

THE PUBLIC ACCOUNTANTS EXAMINATIONS BOARD

A Committee of the Council of ICPAU

ATC(U) EXAMINATIONS

LEVEL ONE

BUSINESS MATHEMATICS & STATISTICS - PAPER 3

TUESDAY, 8 DECEMBER 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) Which of the following measures best describes the comparison of units in the distribution that are the same (e.g. two machines producing identical components)?
- (a) Range
 - (b) Mean deviation
 - (c) Standard deviation
 - (d) Variance.
- (ii) Which of the following definitions best describes a finite set?
- (a) It is an exhaustive set.
 - (b) It is a set of members.
 - (c) It is a non-exhaustive set.
 - (d) It is a set of values.
- (iii) A man gave £720 to be divided among his 3 children as pocket money in proportion to their ages, which are 12 years 9 months, 9 years 9 months, and 7 years 6 months. What was the share of the youngest child?
- (a) £180
 - (b) £90
 - (c) £8
 - (d) £206
- (iv) Simplify the expression: $(2^2)^2 \times (2^{-4})^3$
- (a) 2^{16}
 - (b) 2^8
 - (c) 16
 - (d) 2^{-8}
- (v) The mean marks scored by 30 ATC male candidates and 20 ATC female candidates sitting for a paper at level one were 60 and 170 respectively.

Find the mean mark for all the candidates.

- (a) 126
- (b) 46
- (c) 104
- (d) 4.6

- (vi) Solve $2p^2 - p - 3 = 0$
- (a) $P = -\frac{-3}{2}, 1$
- (b) $P = -1, \frac{3}{2}$
- (c) $P = -1, \frac{-3}{2}$
- (d) $1, \frac{3}{2}$
- (vii) Find the value of x for which $\det N = -6$ given that
- $$N = \begin{pmatrix} x - 1 & x + 1 \\ 3x & x \end{pmatrix}$$
- (N.B \det = determinant)
- (a) $-3, -1$
- (b) $-3, 1$
- (c) $1, -3$
- (d) $3, 1$
- (viii) Given that Set A is defined as $A = \{1, 2, 3\}$, how many subsets does it have?
- (a) 8
- (b) 6
- (c) 5
- (d) 4

Use the following information to answer questions (ix) and (x):

The price, p_r , of a personal computer is made up of fixed costs and variable costs. The price of a personal computer in The United Kingdom is £350 when 250 computers are demanded, but when only 50 computers are demanded the price rises to £550 per computer.

- (ix) Identify a linear demand function.
- (a) $p_r = ax + bx.$
- (b) $p_r = ax + b.$
- (c) $p_r = a + b.$
- (d) $p_r = a + bx.$
- (x) Calculate the price per computer at a demand level of 120.
- (a) £500
- (b) £720
- (c) £100
- (d) £480

- (xi) Find the present value of a debt of \$1000 taken out over a 3 year period at a borrowing rate of 10% and discount rate of 8%.

- (a) \$1056.6
- (b) \$1.075
- (c) \$1232.4
- (d) \$1067.6

- (xii) Identify the third quartile from the following set of numbers:
14, 8, 10, 6, 6, 18, 16

- (a) 18
- (b) 10
- (c) 6
- (d) 16

- (xiii) Information on the mean (\bar{x}) and standard deviation (s.d) of two machines is provided in the table below:

Machine	\bar{x}	s.d
A	240	15
B	275	20

Calculate the coefficient of variation in the two machines and determine which of the two has a higher dispersion.

- (a) A = 6.25
B = 7.17
B higher
- (b) A = 16
B = 13.75
A higher
- (c) A = 6.25
B = 7.17
A higher
- (d) A = 16
B = 13.75
A lower

- (xiv) Differentiate the following function:

$$y = (2x^2 + 3)^2$$

- (a) $16x^3 + 24x$
- (b) $8x^3 + 12x$
- (c) $16x^2$
- (d) $4x^2 + 6$

(xv) The price of a television set was £400 in 1995 and in the year 2000 the same television set cost £495. Find the price relative for the television set in 2000 (1995 = 100).

- (a) 123.8
- (b) 80.8
- (c) 122.5
- (d) 95

(xvi) Given that function $f(x) = x^2 + 3$; find $f(-2)$.

- (a) -1
- (b) 7
- (c) 11
- (d) 8

(xvii) The probability of passing Business Mathematics and Statistics (A) is $\frac{4}{5}$ and that of passing Principles of Law I (B) is $\frac{1}{3}$. Find the probability of passing both papers A and B.

- (a) $\frac{5}{8}$
- (b) $\frac{17}{15}$
- (c) $\frac{4}{15}$
- (d) $\frac{7}{15}$

(xviii) Given the linear equation $x = 4y - 2$; find its gradient (m) and y intercept (c).

- (a) $m = \frac{1}{4}, c = \frac{-1}{2}$
- (b) $m = 4, c = \frac{1}{2}$
- (c) $m = 4, c = 2$
- (d) $m = \frac{1}{4}, c = \frac{1}{2}$

(xix) The best sampling technique to use where no sampling frame exists is:

- (a) quota.
- (b) cluster.
- (c) Multi-stage.
- (d) random.

(xx) Find the harmonic mean of 2 and 4.

- (a) $\frac{3}{4}$.
- (b) $\frac{8}{3}$.
- (c) $\frac{3}{2}$.
- (d) $\frac{4}{3}$.

SECTION B

Question 2

(a) Define the following terms as used in matrices:

- (i) Cell or element.
- (ii) Order of a matrix.
- (iii) Square matrix.
- (iv) Column matrix.

