

THE PUBLIC ACCOUNTANTS EXAMINATIONS BOARD

A Committee of the Council of ICPAU

ATC(U) EXAMINATIONS

LEVEL ONE

BUSINESS MATHEMATICS & STATISTICS - PAPER 3

WEDNESDAY, 15 DECEMBER 2004

INSTRUCTIONS TO CANDIDATES:

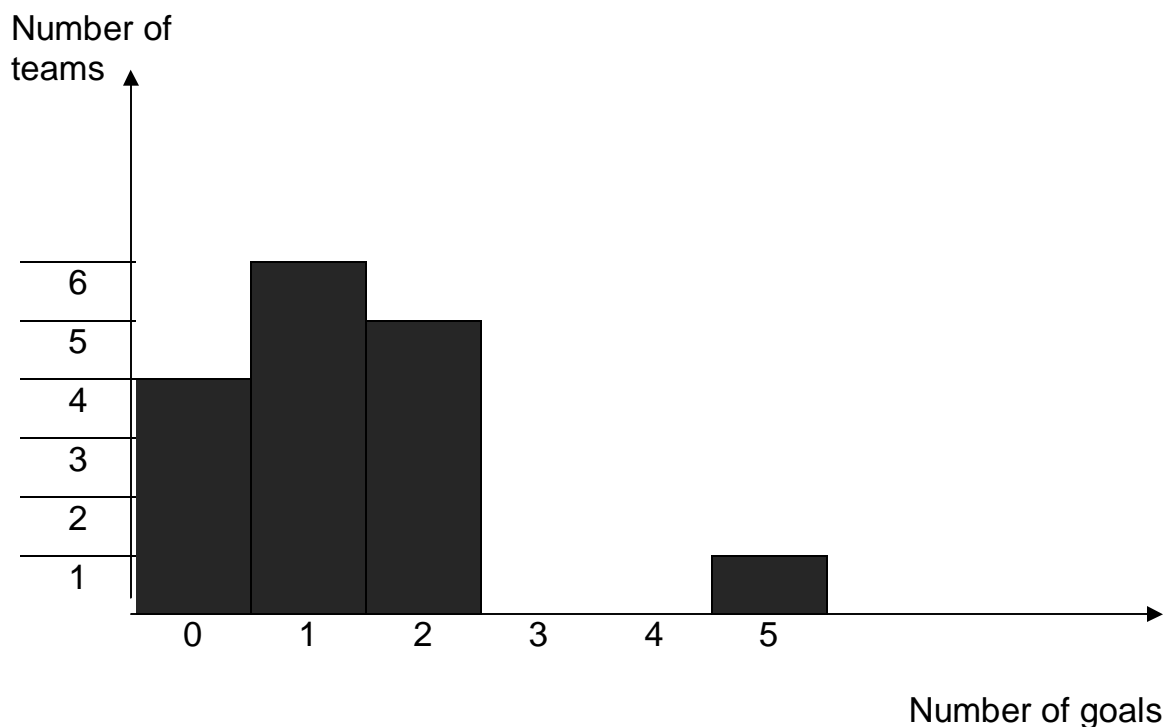
1. Time allowed: **3 hours**
2. Attempt **all** questions in Section A, any **two** questions in Section B and any **two** questions in Section C.
3. Section A has **twenty** compulsory multiple-choice questions, each carrying 1½ marks.
4. Section B has **three** questions and only **two** are to be 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) Find the value of x if $6(2x - 1) - 5(x - 3) = 2$.
- (a) -1 .
 (b) 0 .
 (c) $\frac{6}{7}$.
 (d) 7 .
- (ii) During bumper harvests of apples, they are very cheap. What would be the cost of (m) apples at (n) cents each?
- (a) Shs $\left(\frac{m+n}{100}\right)$
 (b) Shs $\left(\frac{m \cdot n}{100}\right)$
 (c) Shs $[m \cdot n]$
 (d) Shs $100(m+n)$
- (iii) Present the following in ascending order: $\frac{3}{8}$, 0.4 , $\frac{3}{10}$, $\frac{1}{3}$, 38% .
- (a) $\frac{3}{8}$, 0.4 , $\frac{3}{10}$, $\frac{1}{3}$, 38% .
 (b) 0.4 , 38% , $\frac{3}{8}$, $\frac{1}{3}$, $\frac{3}{10}$.
 (c) $\frac{3}{10}$, $\frac{1}{3}$, $\frac{3}{8}$, 38% , 0.4 .
 (d) $\frac{1}{3}$, $\frac{3}{8}$, $\frac{3}{10}$, 38% , 0.4 .
- (iv) Two numbers are in the ratio $4:5$. If 6 is added to each number, they will be in the ratio $6:7$. Find the two numbers.
- (a) 10 and 11 .
 (b) 10 and 12 .
 (c) 66 and 70 .
 (d) 12 and 15 .
- (v) If $A = \begin{pmatrix} 2 & 3 \\ 3 & 5 \end{pmatrix}$ and $B = \begin{pmatrix} 4 & 0 \\ 1 & 2 \end{pmatrix}$ Find BA .
- (a) $\begin{pmatrix} 8 & 0 \\ 3 & 10 \end{pmatrix}$
 (b) $\begin{pmatrix} 6 & 3 \\ 4 & 7 \end{pmatrix}$
 (c) $\begin{pmatrix} 11 & 6 \\ 17 & 10 \end{pmatrix}$
 (d) $\begin{pmatrix} 8 & 12 \\ 9 & 13 \end{pmatrix}$

