STA201 Assignment 3

Dispersion

1. A collar manufacturer is considering the production of new collars to attract young men. Thus following statistics of neck circumference are available based on measurements of a typical group of students of a particular university:

Mid values (in inches):	13.0	13.5	14.0	14.5	15.0	15.5	16.0	16.5	17.0
Number of students:	2	16	36	60	76	37	18	3	2

   Compute the standard deviation and use the criterion $\bar{x} \pm 3\sigma$, where σ is the standard deviation and $\bar{x}$ is the arithmatic mean to determine the largest and smallest size of the collar he should make in order to meet the needs of practically all the customers bearing in mind that collars are worn average half an inch longer than the neck size.

2. The manager of *Nando's Chicken* has just received two dozen tomatoes form her supplier, but she is not ready to accept them. She knows from the invoice that the average weight is 7.5 ounces, but she insists that all be of uniform weight. She will accept them only if the average weight is 7.5 ounces and the standard deviation is less than 0.5 ounce. Here the weights of the tomatoes.

6.3	7.2	7.3	8.1	7.8	6.8	7.5	7.8
7.2	7.5	8.1	8.2	8.0	7.4	7.6	7.7
7.6	7.4	7.5	8.4	7.4	7.6	6.2	7.4

   What would be the manager's decision and why?

3. A construction company is considering employing one of two training programs. Two groups were trained for the same task. Group 1 was trained by program A, group 2 by program B. For the first group, the times required to train the employees had an average of 32.11 hours and a variance of 68.09. In the second group, the average was 19.75 and the variance was 71.14. Which training program has less relative variability in its performance?

4. The normal daily high temperatures (in °F) in January for 10 selected cities are as follows.

   50, 37, 29, 54, 30, 61, 47, 38, 34, 61

   The normal monthly precipitation (in inches) for these same 10 cities is listed below:

   4.8, 2.6, 1.5, 1.8, 1.8, 3.3, 5.1, 1.1, 1.8, 2.5

   Determine which variable demonstrate greater variability?

5. The administrator of a Georgia hospital surveyed the number of days 200 randomly chosen patients stayed in the hospital following an operation. The data are: (next page)

Hospital Stay in days	Number of patients
1 – 3	18
4 – 6	90
7 – 9	44
10 – 12	21
13 – 15	9
16 – 18	9
19 – 21	4
22 – 24	5

Calculate the following:
   i.   Coefficient of variation (CV).
   ii. Comments on the Skew ness of the distribution using the Pearson's methods.

Correlation & Regression

6. The following are the sales and profits of a company for the last 7 day:

Sales ('000'Tk)	Profit ('000' TK)
6	1
7	1
8	3
11	5
12	6
10	4
12	5

   a. Calculate the (Pearson's) correlation coefficient (r) between sales and profit and comment.
   b. Find the relationship between sales and profit by scatter diagram and comment (interpret).
   c. Fit a (least squared) regression line of profit on sales and comment (ordinary least square method).
   d. If sale is 15 ('000'tk), what is profit?
   e. Find coefficient of determination (how well the regression line is fitted).

7. The demand and price of a specific product is given the following table

Demand (kg)	Price (Tk)
10	25
8	37
9	40
7.5	45
5	48
4.5	50
3	55
2	70

   a. Find the relationship between demand and price by scatter diagram and comment(interpret)
   b. Find correlation coefficient and comment.
   c. Fit a least square regression equation (line) of demand on price and comment.
   d. What will be demand when the price is Tk. 52 and Tk. 10?
   e. Find coefficient of determination (how well the regression line is fitted).

8. To study the strength of a certain ware, the following pairs of observations were recorded, the diameter (in cm) and the mass supported in kg/cm.

Diameter (cm)	0.6	1.0	1.2	1.6	2.0	2.2
Mass (kg/cm)	20	50	55	100	105	110

   a. Fit a regression model of mass on diameter.
   b. What will be mass for a wire with diameter 1.3 cm?
   c. Draw a scatter diagram and comment.

