Quadrant II – Transcript and Related Materials

Programme: Bachelor of Commerce (First Year)

Subject: Mathematics

Paper Code: CAC101

Paper Title: Commercial Arithmetic – I (CC 4)

Unit: Unit II – Permutations and Combinations

Module Name: Difference between Permutation and Combination with related examples

Module No: 51

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Difference between Permutation and Combination:

You have to pose the question to yourself:

Does the order of things that are arranged matter or if you require the number of ways that people/items are to be arranged, you must first distinguish if order is important. If the order **does** matter than it is a problem on permutation. If the order **does not** matter than it is a problem on combination.

For example, let us say we are taking the number of ways that the numbers 5, 6 and 7 can be arranged.

These are the possibilities.

If order does matter than 567, 576, 657, 675, 765, 756 are all different numbers. Therefore it is permutation. If order does not matter then 567 will be the same as any other number that you write. Therefore it is combination.

Permutation and combination problems can be compared on the following basis. For permutation order is relevant whereas it is irrelevant for combination. For permutation it denotes arrangement whereas for combination it denotes selection. The clue words for permutation are arrangements, schedule, order, rank whereas the clue words for combination are selection, group and sample.

Let's see some scenarios:

Scenario 1:

Illustration:

In how many ways can 6 athletes finish a race securing first, second and third place?

[Check whether order is relevant/ irrelevant by posing the questions:

- Is there a first place, second place, third place?
- The order in which they finish is important.

If order is relevant, then this is an illustration on permutation.]

Solution:

Total 6 athletes are given and we have to choose 3. Required number of ways is equal to ${}^{6}P_{3}$. Using the formula we get $\frac{6!}{(6-3)!}$ which is equal to $\frac{6!}{3!}$. Reduce 6! upto 3! so that 3! gets cancelled and your final answer is 120.

Scenario 2:

Illustration:

In how many ways can 4 committee members be picked from a pool of 40 people?

[Check whether order is relevant/ irrelevant by posing the questions:

- The role of each member is the same.
- Does not matter if picked first, second or third as they have the same role.
- The order is not important.

If order is irrelevant, then this is an illustration on combination.]

Solution:

Total 40 people are given and we have to choose 4 committee members. Required number of ways is ${}^{40}C_{4}$. Applying the formula we get $\frac{40!}{(4!)(40-4)!}$ which is equal to $\frac{40!}{(4!)(36!)}$ reduce 40! to 36! So that it gets cancelled and also reduce 4! upto 1 and we get the final answer as 91,390.

Scenario 3:

Illustration:

In how many ways can a captain and vice-captain be chosen from 25 people?

[Check whether order is relevant/irrelevant by posing the questions:

- The role of each member is not the same.
- What they are picked for makes a difference.
- The order is important.

If order is relevant, then this is an illustration on permutation.]

Solution:

Total 25 people are given and we have to choose 2. Required number of ways is equal to ${}^{25}P_2$. Using the formula we get $\frac{25!}{(25-2)!}$ which is $\frac{25!}{23!}$ reduce 25! upto 23! so that 23! gets cancelled and we get the final answer equal to 600.

Scenario 4:

Illustration:

How many four letter words can be made from the twenty six letter alphabets?

[Check whether order is relevant/irrelevant by posing the questions:

- The order in which the letters are arranged makes a difference.
- Different orders make different words.
- The order is important.

If order is relevant, then this is an illustration on permutation.]

Solution:

A total of 26 alphabets are given and we have to choose 4. Required number of ways is equal to ${}^{26}P_4$. By applying the formula we get $\frac{26!}{(26-4)!}$ which is equal to $\frac{26!}{22!}$ reduce 26! upto 22! So that it gets cancelled and your answer is 3,58,800.

Scenario 5:

Illustration:

How many ways can four cards be dealt for a poker hand from a deck of 52 cards?

[Check whether order is relevant/irrelevant by posing the questions:

- The order in which they are received is not important.
- What matters is that you have certain cards.
- The order is not important.

If order is irrelevant, then this is an illustration on combination.]

Solution:

From a total of 52 cards we have to choose 4. Required number of ways is equal to ${}^{52}C_4$. By applying the formula we get $\frac{52!}{(4!)(52-4)!}$ which is equal to $\frac{52!}{(4!)(48!)}$ reduce 52! upto 48! so that it gets cancelled and 4! reduce upto 1. Simplifying further we will get the answer as 2,70,725.

Scenario 6:

Illustration:

A High School board with 8 people needs to form a committee with three different responsibilities. How many ways this committee be formed?

[Check whether order is relevant/irrelevant by posing the questions:

- The role of each member is not the same.
- What they are picked for makes a difference.
- The order is important.

If order is relevant, then this is an illustration on permutation.]

Solution:

A total of 8 people are given and we have to choose 3. Required number of ways is equal to ${}^{8}P_3$. By applying the formula we get $\frac{8!}{(8-3)!}$ which is equal to $\frac{8!}{5!}$ reduce 8! upto 5! so that it gets cancelled and we get the final answer as 336.