

# THE PUBLIC ACCOUNTANTS EXAMINATIONS BOARD

*A Committee of the Council of ICPAU*

## ATC(U) EXAMINATIONS

### LEVEL ONE

#### BUSINESS MATHEMATICS & STATISTICS – PAPER 3

**FRIDAY, 5 JUNE 2015**

#### 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. This examination contains Sections **A**, **B** and **C**.
3. Section **A** is bound separately from Sections **B** and **C**.
4. Attempt all the 20 multiple-choice questions in Section **A**. Each question carries 1½ marks.
5. Attempt **two** of the **three** questions in Section **B**. Each question carries 20 marks.
6. Attempt **two** of the **three** questions in Section **C**. Each question carries 15 marks.
7. Formulae are provided on page 6.
8. Write your answer to each question on a fresh page in your answer booklet.
9. Please, read further instructions on the answer book before attempting any question.

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**SECTION B**

*Answer two of the three questions from this section*

**Question 2**

- (a) List any **three** methods that can be used to collect data. **(3 marks)**
- (b) The data summarized in the table below shows the lifetime (hours) of a sample of light bulbs manufactured by a certain electrical firm.

Lifetime	Number of bulbs
30 - 39	3
40 - 49	8
50 - 59	10
60 - 69	12
70 - 79	10
80 - 89	6
90 - 99	1

**Required:**

- Compute the ..... life of the bulbs.
- (i) mean **(4 marks)**
- (ii) modal **(4marks)**
- (iii) median **(4marks)**
- (c) Construct a histogram for the data in (b) above and use it to estimate the modal life of the bulbs. **(5 marks)**
- (Total 20 marks)**

**Question 3**

- (a) The table shows the total expenditure of a businessman during the month of April, 2015.

Item of expenditure	(Shs)
Employees	2,500,000
Transport	1,500,000
Administration	1,420,000
Premises	<u>580,000</u>
Total	<u>6,000,000</u>

**Required:**

- Represent the above information on a pie-chart. **(10 marks)**

- (b) A government wishing to compare the cost of living in families over the years considered a basket of four food items as shown in the following table:

	2012		Year 2013		2014	
	Price (Shs)	Quantity	Price (Shs)	Quantity	Price (Shs)	Quantity
Beans	1,800	10	2,000	12	2,500	15
Maize flour	1,000	15	1,200	15	1,500	20
Cassava	1,000	5	1,500	4	2,000	5
Matooke	15,000	4	18000	3	2,000	2

**Required:**

Calculate Paasche's price index for 2013 and 2014 using 2012 as base year.

**(10 marks)**

**(Total 20 marks)**

**Question 4**

- (a) Explain what is meant by the term 'break-even point' as applied to a manufacturing firm. **(2 marks)**
- (b) A manager of a manufacturing firm knows it that the revenue,  $R$ , obtained by the firm is a function of the quantity,  $q$ , produced by the firm and it is given by  $R = 500q - 2q^2$ . Given that the total cost of production of  $q$  units is given by the expression  $C = 300q + 2000$ ;

**Required:**

- (i) Compute the number of units ( $q$ ) at a point where  $R = C$ . **(3 marks)**
- (ii) Obtain the expression for the profit function  $P$ . **(2marks)**
- (iii) Compute the profit when  $q = 80$  units. **(2 marks)**
- (iv) Find the maximum profit using the:
- profit function obtained in (b) (ii) above. **(5 marks)**
  - microeconomic theory where marginal revenue ( $MR$ ) = marginal cost ( $MC$ ) **(4 marks)**

**Hint:**  $MR = \frac{dR}{dq}$  and  $MC = \frac{dC}{dq}$ .

- (v) Confirm that the maximum profit obtained using the profit function is correct by using the second derivative.

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

### SECTION C

*Answer only two of the three questions from this section*

#### Question 5

- (a) Given that  $x = 2(y - 3)$ ; make  $y$  the subject. **(3 marks)**  
 (b) Given the quadratic equation  $2x^2 + 9x - 5 = 0$ ; find the solutions for  $x$ . **(4 marks)**  
 (c) Given the table below showing classes with frequencies of data; compute the quartile deviation.

