

THE PUBLIC ACCOUNTANTS EXAMINATIONS BOARD

A Committee of the Council of ICPAU

ATC(U) EXAMINATIONS

LEVEL ONE

BUSINESS MATHEMATICS & STATISTICS - PAPER 3

TUESDAY, 16 JUNE 2009

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) The mathematical statement ' $A = KB$ ' best describes:
 - (a) a term.
 - (b) an inverse proportion.
 - (c) a direct proportion.
 - (d) a partial proportion.
- (ii) Which of the following best defines the term "class width" as used in statistics?
 - (a) The difference between the upper and lower true class limits.
 - (b) The difference between the lower and upper class boundaries.
 - (c) The product of class limits.
 - (d) Class breadth.
- (iii) Which of the following best describes the term "grace period" as used in business?
 - (a) A good period in business.
 - (b) A period before one makes good his debt.
 - (c) A business payment period.
 - (d) A holy time set to pray for the business.
- (iv) Compute the variance and standard deviation of the following numbers: 1, 3, 6, 7, 8.
 - (a) 5.1, 2.3.
 - (b) 4.6, 2.2.
 - (c) 4.8, 2.1
 - (d) 0, 0.
- (v) Which of the following describes conditional probability?
 - (a) $P(A \cap B)$
 - (b) $P(A \cup B)$
 - (c) $P(A)^1$
 - (d) $P(A/B)$
- (vi) Given $a = 3$ and $b = -4$, evaluate $5a - 2(a + b)$.
 - (a) 17
 - (b) 1
 - (c) 13
 - (d) -29

Use the following information to answer questions (vii) and (viii).

A number is selected at random from the Set $A = \{x: 1 \leq x \leq 10\}$. Find the probability that the number chosen is:

(vii) an even number

(a) $\frac{2}{5}$

(b) 1

(c) $\frac{1}{2}$

(d) $\frac{3}{5}$

(viii) a prime number

(a) $\frac{2}{3}$

(b) $\frac{1}{2}$

(c) 1

(d) $\frac{2}{5}$

(ix) Solve the following simultaneous equations.

$$x - 2y + 5 = 0$$

$$3x - y - 13 = 0$$

(a) $x = 4.2$
 $y = 4.6$

(b) $x = 6.2$
 $y = 5.6$

(c) $x = 2$
 $y = 3.5$

(d) $x = 4.2$
 $y = 2$

(x) A personal computer costs £ 468. Given the exchange rates as \$ 1 = £ 0.78, \$ 1 = Shs 1,600, determine the cost of the personal computer in Shs

(a) 584,064

(b) 960,000

(c) 0.228150

(d) 228,150

- (xi) Mbabazi bought land and sold it at a loss of 30%. If he sold it at Shs 4.2 billion, at how much did he buy the land?
- (a) Shs 6 billion.
 - (b) Shs 2.94 billion.
 - (c) Shs 1.26 billion.
 - (d) Shs 14 billion.
- (xii) How much should be deposited into a savings account at 6.5% interest annually to have a balance of \$500 after one year?
- (a) \$ 516.44
 - (b) \$ 490.25
 - (c) \$ 469.48
 - (d) \$ 46.948
- (xiii) Which of the following represents the descending order of $\frac{7}{8}$, 0.75, $\frac{11}{12}$, $\frac{2}{3}$?
- (a) 0.75, $\frac{2}{3}$, $\frac{7}{8}$, $\frac{11}{12}$.
 - (b) $\frac{2}{3}$, 0.75, $\frac{7}{8}$, $\frac{11}{12}$.
 - (c) $\frac{11}{12}$, $\frac{7}{8}$, 0.75, $\frac{2}{3}$.
 - (d) $\frac{7}{8}$, 0.75, $\frac{11}{12}$, $\frac{2}{3}$.
- (xiv) Find the value of $\frac{dy}{dx}$ at $x = \frac{1}{32}$ when $y = (4x + 3)^2$.
- (a) 56
 - (b) 24
 - (c) 32
 - (d) 9.25

Use the following information to answer questions (xv) and (xvi)

Bob made a gross profit of Shs 600,000. 20% of the gross profit was paid in taxes, 70% of the remainder was spent on rent and loan servicing in the ratio 2:3 respectively. Calculate the amount paid:

(xv) in taxes.

- (a) Shs 120,400.
- (b) Shs 336,000.
- (c) Shs 134,000
- (d) Shs 201,000.

(xvi) for rent.

- (a) Shs 134,400.
- (b) Shs 182,000.
- (c) Shs 336,000.
- (d) Shs 192,000.

(xvii) Calculate the geometric mean of 36 and 4.

- (a) 24.
- (b) 18.
- (c) 144.
- (d) 12.

(xviii) An individual negotiates a loan of Shs 1 million with interest at 15% per annum over a three year period. Calculate his annual payments.

