

# THE PUBLIC ACCOUNTANTS EXAMINATIONS BOARD

*A Committee of the Council of ICPAU*

## ATC(U) EXAMINATIONS

### LEVEL ONE

#### BUSINESS MATHEMATICS & STATISTICS - PAPER 3

THURSDAY, 16 JUNE 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.

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

- (i) It is estimated that 20% of the members of a health club have high blood pressure. If 300 members of the club are randomly selected, about how many of them can be expected to have high blood pressure?
- (a) 240
  - (b) 60
  - (c) 300
  - (d) 20
- (ii) Describe a circular display in which the angles at the centre of the circle are proportional to the quantity the sectors represent.
- (a) Histogram.
  - (b) Percentage.
  - (c) Pie chart.
  - (d) Line graph.
- (iii) In the standard normal distribution, the Z–score for the x value is:
- (a)  $\frac{\mu - x}{\sigma}$
  - (b)  $\frac{x + \sigma}{\mu}$
  - (c)  $\frac{x - \sigma}{\mu}$
  - (d)  $\frac{x - \mu}{\sigma}$
- (iv) An agent earns Shs 40,000 as commission on all the sales made. If his rate of commission is 5%, the value of the sales is:
- (a) Shs 2,000.
  - (b) Shs 800,000.
  - (c) Shs 38,000.
  - (d) Shs 200,000.
- (v) When two or more events can occur at the same time in probability, they are said to be:
- (a) independent.
  - (b) probable.
  - (c) mutually exclusive.
  - (d) conditional.

(vi) Measures of central tendency include:

- (a) mean, mode and medium.
- (b) range, mode and frequency.
- (c) class marks, mode and frequency.
- (d) median, class mark, and mean.

(vii) The following table represents a probability distribution for a random variable X. Find the probability that  $x = 7$ .

x	6	7	8	9	10
P(x)	0.18	-	0.32	0.25	0.17

- (a) 0
- (b) 0.92
- (c) 0.8
- (d) 0.08

(viii) If the determinant of  $\begin{pmatrix} k & 6 \\ -1 & 2 \end{pmatrix}$  is 16, the value of k is:

- (a) 5
- (b) 3
- (c) -11
- (d) 11

(ix) Five institutes have been enrolling students and on average, they have the following number of students respectively: 210, 320, 260, 280 and 290. What is their overall average?

- (a) 1360
- (b) 272
- (c) 260
- (d) 280

(x) Given that  $2^x = 32$ , the value of x is:

- (a)  $\frac{4}{5}$
- (b)  $2\frac{1}{2}$
- (c) 64
- (d) 5

(xi) The gradient of the curve  $y = x^3 - 5x$  at the point where  $x = 2$  is

- (a) -2
- (b) -4
- (c) 7
- (d) 2

- (xii) A bag contains 16 identical beads. There are 11 red beads and 5 blue ones. Annet takes two beads out of the bag at random, one after the other without replacement. What is the probability that both beads are of the same colour?

- (a)  $\frac{13}{24}$
- (b)  $\frac{11}{24}$
- (c)  $\frac{1}{12}$
- (d)  $\frac{1}{8}$

- (xiii) The table shows the probability distribution functions of a variable X.

X	0	1	2
P(X = x)	0.2	0.4	0.4

The mean of the probability functions is:

- (a) 1.5
  - (b) 1.2
  - (c) 0.8
  - (d) 1.6
- (xiv) A trader buys eggs at Shs 4,500 per a tray of 30 eggs and sells them at Shs 180 per egg. What profit percentage does he make?
- (a) 120
  - (b)  $16\frac{2}{3}$
  - (c)  $83\frac{1}{3}$
  - (d) 20
- (xv) A company has two production units A and B. When used separately, unit A takes 5 hours to produce 50 tonnes while unit B takes 3 hours to produce 50 tonnes. How long will both units working together take to produce 50 tonnes?
- (a) 8 hours
  - (b) 15 hours
  - (c)  $1\frac{7}{8}$  hours
  - (d)  $\frac{8}{15}$  hours
- (xvi) The length of a rectangular card is 2 cm more than the width and the perimeter is 20 cm. The length and the width are:
- (a) 6 and 4
  - (b) 11 and 9
  - (c)  $6\frac{2}{3}$  and  $3\frac{1}{3}$
  - (d) 12 and 10

(xvii) ..... is a curve that demonstrates total wealth disparity among the population proportions.

- (a) Z – chart
- (b) Lorenz curve
- (c) Ogive curve
- (d) Moving average

(xviii) In the formula  $2y + 3 = x$ , the value of  $y$  written in terms of  $x$  is:

- (a)  $\frac{x+3}{2}$
- (b)  $\frac{x-3}{2}$
- (c)  $X - 3$
- (d)  $x + \frac{3}{2}$

(xix) Raw data means data that have:

- (a) not been collected.
- (b) been collected and used over and over.
- (c) not been graded.
- (d) not been manipulated or treated in any way beyond their original collection.

(xx) Which of the following events has the greatest likelihood of occurring?