(4 marks)

(b) Describe the considerations made in multiplying or pre-multiplying two matrices.

(3 marks)

(c) Given $M = \begin{pmatrix} 2 & 3 \\ -1 & 1 \\ 8 & 4 \end{pmatrix}$ and $N = \begin{pmatrix} 1 & 2 & -2 \\ 2 & 8 & 2 \\ 3 & 4 & -6 \end{pmatrix}$

Required:

(i) identify the elements defined by $M_{3,2}$ and $N_{2,2}$

(2 marks)

(ii) work out $\frac{1}{2} (N.M)$

(6 marks)

(d) Given matrix $A = \begin{pmatrix} 3 & 6 \\ 4 & 7 \end{pmatrix}$

Required:

Find A^{-1} (inverse of A)

(5marks)

(Total 20 marks)

Question 3

(a) Describe the following terms as used in set theory:

- (i) Set notation $n(A)$
- (ii) Equal sets
- (iii) Complementary set

(3 marks)

(b) Given $\mathcal{E} = \{k, l, m, n, o, p, q, r\}$.

$$A = \{m, n, o, p\}$$

$$B = \{n, q, r\}$$

Required:

List the members in the following sets:

- (i) $A^1 \cap B^1$
- (ii) $n(A^1 \cup B^1)$

(5 marks)

(c) A flower company, Flora Uganda Limited, produces the following categories of flowers: Perishables (P), Funeral Special (S) and Expo (E). 48 flowers are not classified. 12 flowers are classified as P only, 16 are classified as E only, and 8 are classified as S only. 14 flowers are classified into two categories and no flower is classified into all three. Given also that there are 28 Expo' flowers (E) and 8 Funeral Special flowers (S):

N.B: All flowers / categories in '000' items.

Required:

Find:

- (i) the number of flowers classified as Perishables (P)?
- (ii) the stock of the different categories of flowers held altogether?

(12 marks)

(Total 20 marks)

Question 4

(a) Define and give an example of the following costs:

- (i) Variable cost.
- (ii) Fixed cost.

(4 marks)

(b) A company knows that if x ('000') products are demanded in a month, the total cost (\$'000') is $18 + 4x$ and the total revenue function (\$'000') is $19x - 3x^2$.

Required:

- (i) Derive the total profit function.
- (ii) Find the profit break even point.

(3 marks)

(5 marks)

(c) Solve the following equations simultaneously:

$$2x + 5y = 3$$

$$6x + 7y = 5$$

(8 marks)

(Total 20 marks)

SECTION C

Question 5

Two dice are thrown and their sum score recorded in a table:

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

Required:

(a) Copy and list the possible sums in the table given above.

(6 marks)

(b) Use the table in (a) above to find the probability that the sum is:

- (i) an odd number.
- (ii) a prime number.
- (iii) at least a sum score of 10.

(3 marks)

(c) If $P(A) = 0.6$ and $P(B) = 0.5$; find:

- (i) $P(A \cap B)$
- (ii) $P(A^1 \cap B)$.

(6 marks)

(Total 20 marks)

Question 6

(a) Distinguish between index relative and price relative.

(2 marks)

(b) Give **two** reasons for changing the base of a time series of relatives.

(2 marks)

(c) The table below provides information on prices and quantities of items made and sold by a manufacturing firm for the periods 1990 and 1995:

	1990		1995	
Item	Price \$	Quantity	Price \$	Quantity
Scanner	2,500	30	2,800	19
Rico Printer	2,000	20	2,350	38

Required:

Find the price and quantity relatives for 1995 (1990 = 100).

(8 marks)

(d) Given that the index relative of 5 components of A = 200, 3 components of B = 225 and 1 component of C = 105;

Required:

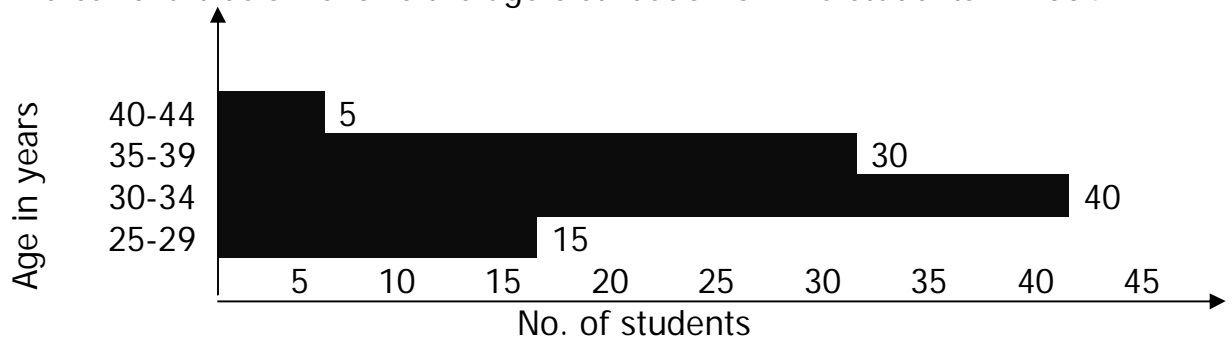
find the weighted average of the relatives.

(3 marks)

(Total 15 marks)

Question 7

- (a) (i) Distinguish between interview and a questionnaire as used in data collection. (2 marks)
- (ii) Identify at least **four** sources of secondary data. (4 marks)
- (b) The bar chart below shows the age distribution of ATC students in 2004:



Required:

- (i) Make a frequency table and state the total number of ATC students in 2004. (4 marks)
- (ii) Represent the data on a pie chart. (5 marks)

(Total 15 marks)