

THE PUBLIC ACCOUNTANTS EXAMINATIONS BOARD

A Committee of the Council of ICPAU

ATC(U) EXAMINATIONS

LEVEL ONE

BUSINESS MATHEMATICS & STATISTICS - PAPER 3

THURSDAY, 09 DECEMBER 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, before you attempt any questions.

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SECTION A**Question 1**

- (i) The sides of a triangle are in the ratio 2:3:4. If the perimeter of the triangle is 18 cm, the lengths, in centimetres, of the sides are:
- (a) 9, 6, 4.5
 - (b) 36, 54, 72
 - (c) 4, 6, 8
 - (d) 16, 15, 14
- (ii) 40% of a certain number is 320. What is the original number?
- (a) 128
 - (b) 192
 - (c) 428
 - (d) 800
- (iii) When $6x^2 + 11x - 10$ is factorized, the factors are:
- (a) $(3x - 2)$ and $(2x + 5)$
 - (b) $(3x + 2)$ and $(2x - 5)$
 - (c) $(3x + 5)$ and $(2x - 3)$
 - (d) $(6x + 11)$ and $(11x - 10)$
- (iv) Given that set $P = \left\{ \triangle \oplus \square \right\}$ the number of subsets of P are:
- (a) 6
 - (b) 8
 - (c) 9
 - (d) 3
- (v) Evaluate $\frac{(y^2)^{1/6}}{(9x)^{1/2}}$ given that $x = 16$ and $y = 8$.
- (a) $\frac{1}{6}$.
 - (b) $\frac{1}{18}$.
 - (c) $\frac{4}{9}$.
 - (d) $\frac{4}{27}$.

- (vi) Joyce earns Shs 3,000 per hour for the first 40 hours, then Shs 4,500 per hour for overtime. How many hours must she work in order to make Shs 165,000?
- (a) 10.
 - (b) 55.
 - (c) 37.
 - (d) 22.
- (vii) Two normal die are tossed. In how many ways can the faces show a sum of 4?
- (a) 1.
 - (b) 2.
 - (c) 3.
 - (d) 4.
- (viii) Out of the three statistics examinations sat for, this semester, Helen obtained scores of 83, 75 and 90. She has another examination to be sat for next week. If Helen wants an average score of 85 in the four examinations, what score must she obtain in next week's examination in order to achieve her goal?
- (a) 85
 - (b) 92
 - (c) 82.5
 - (d) 84
- (ix) Find the coordinates of the points where the line $y = 2x - 6$ cuts the x - axis and y - axis respectively.
- (a) (3, 1) and (1, 3)
 - (b) (1, 1) and (0,0)
 - (c) (2, 3) and (3,2)
 - (d) (3, 0) and (0, -6)
- (x) Commodities that are subject to considerable price variations could be measured by:
- (a) price indices.
 - (b) quantity indices.
 - (c) value indices.
 - (d) consumer indices.

- (xi)refers to a curve that tails off to the left end.
- Symmetrical
 - Skewed right
 - Positively skewed
 - Negatively skewed.
- (xii) What major assumption is made when computing a mean for grouped data?
- All values are discrete.
 - Every value in a class is equal to the midpoint.
 - No value occurs more than once.
 - Each class contains exactly the same number of values.
- (xiii) For a poisson distribution with $\lambda = 2$, the probability of having exactly 10 occurrences is :
- $\frac{2^{-10} e^{10}}{10!}$
 - $\frac{2^{10} e^{-2}}{2!}$
 - $\frac{10^2 e^{-10}}{10!}$
 - $\frac{2^{10} e^{-2}}{10!}$
- (xiv) Given that $y = 6x^2 - 5x$, the value of $\frac{dy}{dx}$, when $x = 1$, is:
- 1
 - 2
 - 7
 - 12
- (xv) Ten numbered balls are placed in a box, numbers 1 to 4 are red and numbers 5 to 10 are blue. What is the probability that a ball drawn at random from the box is blue?
- 0.1
 - 0.4
 - 0.6
 - 1.0

- (xvi) A business person who is said to be averse to risk:
- (a) prefers to take large risks to earn gains.
 - (b) prefers to act anytime provided the expected monetary value is positive.
 - (c) avoids all situations except those with very high expected values.
 - (d) avoids all risk.
- (xvii) The following table shows the number of goals scored by a team in a series of football matches.