Class	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60
Frequency	12	19	10	15	4

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

#### Question 6

- (a) Kore Business Institute purchased goods on credit from a supermarket on the following terms:

Gross price Shs 6,400,000

Trade discount 4% of gross price

Cash discount:

- (i) 2% if paid within one month  
 (ii) 1% if paid over one month

**Required:**

Calculate the amount paid by the Institute if payment was made within one month **(4 marks)**

- (b) Land is assumed to appreciate at a compounded rate of 12% per annum in a certain area. Mr. Modema purchased land worth Shs 15 million in that area.

**Required:**

Calculate the value of Mr. Modema's land after 4 years. **(4 marks)**

- (c) Complaints about a certain staff canteen were received about cleanliness( $C$ ), food ( $F$ ) and service( $S$ ). A total of 173 complaints were received as follows:

$$n(C) = 110, n(F) = 55, n(S) = 67, n(C \cap F \cap S') = 20, n(F \cap S \cap C') = 16 \text{ and } n(C \cap S \cap F') = 11.$$

**Required:**

Use a Venn diagram to determine the complaints about all the three.

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

- (a) Given that  $A$  and  $B$  are two events of a probabilistic process with  $P(A) = 0.55$ ,  $P(B) = 0.35$  and  $P(A \cap B) = 0.165$ ;

**Required:**

- (i) Determine whether  $A$  and  $B$  are independent.

**(3 marks)**

- (ii) Compute  $P(A/B)$

**(3 marks)**

- (b) The marks scored by a group of accounting technician students in an accounts test are normally distributed with a mean of 60 and a standard deviation of 5.

**Required:**

- (i) State any **three** properties of a normal distribution.

**(3 marks)**

- (ii) Calculate the Z-value for which a student's score is 70%.

**(2 marks)**

- (iii) Calculate the probability that a student selected at random scored between 55 and 65 marks.

**(4 marks)****Total 15marks**

**LIST OF FORMULAE**

1 Coefficient of variation, for samples =  $\frac{s}{\bar{x}} \times 100\%$

2 Coefficient of variation, for populations =  $\frac{\sigma}{\mu} \times 100\%$

3 Geometric mean ( $GM$ ) =  $\sqrt[n]{x_1 \times x_2 \times x_3 \times x_4 \dots \times x_n}$

4 Harmonic mean  $hm = \frac{n}{\sum \frac{1}{x}}$

5 Sample standard deviation,  $\sigma = \sqrt{\frac{\sum (x - \bar{x})^2}{n-1}}$

6 Mean  $\bar{x} = \frac{\sum fx}{\sum f}$

7 Median =  $Lb + \left( \frac{\frac{N}{2} - Cfb}{fm} \right) C$

8 Mode =  $lm + \left( \frac{d_1}{d_1 + d_2} \right) C$

9 Quartile deviation =  $Q_3 - Q_1$

10 Pearson coefficient of skewness  $Sk = 3 \frac{(\bar{x} - median)}{\sigma}$

11 Value after  $n$  years =  $p \left[ 1 \pm \frac{r}{100} \right]^n$

12 Combinations  ${}_nC_r = \frac{n!}{(n-r)!r!}$

13 Index numbers:

(a) Price relative index =  $\frac{p_1}{p_0} \times 100$

(b) Weighted average =  $\frac{\sum xw}{\sum w}$

(c) Weighted aggregate price index =  $\frac{\sum (p_1 \times w)}{\sum (p_0 \times w)} \times 100$

(d) Laspeyre's price index =  $\frac{\sum (p_1 \times q_0)}{\sum (p_0 \times q_0)} \times 100$

(e) Paasche's price index =  $\frac{\sum (p_1 \times q_1)}{\sum (p_0 \times q_1)} \times 100$

14 Binomial distribution  $b(x, n, p) = \binom{n}{x} p^x q^{n-x}$

15 Standardizing normal  $z = \frac{\bar{x} - \mu}{\sigma}$

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
0.9	0.3159	3186	3212	3238	3264	3289					3	5	8	11	13	16	19	22	24
							3315	3340	3365	3389	3	5	8	10	13	16	18	21	23
1.0	0.3413	3438	3461	3485	3508						2	5	7	10	12	15	17	20	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.  $P(Z > |Z_p|) = 1 - 2P = 2Q$

