



Faculty	Faculty of Computing		
Assessment Type	Internal Assessment	Paper Code	C-MAT -Int1
Module Name	Mathematics -1	Module Code	C6-DMA-19
Day	Tuesday	Date	22 June 2021
Total Marks	50	Time	2 weeks

Instructions

1. Answer ALL questions
2. No calculators allowed
3. No cell phone allowed
4. Show ALL your working
5. Compile a word document with all the answers. The file name should have the following.
Name_surname_math1.docx. e.g Walter_Juma_math1.docx

Submit on or before 19 March 2021

Question 1 [total = 10 marks]

(a) Answer true/false to the following questions

- (i) Probability is a measure of the level of certainty with which an event can occur. (T/F)
- (ii) Discrete probability is concerned with an infinite number of possible outcomes of an experiment. (T/F)
- (iii) If two events (A and B) are independent, it means that they are also disjoint. (T/F)
- (iv) The conditional probability of disjoint events A and B ($P(B/A)$) will always be equal to 0. (T/F)
- (v) Tree diagrams provide an effective means of solving probability problems but, they become ineffective with problems of too large sample space.

- (b) The following table lists terms and their corresponding definitions. You are required to rearrange these terms so that each term is put adjacent to its definition.

No.	Term	Definition
1	Sample space	Probability of event x occurring
2	Outcome	a physical process with a number of observable outcomes e.g. tossing a coin, playing a game
3	Experiment	Elements of the sample space
4	Event	Set of possible outcomes of an experiment
5	$P(x)$	Each subset of a sample space

Question 2 [total = 12 marks]

- (a) Two cards are chosen at random from a standard deck of 52 cards. What is the probability of selecting a Queen and a Spade from the deck? [4 marks]
- (b) A coin is weighted so that heads is twice as likely to appear as tails. Find;
- $P(\text{Tail})$ [2 marks]
 - $P(\text{Head})$ [2 marks]
- (c) Neo has 4 yellow t-shirts, 6 black t-shirts and 2 blue t-shirts to choose from for her outfit today. She chooses a t-shirt randomly with each t-shirt equally likely to be chosen. Find the probability that a black or blue t-shirt is chosen for outfit. [4 marks]

Question 3 [total = 15 marks]

A die was chosen at random and rolled. The probability that a fair die was chosen, and an even number shows is $\frac{1}{4}$. The probability that a fair die was chosen and an odd number shows is $\frac{1}{4}$. The probability that an unfair die was chosen and an even number shows is $\frac{1}{12}$. The probability that an unfair die was chosen and an odd number shows is $\frac{5}{12}$. Find the following probabilities:

- (a) Even number shows up. [2 marks]
- (b) Unfair die is chosen. [3 marks]
- (c) Unfair die is chosen given that even number shows up. [5 marks]
- (d) Even shows given that an unfair die is chosen. [5 marks]

Question 4 [total = 13 marks]

- (a) State and prove the Bayes' theorem. [5 marks]
- (b) The following information outlines statistics about the chance of developing liver disease if the patient is alcoholic:

Clinical data tells you that 12% of patients entering your clinic have liver disease and 8% patients are alcoholic. The probability that a patient is alcoholic, given that he/she has liver disease, is 7%.

Using Bayes' algorithm, find the probability of a patient having liver disease given that he/she is an alcoholic.

[8 marks]