

1) How many ways to choose 2 students from AI Department, that has a population of 250 students?

$$c(n, r) = \frac{n!}{r!(n-r)!} \quad 250! / 2!(250-2)! = 31124$$

2) How many distinct bit strings can be formed from three 0's and two 1's?

$$N=5 \quad 5! / (2! * 3!) = 10$$

3) How many bit strings of length 5, start and end with 1's?  $1 * 2 * 2 * 2 * 1 = 8$

4) If three awards are given each year to football team members. If there are 30 players this year in this team, and each one of them can receive at most only one award, how many possible ways are there?

$$c(n, r) = \frac{n!}{r!(n-r)!} \quad 30! / 3!(27)! = 4060$$

5) How many ways to select 3 books from 6 Solution if each of the books are distinct?

$$c(n, r) = \frac{n!}{r!(n-r)!} \quad 6! / 3!(3)! = 20$$

6) When you are rolling a pair of (fair) dice three times. What is the probability that, least one of the three tries, you roll a 7?  $\rightarrow 0$

7) How many ways to select 3 books from 6 Solution if there are 2 books that should not both be chosen together?

$$C(6, 3) - C(4, 1) = 16$$

8) In a Discrete Mathematics class, that contains 25 students, among whom are two students with name "Ahmed", two students with name "Sally", two students with name "Mariam", two students with name "Yousef", and two students with name "Ibrahim" (along with the reminder twenty two students whose names are all distinct from those five names and from one another's names)

(a) How many different 14-student study-groups can be formed such that within the study group, there is exactly one student with name "Ahmed", exactly one student with name "Sally", exactly one student with name "Mariam", exactly one student with name "Yousef", and exactly one student with name "Ibrahim"?

$$\begin{aligned} & (2,1) * C(2,1) * C(2,1) * C(2,1) * C(2,1) * C(20,9) \\ & = 2 * 2 * 2 * 2 * 2 * (167960) \\ & = 1,073,741,824 \end{aligned}$$

(b) If the instructor is randomly assigning 14 of these students to a project-team, so what is the ways this team could be formed such that this team will contain two students both with name "Ahmed", two students both with name "Sally", two students both with name "Mariam", two students both with name "Yousef", and two students both with name "Ibrahim"?

$$\begin{aligned} & C(2,2) * C(2,2) * C(2,2) * C(2,2) * C(2,2) * C(20,4) \\ & = 1 * 1 * 1 * 1 * 1 * (4845) \\ & = 4845 \end{aligned}$$