MATH 11: Introduction to Discrete Structures

Homework 4

Multiplication principle and arrangements

The problems in this assignment are based on the material covered in Lecture 12 (Basic Counting Principles) notes.

Problem 1. A bookstore has 4 different novels, 5 different non-fiction books, and 6 different magazines on display.

(a) (5 points) If a customer can choose one item to purchase, how many different choices do they have?

(b) (5 points) If a customer can choose one item to purchase from each group, how many different choices do they have?

Problem 2.

(a) (10 points) In a race with 6 participants, how many different ways can the gold and silver medals be awarded based on the participants' finishing order?

(b) (10 points) Out of 6 available workshops at a conference, you need to select 2 to attend. How many different pairs of workshops can you choose?

(c) (10 points) A committee of 6 people is to be formed from a group of 8 women and 6 men. If the committee must have 3 women and 3 men, how many different committees can be formed?

Problem 3. Compute the number of different arrangements that can be made with the letters of the following words.

(a) (10 points) "BANANA"

(b) (10 points) "MISSISSIPPI"

The pigeonhole principle

Problem 4. (10 points) Suppose you have 12 apples and you need to place them into 5 boxes. Show that there must be at least one box containing at least 3 apples.

Problem 5. (10 points) A class of 27 students takes a quiz with 7 questions. Each question has only two possible answers: true or false. Show that there must be at least four students who answered the same number of questions correctly.

Tree diagrams

Problem 6. (10 points) A student is choosing an elective course for the upcoming semester. They can choose between art, music, and drama, and each course has two sections: morning and afternoon. Construct a tree diagram to show all the possible combinations of elective courses and sections.

Problem 7. (10 points) A restaurant offers a set menu where customers can choose an appetizer, a main course, and a dessert. The appetizer options are soup or salad, the main course options are steak or fish, and the dessert options are cake or ice cream. Create a tree diagram to show all the possible meal combinations.