

THE PUBLIC ACCOUNTANTS EXAMINATIONS BOARD

A Committee of the Council of ICPAU

ATC(U) EXAMINATIONS

LEVEL ONE

BUSINESS MATHEMATICS & STATISTICS - PAPER 3

TUESDAY 18 JUNE 2002.

INSTRUCTIONS TO CANDIDATES:

1. Time allowed: **3 hours**
2. Attempt **all** questions in Section A, any **two** questions in Section B and any **two** questions in Section C.
3. Section A has **twenty** compulsory multiple-choice questions, each carrying 1½ marks.
4. Section B has **three** questions and only **two** are to be attempted. Each question carries 20 marks.
5. Section C has **three** questions and only **two** are to be attempted. Each question carries 15 marks.
6. Please read further instructions on the answer booklet.

SECTION A

Question 1

- (i) If $A = 4 \times 10^{-2}$ and $B = 13 \times 10^{-3}$. Find the value of $A + B$.
- (a) 0.0413
 - (b) 0.017
 - (c) 0.053
 - (d) 0.413
- (ii) Balak bought a car which costs Shs. 3,600,000/=. He made an initial payment of 30% of its cost and arranged to pay the remainder in 20 equal monthly installments. What was his monthly installment?
- (a) Shs. 54,000.
 - (b) Shs 126,000.
 - (c) Shs 2,520,000.
 - (d) Shs 1,800,000.
- (iii) At a certain factory, 330 workers must have either milk or orange juice for break, but not both. For every three workers who take milk, two take orange juice. Find the actual number who take juice.
- (a) 110
 - (b) 132
 - (c) 198
 - (d) 220
- (iv) Three ladies invested Shs. 2,000, Shs 3,000 and Shs. 4,000 in a business and decided to share the profits in the ratio of their investments. If their total profit was Shs. 2,700, what did the lady who invested Shs. 2,000 receive from the share of profits?
- (a) Shs 600.
 - (b) Shs 900.
 - (c) Shs 1,200.
 - (d) Shs 2,000.

- (v) 20 people went together for an exhibition. There were X adults for whom entrance fee was Shs 3,000 each and the rest were children who were charged Shs 2,000 each. The total cost was Shs 52,000. Derive an equation for finding the number of adults.

- (a) $3x + 2(20 - x) = 52$
- (b) $2x + 3(20 - x) = 52$
- (c) $3x + 40 = 52$
- (d) $52 - 3x = 20 - x$

- (vi) A motor bike was valued at Shs. 300,000/= in January 2001. Each year its value decreased by 20% of its value at the beginning of the year. Find its value in January 2003.

- (a) $300,000 \times 0.88^2$
- (b) $300,000 \times 0.76$
- (c) $300,000 \times 0.88^3$
- (d) $300,000 \times (0.24)^2$

(vii) If $\begin{pmatrix} a & b \\ b & 3 \end{pmatrix} \begin{pmatrix} 1 & c \\ 5 & 4 \end{pmatrix} = \begin{pmatrix} 13 & 2 \\ 17 & d \end{pmatrix}$

What is the value of d ?

- (a) 14
- (b) 12
- (c) 8
- (d) Impossible to find

- (viii) Given $\Sigma = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $P = \{\text{even numbers}\}$ and $Q = \{\text{Triangle numbers}\}$.

Describe the set given by $\{0, 5, 7, 9\}$.

- (a) $P \cup Q'$
- (b) $P' \cap Q$
- (c) $P' \cup Q'$
- (d) $P' \cap Q'$

- (ix) The figures below illustrate the number of tourists who visited Rwenzori National Park from 1998 to 2001

1998 ☺ ☺ ☺ ☺ ☺
 1999 ☺ ☺ ☺
 2000 ☺ ☺ ☺
 2001 ☺ ☺ ☺ ☺

☺ represents 100 tourists.

Identify the method used in this data representation.

- (a) Bar chart
- (b) Polygram
- (c) Pictogram
- (d) Histogram

(x) Which of the following is not a continuous random variable?

