

NCERT Class 11 Mathematics Solutions: Chapter 7 – Permutation and Combinations Miscellaneous Exercise Part 2

Permutations vs Combinations

- Permutations are written as nP_x where n is the number of total choices possible and x is the number of choices that will be used. This is calculated as $nP_x = \frac{n!}{(n-x)!}$
- Permutations represent the number of ways we can choose x objects from n possibilities where the order of selection matters.
- Combinations represent the number of ways we can choose x objects from n possibilities where the order of selection does not matter. This is calculated as $nC_x = \frac{n!}{x!(n-x)!}$

Permutation vs Combinations

1. 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**?

Answer:

In the given word **EXAMINATION**, there are 11 letters out of which, **A**, **I**, and **N** appear 2 times and all the other letters appear only once.

The words that will be listed before the words starting with **E** in a dictionary will be the words that start with **A** only.

So, to get the number of words starting with **A**, the letter **A** is fixed at the extreme left position, and then the remaining 10 letters taken all at a time are rearranged.

Since there are 2 Is and 2 Ns in the remaining 10 letters,

$$\text{Number of words starting with A} = \frac{10!}{2!2!} = 907200$$

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So, the required numbers of words is **907200**.

2. 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?

Answer:

A number is divisible by **10** if its units digits is **0**.

So, **0** is fixed at the units place.

So, there will be as many ways as there are ways of filling **5** vacant places



Five Vacant Places

in succession by the remaining **5** digits (*i. e.*, **1, 3, 5, 7 and 9**).

The **5** vacant places can be filled in **5!** ways.

Hence, required number of **6**-digit numbers = **5! = 120**

3. 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?

Answer:

2 different vowels and **2** different consonants are to be selected from the English alphabet.

Since there are **5** vowels in the English alphabet, number of ways of selecting **2** different vowels from the alphabet = ${}^5C_2 = \frac{5!}{2!3!} = 10$

Since there are **21** consonants in the English alphabet, number of ways of selecting **2** different consonants from the alphabet = ${}^{21}C_2 = \frac{21!}{2!19!} = 210$.

So, number of combinations of **2** different vowels and **2** different consonants = **10 × 210 = 2100**

Each of these **2100** combinations has **4** letters, which can be arranged among themselves in **4!** ways.

Therefore, required number of words = **2100 × 4! = 50400**