

Tips And Tricks To Solve Permutation And Combination

Aparna Shukla · 07 Jan 2021

In law entrance tests, questions from Permutation and Combination cover a good part (around 3-4 questions) of math's section.

These questions are mostly easy but only if one has her basic concepts clear. So in this article, an attempt has been made to do so.

So starting with permutation, a permutation is an arrangement of all or part of a number of things in a definite order.

For example, the permutations of the three letters a, b, c taken all at a time are:

abc, acb, bca, bac, cba, cab. The permutations of the three letters a, b, c taken two at a time are- ab, ac, ba, bc, ca, cb.

Thus $8P_3$ denotes the numbers of permutations of 8 different things taken 3 at a time and $5P_5$ denotes the number of permutations of 5 different things taken 5 at a time. Important In permutations, the order of arrangement is taken into account; when the order is changed, a different permutation is obtained.

Example:

How many ways can we award a 1st, 2nd and 3rd place prize among eight contestants? (Gold / Silver / Bronze)

We're going to use permutations since the order we hand out these medals matters.

Here's how it breaks down:

- Gold medal: 8 choices: A B C D E F G H. Let's say A wins the Gold.
- Silver medal: 7 choices: B C D E F G H. Let's say B wins the silver.
- Bronze medal: 6 choices: C D E F G H. Let's say... C wins the bronze.

We picked certain people to win, but the details don't matter: we had 8 choices at first, then 7, then 6.

We had to order 3 people out of 8. To do this, we started with all options (8) then took them away one at a time (7, then 6) until we ran out of medals.

Where $8!/5!$ is just a fancy way of saying "Use the first 3 numbers of 8!". If we have n items total and want to pick k in a certain order, we get: $P(n, k)$ or $nPk = n! / (n - k)!$ (general formula)

So ways in which we can award 1st 2nd 3rd prize will be $= 8 \cdot 7 \cdot 6 = 336$

If we find the total number of ways in which 4 persons can take their places in a cab having 6 seats.

Solution:

The number of ways in which 4 persons can take their places in a cab having 6 seats

$${}^6P_4 = 6 \times 5 \times 4 \times 3 = 360 \text{ ways.}$$

Mario, Sandy, Fred, and Shanna are running for the offices of president, secretary and treasurer. So, in how many ways can these offices be filled: ${}^4P_3 = 4 \times 3 \times 2 = 24$. The offices can be filled 24 ways.

Permutations and Combinations for CLAT

Coming on Combinations, these are easy going. An order doesn't matter.

The general formula is:

$$C(n, k) \text{ or } {}^nC_k = P(n, k) / k!$$

Which means "Find all the ways to pick k people from n , and divide by the $k!$ variants". Writing this out, we get our combination formula or the number of ways to combine k items from a set of n :

$$C(n, k) = n! / (n-k)! \cdot k!$$

A few examples

Here's a few examples of combinations (order doesn't matter) from permutations (order matters).

- Combination: Picking up 3 pens from a bunch of 10.

$$C(10,3) = 10!/(7! \cdot 3!) = 10 \cdot 9 \cdot 8 / (3 \cdot 2 \cdot 1) = 120.$$

Permutation: Picking a President, VP and Secretary from a group of 10.

$$P(10,3) = 10!/7! = 10 \cdot 9 \cdot 8 = 720.$$

- Combination: Choosing 3 dishes from a menu of 10.

$$C(10,3) = 120.$$

Permutation: Listing your 3 favourite dishes, in order, from a menu of 10.

$$P(10,3) = 720.$$

The difficulty arises sometimes when we fail to determine if the situation represents a permutation or a combination. So we need to first determine that order is important or not in the given situation.

In a Permutation the order of occurrence of the object or the arrangement is important but in Combination, the order of occurrence of the object or the arrangement is not important.

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