

THE PUBLIC ACCOUNTANTS EXAMINATIONS BOARD

A Committee of the Council of ICPAU

CPA (U) EXAMINATIONS

LEVEL ONE

QUANTITATIVE TECHNIQUES - PAPER 5

WEDNESDAY, 10 DECEMBER 2008

INSTRUCTIONS TO CANDIDATES

1. Time allowed: **3 hours**.
2. Attempt **three** questions in Section **A** and **two** questions in Section **B**.
3. Section A has **four** questions and only **three** are to be attempted. Each question carries 20 marks.
4. Section B has **three** questions and only **two** are to be attempted. Each question carries 20 marks.
5. Tables are given on page 7 – 8.
6. Please read further instructions on the answer booklet.

SECTION A**Question 1**

- (a) (i) Define the term “classification” of data. (1 mark)

- (ii) State any **four** objectives of classifying data. (4 marks)

- (b) The mean and standard deviation for 100 CPA(U) students in a Financial Accounting paper in the year 2005 were hurriedly recorded as 60 and 10 respectively. At the time of calculation, marks for two students were wrongly taken as 5% and 45% instead of 30% and 20% respectively.

Required:

Calculate the correct mean and standard deviation.

(7 marks)

- (c) The following facts were collected from Tukole Bukozi casual workers before and after a pay dispute:

	Before dispute	After dispute
Number of workers	515	509
Mean pay (Shs)	4,950	5,275
Median pay (Shs)	5,280	500
Variance pay (Shs)	12,100	14,400

Required:

Compare the position of payment before and after the dispute in respect of:

- (i) modal pay. (4 marks)
 (ii) skewness of pay. (4 marks)

(Total 20 marks)**Question 2**

- (a) (i) Explain the term “index number”. (4 marks)

- (ii) State any **four** important factors that should be considered in the construction of index numbers.

(4 marks)

- (b) **Study the table below and answer the question that follows:**

Commodity	Base Year		Current Year	
	Price (Shs '000')	Quantity (kg)	Price (Shs '000')	Quantity (kg)
X	1	10	2	5
Y	1	5	-	2

Required:

If the ratio between Laspeyre's and Paasches' index numbers is 28:27, find the missing figure on the table.

(4 marks)

- (c) An oil company may bid for drilling one of the two contracts for drilling oil in two different areas in Western Uganda. It is estimated that the profit of \$ 3 million per month would be realized in the first field and \$ 4 million in the second field.

These profit figures were determined ignoring the cost of bidding which amounts \$ 3,500 for first the field and \$ 5,000 for the second field.

Required:

Advise the oil company on which field they should bid for if the probability of winning a contract for the first field was $\frac{7}{10}$ and the second field was $\frac{3}{5}$.

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

- (a) The Ministry of Education organised a National Book Exhibition where all the book publishers from Uganda participated. 35% of the total visitors bought books and 40% of those who bought books were students. Of the people who visited the exhibition but did not buy any book, 20% were students.

Required:

- (i) If a person visited the exhibition and happened to be a student, what is the probability that he / she bought books?
 (ii) If a person visited the exhibition and happened to be a non-student, what is the probability that he / she bought books?

(7 marks)

- (b) Lion Bank claims that their fuel cards are used by 40% of the people buying fuel in Kampala. A random sample of 20 fuel buyers is made.

Required:

If the bank's claim is correct, determine the probability that:

- (i) from 6 to 12 people in the sample use fuel cards.
 (ii) less than 4 people in the sample use the cards.

(9 marks)**(4 marks)****(Total 20 marks)**

Question 4

- (a) (i) Define the term “marginal cost”. **(1 mark)**
- (ii) The cost equation of KK Ltd, a firm which produces shavers, is given by $C = 300q - 10q^2 + \frac{1}{3}q^3$, where q are boxes of shavers and C the cost.

Required:

Calculate the output at which marginal cost is minimum.

(4 marks)

- (b) At ABC factory a machine costs USD 12,000. The operational cost from the time of purchase of the machine at anytime (t) years is given by $20t^2 + 15t$. The machine's resale value at anytime is given by $6,880 - 60t^2$.

Required:

- (i) Express the average cost of the machine at the time of replacement in terms of t .

(3 marks)

- (ii) Find the optimum time for the replacement of the machine.

