MATH255 Homework 1 Part B

(Clearly justiyfy all answers.)

(Due 11 October 2023. Upload your solutions to MOODLE.)

Write your Bilkent student number. Take its four least signifcant digits as a four digit number; call it N. Compute $M = [(N^2 - 1) \mod 5] + 2$. Example: for student number 21003141, $M = [(3141^2 - 1) \mod 5] + 2 = 2$.

Q1- 180 people attend a contest. Teams are formed randomly without any preference; each team has M people. Teams are identified only by the team members that form the team.

a) i- A team is formed by selecting M people from a group of 180. In how many ways can you form this (single) team?

a) ii- A group (set) of teams is formed, where each team has M people, and therefore, a group has $180/M$ teams in it. Each such "group of teams" is considered as the outcome of the team forming stage. How many such outcomes are possible?

b) If $3M$ of these 180 people are females, what is the probability that a randomly selected team after the teams are formed has only females in it.

c) What is the probability that exactly $3M$ teams, among the formed teams, have exactly one female in it?

d) Assume that the 180 players have already formed $T = 180/M$ teams. If two teams play a game, how many possible games are there among these T teams.

e) Repeat (d) if a game is played among five teams.

f) Suppose that each one of these T teams are assigned a room randomly without a preference, where each room has its own label, i, $i = 1, 2, 3, \cdots, T$. What is the probability that a designated person whose unique name is A is in Room 4? What is the probability that another designated person, whose unique name is B, is in Room 8? What is the probability that B is in Rm 8, given that A is in Room 4? Are these two events independent?