- (vi) The diagram shows the goals scored by some football teams in Kampala.



Use the diagram to find the total number of goals.

- (a) 15.
 (b) 16.
 (c) 21.
 (d) 28.
- (vii) Name the diagram in (vi) above.
- (a) Histogram.
 (b) Pictogram.
 (c) Bar chart.
 (d) Frequency chart.
- (viii) If x similar articles cost a total of y shillings and there are z shillings in each dollar, how much is the cost of one article in dollars.
- (a) $\frac{xz}{z}$
 (b) $\frac{xz}{y}$
 (c) $\frac{x}{yz}$
 (d) $\frac{y}{xz}$

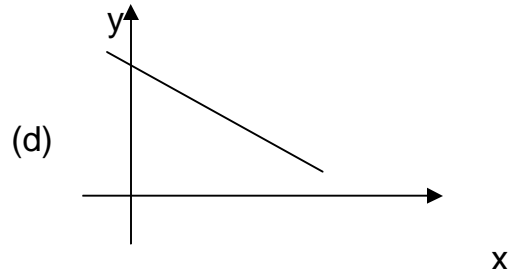
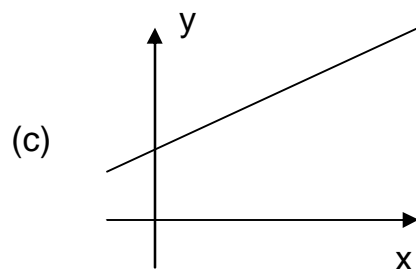
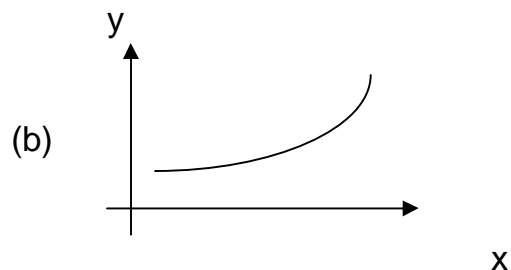
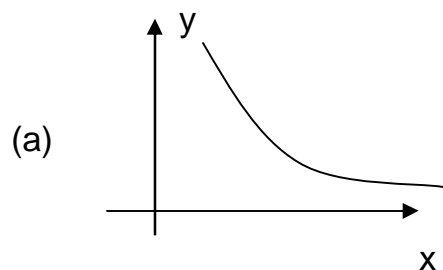
- (ix) Using the Data in the table.

| | | | | | |
|-------|---|---|---|---|----|
| i | 1 | 2 | 3 | 4 | 5 |
| x_i | 2 | 1 | 5 | 6 | 10 |

Evaluate $5 \sum x_i$.