(4 marks)

- (c) Mr. Magoba, a monopolist in the production of ladies earrings (q), cost his earrings as follows:

5 earrings cost Shs 13,525

2 earrings cost Shs 12,880

8 earrings cost Shs 14,280

Required:

- (i) Determine Mr. Magoba's particular quadratic cost equation in terms of q .

(6 marks)

- (ii) Determine the cost of 12 earrings based on the same cost equation.

(2 marks)**(Total 20 marks)**

SECTION B**Question 5**

- (a) (i) What does the regression coefficient represent?
(1 mark)
- (ii) Given a set of data for X and Y and the coefficient of Y on X and X on Y, is it possible that one coefficient has a positive value whereas the other has a negative value?
(2 marks)
- (b) The following data are marks awarded to APAS candidates in two subjects X and Y.

X	57	58	59	59	60	61	62	64
Y	77	78	75	78	82	82	79	81

Required:

- (i) Use the method of rank correlation to determine the relationship in performance between the two subjects.
(7 marks)
- (ii) Form two regression equations based on the above data.
(9 marks)
- (iii) Estimate the value of Y when X = 65.
(1 mark)

(Total 20 marks)**Question 6**

- (a) Briefly describe the following ways of selecting a sample: quota, block (cluster) and area sampling methods.
(6 marks)
- (b) In a survey of 200 (two hundred) boys of which 75 were intelligent, 40 had skilled fathers; while 85 of the unintelligent boys had unskilled fathers.

Required:

Using X^2 test, determine whether the information support the hypothesis that skilled fathers have intelligent boys at 5% level of significance.

(14 marks)
(Total 20 marks)

Question 7

- (a) Builders Construction Company Limited has a project to renovate a bungalow in Muyenga. The major activities and their duration are as follows:

Activity	Preceding Activity	Duration (days)
A: Replace windows	-	5
B: Re-wiring	-	4
C: Re-plastering	A	2
D: Fit lights	B	1
E: Decorate bedrooms	B	5
F: Install plumbing	B	5
G: Decorate living room	C,D	4
H: Decorate kitchen	F	3
I: Decorate bathroom	F	2

Required:

Draw a network for the above project and identify the critical path.

(8 marks)

- (b) A linear programming problem with three variables x_1 , x_2 and x_3 , has the objective function $P=100x_1+300x_2+200x_3$ and the following constraints:

$$x_1 + x_2 + x_3 \leq 100$$

$$40x_1 + 20x_2 + 30x_3 \leq 3,200.$$

$$x_1 + 2x_2 + x_3 \leq 160.$$

and the non-negative constraints.

Required:

Solve the linear programming problem using simplex tableau method and interpret the results.

