CSE230 | Fall 2022
Assignment 1

Total: 40 marks

Submission Instructions:

1. **DO NOT add any additional cover page, simply write your name, id, section on top of the first page and start writing your answer from below it.**
2. **Submit HAND WRITTEN hard copy in the class, there will be no online submission.**
3. **Use a MINIMUM number of paper, do not waste paper.**
4. **NO LATE SUBMISSION WILL BE ACCEPTED**
5. **DEADLINE: *****CHECK DISCORD*********

Basic Counting [8 marks]

Q1. This year Apple has launched iPhone 14. There are 4 different colors (Silver, gold, space black, purple) of iPhone 14 Pro Max and iPhone 14 Pro. Also, there are 5 different colors (Midnight, blue, starlight, purple, red) available for iPhone 14 plus and iPhone 14. How many different types of phones are available this year? *[3 marks]*

Q2. A quiz contains 10 questions. There are four possible answers for each question.

a. In how many ways can a student answer the questions on the test if the student answers every question? *[3 marks]*
b. In how many ways can a student answer the questions on the test if the student can leave answers blank? *[2 marks]*

Permutations and Combinations [24 marks]

Q4. There exists a word in the dictionary: ‘addresses’.

a. How many different 9-letter words can be formed from the letters of the word ‘addresses’? Remember the words do not have to make sense, they are just concatenations of letters. *[2 marks]*

b. How many different 5-letter words can be formed? *[2 marks]*

c. How many words can be formed with the consonants and vowels grouped together separately? *[2 marks]*

d. How many words ensure a vowel is always placed only after 2 consonants? *[2 marks]*

Q5. A group of 8 people, A, B, C, D, E, F, G, and H are visiting an amusement park.

a. The park is shaped like a 9-sided polygon (with no adjacent sides being collinear). How many triangles can be formed from the vertices of this park/polygon? *[2 marks]*

b. The group forms a line at the ticket counter. E, F, G, and H are a family, thus they would like to stay together. How many permutations/arrangements of the line ensure they are together? *[3 marks]*

c. How many arrangements of the line ensure that the family stays together but at the end of the line? *[2 marks]*

d. The family has now had an argument and would like to stay away from each other. How many permutations ensure all 4 of them are not grouped together anymore? *[2 marks]*

e. The argument has gone beyond control; the park staff had to separate them. How many arrangements are there where no two members of the family are together? In other words, there is at least one other person between two members of the family in the line. *[3 marks]*

f. In the 8-man group, the adults are A, B, C, E, and F, and the minors are D, G, and H. There is a ride in the park that requires 3 adults and 2 minors to ride on it. How many combinations of people in this group are permitted to go on this ride? *[2 marks]*

g. More drama. A and B have had a falling out. How many combinations of people where A
and B are not together can go on the ride above? *[2 marks]*

Pigeonhole Principle [8 marks]

Q6. How many numbers must be selected from the set {20,30,40,50,60,70,80} to guarantee that at least one pair of these numbers add up to 100? *[1 mark]*

Q7. Three parties are running for Bangladesh’s upcoming govt election. There are 5,00,500 people who vote. What is the minimum number of votes needed for any party to win the election? *[2 marks]*

Q8. There are 7 different time periods in a day during which classes at BRAC University can be scheduled. If there are 597 classes of different courses held per day, what is the minimum number of classrooms that will be needed? *[2 marks]*

Q9. What is the minimum number of students, each of whom comes from one of the 64 districts of Bangladesh, which must be enrolled in BRAC University to guarantee that there are at least 200 who come from the same district? *[3 marks]*