- (a) The time taken to run a race.
- (b) The weight of a randomly selected pear.
- (c) The length of a randomly selected snake.
- (d) The score obtained when a die is tossed.

(xi) A trade union negotiated the following rise in wages on behalf of its members. 5% of weekly wage or Shs 6 per week, whichever is greater. One employee found that there was no difference between the rise of 5% and that of Shs 6 per week on his wages.

Calculate this employee's weekly wage before the rise.

- (a) 100
- (b) 120
- (c) 106
- (d) 300

(xii) If $f: x \longrightarrow \frac{3x+1}{1-x}$ Find $f: 3$

- (a) 5.
- (b) $\frac{5}{2}$.
- (c) -5.
- (d) $-\frac{2}{3}$.

(xiii) Calculate the Harmonic mean of 4,5,6.

- (a) 4.86.
- (b) 5.
- (c) 0.2.
- (d) 8.53.

- (xiv) Find $\frac{d^2 S}{dt^2}$ if $S = 4t^3 - 3t^2 + 4t$.
- (a) $12t^2 - 6t + 4$
 - (b) $-4t + 4$
 - (c) $24t + 6$
 - (d) $24t - 6$
- (xv) Which of the following is correct about amortisation of a loan?
- (a) Repayment of a loan is by equal periodic payments.
 - (b) Is a written promise to pay for a loan with periodic interest.
 - (c) Is an annuity established so that the maturity value of a loan will be a specific amount.
 - (d) Payment plan that requires periodic payments for a limited time.
- (xvi) In a normal distribution, the following is valid.
- (a) The mode and the median will be on one side of the mean.
 - (b) The mean will be in between the mode and median.
 - (c) The mode; mean and median will coincide.
 - (d) The mode will always be less than the median.
- (xvii) In how many ways can 3 men be selected out of 15 men if two men are to be excluded from every selection?
- (a) 455
 - (b) 286
 - (c) 13
 - (d) 12
- (xviii) Evaluate $(0.004) (30,000)^2$.
- (a) 9×10^8
 - (b) 3.6×10^6
 - (c) 2.25×10^{11}
 - (d) 1.2×10^4

- (xix) Management of a theatre found out that when it raises its prices, the percentage increase in price is directly proportional to percentage decrease in the number of people attending theatre. When the price was increased by 10%, 6% fewer people attended.

What is the percentage reduction in the audience if the price is raised by 1%.

- (a) $\frac{5}{3}\%$.
 - (b) 6%.
 - (c) 0.6%.
 - (d) $\frac{3}{5}\%$.
- (xx) In a group of 12 men and 9 women, two of them only are known to be Local Council executive members.

What is the probability that they are of the same sex?

- (a) $\frac{132}{470}$
- (b) $\frac{72}{470}$
- (c) $\frac{72}{132}$
- (d) $\frac{204}{420}$

SECTION B: MATHEMATICS

Question 2

(a) Consider the matrix:

$$A = \begin{pmatrix} 2 & 1 & 7 & 4 \\ 2 & 2 & 3 & -1 \\ 1 & 2 & 4 & -7 \end{pmatrix}$$

(i) State the order of the matrix.

(1 mark)

(ii) Identify A 3,2.

(1 mark)

(iii) State the row and column which describe the position of the element -7.

(1 mark)

(b) Solve for x in the equation below:

$$\begin{pmatrix} 2 & 1 \\ 4 & 7 \end{pmatrix} x = \begin{pmatrix} 1 & 2 \\ 3 & 14 \end{pmatrix}$$

(7 marks)

(c) Suppose 60 members of staff of a bank were surveyed to find out how many spent their leisure time reading The Monitor (M), The New Vision (N) and The East African (E) newspapers. And the results obtained were recorded as shown in the venn diagram below:

- (i) What is the total number that read both The Monitor and The New Vision?
(2 marks)
- (ii) What does the region containing 9 members represent?
(2 marks)
- (iii) Find $n(M \cup N \cup E)$
(2 marks)
- (d) If $A = P(1 + \frac{R}{100})$. Find R in terms of A and P.
(4 marks)
- (Total 20 marks)**

Question 3

- (a) Two outcomes M and N occurring with the following probabilities:
 $P(M) = 0.5$, $P(M \cap N) = 0.15$, $P(M' \cap N') = 0.10$ are represented on a Venn diagram.

