

# THE PUBLIC ACCOUNTANTS EXAMINATIONS BOARD

*A Committee of the Council of ICPAU*

## ATC(U) EXAMINATIONS

### LEVEL ONE

#### BUSINESS MATHEMATICS & STATISTICS - PAPER 3

**TUESDAY, 30 NOVEMBER 2011**

#### 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, before you attempt any questions.

**© 2011 Public Accountants Examinations Board**

**SECTION A****Question 1**

- (i) The mean weight of a group of 11 men is 70 kg. What is the mean weight, in kilograms, of the remaining men when a man weighing 90 kg leaves?
- (a) 80
  - (b) 72
  - (c) 68
  - (d) 62
- (ii) A man paid tax of 30% on Shs 90,000 in 6 equal instalments. Calculate the amount paid for each instalment.
- (a) Shs 19,500
  - (b) Shs 4,500
  - (c) Shs 54,000
  - (d) Shs 27,000
- (iii) If  $(x - 3)(x - 2) = 0$ , the values of  $x$  are:
- (a) (0, 6)
  - (b) (6, 0)
  - (c) (3, 2)
  - (d)  $(-3, -2)$
- (iv) A firm employs 1,200 people of whom 240 are men. The percentage of employees who are men is:
- (a) 40
  - (b) 10
  - (c) 15
  - (d) 20
- (v) Given that  $y = 3x + 5x^2$ , then  $\frac{dy}{dx}$  is:
- (a)  $3 + 5x$
  - (b)  $3 + 10x$
  - (c) 3
  - (d)  $10x$
- (vi) The measure that summarizes how far from the average the data values are is the:
- (a) range.
  - (b) spread.
  - (c) mean.
  - (d) standard deviation.

- (vii) What is the value of  ${}^8C_5$  ?
- (a) 40
  - (b) 56
  - (c) 40
  - (d) 6,720
- (viii) ..... is data originally collected during an investigation before being sorted, classified or summarized in any way.
- (a) Sample data
  - (b) Secondary data
  - (c) Primary data
  - (d) Tabulated data
- (ix) If  $f(x) = \frac{x^2 - x - 6}{x + 2}$ , then the value of  $f(-3)$  is:
- (a) 12
  - (b) -6
  - (c) 9
  - (d) 18
- (x) Packets of biscuits are sold at Shs 2,200 each. If one buys 60 packets, he or she is allowed a 10% discount. How much does one pay for 60 packets?
- (a) Shs 13,200.
  - (b) Shs 145,000.
  - (c) Shs 118,800.
  - (d) Shs 1,320,000.
- (xi) Which of the following factors is **NOT** considered when constructing an index number?
- (a) Time series.
  - (b) Purpose of the index.
  - (c) Choice of weights.
  - (d) Selection of the items.
- (xii) A box contains 60 cans of a certain jelly in several colours. 22 cans have a white jelly, 18 green, 11 yellow, 5 red and 4 purple. If a jelly can is chosen at random, what is the probability that the jelly will be neither red nor purple?
- (a) 0.09
  - (b) 0.15
  - (c) 0.54
  - (d) 0.85