- (a) Shs 367,228.53.
- (b) Shs 506,958.30.
- (c) Shs 367,188.07.
- (d) Shs 437,977.

Use the information to answer questions (xix) and (xx).

Given the equation of the curve $Y = 2x^2 - 8x + 4$ determine the:

(xiv) value of x at the turning point of the curve.

- (a) $X = 4$.
- (b) $X = 2$.
- (c) $X = 8$.
- (d) $X = -4$.

(xx) nature of the turning point.

- (a) Minimum.
- (b) Maximum.
- (c) Inflexion.
- (d) Saddle.

SECTION B**Question 2**

- (a) Distinguish between a percentage and a proportion.

(2 marks)

- (b) Transpose the following matrix.

$$\begin{pmatrix} a & c & e \\ b & d & f \end{pmatrix}$$

(2 marks)

- (c) Shs 1 million is subjected to interest at 16%, compounded quarterly. What is the accrued amount after one year?

(7 marks)

- (d) Solve the simultaneous equations.

$$5x + 9y + 30 = 0$$

$$6x - 2y - 28 = 0$$

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

- (a) Give the condition(s), steps or procedure(s) followed in the multiplication matrices.

(4 marks)

(b) Work out $\begin{pmatrix} 2 & 3 \\ 1 & 0 \end{pmatrix} \times \begin{pmatrix} 1 & -2 & 4 \\ 3 & 0 & -1 \end{pmatrix}$

(4 marks)

- (c) The following information was extracted from the Premier League results chart for the year 2006. All teams played
- 18 matches**
- in the first round. Manchester United (M) played and won 14 matches, drew 2 and lost 2. Chelsea (C) won 10 matches, drew 6 and lost 2; Arsenal (A) won 12 matches, drew 3 and lost 3, while Liverpool (L), won 9 matches, drew 6 and lost 3.

Required:

- (i) Represent the above information in a 4 x 3 matrix.
 (ii) Given that a win is awarded 3 points, a draw 1 point and no point for a loss.

Use matrix multiplication to identify the positions of the four teams and the total points they got.

(12 marks)**(Total 20 marks)**

Question 4

A process has a total cost function given by $C = 20 + 4x$ and a revenue function given by $R = 22x - 4x^2$, where x is the level of activity (in thousands of units) and C and R are both in units of Shs 10,000.

Required:

- (a) Derive an expression for profit (P).
(3 marks)
- (b) Calculate the level of activity that maximizes profit and the amount of the profit at that level.
(11 marks)
- (c) Determine the total cost and total revenue using the value of x that gives maximum profit.
(6 marks)
- (Total 20 marks)**

SECTION C**Question 5**

- (a) Copy and complete the following frequency table.

Classes	Frequency	Cumulative frequency	Mid values	
	(f)	(cf)	(x)	fx
4.0 - 5.9	1	1	4.95	4.95
6.0 - 7.9	3	4	6.95	20.85
8.0 - 9.9	-	11	8.95	-
10.0 - 11.9	9	20	10.95	98.55
12.00 - 13.9	9	-	-	116.55
14.00 - 15.9	-	41	-	-
16.0 - 17.9	8	49	-	136.60
18.0 - 19.9	-	50	-	-
	$\Sigma f = \underline{\hspace{1cm}}$			$\Sigma fx = \underline{\hspace{1cm}}$

- (8 marks)**
- (b) Compute the mean from data in the table.
(2 marks)
- (c) Represent the data on an ogive (cumulative frequency curve) on a squared paper and use the ogive to estimate the median value.
(5 marks)
- (Total 15 marks)**

Question 6

If $P(A) = 0.3$, $P(B) = 0.4$ and $P(A \cap B) = 0.1$

Required:

- (a) Represent information on a venn diagram. (3 marks)
- (b) Find:
- (i) $P(A \cup B)$ (2 marks)
 - (ii) $P(A \cup B)^1$ (2 marks)
 - (iii) $P(A \cup B^1)$ (2 marks)
- (c) If A and B are two events such that $P(A) = \frac{1}{3}$, $P(B) = \frac{1}{2}$ and $P(\frac{A}{B}) = \frac{1}{6}$

Required:

Find:

- (i) $P(A \cap B)$ (4marks)
- (ii) $P(A \cup B)$ (2 marks)

(Total 15 marks)

Question 7

ATC(U) registered the following numbers of students for Level One subjects:
 Business Mathematics & Statistics: 156, Commercial Environment: 84, Principles
 of Law I: 108 and Principles of Accounting I: 120. Each of the papers registered
 students re-sitting for it in the following proportions 4:1:3:4.

Required:

- (a) Find the number of students re-sitting for each subject. (9 marks)
- (b) Represent the information on a pie-chart. (6 marks)
- (Total 15 marks)