

# THE PUBLIC ACCOUNTANTS EXAMINATIONS BOARD

*A Committee of the Council of ICPAU*

## ATC(U) EXAMINATIONS

### LEVEL ONE

#### BUSINESS MATHEMATICS & STATISTICS - PAPER 3

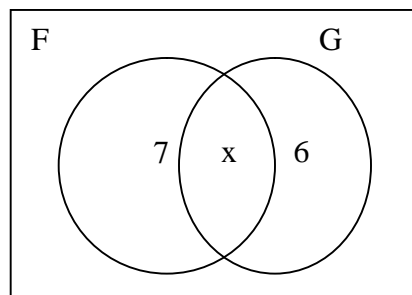
THURSDAY 17 JUNE 2010

#### INSTRUCTIONS TO CANDIDATES:

1. Time allowed: **3 hours 15 minutes**.  
The first 15 minutes of this examination have been designated for reading time. You may not start to write your answer during this time.
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  $1\frac{1}{2}$  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  $m = 2^3 \times 3$  and  $n = 2 \times 3^2$ , then the value of  $mn$  expressed in powers of 2 and 3 is
- (a)  $2^3 \times 3^4$
  - (b)  $2^4 \times 3^3$
  - (c)  $2^5 \times 3^5$
  - (d)  $2 \times 3$
- (ii) Given that  $k^2 - 5k - 6 = 0$ ; the two values of  $k$  are:
- (a) 6 and -1
  - (b) -6 and 1
  - (c) 5 and -5
  - (d) -2 and -3
- (iii) Onzima bought a car for Shs 6.5 million and sold it at Shs 4.5 million after one year. What was the percentage loss he made?
- (a) 2
  - (b) 144.4
  - (c) 30.8
  - (d) 69.2
- (iv) The venn diagram below shows the number of students who speak two languages; French (F) or German (G) or both.



Given that  $n(G) = 18$ ; find  $n(F)$ .

- (a) 12
- (b) 5
- (c) 19
- (d) 13

- (v) Two candidates for class prefect received a total of 116 votes. The winner received 3 times as many votes as the runner-up. How many votes did each candidates receive?
- (a) 29 and 87
  - (b) 3 and 116
  - (c) 39 and 77
  - (d) 58 and 61
- (vi) Theatre tickets cost Shs 3,500 for children and Shs 6,500 for adults. Jane bought 8 tickets and spent Shs 37,000. How many adult tickets did she buy?
- (a) 5
  - (b) 6
  - (c) 11
  - (d) 3
- (vii) Find the value of  ${}^6P_3$ .
- (a) 20
  - (b) 120
  - (c) 180
  - (d) 63
- (viii) In a survey, Akello found that 8 out of 40 students were the eldest child in their family. If 250 students had participated in the survey, how many would be expected to be the eldest child?
- (a) 120
  - (b) 75
  - (c) 60
  - (d) 50
- (ix) Which of the following points lie on the line  $y = 2x - 3$ ?
- (a) (0, 3)
  - (b) (1, 1)
  - (c) (2, 2)
  - (d) (3, 3)
- (x) To measure changes in total monetary worth, one should calculate:
- (a) price index.
  - (b) quality index.
  - (c) value index.
  - (d) consumer index.

- (xi) For a particular decision, the total benefit of a new plant is Shs 18.2 billion. If the expected net benefit of this plant is Shs 11.5 billion, what is the cost of the plant in billion shillings?
- (a) 6.7
  - (b) 8.4
  - (c) 29.7
  - (d) 11.5
- (xii) Which of the following is **NOT** a measure of central tendency?
- (a) Arithmetic mean.
  - (b) Mode.
  - (c) Median.
  - (d) Range.
- (xiii) A relative frequency distribution presents frequencies in terms of:
- (i) fractions.
  - (ii) whole numbers.
  - (iii) percentages.
- (a) (i) and (ii).
  - (b) (ii) and (iii)
  - (c) (iii)
  - (d) (i) and (iii).
- (xiv) If one event is unaffected by the outcome of another event, the two events are said to be:
- (a) dependent.
  - (b) independent.
  - (c) interdependent.
  - (d) mutually exclusive.
- (xv) A population is made up of groups that have wide variations within each group but little variation from group to group. The appropriate type of sampling for such a population is:
- (a) stratified.
  - (b) systematic.
  - (c) cluster.
  - (d) judgemental.

- (xvi) If  $P(A \text{ or } B) = P(A) + P(B)$ , then;
- (a) A and B are mutually exclusive.
  - (b) The Venn diagram areas of A and B overlap.
  - (c)  $P(A) + P(B)$  is joint probability of A and B.
  - (d) A and B are independent.
- (xvii) Given matrix  $\begin{pmatrix} 3 & 1 \\ 2 & 5 \end{pmatrix}$ ; its determinant is
- (a) -7
  - (b) -13
  - (c) 13
  - (d) 7
- (xviii) Given that quantity x is proportional to quantity y, and that  $x = 30$  when  $y = 12$ ; find the value of x when the value of y is 10.
- (a) 25
  - (b) 4
  - (c) 120
  - (d) 300
- (xix) Two machines A and B can take 30 hours and 60 hours respectively when doing similar work independently. How many hours will the two machines take if they worked together?
- (a) 45
  - (b) 90
  - (c) 75
  - (d) 20
- (xx) The curve that demonstrates disparity in wealth or income or wage distribution is:
- (a) z-chart.
  - (b) lorenz.
  - (c) ogive.
  - (d) cumulative frequency.