Required:

Calculate $P(N)$. (7 marks)

- (b) Mukungu Enterprises is trying to decide whether to invest in a project. The proprietor estimates that there are three possible outcomes.

OUTCOME	PROFIT / (LOSS) SHS	PROBABILITY
Success	10,000,000	0.2
Moderate success	2,000,000	0.7
Failure	(4,000,000)	0.1

Compute the expected values of profit and recommend a course of action Mukungu enterprise should take.

(8 marks)

- (c) Opiyo borrowed Sh 8,000 at 4% compound interest compounded annually and he repays Shs 660 at the end of each year.

Required:

Find the amount of the loan outstanding at the beginning of the fourth year.

(5 marks)
(Total 20 marks)

Question 4

- (a) Find the values of x which satisfy the following equations:

(i) $x^2 - 3x - 4 = 0$

(2 marks)

(ii) $2x^2 - 32 = 0$

(2 marks)

- (b) Distinguish between marginal cost and marginal revenue.

(2 marks)

- (c) Picfare company estimated that the cost in shillings of producing X exercise books is given by the function.

$$C = 800 + 0.04X + 0.0002X^2.$$

Find the production level that minimizes the average cost per unit and the resulting cost.

(9 marks)

- (d) If Shs. 2,000,000 is deposited on a savings account, at an annual compound interest rate of 7%. If no further deposits or withdrawals are made, find the number of years it will take the account to accumulate to more than Shs 3,000,000.

(5 marks)
(Total 20 marks)

SECTION C: STATISTICS

Question 5

- (a) What type of measure of central tendency would be most appropriate to use in the following circumstances. Give a reason.
- (i) The weekly wages of supermarket attendants in 3 different supermarkets. **(1 mark)**
 - (ii) The average life of 100 bulbs. **(1 mark)**
 - (iii) The most popular game park visited in a year. **(1 mark)**
 - (iv) The average number of employees of an expanding firm. **(1 mark)**
- (b)
- (i) Give at least two advantages of using the mean instead of the mode as a statistical measure. **(2 marks)**
 - (ii) Mention at least three main weaknesses of the mode. **(3 marks)**
- (c) Briefly explain the following terms:
- (i) Sample. **(2 marks)**
 - (ii) Sampling frame. **(2 marks)**
 - (iii) Quota sampling. **(2 marks)**
- (Total 15 marks)**

Question 6.

100 eggs are classified by mass in the following table.

	Mass	Frequency
Extra Small	40 – 42	1
Small	42 – 46	3
Medium	46 – 53	25
Standard	53 – 62	35
Large	62 - 75	36

Required:

- (a) Draw a histogram to illustrate the Data. **(5 marks)**
- (b) Calculate the mean and the standard deviation of this sample. **(7 marks)**
- (c) For a normal distribution it would be expected that more than 95% of the distribution would be contained in the interval ± 2 standard deviations.

For this sample, using your answers to part (b) calculate the numerical limits of this interval and estimate the percentage of the sample which lies within this interval.

(3 marks)
(Total 15 marks)

Question 7

- (a) In 1990, the index number of the value of a commodity was 135; when 1988 was taken as a base year. The value of the commodity in 1990 was \$ 54 and in 1989 was \$ 46.

Find:

- (i) The value of the commodity in 1988.
(ii) The index number of the value of the commodity in 1989 when 1988 was taken as the base year.

(5 marks)

- (b) The cost of servicing a car depends on three items: cost of materials, cost of labour and cost of overheads. The price relatives of those items in 1990 using 1988 as the base year are shown in the table with weights attached to them.

	Materials	Labour	Overheads
Price relative	115	110	X
Weight	2	5	3

Given the cost of servicing a car was \$ 50 in 1988 and \$ 57 in 1990.
Find the value of x.

(5 marks)

- (c) How many different committees each consisting of 3 men and 2 ladies can be chosen from 7 men and 5 ladies?

(5 marks)
(Total 15 marks)