- (a) 120.
 (b) 465.
 (c) 360.
 (d) 24.
- (x) The distribution of length of time of telephone calls made in one office was studied. It was found that it had a median of 100 seconds and the 80th percentile of 190 seconds. Find its upper quartile.
- (a) 175 seconds.
 (b) 142.5 seconds.
 (c) 75 seconds.
 (d) 178.1 seconds.
- (xi) In the year 2000, the prices of commodities A, B and C were Shs. 7,200, Shs 8,300 and Shs 9,500 respectively. Given that the prices of the same commodities in 2002 were Shs 8,600, Shs 9,400 and x respectively and that a simple aggregate price index was 140, find the value of x .
- (a) Shs 1,700.
 (b) Shs 17,000.
 (c) Shs 170.
 (d) Shs 170,000.

- (xii) Which of the following graphs shows a direct positive linear relationship.



(xiii) Frequency density is described as:

- (a) $\frac{\text{Mass}}{\text{Volume}}$.
- (b) $\frac{\text{Frequency}}{\text{Class width}}$.
- (c) $\frac{\text{Class size}}{\text{Total frequency}}$.
- (d) $\frac{\text{Class Interval}}{\text{Class width}}$.

(xiv) A candidate obtained the following results in an examination:

Paper 1: 72% Paper 2: 64% Coursework 73%

The regulations state that the two written papers have equal weights and account for 80% of the final result, whereas the coursework accounts for 20% of the final result. Find the candidates final mark.

- (a) 70%.
- (b) 54.5%.
- (c) 69%.
- (d) 45%.

(xv) The number of errors x , on each of the 200 pages of typescript was monitored. The results summarized showed that:

$\sum X = 920$ $\sum X^2 = 5,032$. Find the standard deviation.

- (a) 4.6.
- (b) 4.
- (c) 2.4.
- (d) 2.

(xvi) A bookshop in Kampala buys books from a publisher at a price which is 30% less the marked price on the books. What is the profit a bookshop expects to make on a book marked shillings x ?

- (a) $\frac{3x}{10}$
- (b) $\frac{7}{10}x$
- (c) $\frac{3}{7}x$
- (d) $\frac{13}{10}x$

- (xvii) A car was valued at £ 30,000 in January 2001. Each year its value decreased by 12% of its value at the beginning of the year. What was its value in January 2003?
- (a) $30,000 \times 0.76$
 - (b) $30,000 \times (0.88)^2$
 - (c) $30,000 - 0.24$
 - (d) $30,000 \times 0.88^3$
- (xviii) Which of the following are factors of $6a^2 - 2ab - 3ab + b^2$?
- (i) $3a - b$.
 - (ii) $2a + b$.
 - (iii) $2a - b$.
- (a) (i).
 - (b) (i) and (ii).
 - (c) (i) and (iii).
 - (d) (ii) and (iii).
- (xix) If $y = (2x - 3)^4$. Find the value of x for which $\frac{dy}{dx} = 0$
- (a) $\frac{2}{3}$.
 - (b) $4(2x - 3)^3$.
 - (c) $8(2x - 3)^3$.
 - (d) $\frac{3}{2}$.
- (xx) A student invested Shs. 3,000,000 on 1 January for 6 years at 8% compound interest. Find the total amount of his investment at the end of 6 years.
- (a) Shs 23,768,410.
 - (b) Shs 19,007,787.
 - (c) Shs 1,944,000.
 - (d) Shs 28,909,882.90.

SECTION B**Question 2**

- (a) Simplify $(-27)^{2/3}$ **(3 marks)**
- (b) The choices of 60 customers in the Boyz Supermarket were noted: 13 chose strawberry only and 2 chose chocolate only. 8 chose strawberry and chocolate, 14 chose chocolate and vanilla. The number who chose vanilla only was three times as many as the number who chose all the three.
- (i) Draw a Venn diagram using **S** to denote the set of customers who chose straw berry, **C** the set of customers who chose chocolate and **V** the set of customers who chose vanilla; and denoting the number of customers who chose all the three by **x**. **(6 marks)**
- (ii) Form an equation in terms of **x** and solve it. **(3 marks)**
- (iii) Using your answer to (ii) and your Venn diagram find $n(C \cup V)$ ¹ **(1 mark)**
- (c) An agent sold motor spares worth Shs. 8,400,000 on behalf of importers. The agent received a commission of 10% on the first Shs. 500,000/= and 2% on the remainder. How much did the importers receive? **(7 marks)**
- (Total 20 marks)**

