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

Permutations vs Combinations

- Permutations are written as nPx where n is the number of total choices possible and x is the number of choices that will be used. This is calculated as nPx = $\frac{n!}{(n-x)!}$

- 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 nCx = $\frac{n!}{x!(n-x)!}$

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,

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

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 form 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 $= {}^{21}C_2 = \frac{21!}{2!9!} = 210.$

So, number of combinations of 2 different vowels and 2 different consonants $= 10 \times 210 = 2100$

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

Therefore, required number of words $= 2100 \times 4! = 50400$