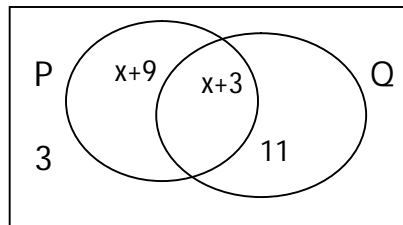
- (xiii) Which of the following is a characteristic of a poisson distribution?
- (a) The average rate of occurrence is constant over time.
  - (b) Continuous distribution represented by a bell-shaped curve.
  - (c) Represents the number of occurrences for which each event has the same probability of happening.
  - (d) Trials are independent of one another.
- (xiv) Which of the following numerals does  $n$  represent in  $5^n = 5 \times 5 \times 5$ ?
- (a) 125
  - (b) 15
  - (c) 3
  - (d) 25
- (xv) Which of the following sets is an infinite set?
- (a) Whole numbers between 10 and 20.
  - (b) Whole numbers greater than 1.
  - (c) Factors of 3.
  - (d) Number of students in the ATC class.
- (xvi) When money is borrowed from a bank or some other lending institution, the borrower is charged:
- (a) interest.
  - (b) principal.
  - (c) fine.
  - (d) tax.
- (xvii) A commission agent received a commission of Shs 49,000 on a sale of an item worth Shs 140,000. At what percentage was the commission paid to the agent?
- (a) 35
  - (b) 286
  - (c) 2.86
  - (d) 91000
- (xviii) If 55% of the people who purchase a certain product are female, what is the ratio of the number of females who purchase the product to the number of males who purchase the product?
- (a) 11 : 20
  - (b) 5 : 11
  - (c) 11 : 9
  - (d) 2 : 5

- (xix) Determine the values of  $x$  and  $y$  that satisfy both of the equations:  
 $3x + y = 1$  and  $x - 2y = 5$ .
- (a)  $(-1, 0)$
  - (b)  $(1, -2)$
  - (c)  $(-2, 4)$
  - (d)  $(2, -4)$
- (xx) Which of the following combinations best describes statistical measures of variability?
- (a) Median, range, harmonic mean, coefficient of variation.
  - (b) Mean, inter-quartile range, variance, median.
  - (c) Standard deviation, mode, coefficient of variation.
  - (d) Range, inter-quartile range, standard deviation.

## SECTION B

### Question 2

- (a) Illustrate each of the following expressions using set symbols only.
- (i) Object  $b$  is an element in set  $K$ .
  - (ii) Set  $P$  is a subset of set  $G$ .
  - (iii)  $M$  is an empty set.
  - (iv) Object  $h$  is not a member of set  $G$ .
- (4 marks)**
- (b) Study the following venn diagram and answer the questions that follow:



#### Required:

Given that  $n(Q) = 24$ , find:

- (i) the value of  $x$ . **(2 marks)**
  - (ii)  $n(P \cap Q)$  **(1 mark)**
  - (iii)  $n(P)$  **(2 marks)**
  - (iv)  $n(\epsilon)$  **(2 marks)**
- (c) Of the 35 students in a hostel, 15 take calculus, 13 take economics, and 17 take accounting. Further more, 5 take both calculus and accounting, 3 take both calculus and economics, while 6 take both accounting and economics. 2 students in the group take all three courses.

**Required:**

- (i) Represent the information on a Venn diagram. (7 marks)
  - (ii) Find the number of students who do not take any of the three courses. (1 mark)
  - (iii) Find the number of students who take only calculus. (1 mark)
- (Total 20 marks)**

**Question 3**

- (a) Differentiate between an entry and an order of a matrix. (2 marks)
- (b) Given the matrix  $\begin{pmatrix} 3 & 5 \\ 2 & 4 \end{pmatrix}$ , write down its inverse. (3 marks)
- (c) Given the matrix equation,  $\begin{pmatrix} x & 4 \\ 4y & w \end{pmatrix} - \begin{pmatrix} 4x & 2z \\ -3 & -2w \end{pmatrix} = \begin{pmatrix} 12 & 8 \\ y & 6 \end{pmatrix}$ ; find the values of  $x$ ,  $y$ ,  $z$  and  $w$ . (8 marks)
- (d) An airline company has flights from one airport to cities  $C_1$ ,  $C_2$ ,  $C_3$  and  $C_4$ . Its costs per flight, in thousand dollars, are given by matrix A as follows:

$$A = \begin{matrix} & \begin{matrix} C_1 & C_2 & C_3 & C_4 \end{matrix} \\ \begin{pmatrix} 3 & 5 & 4 & 2 \\ 2 & 3 & 3 & 1 \\ 1 & 3 & 2 & 1 \end{pmatrix} & \begin{matrix} \text{fuel} \\ \text{personnel} \\ \text{overheads} \end{matrix} \end{matrix}$$