**SECTION B****Question 2**

- (a) A function  $h$  is such that  $h = 3x^3 - 2x^2 + 1$ .

**Required:**

Find:

(i)  $\frac{dh}{dx}$

(ii)  $\frac{d^2h}{dx^2}$

- (iii) the value of  $x$  when  $\frac{dh}{dx} = 0$

**(8 marks)**

- (b) A calculator manufacturing company has been making programmable calculators monthly. An analysis of its operations shows that its cost of producing  $x$  calculators in a month is  $C = 0.003x^2 + 30x + 25000$  and its revenue function is  $R = 60x - 0.002x^2$ .

**Required:**

Determine the:

- (i) profit function.
- (ii) marginal cost function.
- (iii) marginal revenue function.
- (iv) number of calculators produced when marginal revenue is zero.
- (v) Cost incurred on producing the number of calculators in (b) (iv) above.

**(12 marks)**

**(Total 20 marks)**

**Question 3**

- (a) Explain the following terms as used in sets:

- (i) Proper subset.
- (ii) Null set.
- (iii)  $n(A)$ .
- (iv) Equivalent sets.

**(4 marks)**

- (b) A group of 55 students registering at the Institute were interviewed how they attended their classes. It was found out that 19 attended full time (F), 24 attended evening (E) and 25 attended weekend (W). 3 attended

full time and weekend only, 2 attended evening and weekend only while none of the students attended full time and evening only. 4 students did not attend any of the classes.

**Required:**

- (i) Represent the above information on a venn diagram. (8 marks)
- (ii) Find the number of students who attended:
- all the three types of classes.
  - full time classes only.
  - evening classes only.
  - weekend classes only.
- (5 marks)
- (c) Find the percentage of the students who attended only one type of class. (3 marks)
- (Total 20 marks)**

**Question 4**

- (a) Define the following terms as used in matrices:
- (i) Singular matrix.
  - (ii) Zero matrix.
  - (iii) Order of matrix.
- (3 marks)
- (b) Given matrices A and B such that  $A = \begin{pmatrix} 2 & -1 \\ 4 & 3 \end{pmatrix}$  and  $B = \begin{pmatrix} 3 & 0 \\ 5 & 1 \end{pmatrix}$ ; find the value of:
- (i)  $2A - B$ ; and
  - (ii)  $A^2$
- (6 marks)
- (c) Given the matrix equation  $\begin{pmatrix} 5 & 2 \\ 3 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 4 \\ 4 \end{pmatrix}$ ; solve for the value of x and y using matrix methods. (6 marks)
- (d) If  $P = \begin{pmatrix} 5 & -3 \\ 1 & 2 \end{pmatrix}$  is a matrix; find the inverse of P. (5 marks)
- (Total 20 marks)**

**SECTION C****Question 5**

- (a) The table below shows age groups and their relative population proportions for a sample of 3,000 people:

<b>Age group</b>	<b>Relative proportion of population</b>
12 - 17	0.17
18 - 23	0.31
24 - 29	0.27
30 - 35	0.21
36 and above	0.04

**Required:**

Compute the number of people in each age group.

**(5 marks)**

- (b) The following data represents ages of patients admitted to a hospital during a certain week.

85	75	66	43	40
88	80	56	56	67
89	83	65	53	75
87	83	52	44	48

**Required:**

- Construct a frequency distribution table with class (40-49), (50-59), etc.
- Compute the mean from the frequency table.
- Compute the mean from the raw data.
- State which of the two means in (b) (i) and (b) (ii) above is a better value and why.

**(10 marks)****(Total 15 marks)**



**Question 6**

- (a) During a certain year, Katanga City Council (KCC) spent 65% of its income on services, 25% on garbage collection, 4% on recreation and 6% on administration.

**Required:**

Construct a pie chart showing how the council spent its income.

**(8 marks)**

- (b) The table below shows the index and weighting for each of the four items used in constructing a price index.

Item	Index	Weighting
Food	125	3
Rent	112	6
Fuel	107	2
Education	106	1

**Required:**

Calculate the price index.

**(7marks)**

**(Total 15 marks)**

**Question 7**

- (a) Distinguish between permutations and combinations.

**(2 marks)**

- (b) Given that  ${}^n P_2 = 72$ ; find the value of n.

**(4 marks)**

- (c) Two normal dice are thrown and the values showing on their tops added to get a sum.

**Required:**

- (i) Prepare a probability possibility table for the sums.

**(4 marks)**

- (ii) Calculate the probability that the sum score is exactly 5, less than 5 and at least 6.

**(9marks)**

**(Total 15 marks)**