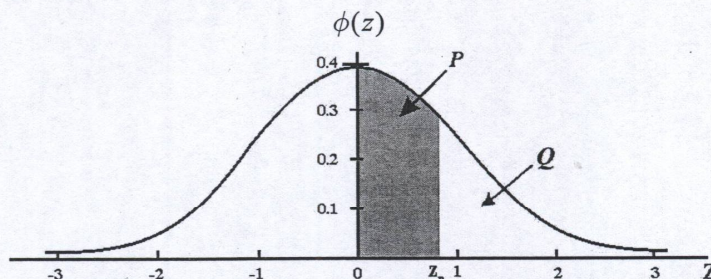
(12 marks)**(Total 20 marks)**

CUMULATIVE NORMAL DISTRIBUTION $P(z)$											ADD								
Z	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
0.0	0.0000	0040	0080	0120	0160	0199	0239	0279	0319	0359	4	8	12	16	20	24	28	32	36
0.1	0.0398	0438	0478	0517	0557	0596	0636	0675	0714	0753	4	8	12	16	20	24	28	32	36
0.2	0.0793	0832	0871	0910	0948	0987	1026	1064	1103	1141	4	8	12	15	19	22	27	31	35
0.3	0.1179	1217	1255	1293	1331	1368	1406	1443	1480	1517	4	8	11	15	19	22	26	30	34
0.4	0.1554	1591	1628	1664	1700	1736	1772	1808	1844	1879	4	7	11	14	18	22	25	29	32
0.5	0.1915	1950	1985	2019	2054	2088	2123	2157	2190	2224	3	7	10	14	17	21	24	27	31
0.6	0.2257	2291	2324	2357	2389	2422	2454	2486	2517	2549	3	6	10	13	16	19	23	26	29
0.7	0.2580	2611	2642	2673							3	6	9	12	15	19	22	25	28
					2704	2734	2764	2794	2823	2852	3	6	9	12	15	18	21	24	27
0.8	0.2881	2910	2939	2967	2995	3023					3	6	8	11	14	17	20	22	25
							3051	3078	3106	3133	3	5	8	11	13	16	19	22	24
0.9	0.3159	3186	3212	3238	3264	3289					3	5	8	10	13	16	18	21	23
							3315	3340	3365	3389	2	5	7	10	12	15	17	20	22
1.0	0.3413	3438	3461	3485	3508						2	5	7	10	12	14	17	19	22
						3531	3554	3577	3599	3621	2	4	7	9	11	13	15	18	20
1.1	0.3643	3665	3686	3708							2	4	6	8	11	13	15	17	19
					3729	3749	3770	3790	3810	3830	2	4	6	8	10	12	14	16	18
1.2	0.3849	3869	3888	3907	3925						2	4	6	8	10	11	13	15	17
						3944	3962	3980	3997	4015	2	4	5	7	9	11	13	14	16
1.3	0.4032	4049	4066	4082	4099	4115	4131	4147	4162	4177	2	3	5	6	8	10	11	13	14
1.4	0.4192	4207	4222	4236	4251	4265	4279	4292	4306	4319	1	3	4	6	7	8	10	11	13
1.5	0.4332	4345	4357	4370	4382	4394	4406	4418	4429	4441	1	2	4	5	6	7	8	10	11
1.6	0.4452	4463	4474	4484	4495	4505	4515	4525	4535	4545	1	2	3	4	5	6	7	8	9
1.7	0.4554	4564	4573	4582	4591	4599	4608	4616	4625	4633	1	2	3	3	4	5	6	7	8
1.8	0.4641	4649	4656	4664	4671	4678	4686	4693	4699	4706	1	1	2	3	4	4	5	6	6
1.9	0.4713	4719	4726	4732	4738	4744	4750	4756	4761	4767	1	1	2	2	3	4	4	5	5
2.0	0.4772	4778	4783	4788	4793	4798	4803	4808	4812	4817	0	1	1	2	2	3	3	4	4
2.1	0.4821	4826	4830	4834	4838	4842	4846	4850	4854	4857	0	1	1	2	2	2	3	3	4
2.2	0.4861	4864	4868	4871	4875	4878	4881	4884	4887	4890	0	1	1	1	2	2	2	3	3
2.3	0.4893	4896	4898	4901	4904	4906	4909	4911	4913	4916	0	0	1	1	1	2	2	2	2
2.4	0.4918	4920	4922	4925	4927	4929	4931	4932	4934	4936	0	0	1	1	1	1	1	2	2
2.5	0.4938	4940	4941	4943	4945	4946	4948	4949	4951	4952									
2.6	0.4953	4955	4956	4957	4959	4960	4961	4962	4963	4964									
2.7	0.4965	4966	4967	4968	4969	4970	4971	4972	4973	4974									
2.8	0.4974	4975	4976	4977	4977	4978	4979	4979	4980	4981									
2.9	0.4981	4982	4982	4983	4984	4984	4985	4985	4986	4986									
3.0	0.4987	4990	4993	4995	4997	4998	4998	4999	4999	5000									

The table gives $P(z) = \int_0^z \phi(z) dz$

If the random variable Z is distributed as the standard normal distribution $N(0,1)$ then:

1. $P(0 < Z < z_p) = P(\text{Shaded Area})$
2. $P(Z > z_p) = Q = \frac{1}{2} - P$
3. $P(Z > |z_p|) = 1 - 2P = 2Q$



