United International University

School of Science and Engineering

Mid Term Exam Trimester: - Summer 2023

Course Title: Probability and Statistics

Course Code: Math 2205/Stat 205 Marks: 30 Time: 1 Hour 45 minutes

[Note that the number of marks is given in brackets at the end of each question or part question. You have to answer all the questions]

Q1

(a) Each member of an athletics club was asked to monitor the distance run in training during a particular week. The table below summarizes the results. **[1+4= 5]**

Distance to nearest Km	30-40	40-50	50-60	60-70	70-80	80-90
Number of athletes'	2	4	7	12	9	6

(i) Identify the modal and median class.

(ii) Estimate the standard deviation of this population of athletes.

(b)

The back-to-back stem-and-leaf diagram shows the diameters, in cm, of 19 cylindrical pipes produced by each of two companies, *A* and *B*.

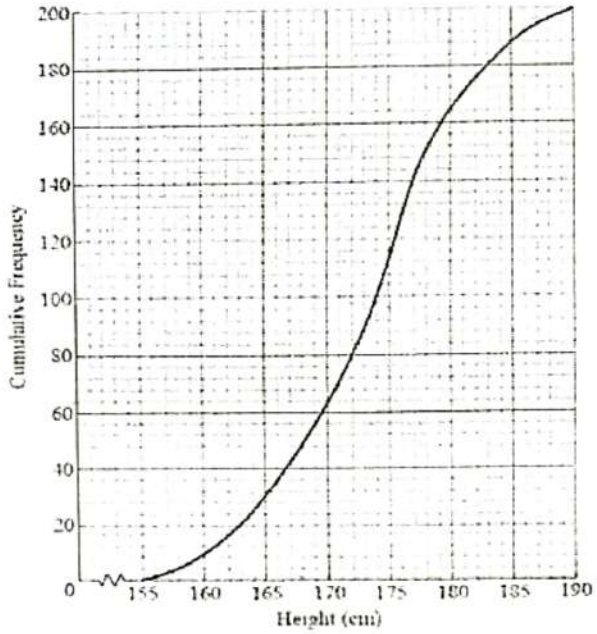
Company *A*							Company *B*				
					4	33	1	2	8		
	9	8	3	2	0	34	1	6	8	9	9
8	7	5	4	1	1	35	1	2	2	3	
		9	6	5	2	36	5	6			
			4	3	1	37	0	3	4		
						38	2	8			

Key: 1 | 35 | 3 means the pipe diameter from company *A* is 0.351 cm and from company *B* is 0.353 cm.

(i) Find the interquartile rang of the diameter of the pipes produced by the companies A and B.

(ii) Comment of the nature of distribution for each set of data. **[3+2 = 5]**

Q2



The cumulative frequency graph illustrates the height of 200 students in a community.

(i) State the range of the data.

(ii) Construct a box and whisker plot to illustrate the data.

(iii) What percentage of students have height more than 170 cm. ?

(iv) Find the outlier if there exits any.

[2+4+2+2 = 10]

Q3 **(a)** The following table shows the hours of sunshine, x, during nine days in August and the number of ice creams, y, sold by a beach shop in Cornwall.

x	4.3	6.9	0.0	10.4	5.2	1.8	8.0	9.2	2.1
y	224	208	123	419	230	184	362	351	196

(i) Calculate the equation of the regression line of y on x.

(ii) Calculate the number ice creams sold when the numbers of hours of sunshine was 3.5 hours.

(iii) The owner uses the regression equation to forecast the daily sales if there were 20 hours of sunshine. Give a reason why it would be inappropriate to do this. **[4+1+1 = 6]**

(b) The table shows a Verbal Reasoning test score, x, and an English test score, y, for each of a random sample of 8 children who took both tests.

Child	*A*	*B*	*C*	*D*	*E*	*F*	*G*	*H*
x	112	113	110	113	112	114	109	113
y	69	65	75	70	70	75	68	76

(i) Calculate the value of the correlation coefficient between the scores in verbal reasoning and English.

(ii) Comment briefly, in context, on the result obtained in part b(i). **[3+1 = 4]**

120.69
25.27

Formulae:

For the linear regression $y = a + bx$ $\quad a = \frac{\Sigma y \Sigma x^2 - \Sigma x \Sigma xy}{[n\Sigma x^2 - (\Sigma x)^2]}$ and $b = \frac{n\Sigma xy - \Sigma x \Sigma y}{[n\Sigma x^2 - (\Sigma x)^2]}$

Spearman's rank correlation Coefficient: $\rho = 1 - \frac{6\sum d_i^2}{n(n^2-1)}$

Correlation Coefficient: $r = \frac{\Sigma (x-\bar{x})(y-\bar{y})}{\sqrt{\Sigma(x-\bar{x})^2 \Sigma(y-\bar{y})^2}}$