**CSE230: Discrete Mathematics**  
Practice Sheet 6: **Counting**

| Q1 | A password consists of 3 letters followed by 2 digits. How many different passwords can be created if letters and digits can repeat? |
| --- | --- |
| Q2 | A club has 3 types of snacks and 2 types of drinks. Alternatively, they can offer 4 types of combo meals. How many choices does a customer have? |
| Q3 | How many three-digit numbers can be formed using the digits 1, 2, 3, 4, 5 if repetition is not allowed and the number must be divisible by 5? |
| Q4 | A committee of 3 people is to be formed from 5 men and 4 women such that there is at least one woman. How many such committees are possible? |
| Q5 | Some companies offer 4 models of phones in 3 colors each. How many different phone options are available? |
| Q6 | A library has 5 sections. Each section has 3 types of books. How many ways can a student choose one book if they are restricted to one section? |
| Q7 | How many ways can you arrange the letters in the word "PERMUTATIONS" if the vowels must be together? |
| Q8 | How many ways can you arrange the letters in the word “CALCULUS” if the first and the last character must be the same? |
| Q9 | A 4-digit lock code is created using digits 1 to 6. How many such codes are possible if no digit can appear more than once? |
| Q10 | In a row of 6 chairs, how many ways can 3 people sit if no two people can sit next to each other? |
| Q11\*\* | How many ways can a 5-digit number be formed using the digits 0, 1, 2, 3, 4, 5 if the number must not start with 0 and repetition is not allowed? How many of those numbers will be even? |
| Q12 | In a race of 8 people, how many ways can the top 3 positions be awarded if no ties are allowed? |
| Q13 | In the last BRACU chess competition, there were a total of 105 participants. The rules were simple. A game of chess will be played between two of the participants randomly. The loser will be eliminated immediately. What was the total number of games played in that competition? |
| Q14 | There are 17 points in a plane. 5 of them lie on the same straight line. No three other points lie on a single straight line.   1. How many straight lines can be drawn using the points? 2. How many different triangles can be drawn? |
| Q15\* | In how many ways can the letter of the words “MATHEMATICS” be arranged maintaining the following conditions?   1. Keeping the vowels together. 2. Keeping the relative position of vowels and consonants unchanged. 3. Starting and ending with the same letters. 4. Starting with M. 5. Ending with T. 6. Starting with M or ending with T. 7. Starting with a vowel. 8. Keeping the relative position of C and S unchanged. |

**CSE230: Discrete Mathematics**  
Practice Sheet 6: **Pigeonhole Principle**

| Q1\* | An opaque container has 7 red balls, 12 yellow balls, 8 green balls, 5 blue balls and 21 black balls. What is the least number of balls you need to pick up from that container to ensure that,   1. you have at least 3 balls of the same color 2. you have at least 9 balls of the same color 3. you have at least 2 red balls 4. you have one ball of each color |
| --- | --- |
| Q2 | The population of BRAC University students will become 300 million by 2030. There are 30 departments and each department allocates 10 million students. While forming a club, what is the minimum number of students that needs to be selected randomly so that at least 5 of the students come from the same department? |
| Q3 | What is the minimum number of students, each of whom comes from one of the 64 districts of Bangladesh, who must be enrolled in a university to guarantee that there are at least 100 who come from the same district? |
| Q4 | In one of the admission tests, a university decided to intake students such that at least 10 newly admitted students share the same birthday. What is the minimum number of students the university needs to admit in that intake? [Based on a real-life university] |
| Q5 | How many numbers must be selected from the set {1, 3, 5, 7, 9, 11, 13, 15} to guarantee that at least one pair of these numbers add up to 16? |
| Q6 | Suppose that there are nine students in a discrete mathematics class at a small college.   1. Show that the class must have at least five male students or at least five female students. 2. Show that the class must have at least three male students or at least seven female students. |
| Q7 | What is the minimum number of students required in a CSE230 class to be sure that at least six will receive the same grade if there are 13 possible grades, A+, A, A-, B+, B, B-, C+, C, C-, D+, D, D- and F? |
| Q8 | What is the size of the smallest group of people where at least 9 people share the same birth month? |
| Q9\*\* | Show that for every integer n there is a multiple of n that has only 0s and 1s in its decimal expansion. |

\* symbol indicates the degree of difficulty