



FACULTY/COLLEGE	College of Business and Economics
SCHOOL	Johannesburg Business School
DEPARTMENT	Business Management
CAMPUS	APB
MODULE NAME	Quantitative Techniques 1B
MODULE CODE	ADBQ01B
SEMESTER	Second
ASSESSMENT OPPORTUNITY, MONTH AND YEAR	Final Summative Assessment November 2019

ASSESSMENT DATE	20 November 2019	SESSION	
ASSESSOR	Mr E. Kande		
MODERATOR	DR W. Mbiombi		
DURATION	120 minutes	TOTAL MARKS	100

NUMBER OF PAGES OF QUESTION PAPER (Including cover page)	10
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INFORMATION/INSTRUCTIONS:

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- This is a closed-book assessment.
 - Question papers must be handed in together with your answer books.
 - Read the questions carefully and answer only what is asked.
 - Answer all the questions:
 - Answer **Section A** on the multiple-choice page in the back of your answer book.
 - Answer **Section B** in the answer book.
 - Number your answers clearly.
 - Write neatly and legibly on both sides of the paper in the answer book, starting on the first page.
 - Structure your answers by using appropriate headings and subheadings.
 - The general University of Johannesburg policies, procedures and rules pertaining to written assessments apply to this assessment.

SECTION A**[20 MARKS]****QUESTION 1**

For a given problem situation, there are certain essential conditions that need to be solved by using linear programming. Which of the following option is incorrect?

- a. Limited resources
- b. Maximize the profits or minimize the cost
- c. Homogeneity
- d. Non-divisibility

QUESTION 2

The following properties form the linear programming model except:

- a. The relationship among decision variables must be non-linear in nature
- b. The model must have an objective function
- c. Resource constraints are essential
- d. A model must have a non-negativity constraint

QUESTION 3

A simple index number measures the changes in price or quantity of a single item over time. Which of the following is not in the steps of calculating the simple index number?

- a. Obtain the prices or quantities for the product over the time of interest
- b. Select the period to be used as base
- c. Multiply the current price of the commodity by the base price
- d. Multiply the ratio by 10

QUESTION 4

Which of the following statement is correct?

- a. The probability of the event that is certain to occur is equal to zero
- b. The probability of the event can be negative
- c. The sum of probabilities for all the possible outcomes of an experiment for any event is always greater than 1
- d. The probability for any event is $0 \leq P(r) \leq 1$

QUESTION 5

If a fair dice is rolled, the probability of getting a multiple of 2 is:

- a. $\frac{1}{6}$
- b. $\frac{1}{2}$
- c. $\frac{2}{6}$
- d. $\frac{1}{3}$

QUESTION 6

Solve the following expression and choose the correct option:

$$4 \times 3! =$$

- a. 24
- b. 12
- c. 18
- d. 7

QUESTION 7

Which of the following is an example of empirical probability?

- a. A random process of drawing a red card from a card deck
- b. A random experiment of selecting company from the Johannesburg stock exchange
- c. A random process of selecting an Ace card from a card deck
- d. A and C

QUESTION 8

To differentiate the statistics and the parameters, we use Greek alphabet for the parameters and Roman letters for the statistics.

Which of the following symbol indicate population parameter?

- a. \bar{x}
- b. s
- c. μ
- d. P

QUESTION 9

Which of the following is not a component of a time series?

- a. Trend
- b. Cyclical variations
- c. Seasonal variation
- d. Coefficient of variation

QUESTION 10

Which of the following is not a quality of a good estimator?

- a. Efficiency
- b. Consistency
- c. Unbiasdness
- d. Relevant

SECTION B**[80 MARKS]****QUESTION 1****[20 MARKS]**

Bety's Fashion Design manufactures Trousers, and Shirts. Each trouser yields a profit of R 30, while each Shirt yields R 20. To manufacture one trouser it requires 30 minutes of cutting and 20 minutes of stitching. And one shirt requires 10 minutes of cutting and 12 minutes of stitching. 8 hours are available for cutting, but only 6 hours are available for stitching.

Required:

- 1.1 . Formulate the objective function, as an LP model to maximize the profit, use X_1 to represent the number of trousers, and X_2 the number of shirts. (3)
- 1.2. Construct the constraints equations and the non-negativity conditions (8)
- 1.3. Calculate the values X_1 and X_2 and determine the graphically the feasible region (9)

QUESTION 2**[20 MARKS]**

A random sample of 100 households has been selected in order to establish a price index for housing utilities. The following average annual figures have been obtained:

	Prices (Rand/units)			Quantities		
	2016	2017	2018	2016	2017	2018
Electricity	5	6	6.5	62	64	68
Gas	8	10	11	9	9	10
Water	2	2.5	3	296	297	298
Telephone	4	5	6	55	56	58

- Construct the weighted composite index, and calculate the Laspeyres price index for 2017, using 2016=100. What is the percentage increase in 2018 over those in 2016?

- Calculate the Paasche price index for 2017, using 2016=100. What is the percentage increase in 2017 over those in 2016?
- Calculate the Laspeyres price index for 2018, using 2017=100. What is the percentage increase in 2018 over those in 2017?
- Calculate the Paasche price index for 2018, using 2017=100. What is the percentage increase in 2018 over those in 2017?

QUESTION 3**[20 MARKS]**

Before entering into wage negotiations, the workers' representative of the newly formed farm workers trade union wanted to know the average wage of its union members. The average wage of a random sample of 64 members was found to be R620 per week with a standard deviation of R160 per week.

- Set up the 90% confidence interval estimate for the true mean weekly wages paid to farm workers? (show all your calculations) (10)
- Set up the 99 confidence interval estimate for the true mean monthly wages paid to farm workers? (show all your calculations) (10)

QUESTION 4**[20 MARKS]**

4.1 The time taken to install a new telephone is found to be normally distributed with a mean time equal to 45 minutes and a standard deviation of 8 minutes.

For a new installation, what is the probability that:

1. It will take between 45 and 51 minutes? (4)
 2. It will take between 43 and 45 minutes? (4)
 3. It will take less than 40 minutes? (4)
- 4.2. 10 horses compete in a race
1. How many distinct arrangements are there of the first 3 horses past the post? (4)
 2. How many arrangements are there of the first 3 horses past the post, not considering the order in which the first three pass the post? (4)

FORMULA SHEET**- Laspeyres index**

$$I_{P(L)} = \frac{\sum p_i Q_b}{\sum P_b Q_b} \times 100$$

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Paasches index

$$I_p(P) = \frac{\sum P_i Q_i}{\sum P_b Q_i} \times 100$$

Permutation

$$nP(r)$$

Combination

$$nC(r)$$

The addition rule

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

Expected value

$$\mu = E(X) = \sum_{i=1}^N X_i P(X_i)$$

The slope

$$b = \frac{\sum xy - \sum x \sum y}{n \sum x^2 - (\sum x)^2}$$

The intercept

$$a = \frac{\sum y}{n} - b \frac{\sum x}{n}$$

$$\hat{y} = a + bx$$

Estimation confidence interval

$$\mu = \bar{x} \pm z \cdot \frac{\sigma}{\sqrt{n}}$$

Normal distribution

- $Z = \frac{x-\mu}{\delta}$

Proportion

· $\pi = p \pm z \sqrt{\frac{p(1-p)}{n}}$

Normal Distribution Table