Question 3

- (a) Ashaba receives Shs. 720,000 a year as interest on an investment, and this makes $4\frac{1}{2}\%$ of the money invested. Derive the amount Ashaba invested. **(4 marks)**
- (b) A cleaner at MEBO Ltd had Shs. 20,000; part of which she invested at 8% and the rest at 6%. If her total interest income from the two investments for one year was Shs. 1,460. How much did she invest at each rate? **(9 marks)**
- (c) The value of a Shs 15,000,000 house appreciated by 25% in the first year and by 10% in the second year, but depreciated by 20% in the third year. Find the value of this house after three years. **(7 marks)**
- (Total 20 marks)**

Question 4

$$(a) \quad X = \begin{pmatrix} 2 & -2 \\ 1 & 1 \end{pmatrix} \quad Y = \begin{pmatrix} 4 & -1 \\ -2 & 0 \end{pmatrix} \quad Z = \begin{pmatrix} 2 & 0 \\ 1 & 1 \end{pmatrix}$$

Find the value of $3x - 2y + z^2$.

(4 marks)

- (b) 15 people working for 6 hours a day on a construction site can complete the work in 72 days. How many hours should 18 people work per day in order to complete the same job in 72 days, assuming all of them work at the same rate.

(6 marks)

- (c) The profit made of P shillings in the manufacture and sale of a product is given by the profit equation $P = \frac{1}{100} n^2 - 40n$

where n is the number of articles manufactured and sold.

- (i) How many articles must be manufactured and sold to make a profit of Shs. 120,000?

(5 marks)

- (ii) How many articles should be manufactured and sold in order to maximize profits?

(5 marks)**(Total 20 marks)****SECTION C****Question 5**

The table shows the expenditure on examiners in thousands of Uganda Shillings during the year 2003 ATC marking exercise.

| | | | | | | | |
|----|----|----|----|----|----|----|----|
| 16 | 10 | 11 | 25 | 10 | 12 | 14 | 20 |
| 24 | 21 | 22 | 32 | 13 | 17 | 18 | 30 |
| 50 | 27 | 35 | 53 | 40 | 44 | 39 | 54 |
| 51 | 44 | 37 | 15 | 36 | 39 | 52 | 57 |
| 38 | 16 | 19 | 40 | 34 | 43 | 26 | 53 |

- (a) Form a frequency distribution table with class intervals of Shs 5,000, the lowest class limit being Shs 10,000.

(2 marks)

- (b) Draw a histogram to represent the data in (a) and superimpose a frequency polygon.

(7 marks)

- (c) Calculate the:

- (i) mean expenditure.

(3 marks)

- (ii) standard deviation.

(3 marks)**(Total 15 marks)**

Question 6

- (a) The cost of production at one factory during 2002 was recorded as follows.

| | Amount (Shs million) |
|----------------------|----------------------|
| Direct materials | 70 |
| Direct labour | 30 |
| Production overheads | 90 |
| Office costs | 10 |
| Total | 200 |

- (i) Calculate the angle that represents the sector of production overheads. (4 marks)
- (ii) Find the percentage difference between direct labour costs and production overhead costs. (2 marks)
- (iii) State two advantages and three disadvantages of pie-charts. (5 marks)
- (b) Define the following terms and state with an example the type of data required in each:
- (i) Enumeration.
- (ii) Registration.

(4 marks)
(Total 15 marks)

Question 7

A firm would like to produce a new product called **X**. They can either test the market or abandon the whole project. The details are set out below.

The firm can test the market at a cost of Shs. 50,000. The likely outcomes are favourable ($P = \frac{7}{10}$) or unfavourable ($P = \frac{3}{10}$). If the outcomes are favourable, the firm can operate in 3 demand situations.

| | | | | | | |
|--------|---|---|----------------|--------|-----|----------|
| Low | P | = | $\frac{1}{4}$ | Loss | Shs | 100,000. |
| Medium | P | = | $\frac{3}{5}$ | Profit | Shs | 150,000. |
| High | P | = | $\frac{3}{20}$ | Profit | Shs | 450,000. |

If testing the market indicates failure the project would be abandoned. Abandoning the project at any stage results in a gain of Shs 30,000 from the special machinery used.

- (a) Draw the decision tree showing the nodes and probabilities. (8 marks)
- (b) Evaluate the decision tree. (7 marks)
- (Total 15 marks)