9. Daily studying (x) (in hours) and marks (y) in a quiz (out of 15) of 10 students were as follows:

Studying	6	5	4	2	1	7	10	0	8	5
Marks	14	12	10	8	6	12	13	12	15	9

   a. Fit the regression equation of Studying(y) on marks.
   b. What will be marks for studying 3 hours daily?
   c. Can you verify the relationship between marks and daily studying? Try all the methods.

10. A department of transportation's study on driving speed and mileage for midsize automobile resulted in the following table:

Driving speed	30	40	50	55	25
Mileage	27	25	30	35	22

   a. Is there any the relationship between Driving speed and Mileage? Verify your answer
   b. Find the regression equation of driving speed on mileage.
   c. What will be mileage when speed is 45?
   d. Test the fitness of your regression model with explanation.

Probability

11. In a simultaneous throw of a pair of dice, find the probability of getting:
   a. 8 as the sum
   b. a doublet
   c. a doublet of prime numbers
   d. a doublet of odd numbers
   e. a sum greater than 9
   f. an even number on first
   g. an even number on one and a multiple of 3 on the other

12. A bag contains 25 balls numbered 1 through 25. Suppose an odd number is considered a 'Success'. Two balls are drawn from the bag with replacement. Find the probability of getting
   a. Two successes
   b. exactly one success
   c. at least one success
   d. no successes

13. An elementary school is offering two optional language classes, one in French and the other in Spanish. These classes are open to any of the 120 upper grade students in the school. Suppose there are 32 students in the French class, 36 in the Spanish class, a total of 8 who are in both classes. If an upper grade student is randomly chosen, what is the probability that this student is not enrolled in any one of these classes?

14. Assume that the chances of the patient having a heart attack are 40%. It is also assumed that a meditation and yoga course reduce the risk of heart attack by 30% and prescription of certain drug 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?

15. Bag A contains 3 red and 4 black balls and Bag B contains 4 red and 5 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 red in color. Find the probability that the transferred ball is black.

Combinatorics

16. In the annual picnic for STA 201 course teachers, 11 faculties (including a pair of twins, Snigdho and Mugdho) have been selected for a game of musical chair. (A game where all the participants have to sit on chairs arranged in circular fashion).
    a. How many ways can all those 11 faculties be arranged at the beginning of the game of musical chair?
    b. If Snigdho and Mugdho are determined about not sitting beside each other in the first round, how many ways can they sit so that they do not have to sit on adjacent chairs?
    c. What is the probability that Snigdho and Mugdho will not be adjacent to each other?
       [Hint: Probability of an event A, P (A) = $\frac{\text{No.of outcomes (ways) under event A}}{\text{Total no of possible outcomes}}$]
    d. After 5 teachers being eliminated from the game, in how many ways can the remaining teachers be arranged in circular fashion?

17. 10 BRACU students' responses were following about their preferred device for buX login:

Preferred device	No. of students
Mobile phone	3
Tablet	2
Laptop	5

    a. How many ways 3 students can be chosen from 5 laptop preferring students whom BRACU will provide 3 laptops?
    b. How many ways can the (above mentioned) 3 laptop winners be arranged in a line for a photo-shoot?
    c. If we choose one student out of them, show that the probability of that student being from modal class is the highest according to the table.
    d. How many ways can BRACU choose 1 mobile lover, 1 tablet lover and 1 laptop lover (total 3 students) for sharing their buX experience?

18. Suppose there are 5 sections (A, B, C, D, and E) in the Final Exam Question (STA 201, summer 2020). A student can either pass or fail in a section. One student will pass the exam **only if s/he passes in all 5 sections.**
    a. In how many ways can a student fail in exactly one section of the final test?
    b. In how many ways can a student pass exactly 3 of those 5 sections?
    c. In how many can a student fail to pass the final exam?
    d. Knowing that a student has equal chance to pass or fail in a section, determine the probability of a student passing the final test?