PERCENTAGE POINTS OF THE CHI-SQUARE (χ^2) DISTRIBUTION χ^2_Q

Probability Q										
ν	0.995	0.990	0.975	0.950	0.100	0.050	0.025	0.010	0.005	0.001
1	0.0 ⁴ 393	0.0 ³ 157	0.0 ³ 982	0.0 ² 393	2.706	3.841	5.024	6.635	7.879	10.83
2	0.0100	0.0201	0.0506	0.1026	4.605	5.991	7.378	9.210	10.60	13.82
3	0.0717	0.1148	0.2158	0.3518	6.251	7.815	9.348	11.34	12.84	16.27
4	0.2070	0.2971	0.4844	0.7107	7.779	9.488	11.14	13.28	14.86	18.47
5	0.4117	0.5543	0.8312	1.145	9.236	11.07	12.83	15.09	16.75	20.52
6	0.6757	0.8721	1.237	1.635	10.64	12.59	14.45	16.81	18.55	22.46
7	0.9893	1.239	1.690	2.167	12.02	14.07	16.01	18.48	20.28	24.32
8	1.344	1.646	2.180	2.733	13.36	15.51	17.53	20.09	21.95	26.12
9	1.735	2.088	2.700	3.325	14.68	16.92	19.02	21.67	23.59	27.88
10	2.156	2.558	3.247	3.940	15.99	18.31	20.48	23.21	25.19	29.59
11	2.603	3.053	3.816	4.575	17.28	19.68	21.92	24.73	26.76	31.26
12	3.074	3.571	4.404	5.226	18.55	21.03	23.34	26.22	28.30	32.91
13	3.565	4.107	5.009	5.892	19.81	22.36	24.74	27.69	29.82	34.53
14	4.075	4.660	5.629	6.571	21.06	23.68	26.12	29.14	31.32	36.12
15	4.601	5.229	6.262	7.261	22.31	25.00	27.49	30.58	32.80	37.70
16	5.142	5.812	6.908	7.962	23.54	26.30	28.85	32.00	34.27	39.25
17	5.697	6.408	7.564	8.672	24.77	27.59	30.19	33.41	35.72	40.79
18	6.265	7.015	8.231	9.390	25.99	28.87	31.53	34.81	37.16	42.31
19	6.844	7.633	8.907	10.12	27.20	30.14	32.85	36.19	38.58	43.82
20	7.434	8.260	9.591	10.85	28.41	31.41	34.17	37.57	40.00	45.31
21	8.034	8.897	10.28	11.59	29.62	32.67	35.48	38.93	41.40	46.80
22	8.643	9.542	10.98	12.34	30.81	33.92	36.78	40.29	42.80	48.27
23	9.260	10.20	11.69	13.09	32.01	35.17	38.08	41.64	44.18	49.73
24	9.886	10.86	12.40	13.85	33.20	36.42	39.36	42.98	45.56	51.18
25	10.52	11.52	13.12	14.61	34.38	37.65	40.65	44.31	46.93	52.62
26	11.16	12.20	13.84	15.38	35.56	38.89	41.92	45.64	48.29	54.05
27	11.81	12.88	14.57	16.15	36.74	40.11	43.19	46.96	49.64	55.48
28	12.46	13.56	15.31	16.93	37.92	41.34	44.46	48.28	50.99	56.89
29	13.12	14.26	16.05	17.71	39.09	42.56	45.72	49.59	52.34	58.30
30	13.79	14.95	16.79	18.49	40.26	43.77	46.98	50.89	53.67	59.70
40	20.71	22.16	24.43	26.51	51.81	55.76	59.34	63.69	66.77	73.40
50	27.99	29.71	32.36	34.76	63.17	67.50	71.42	76.15	79.49	86.66
60	35.53	37.48	40.48	43.19	74.40	79.08	83.30	88.38	91.95	99.61
70	43.28	45.44	48.76	51.74	85.53	90.53	95.02	100.4	104.2	112.3
80	51.17	53.54	57.15	60.39	96.58	101.9	106.6	112.3	116.3	124.8
90	59.20	61.75	65.65	69.13	107.6	113.1	118.1	124.1	128.3	137.2
100	67.33	70.06	74.22	77.93	118.5	124.3	129.6	135.8	140.2	149.4

The function tabulated is χ^2_Q defined by

$$\int_{\chi^2_Q}^{\infty} f(x) dx = Q; \quad f(x) = \frac{1}{2^{\nu/2} (\nu/2 - 1)!} x^{\nu/2 - 1} e^{-x/2} (x > 0)$$

where $f(x)$ is the probability density of the χ^2 distribution for ν degrees of freedom. Interpolation ν -wise for $\nu > 30$ gives adequate values (but errors up to 5 units in the last figure may occur for the smaller ν). For $\nu > 100$ the distribution of $\sqrt{2\chi^2}$ is approximately normal with mean $\sqrt{2(\nu - 1)}$ and unit variance.

Note: $0.0^4 2 = 0.00002$
 $0.0^3 3 = 0.0003$
 $0.0^2 4 = 0.004$