

# KASNEB

ATD LEVEL II

DCM LEVEL II

## BUSINESS MATHEMATICS AND STATISTICS

TUESDAY: 23 May 2017.

Time Allowed: 3 hours.

Answer ALL questions. Marks allocated to each question are shown at the end of the question. Show ALL your workings.

### QUESTION ONE

(a) Explain the following terms as used in probability:

- (i) Addition law of probability. (2 marks)
- (ii) Multiplication law of probability. (2 marks)
- (iii) Baye's theorem. (2 marks)

(b) Nairobi residents were surveyed to determine the readership of newspapers available. 50% of the residents read the Newsera newspaper. 60% of the residents read the Newsupdates newspaper. 20% of the residents read both newspapers.

**Required:**

The probability that a resident selected at random reads either the Newsera or Newsupdates or both newspapers.

(3 marks)

(c) A retail shop sold two types of goods namely; X and Y in a given month totalling to 430 goods. The cost of selling type X good is Sh.300 per item while the cost of selling type Y good is Sh.425 per item. During the month, the total sales of type X and type Y goods amounted to Sh.151,500.

**Required:**

Using matrix algebra, determine the number of goods of type X and type Y sold.

(4 marks)

(d) An importer buys goods from his supplier based in Britain at a cost of 7.20 Sterling pounds per unit. Freight charges and insurance on transit amount to 20% of total cost. Customs duty was charged at Ksh.150 per unit and other expenses amounted to Ksh.194,400.

**Additional information:**

Cost of all units at source = Ksh.2,088,000

1 Sterling pound = Ksh.145.00

**Required:**

- (i) The number of units the importer bought. (2 marks)
- (ii) The selling price per unit, if the importer has to make a profit of 25% on cost. (4 marks)
- (iii) The profit margin. (1 mark)

(Total: 20 marks)

### QUESTION TWO

(a) The following data relate to the height of students in a class:

Height (centimetres)	Frequency
150 and under 155	1
155 and under 160	1
160 and under 165	2
165 and under 170	3
170 and under 175	6
175 and under 180	2
180 and under 185	4
185 and under 190	<u>1</u>
	<u>20</u>

**Required:**

The standard deviation of the height of students.

(6 marks)

- (b) A dry cleaning business in the city finds that its variable cost ( $V$ ) is a function of the number of houses cleaned each month ( $H$ ) and is given by:

$$V = 240H - 20H^2$$

Its monthly fixed cost is Sh.30,000.

Customers are charged a price of Sh.640 per house cleaned.

**Required:**

- (i) The total profit function. (2 marks)
- (ii) The profit during a month when 50 houses were cleaned. (4 marks)
- (iii) The break-even level for the business. (4 marks)
- (c) A certain health club specialises in take away "Breakfast Special" packed in 500 grammes. Each package sells for Sh.320. It costs the club Sh.105 per package for materials and labour and sh.37 for packaging each package. Daily transport costs amount to Sh.47,850.

The demand is high and all the "Breakfast Special" produced is sold the same day. Current production is 2,500 packages per day. The club's fixed cost is Sh.94,225.

**Required:**

The club's daily profit.

(4 marks)

**(Total: 20 marks)****QUESTION THREE**

- (a) A survey of 500 pupils taking the early childhood skills of Reading, Writing and Arithmetic revealed the following number of pupils who excelled in various skills:

Reading	329	Reading and Writing	83
Writing	186	Reading and Arithmetic	217
Arithmetic	295	Writing and Arithmetic	63

**Required:**

- (i) A Venn diagram for the above information. (5 marks)
- (ii) The number of pupils who excelled in all the skills. (2 marks)
- (iii) The number of pupils who excelled in two skills only. (3 marks)
- (iv) The number of pupils who excelled in Reading or Arithmetic but not both. (2 marks)
- (v) The number of pupils who excelled in Arithmetic but not Writing. (2 marks)
- (b) The probability of A winning a game is  $\frac{1}{2}$  while the probability of B winning a game is  $\frac{1}{3}$ . However, the probability of having a tie is  $\frac{1}{6}$ . A and B agree to play a tournament consisting of 3 games.

**Required:**

The probability that:

- (i) A wins all the games. (2 marks)
- (ii) Two games end in a tie. (2 marks)
- (iii) B wins at least one game. (2 marks)

**(Total: 20 marks)**

**QUESTION FOUR**

(a) The following data relate to prices and quantities of three items over the years 2014 – 2016:

Year Item	2014		2015		2016	
	Price (Sh.)	Quantity (Units)	Price (Sh.)	Quantity (Units)	Price (Sh.)	Quantity (Units)
X	300	20,000	375	24,000	525	20,000
Y	375	12,000	375	16,000	150	20,000
Z	1,500	3,000	3,000	2,000	3,000	3,000

**Required:**

- (i) Paasche's price index for the years 2015 and 2016 using 2014 as the base year. (6 marks)
- (ii) Laspeyre's price index for the years 2015 and 2016 using 2014 as the base year. (6 marks)

(b) Realtime Products Limited deals in product X. The average revenue (AR) and average cost (AC) functions of product X are as follows:

$$AR = 60 - 15X$$

$$AC = 24 - 3X + X^2 + \frac{15}{X}$$

Where AR = Average revenue function in million of shillings  
 AC = Average cost in million of shillings  
 X = Units of product X.

**Required:**

- (i) The total profit function. (4 marks)
- (ii) The maximum profit. (4 marks)

**(Total: 20 marks)**

**QUESTION FIVE**

(a) Distinguish between the following terms as used in sampling:

- (i) "Sample frame" and "stratification". (4 marks)
- (ii) "Cluster sampling" and "quota sampling". (4 marks)

(b) Explain the purpose of a Lorenz curve. (2 marks)

(c) The following distribution represents weekly earnings of different employees in a hotel establishment:

Income (Sh.)	4,000 – 4,200	4,200 – 4,400	4,400 – 4,600	4,600 – 4,800	4,800 – 5,000	5,000 – 5,200
Number of employees	14	22	44	50	40	30

**Required:**

- (i) A frequency polygon. (5 marks)
- (ii) From your frequency polygon obtained in (c) (i) above, estimate the mode. (1 mark)

(d) An insurance agent receives a monthly commission on insured property as follows:

5% on the first Sh.200,000 of property insured.  
 3% on the remainder of the property insured.

The agent received a total commission of Sh.79,000 in a given month.

**Required:**

The value of property insured.

(4 marks)

**(Total: 20 marks)**