

THE PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY
DEPARTMENT OF MATHEMATICS & COMPUTER SCIENCE
SECOND SEMESTER EXAMINATIONS – 2022
FIRST YEAR BACHELOR IN APPLIED MATHEMATICS

AM124 – STATISTICS AND PROBABILITY

TIME ALLOWED: 3 HOURS

INFORMATION FOR CANDIDATES

1. Write your name and student number clearly on the front of the examination answer booklet.
2. You have 10 minutes to read this paper. You must not begin writing during this time.
3. This paper contains FIVE (5) questions. You are to **answer ALL** the questions.
4. All answers must be written in examination answer booklets provided. No other written materials will be accepted.
5. Start the answer for each question on a **new** page. Do **not** use red ink.
6. Notes, textbooks, mobile phones and other recording devices are not allowed in the examination room.
7. Scientific and business calculators are allowed in the examination room.
8. A formula sheet and a normal distribution graph is attached.

MARKING SCHEME

Marks are indicated at the beginning of each question. The total is **100 marks**.

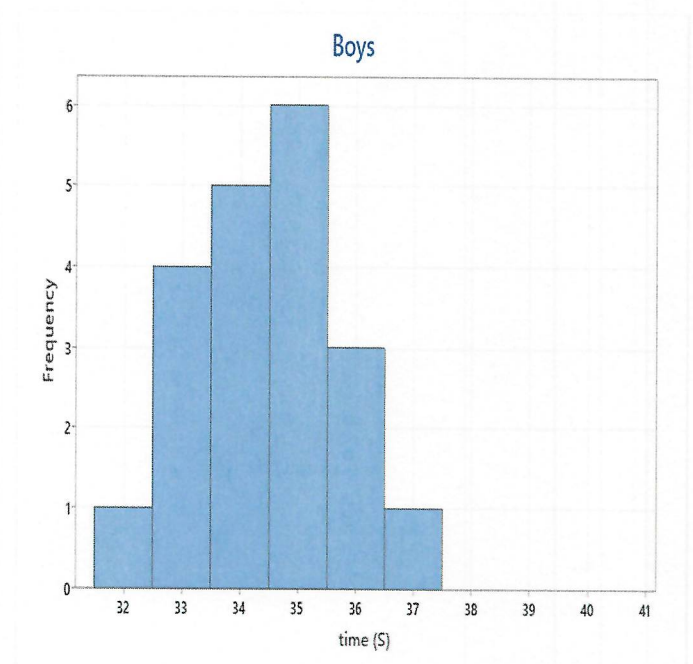
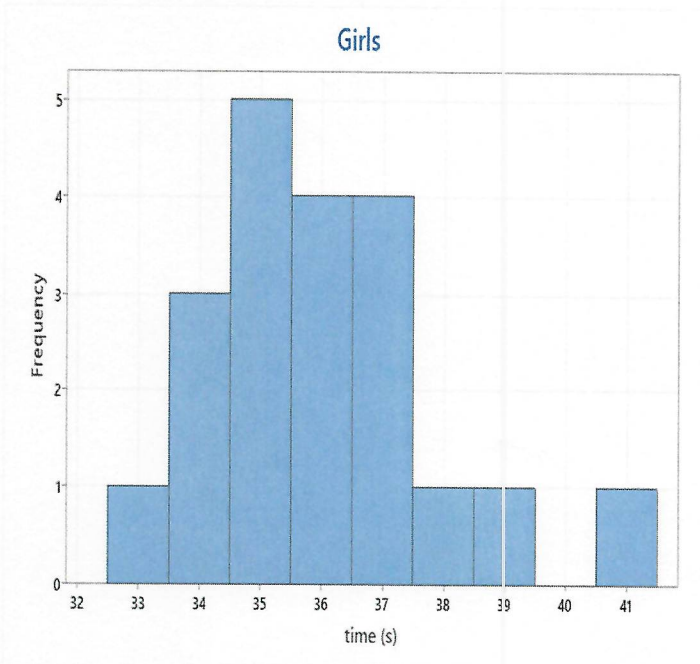
QUESTION 1 [6 + (3 + 3 + 4 + 4) = 20 marks]

In a class of 40 students, 34 like bananas, 22 like pineapple, and 2 dislike both fruits. A student is randomly selected.

