



(Knowledge for Development)

KIBABII UNIVERSITY
UNIVERSITY EXAMINATIONS
2020/2021 ACADEMIC YEAR
FIRST YEAR SECOND SEMESTER
MAIN EXAMINATION

**FOR THE DEGREE OF BACHELOR OF EDUCATION AND
BACHELOR OF SCIENCE**

COURSE CODE: STA 122

COURSE TITLE: PROBABILITY AND STATISTICS

DATE: 12/07/21

TIME: 2 PM -4 PM

INSTRUCTIONS TO CANDIDATES

Answer Question One and Any other TWO Questions

TIME: 2 Hours

This Paper Consists of 3 Printed Pages. Please Turn Over.

Instructions: Answer question one and any other two questions

Question 1 30 mks

a) Define the following terms 2 mks

i Data

ii Skewness

b) Distinguish between descriptive statistics and inferential statistics. 4 mks

c) Calculate the mean deviation from the median of the following dataset. 3 mks

100, 150, 80, 90, 160, 200, 140

d) Calculate the standard deviation of the following marks scored by students in a given test. 5 mks

43, 48, 65, 57, 31, 60, 37, 48, 78, 59

e) Let A and B be two events such that $P(A) = 0.6$ and $P(A \cap B) = 0.7$ and $P(A \cup B) = 0.9$. Determine

4 mks

i $P(A \cap B)$

ii $P(A' \cap B)$

f) Construct a stem-and-leaf plot for the 20 test scores given below. 5 mks

91	74	82	75	96	78	84	79	71	83
78	74	82	66	94	71	64	88	55	80

g) List and explain three main components of a dataset 6 mks

Question 2 20 mks

a) Define the following terms in relation to probability 4 mks

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PROBABILITY AND STATISTICS I

END SEMESTER 2 EXAMINATIONS

ii Independent and disjoint events

b There are 12 patients available for a study. Only 7 of them should be assigned to receive the study treatment. How many different subsets of seven patients can be selected? 3mks

c The random variable $X \sim P_o(25)$ Use a normal approximation to estimate 6 mks

a) $p(X > 30)$.

b) $p(18 \leq X < 35)$.

d Two judges in a beauty competition rank 12 contestants as below.

JUDGE 1	1	2	3	4	5	6	7	8	9	10	11	12
JUDGE 2	12	9	6	10	3	5	4	7	8	2	11	1

What degree of agreement is there between the judges? 7 mks

Question 4 20 mks

a) Let $X \sim B(n, p)$ with $E(X) = 2$ and $\text{Var}(X) = \frac{4}{3}$. Find $p(X > 4)$. 5mks

b) Define correlation 2mks

c) A researcher did a study on feelings of stress and life satisfaction at the university. Participants completed a measure on how stressed they were feeling (on a 1-30 scale) and a measure of how satisfied they felt with their lives (measured on a 1 to 10 scale). The table below indicates the participant's scores.

Participant	1	2	3	4	5	6	7	8	9	10
Stress score (X)	11	25	19	7	23	6	11	22	25	10
Life Satisfaction (Y)	7	1	4	9	2	8	8	3	3	6

Using the data below, answer the following questions.

i An experiment

ii Equally likely events

b Some trees in a forest were showing signs of disease. A random sample of 200 trees of various sizes was examined yielding the following results: 4 mks

Type	Disease free	Doubtful	Diseased	Total
Large	35	18	15	68
Medium	46	32	14	92
Small	24	8	8	40
Total	105	58	37	200

i) What is the probability that one tree selected at random is both small and diseased?

ii) What is the probability that one tree selected at random is either small or disease-free?

c A random variable Y has probability density function mks

$$f(y) = \begin{cases} \frac{y}{4}, & 1 \leq y \leq 3 \\ 0, & \text{elsewhere} \end{cases}$$

Find:

