

# **Tutorial letter 012/0/2021**

## **Descriptive Statistics and Probability STA1501**

**Year module**

**Department of Statistics**

**Assignment 2 Questions**

<p style="text-align: center;"><b>ASSIGNMENT 02</b> <b>Unique Nr.: 692859</b> <b>Fixed closing date: 22 June 2021</b></p>
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Please study Chapter 6 and corresponding parts of the study guide before answering the following questions.

**Remember that in this module, to get examination admission you must have a year mark of at least 40%. Your year mark is calculated as the average of the four best marks of your 6 assignments.**

This assignment consists of two parts, namely: The true/false questions (part A) – 20 marks and the written questions (part B) – 80 marks, thus the total for the assignment is 100 marks.

**PART A: 20 Marks**

State whether the following statements are true or false.

**QUESTION 1**

A sample space is a listing of all possible outcomes from the experiment being considered.

**QUESTION 2**

An approach of assigning probabilities which assumes that all outcomes of the experiment are equally likely is referred to as the relative frequency approach.

**QUESTION 3**

If  $A$  and  $B$  are independent events with  $P(A) = 0.35$  and  $P(B) = 0.55$ , then  $P(A|B)$  is  $0.35/0.55 = 0.64$ .

**QUESTION 4**

If  $A$  and  $B$  are any two events of a sample space  $S$ , then  $P(A) = P(A \text{ and } B) - P(B)$ .

**QUESTION 5**

If  $P(A) = 0.4$  and  $P(B) = 0.6$ , then  $A$  and  $B$  must be mutually exclusive.

**QUESTION 6**

If two events are mutually exclusive, then they are independent.

**QUESTION 7**

If  $A$  and  $B$  are independent events, then  $P(A \text{ and } B) = P(A) \cdot P(B)$ .

**QUESTION 8**

If events  $A$  and  $B$  are mutually exclusive, then  $P(A \text{ and } B) = 0$ .

**QUESTION 9**

If  $A$  and  $B$  are independent, then  $P(A | B) = P(A)$ .

**QUESTION 10**

For any events  $A$  and  $B$ , the inequality  $P(A | B) \leq P(A)$  must always hold.

**PART B: 90 Marks**

Study Chapter 6 of the textbook and the corresponding parts of the study guide before attempting these questions. Give full calculations, and use correct mathematical and statistical notation.

**QUESTION 11**

Assume that  $A$  and  $B$  are events, with  $P(A) = 0.6$ ,  $P(B | A) = 0.2$  and  $P(B | A^c) = 0.1$ . Find the following probabilities:

- (a)  $P(B)$  (5)
- (b)  $P(A \cap B)$  (3)
- (c)  $P(A \cup B)$  (3)
- (d)  $P(B^c | A)$  (2)
- (e)  $P(A | B^c)$  (4)

**[17]**

## QUESTION 12

A takeaway pizza shop conducted analysis of the takeaway meals ordered, and found that 40% of orders were for a meat pizza with a drink, 20% for a vegetarian pizza with a drink, 10% for a meat pizza without a drink, and 30% for a vegetarian pizza without a drink. If a takeaway order is randomly selected, find the probability that it is for:

- (a) A meat pizza without a drink. (2)
- (b) An order with a drink. (2)
- (c) A meat pizza. (2)
- (d) A meat pizza or an order with a drink. (3)
- (e) A meat pizza, if the order included a drink. (2)
- (f) An order with a drink, if a vegetarian pizza was ordered. (2)

**[13]**

## QUESTION 13

The following data describes the gender and marital status of 100 UNISA employees.

Gender	Marital Status		
	Single	Married	Divorced
Male	25	15	5
Female	30	20	5

Suppose that an employee is selected at random.

- (a) Construct the joint and marginal probability table. (6)
- (b) Find the probability that the employee selected is a married male. (2)
- (c) Find the probability that the employee selected is married or divorced. (4)
- (d) Find the probability that the employee selected is divorced given that he is male. (4)
- (e) Are gender or marital status independent in this data set? Justify your answer. (4)

**[20]**

**QUESTION 14**

Students taking a module have a yearmark above 75 with probability 20%, a yearmark between 30 and 75 with probability 60%, and a yearmark below 30 with probability 20%. A student with a yearmark above 75 passes the exam with probability 70%, a student with a yearmark between 30 and 75 passes the exam with probability 65% and a student with a yearmark below 30 passes the exam with probability 15%.

- (a) Construct a probability tree for the described scenario. (6)
- (b) What is the probability that a randomly chosen student passes the exam? (6)
- (c) If a student has a yearmark below 75, what is the probability that the student passes the exam? (4)

**[16]****QUESTION 15**

Assume that a weather forecast for tomorrow states that it rains in Johannesburg with probability 0.2, and it rains in Pretoria with probability 0.3. Assume further that we are told that if it does rain in Pretoria, then it rains in Johannesburg with probability 0.8. Calculate the following:

- (a) The probability that it rains in both Pretoria and Johannesburg. (4)
- (b) The probability that it rains in at least one of the cities. (4)
- (c) The probability that it does not rain in either city. (2)
- (d) The probability that it rains in Pretoria, if it rains in Johannesburg. (4)

**[14]****Total marks (Part A & Part B): [100]**