Department of Computer Science and Engineering
Brac University
CSE230: Discrete Mathematics
Assignment on Combinatorics

1. 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 iPhone 14 are available this year?
2. A small community consists of 10 women, each of whom has 3 children. If one woman and one of her children are to be chosen as mother and child of the year, how many different choices are possible?
3. A college planning committee consists of 3 freshmen, 4 sophomores, 5 juniors, and 2 seniors. A subcommittee of 4, consisting of 1 person from each class, is to be chosen. How many different subcommittees are possible?
4. How many different 7-place license plates are possible if the first 3 places are to be occupied by letters and the final 4 by numbers?
5. How many license plates would be possible if repetition among letters or numbers were prohibited?
6. How many functions defined on n points are possible if each functional value is either 0 or 1?
7. How many arrangements of COURAGE begin with a vowel?
8. How many arrangements of ARRANGE do not contain the two It together?
9. How many arrangements of TRIANGLE do not contain all the vowels together?
10. How many rearrangements of PERMUTATION are there so that no vowel changes its position?
11. For each of the following cases, find the number of ways the letters of PERMUTATIONS can be arranged.
    - Each arrangement starts with P and ends with S.
    - Vowels are all together.
    - There are always 4 letters between P and S
12. Find the number of rearrangements of DIRECTOR for each of the following cases.
    - Order of the vowels are maintained.
    - Position of the vowels are not changed.
    - Relative position of the vowels and consonants are not changed.
13. Find the number of arrangements of ARTICLE for each of the following cases.
    - Vowels are only in even positions.
    - Vowels are only in odd positions.
14. How many 5-letter arrangements of CAMBRIDGE contain all the vowels?
15. How many ways are there for the letters of DIAPHANOUS to be arranged so that all the vowels stay together?

Department of Computer Science and Engineering
Brac University
CSE230: Discrete Mathematics
Assignment on Combinatorics

16. How many sequences of letters can you form by taking 5 or 6 letters from ENDANGERED?
17. How many arrangements of TIAMARIA are possible so that no two consonants are side-by-side?
18. In how many ways can you arrange the letters of NORMALIZE so that Z always comes after M? For example, OMEZRANLI is acceptable, whereas ARLZEMONI is not.
19. How many 5-digit numbers are divisible by 4 if each number is formed using each of 5, 6, 7, 8, 0 exactly once?
20. How many 7 digit numbers are there that are o divisible by 2? divisible by 5 but not by 25?
21. How many numbers are there in the set {1,2,3 ..... 200} which are divisible by either 7 or 9 but not both?
22. How many numbers are there in the set {1,2,3 ..... 200) which are divisible by neither 3 nor 4 nor 12?
23. Consider the set of digits: {1,2,4,5,6,7). How many odd numbers of 4 digits can be made taking each digit from the set only once?
24. A group of 8 people, A, B, C, D, E, F, G, and H are visiting an amusement park. o 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?
25. 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?
    - How many arrangements of the line ensure that the family stays together but at the end of the line?
    - The family has now had an argument and would not like to stay together. How many permutations ensure that all 4 of them are not grouped together anymore?
    - 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 must be at least one other person between two members of the family in the line.
    - In the 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?
    - More drama. A and B have had a falling out. How many combinations of people can go on the ride where A and B are not together?

Department of Computer Science and Engineering
Brac University
CSE230: Discrete Mathematics
Assignment on Combinatorics

26. A box contains 7 white, 6 red and 3 blue balls. All the balls are mutually distinguishable. In how many ways can you pick 5 balls?
    - What if exactly 3 of them are red?
    - What if at most 4 of them are blue?
    - A box contains 6 white, 5 red and 3 blue balls. All the balls are mutually distinguishable. In how many ways can you pick 5 balls?
    - What if exactly 3 of them are red?
    - What if at most 4 of them are blue?
27. A box contains 11 white, 12 red and 13 blue balls. All the balls are mutually distinguishable. In how many ways can you pick 10 balls so that at least 3 of them are blue? Express the number in decimal digits.
28. A box contains 11 white, 12 red and 13 blue balls. All the balls are mutually distinguishable. In how many ways can you pick 10 balls so that at most 7 of them are red? Express the number in decimal digits.
29. There are 12 boys, 12 girls and 3 teachers in a club. In how many ways can you form a committee of 10 members so that at most 7 of them are boys? Express the number in decimal digits.
30. There are 12 boys, 12 girls and 3 teachers in a club. In how many ways can you form a committee of 10 members so that at least 3 of them are girls? Express the number in decimal digits.
31. There are 5 bowlers and 3 wicket-keepers among 15 players of a club. How many 11-player teams can be formed with at least 4 bowlers and at least 2 wicket-keepers?
32. There are 7 lines in a set. Their lengths are 1, 2, 3, 4, 5, 6 and 7 an. Find the number of ways a quadrilateral can be formed taking 4 different lines from the set.
33. Find the number of factors of the number 277200.
34. Find the number of combinations using the letters of the sentence "DADDY DID A DEADLY DEED". A combination must contain at least one letter.
35. There are 3 coconuts, 4 apples and 2 oranges. Find the number of ways a basket of fruit can be selected so that there are at least one fruit of each type in the basket.
36. Find the number of ways 9 people can travel in two vehicles if the first vehicle has 7 seats and the second one has 4 seats.

(Write all the answers on paper, then scan and make a pdf. Submit the pdf only. Naming format: Name_ID)
Submission link: ***HERE***