i) $E(y)$,

ii) $E(2y - 3)$,

iii) $\text{Var}(y)$ and

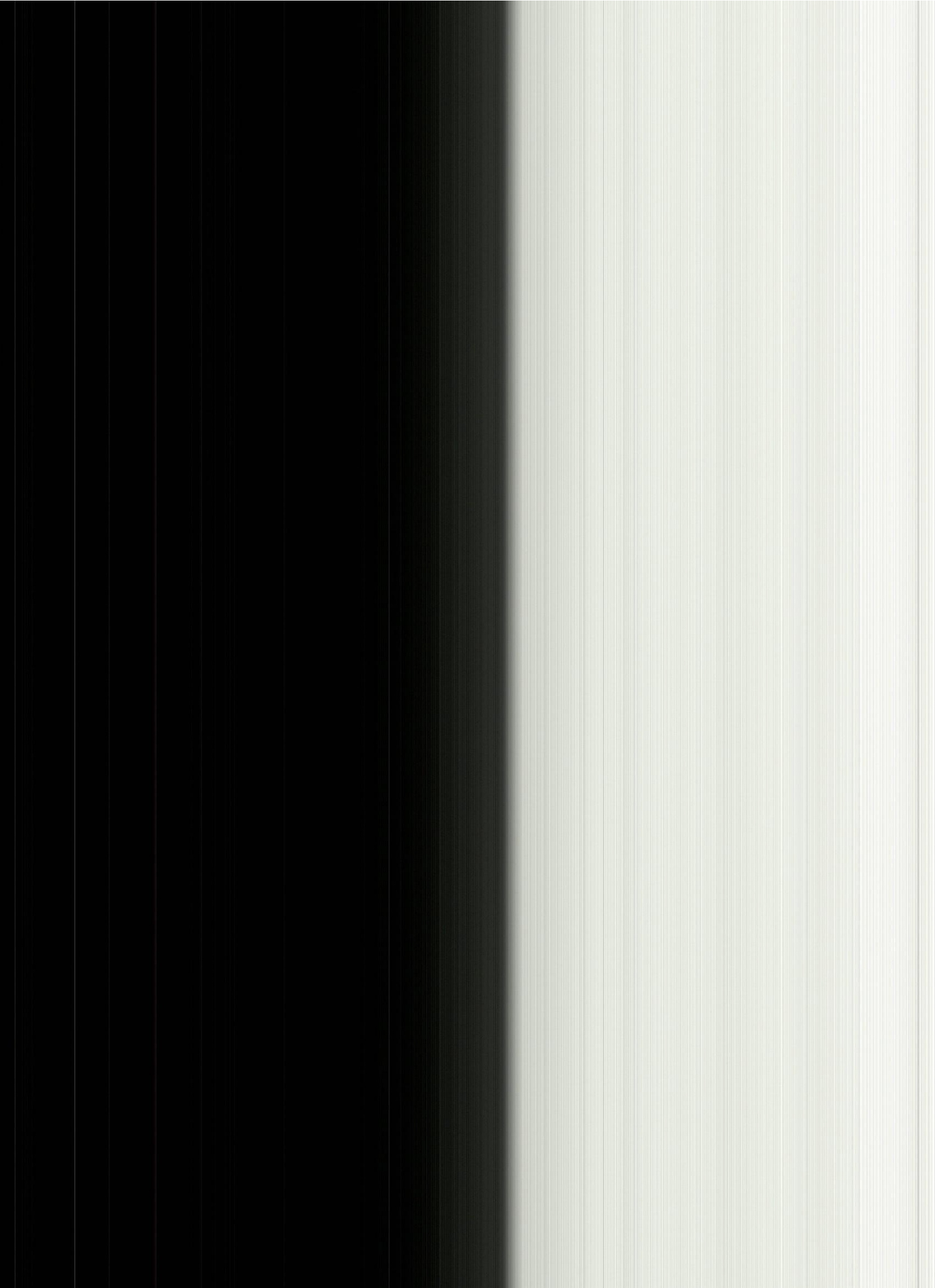
iv) $\text{Var}(2y - 3)$.

d The lengths of pregnancies are normally distributed with mean 268 days and a standard deviation of 15 days. Out of 100 pregnancies, how many would you expect to last less than 20 days? 6mks

Question 3 20 mks

a Differentiate between the following terms 4 mks

i Simple and compound events



- i) Sketch a scatter plot to get an idea what the data looks like. Using your scatter plot, comment on the nature of correlation. 2 mks
- ii) Calculate the Karl Pearson product-moment correlation between stress and life satisfaction 6mks
- iii) Write a brief interpretation of this correlation, including the strength and direction, and an explanation of the effect. 3mks
- iv) Can you say that being more stressed causes a lower level of life satisfaction? Why or why not? 2mks

Question 5 20mks

- a A librarian has 9 textbooks. How many ways can he arrange 4 textbooks on a bookshelf side by side? 3mks
- b Philip's smartphone crashes on average once every three months. 6mks
 - i What is the probability that it will not crash in a period of 3 months?
 - ii What is the probability that it will crash at most 2 times in a period of 3 months?
- c The age in years and glucose levels of 6 individuals was recorded in a local hospital in an attempt to study the effect of age on the weight of individuals. The data was recorded in the table below

Age	43	21	25	42	57	59
Glucose level	99	65	79	75	87	81

- i) Find a and b, the regression coefficients. 8mks
- ii) Write down the regression equation, and estimate the glucose levels for an individual aged 70 years old. 3mks