- (a) Represent this information on a Venn diagram.
- (b) Use your answer in (a) above to find the probability that the student:
 - (i) Likes both fruits
 - (ii) Likes at least one fruit
 - (iii) Likes banana given that he or she likes pineapple
 - (iv) Dislike pineapple given that he or she likes bananas.

QUESTION 2 [(2 + 2) + (3 + 3) + (4 + 4) + 2 = 20 marks]

The histogram below shows the times for the 100 meter freestyle recorded by members of a swimming squared for two groups.



Using the two histograms answer the following questions.

- (a) Comment on the distribution of both groups.
- (b) Calculate the mean for both groups.
- (c) Calculate the standard deviation for both groups.
- (d) Which group is more consistent?

QUESTION 3 [6 + 4 + 10 = 20 marks]

The winning margin in 100 soccer games was recorded. The results are given in the first two columns of the table below.

Margin (Points)	Frequency	Middle score (x)	Cumulative frequency
10 - 19	13		
20 - 29	35		
30 - 39	27		
40 - 49	18		
50 - 59	7		
TOTAL			

- (a) Copy and complete the missing values in the above table.
- (b) Sketch an ogive using the half plane on graph paper provided.
- (c) Calculate the quartile deviation.

QUESTION 4 [5 + 6 + 9 = 20 marks]

- (a) In a Standard Normal (Z) distribution, what percentage of the scores fall in between $Z = 0$ and $Z = -1.8Z$?
- (b) For a Standard Normal (Z) distribution, what is the Z -value such that 15 percent of the area lies between $Z = Z_0$ and the right-hand end?
- (c) An adult scallop population is known to be normally distributed with a standard deviation of 5.9 g. If 15% of scallops weigh less than 58.2 g, find the mean weight of the population.

QUESTION 5 [(4 + 6) + (4 + 6) = 20 marks]

- (a) Emergency Room Traffic at Angau Hospital keeps records of emergency room (ER) traffic. Those records indicate that the number of patients arriving between 6:00 P.M. and 7:00 P.M. has a Poisson distribution with parameter $\lambda = 2.9$. Determine the probability that, on a given day, the number of patients who arrive at the emergency room between 6:00 P.M. and 7:00 P.M. will be:
- (i) Exactly 4.
 - (ii) At most 3 arrivals.
- (b) When rifle shooter Huy fires a shot, he hits the target 80% of the time. If Huy fires 4 shots at the target, determine the probability that he has:
- (i) 2 hits and 2 misses in any order.
 - (ii) At least 2 hits.

END OF EXAM

FORMULA SHEET

1. Standard Deviation = $\sqrt{\frac{1}{n-1} \left(\sum x^2 - \frac{(\sum x)^2}{n} \right)}$

2. Median Estimate = $LL + W(N/2 - CB)/F$

3. Mode Estimate = $LL + Wd_1/(d_1 + d_2)$

4. $Q_1 = LL + W(N/4 - CB)/F$

5. $Q_3 = LL + W(3N/4 - CB)/F$

6. Variance = $\frac{(\sum FX^2)}{N} - \left(\frac{\sum FX}{N} \right)^2$

7. $\rho = 1 - \frac{6 \sum d^2}{n(n^2 - 1)}$

8. $r = \frac{N \sum XY - (\sum X)(\sum Y)}{\sqrt{[N \sum X^2 - (\sum X)^2] * [N \sum Y^2 - (\sum Y)^2]}}$

9. $b = \frac{n \sum xy - (\sum x)(\sum y)}{n \sum x^2 - (\sum x)^2}$ and $a = \bar{y} - b\bar{x}$

10. Poisson distribution $P(X = x) = e^{-\lambda} \frac{\lambda^x}{x!}$ for $x = 0, 1, 2, \dots$

11. Binomial distribution $P(X = x) = \binom{n}{x} p^x (1 - p)^{n-x}$

