items, such that p items are alike of one kind, q items are alike of second kind and r items are alike of third kind, then the number of ways in which we can select one or more items is given by $[(p+1)(q+1)(r+1)2^n] - 1$.

Number of Divisors And The Sum Of The Divisors Of A Given Natural Number

Let us consider $N = {p_1}^{n_1} . {p_2}^{n_2} . {p_3}^{n_3} . {p_4}^{n_4} \ldots \ldots {p_k}^{n_k}$, where $p_1, p_2 \ldots, p_k$ are distinct prime numbers and $n_1, n_2 \ldots, n_k$ are positive integers.

- Then, the total number of divisors $= (n_1 + 1)(n_2 + 1) \ldots (n_k + 1)$.
- The above divisors also include 1 and n as divisors, then the number of divisors other than 1 and n is $= (n_1 + 1)(n_2 + 1) \ldots (n_k + 1) - 2$.
- And the sum of all divisors is given by $= \left\{ \frac{{p_1}^{n_1+1}}{p_1 - 1} \right\} \left\{ \frac{{p_2}^{n_2+1}}{p_2 - 1} \right\} \left\{ \frac{{p_3}^{n_3+1}}{p_3 - 1} \right\} \ldots \left\{ \frac{{p_k}^{n_k+1} - 1}{p_k - 1} \right\}$.

Dearrangements:

Benefits of CBSE Class 11 Maths Notes Chapter 7

Simple Summaries: Acquire essential knowledge quickly for effective learning.

Simplified Topics: Make difficult subjects easier to understand by keeping them simple.

Last-Minute Exam Prep: A useful tool for successful last-minute study sessions.

Retention Aid: Boost memory for knowledge to help in exam recall.

Exam Support: Prepare for tests with these key ideas and advice.

Time Saver: Get organised information in one location to save time.

Priority Focus: Concentrate on crucial subjects and inquiries to ensure focused preparation.

Real-World Examples: Useful illustrations to improve relationships in the real world.

Confidence Booster: Use thorough notes to increase your confidence before tests.