

**Class – XI**  
**Lesson Plan**

**Topic: Permutation and Combination**

**Brief Description of the lesson:**

In this chapter students will learn about a new counting method based on fundamental principle of counting. Students will be able to learn arrangements and selections in different situations and also the formulae used.

**Objectives:**

**I - Specific Objectives:**

Students will be able to:

- 1) S1 state and apply the Fundamental Principle of Counting (**Understanding**) (**Application**)
- 2) S2 define factorial notation and evaluate factorials for different values of n. (**Understanding**) (**Application**)
- 3) S3 understand basic concept of Permutation and formula for finding number of permutations in different situations. (**Understanding**) (**Analysis**)
- 4) S4 understand basic concept of Combination and formula for finding number of permutations in different situations. (**Understanding**) (**Analysis**)
- 5) S5 distinguish between permutations and combinations. (**Analysis/Differentiate**)
- 6) S6 apply the formulas for permutations and combinations to solve real-world problems. (**Application**)

**II - Behavioral Objectives:**

B1 Given a set of objects, students will be able to calculate the number of permutations of those objects, both when the objects are distinct and when they are not distinct. (**Analysis**)

B2 Given a set of objects, students will be able to calculate the number of combinations of those objects, both when order matters and when it does not. (**Analysis**)

B3 Students will be able to differentiate between arrangement and selection. As an example seating arrangement of a class room is a case of permutation and selection of players to make a cricket team of the class is a case of combination. (**Analysis/Differentiate**)

**Process / Activities:**

ACT1 Bookshelf activity: Give students a bookshelf with five spaces and five different books. Ask them to arrange the books in all possible ways. This activity can be used to teach students the concept of permutations and how to use the permutation formula. (**Apply/Execution**)

ACT2 Handshake activity: Select 10 students randomly from the class and tell each student to shake hand with other and each one must shake hand with all other 9 students. Then students will find total number of handshakes manually as well as using concept and formula of combination. **(Apply/Execution)**

**Skills:**

- (i) Problem-solving skills
- (ii) Logical thinking skills
- (iii) Mathematical reasoning skills

**Assessment:**

A1 Assessment of activity will be done based on decided rubrics.

**Expected Learning Outcomes:**

Students would be able to:

- 1) Understand the fundamental principle of counting. **(Understand/Clarifying)**
- 2) Define permutations and combinations and distinguish between the two. **(Understand/Clarifying) (Analyze/Differentiating)**
- 3) Calculate factorial of a given number **(Apply/Implementation)**
- 4) Use permutations and combinations to solve counting problems. **(Apply/Implementation)**
- 5) Apply permutations and combinations to real-world situations. **(Apply/Implementation)**

**Placements of Objectives, Instructional Activities and Assessment:**

Topic/Start Date/Assessment					
Knowledge	Understanding	Application	Analysis	Synthesis	Evaluation
	S1	S1	S3		
	S2	S2	S4		
	S3	S6	S5		
	S4	ACT1	B1		
		ACT2	B2		
			B3		

## **REVIEW OF THE LESSON PLAN**

(To be done when the lesson gets over)

### **Problems Faced:**

1. A very few students had difficulty in understanding the difference between permutations and combinations.
2. A very few students had difficulty in applying the formulas for permutations and simultaneously applying fundamental principle of counting to the same problem.

**Success:** about 98% of the students understand the topic better and have ability to express it properly.

**Failure:** about 02% of students not be able to solve a particular set of questions, requiring a good understanding of formulae and fundamental principle of counting (basic method).

### **Real Learning Outcomes:** Students were able to

1. understand factorials and define a permutation as a distinct arrangement of objects in a row and a combination as a selection of objects from a set without regard to order.
2. to solve both simple and complex problems involving permutations and combinations. For example, students should be able to solve the problem "How many ways are there to arrange 5 students in a line?" and the problem "How many different combinations of 3 letters can be formed from the word 'APPLE'?".
3. to use permutations and combinations to solve a variety of real-world problems, such as finding the number of ways to arrange a group of people for a photo, finding the probability of winning a lottery, or finding the number of ways to choose a team from a larger group.

**Student's Response:** Students enjoyed and participated throughout the chapter as it is a very interesting and engaging topic. All were eager to learn.

**Teacher's Learning:** While teaching permutations and combinations a always learn about new ways to visualize permutations and combinations, different methods for solving permutation and combination problems, common errors that students make when solving permutation and combination problems.