Event	Probability that this event will occur.
P	0.18
Q	0.81
R	0.97
S	0.097

- (a) P
- (b) Q
- (c) R
- (d) S

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

- (a) Distinguish between a:
- (i) row matrix and a column matrix (2 marks)
  - (ii) unit matrix, a null matrix and a square matrix. (6 marks)

- (b) Given matrices P and Q where  $P = \begin{pmatrix} 3 & 2 \\ 5 & 1 \end{pmatrix}$  and  $Q = \begin{pmatrix} 0 & 1 \\ 3 & 4 \end{pmatrix}$

**Required:**

Find the value of:

- (i)  $P + Q$  (2 marks)
  - (ii)  $P - Q$  (2 marks)
  - (iii)  $(P + Q)(P - Q)$  (3 marks)
- (c) Use matrix method to solve the simultaneous equations below:
- $$3x + 2y = -3$$
- $$10x + 3y = 1$$

**(5 marks)****(Total 20 marks)****Question 3**

- (a) A popular drug for malaria is sold in 88 different pharmacies located in Kampala. In order to determine the average price for its dosage, a survey was carried out. The results are as follows:

Number of pharmacies	Price charged (Shs)
27	19,950
32	21,950
16	23,750
13	24,500

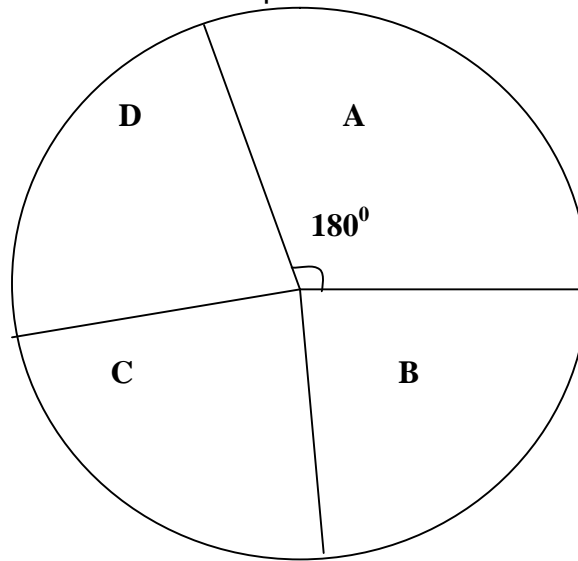
**Required:**

- Find the average price charged by these pharmacies. (7 marks)
- (b) The price of kerosene in a certain year was Shs 680 per litre.
- (i) If 70% of this price was tax; calculate how much tax was paid on a litre of kerosene. (2 marks)
  - (ii) If Janet had Shs 7,480, how many full litres of kerosene did she buy with that money? (2 marks)

- (iii) In the following year, the price of kerosene rose to Shs 750, calculate the percentage increase in the price.

**(3 marks)**

- (c) A group of students sat an examination. Each student got one of the grades A, B, C or D. The pie chart shows the results.



Thirty six students got grade A.

**Required:**

- (i) Calculate the total number of students who sat the examination. **(3 marks)**
- (ii) Find the number of students who did not get grade A.

**(3 marks)**

**(Total 20 marks)**

#### Question 4

- (a) Distinguish between:
- (i) commission and discount. **(2 marks)**
  - (ii) profit and appreciation. **(2 marks)**
- (b) In 1988, the cost of producing a certain product was Shs 40,500 and this was made up of the cost of raw materials, transport and labour in the ratio 5:3:1 respectively. In 1989, the costs of raw materials and labour rose by 20% and 10% respectively. Transport costs remained the same.

**Required:**

Calculate the cost of producing the product in 1989.

**(8 marks)**

- (c) The demand function and total cost (TC) functions for a firm are given as:  
 Demand function  $q = 101.25 - 0.25p$   
 Total cost function  $TC = 40 + 5q + q^2$ .

**Required:**

Find the:

- (i) price function (1 mark)
- (ii) total revenue function. (2 marks)
- (iii) profit maximizing output. (4 marks)
- (iv) profit maximising price. (1 mark)

(Total 20 marks)

**SECTION C**

**Question 5**

- (a) Distinguish between permutation and combination. (2 marks)
- (b) Write down all the different permutations that can be formed from the letters of abbreviation "A.T.C". (6 marks)
- (c) A certain town has two ambulances attached to two different health units. Records indicate that the first ambulance (A) is in the garage for servicing is 60% of the time while the second ambulance (B) is in the garage for servicing 40% of the time.

**Required:**

Find the probability that when an ambulance is needed.

- (i) both will not be available. (2 marks)
- (ii) at least one will be available. (2 marks)
- (iii) only one will be available. (3 marks)

(Total 15 marks)

**Question 6**

- (a) Define the terms:
  - (i) sinking fund (2 marks)
  - (ii) annuity (2 marks)
  - (iii) amortization (2 marks)
- (b) At what rate of simple interest will Shs 100,000 accumulate to Shs 170,000 in 5 years? (4 marks)
- (c) The department of bureau of statistics computed cost indices directly related to the employees. The following table shows the results.



Indices of costs (Jan 1990 = 100):

	Labour costs	Health insurance costs	Pension costs
Month/year			
Jan. 1993	106	115	103
Jan. 1994	108	111	94
Jan. 1995	109	113	100

**Required:**

- (i) State the cost and year with the:
    - smallest increase. (2 marks)
    - highest increase. (2 marks)
  - (ii) Explain the pension cost index of 94 in 1994. (1 mark)
- (Total 15 marks)**

### Question 7

- (a) Distinguish between:
  - (i) equal sets and equivalent sets. (2 marks)
  - (ii) empty sets and subsets (2 marks)

- (b) For the sets G and C where:

$G = \{ \text{all girls} \}$

$C = \{ \text{all people who like chocolate} \}$

**Required:**

Draw separate venn diagrams to show that:

- (i) All girls like chocolate. (2 marks)
- (ii) No girl likes chocolate. (2 marks)
- (iii) Some girls like chocolate. (2 marks)
- (c) In a group of 50 students of ATC, 37 like statistics, 23 like probability and 5 do not like either. Using a venn diagram, find the number of students who like both.

**(5 marks)**  
**(Total 15 marks)**