Number of goals	1	2	3	4	5
Number of matches	3	4	1	Y	2

If the mean number of goals is 3, the value of y is:

- (a) -5
 - (b) -15
 - (c) 15
 - (d) 6
- (xviii) The following are lines forming the z - chart **EXCEPT**:
- (a) monthly totals.
 - (b) moving annual totals.
 - (c) lorenz curve.
 - (d) cumulative monthly totals.
- (xix) In the equation $y = a + bx$, the value of b in terms of others is
- (a) $\frac{y-a}{x}$
 - (b) $y - a$
 - (c) $\frac{y}{x}$
 - (d) $\frac{y+a}{x}$

(xx) For the given matrix $A = \begin{pmatrix} -1 & 3 \\ 4 & 5 \end{pmatrix}$, the value of A^2 is

(a) $\begin{pmatrix} 1 & 9 \\ 16 & 25 \end{pmatrix}$

(b) $\begin{pmatrix} 13 & 12 \\ -16 & 37 \end{pmatrix}$

(c) $\begin{pmatrix} 13 & 12 \\ -16 & 27 \end{pmatrix}$

(d) $\begin{pmatrix} 13 & 12 \\ -16 & 27 \end{pmatrix}$

SECTION B

Question 2

(a) Represent the following statements by use of venn diagrams.

- (i) Two sets A and B are disjoint.
- (ii) Two sets P and Q, where P is a subset of Q.

(4 marks)

(b) Of the 53 students who came for a statistics examination, 30 had calculators (C), 20 had geometry sets (S) and 15 had mathematical tables (M). 6 students had both calculators and geometry sets, 4 had both geometry sets and mathematical tables while 5 had both calculators and mathematical tables. Only 1 student did not have any.

Required:

- (i) Represent the information on a venn diagram.
- (ii) Find the number of students who had all the three instruments.
- (iii) Find the fraction of students that had
 - geometry sets only
 - geometry sets and no mathematical tables.
- (iv) Find the number of students who had only one type of instrument.

(16 marks)

(Total 20 marks)

Question 3

- (a) (i) Define the term 'matrix'.
 (ii) Give **two** conditions for the addition of matrices.

(4 marks)

- (b) Given two matrices, P and Q, where $P = \begin{pmatrix} -2 & 0 \\ 2b & 3 \end{pmatrix}$ and $Q = \begin{pmatrix} a & b+3 \\ c-3 & \end{pmatrix}$

are such that $P = Q$.**Required:**

Find the values of a, b and c.

(6 marks)

- (c) Matrices A and B are defined as $A = \begin{pmatrix} 2 & -3 \\ 1 & 5 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 3 \\ 2 & 6 \end{pmatrix}$

Required:

Find the:

- (i) the inverse of $A + B$
 (ii) product $A \times B$

(10 marks)**(Total 20 marks)****Question 4**

- (a) V&A Ltd exports wine to U.S.A at £18.50 per crate of twelve bottles. The retail price of a bottle of wine in U.S.A is \$8.80, and taxation and customs clearing amount to \$38 per crate.

Required:

Calculate the percentage profit an American importer would make on one crate.

(Use an exchange rate of £1 = \$2.40)

(6 marks)

- (b) The cost of producing x units of some commodity is given by the cost function defined by $C = 5x^2 + 100$

Required:

Find the:

- (i) fixed cost
 (ii) equation for marginal cost.
 (iii) marginal cost at $x = 300$.

(4 marks)

- (c) A total revenue equation is given by $R = 9x - 2x^2$.

Required:

Find the:

- (i) level of output when revenue is zero.
- (ii) marginal revenue equation.
- (iii) level of output when marginal revenue is zero.
- (iv) revenue when marginal revenue is zero.

(10 marks)

(Total 20 marks)

SECTION C

Question 5

- (a) The following table shows the number of births per day recorded in a certain week.

Day of birth	Mon	Tue	We d	Thu r	Fr i	Sa t	Su n
Frequenc y	22	10	32	17	13	32	14

Required:

Give the modal values of the distribution.

(2 marks)

- (b) A binomial distribution is defined by $n = 16$ and $P = 0.4$.

Required:

Compute the mean and standard deviation.

(4 marks)

- (c) The probability distribution of a set of outcomes is given in table below.

x	0	15	30	45	60	75
Frequen cy	25	125	75	175	75	25

Required:

- (i) Construct a probability distribution for the set of outcomes.
- (ii) Compute the expected value of the outcome.

(9 marks)

(Total 15 marks)

Question 6

- (a) Write down **three** characteristics of a binomial experiment. **(4 marks)**
- (b) Three darts players A, B and C fire one shot each at a target. The probabilities that A, B or C will hit the target are $\frac{1}{5}$, $\frac{1}{4}$ and $\frac{1}{3}$ respectively. The three fire together.

Required:

Calculate the probability that:

- (i) all the three shots hit the target.
 (ii) C only hits the target.
 (iii) at least one shot hits the target.

(11marks)**(Total 15 marks)****Question 7**

- (a) A number of theft cases reported to police on six different occasions in one month were 9, 8, 6, 4, 2 and 1.

Required:

Compute the:

- (i) mean
 (ii) standard deviation.

(7 marks)

- (b) The table below gives details of the mixture, prices and quantities used in making an animal feed:

Mixture	Price (Shs '000')		Quantity
	2006	2007	
A	50	60	6
B	40	30	3
C	25	75	2

Required:

- (i) Calculate the price index for each mixture using 2006 as the base year.
 (ii) Compute the simple weighted average index.

(8 marks)**(Total 15 marks)**