CSE230 (Discrete Mathematics)
Assignment 03 (Bonus)

Lecture 9:

1. According to estimates, 44 percent of Bangladeshis have blood type B+. Suppose, you have started to sample people as you are looking for B+ blood type. Once you find a person with B+ blood type, you'll stop sampling immediately. What's the probability that you'll need to sample **exactly 6 people** to find someone with blood type B+? What is the expected number of people to sample in order to find someone with that blood type and what is the standard deviation?
2. Shomee is rolling a die repeatedly. What is the probability that a six will emerge **for the first time** on the fifth roll? What is the expected number of rolls to get the first six and what is the standard deviation of the number of rolls?
3. A student's chances of being accepted to Harvard are about 5%. What is the probability that **only three** students from the same school will be accepted if **twenty** apply?
   Calculate the expected number of accepted students if there were **ten applicants** from the same school. Also, find the standard deviation of the number of accepted applicants.
4. It's estimated that only about 5% of the population has hazel eyes. What is the probability that only **10 people** from a gathering of **100 people** have hazel eyes? Calculate the mean and the variance of the number of hazel-eyed people from a gathering of **150 people**.

Lecture 10:

1. Suppose 4% of the toys in a batch will malfunction. Use the Poisson approximation to calculate the probability that in a big batch of 400 there will be **at most 1 defective toy.**
2. Ships dock at a bay at an average rate of 180 per hour.
   a. What is the probability that **no ship** docks in **a minute**?

b. Calculate the expected number of docking in **10 minutes**

3. In a football match, suppose that the probability of Team A winning is 0.3, Team B winning is 0.5 and the rest is the probability of a Tie. If 30 games are played, what is the probability that all games end in a Tie?

4. A baseball player is said to "hit for the cycle" if he has a single, a double, a triple, and a home run all in one game. Suppose these four types of hits have probabilities 1/16, 1/4, 1/5, and 1/24. What is the probability of hitting for the cycle if he gets to bat (a) eight times and (b) four times?

Lecture 11 & 12:

1. An urn contains 6 red, 7 blue, and 5 green balls. You draw out two balls and they are different colors. Given this, what is the probability that the two balls were red and blue?

2. The following is a table showing the number of regular and irregular students in CSE230 live consultation hours and their grades in the viva voce .

	Good	**Average**	**Bad**	**Total**
Regular	22	2	x	5z-5
Irregular	v	u	w	z+3
Total	23	u+2	u-v	**40**

What is the probability that a student gets a bad grade in viva **given** that s/he is irregular in consultation? [Hint: You need to determine the unknowns first]

3. An almost out-of-business movie theatre has three categories of seats - front, middle, and rear. Of the total number of seats, 10% are front seats, 30% are middle seats, and the rest are rear seats. It is known from previous experience of movie-goers that 5% of the front seats, 10% of middle seats, and 20% of the rear seats are broken. Determine the probability of a randomly selected seat being broken.

4. An insurance company classifies people into one of the three classes – good risks, average risks and bad risks. 30% of the population are labelled as "good risk", 60% as "average risk" and the remaining as "bad risk". Their records indicate that over a 1-year span 10% of good risk people, 20% of average risk people, and 30% of bad risk people are involved in an accident.Determine the probability of a randomly selected policy holder being involved in an accident.

5. Bag A contains 6 red and 7 black balls and Bag B contains 9 red and 6 black balls. One ball is transferred from Bag A to Bag B and then a ball is drawn from Bag B. The ball so drawn is found to be black in color. Find the probability that the transferred ball was red.

6. Suppose there are 8 fair coins and 12 unfair coins in a bag such that the unfair coins have a 75% probability of landing heads. A coin is randomly picked from the bag and flipped 9 times. If the coin landed heads 7 times out of 9, what is the probability that the coin to be unfair?

7. Assume that the chances of the patient having a heart attack are 40%. It is also assumed that a meditation and yoga course reduces the risk of heart attack by 30% and prescription of certain drugs reduces its chances by 25%. At a time, a patient can choose any one of the two options with equal probabilities. It is given that after going through one of the two options the patient selected at random suffers a heart attack. Find the probability that the patient followed a course of meditation and yoga?