During a one week period, the number of scheduled flights were  $V = \begin{pmatrix} 10 \\ 5 \\ 7 \\ 15 \end{pmatrix} \begin{matrix} c_1 \\ c_2 \\ c_3 \\ c_4 \end{matrix}$

**Required:**

- (i) State the order of matrix A and matrix V. (2 marks)
  - (ii) Multiply the two matrices together. (2 marks)
  - (iii) State the total cost for fuel, personnel and overheads respectively (3 marks)
- (Total 20 marks)**

**Question 4**

- (a) A product sold at Shs 5,900 has a value added tax of 18% inclusive. What is the value of the product without tax?  
(2 marks)
- (b) If Shs 200,000 was deposited in a bank at a compound interest of 8.5% per annum, by direct calculation, what will be the total amount of money after 3 years?  
(6 marks)
- (c) A landlord has fixed costs of Shs 750,000 per annum and variable costs of Shs 30,000x, where x is the number of rooms renovated per annum.

**Required:**

- (i) Write the total cost function,  $C(x)$ .  
(1 mark)
- (ii) Determine the total cost of renovating 50 rooms.  
(2 marks)
- (iii) Graph the total cost function,  $C(x)$ .  
(3 marks)
- (d) The total revenue function for a commodity is  $R(x) = 2x$  and the total cost function is  $C(x) = 100 + 0.2x^2 + x$

**Required**

Find the:

- (i) marginal profit function.  
(3 marks)
- (ii) marginal profit if 10 units are produced and interpret your answer  
(3 marks)

**(Total 20 marks)**

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

- (a) What interpretation is given to the probability of an event A if:

- (i)  $P(A) = 0$   
 (ii)  $P(A) = 1$

**(2 marks)**

- (b) Fifteen persons reported to a clinic for screening of their blood groups and the following results were obtained:

Blood group	O	A	B	AB	Total
Number of persons	3	5	6	1	15

A person is randomly selected.

**Required:**

Find the probability that the person's blood group is:

- (i) AB **(1 mark)**  
 (ii) either A or B. **(1 mark)**  
 (iii) not O. **(1 mark)**

- (c) Candidates A, B and C are the finalists in the local competition. The winner and the first runner-up are to compete in the national competition.

**Required:**

- (i) List the sample space concerning the outcome of the local competition. **(6 marks)**  
 (ii) Give the composition of the event that C was the local contest winner. **(2 marks)**  
 (iii) Give the composition of the event that A does not qualify for the next competition. **(2 marks)**

**(Total 15 marks)**



**Question 6**

- (a) Explain each of the concepts: range, mode and central tendency.  
(3 marks)
- (b) Draw a sketch of a histogram that is:  
(i) skewed left.  
(ii) skewed right.  
(iii) symmetric.  
(3 marks)
- (c) As sample of scores obtained in a quiz were: 5, 7, 8, 12 and 18

**Required:**

Calculate the:

- (i) mean score. (2 marks)  
(ii) standard deviation. (7 marks)  
(Total 15 marks)

**Question 7**

- (a) Distinguish between the terms: uni-variate, bi-variate and multivariate.  
(3 marks)
- (b) Classify each of the following as either a parameter or statistic:  
(i) Sample standard deviation.  
(ii) Population 20<sup>th</sup> percentile.  
(iii) Sample mean.  
(iv) Population mean.  
(4 marks)
- (c) A student tossed a die 50 times and obtained the following results:

2	5	4	4	1	5	3	5	6	6
2	5	2	5	5	1	1	5	4	6
2	4	4	6	6	3	2	6	1	1
6	1	6	4	5	4	1	6	3	2
3	4	4	5	6	4	6	1	2	3

**Required:**

Use the information in the table above to:

- (i) construct a frequency distribution table. (3 marks)  
(ii) state the mode. (1 mark)  
(iii) calculate the mean. (4 marks)  
(Total 15 marks)