CERTIFIED ACCOUNTING TECHNICIAN

LEVEL 1 EXAMINATION

L1.4: BUSINESS MATHEMATICS

WEDNESDAY: 30 NOVEMBER 2016

INSTRUCTIONS:

1. **Time Allowed: 3 hours 15 minutes** (15 minutes reading and 3 hours writing).
2. This examination has **seven** questions and only **five** questions are to be attempted.
3. Marks allocated to each question are shown at the end of the question.
4. Show all your workings.
5. All iCPAR Examination rules and regulations apply

Attempt any five questions

QUESTION ONE

(a) While on a tour of a popular chain store in Rwamagana, Grace on one occasion bought 10 and 15 sweets of chocolate and vanilla flavours respectively. On the second occasion she bought the same number of chocolate flavoured sweets but 10 more vanilla flavoured sweets. Grace spent Frw 450 and Frw 650 on the two occasions respectively. Assuming that each chocolate flavoured and each vanilla flavoured sweet costs Frw x and y respectively;

REQUIRED:

(i) Form two equations in terms of x and y for the information above. **(2 Marks)**

(ii) Using a scale 1 cm to represent 5 units on the x axis and 2 cm to represent 5 units on the y axis; solve the two equations in (a) (i) above graphically. **(3 Marks)**

(iii) Find the amount Grace paid on the third occasion when she bought, 5 sweets of each flavor. **(2 Marks)**

(b) Given the following inequalities:

$x + y \leq 100$,

$5x \geq -y$, and

$x \geq 1$.

REQUIRED:

(i) Plot the above inequalities on one graph. **(6 Marks)**

(ii) Identify the shape formed by the un-shaded region. **(1 Mark)**

(c) The time taken by a newspaper vendor to deliver news on a daily basis to iCPAR Secretariat is normally distributed with a mean of 20 minutes and a standard deviation of 4 minutes. (It can be assumed that there are 365 days in a year).

REQUIRED:

Determine the number of days in the year when she takes:

(i) Longer than 24 minutes. **(3 Marks)**

(ii) Less than 18 minutes. **(3 Marks)**

(Total 20 Marks)

QUESTION TWO

(a) Distinguish between risk and uncertainty**.** **(2 Marks)**

(b) A and B are two events such that $P(A) = \frac{1}{4}, P(B) = \frac{2}{5}$ *and* $P(A \cup B) = \frac{1}{\square}$.

REQUIRED:

Find:

(i) $P(A \cap B)$ **(3 Marks)**

(ii) $P(A^1 \cup B)$ **(3 Marks)**

(iii) State, with a reason, the relationship between events A and B. **(3 Marks)**

(c) A lottery game is played in such a way that after putting up a bet one picks two marbles, one after another, without replacement from 'a magic bag'. The player wins if he/ she picks marbles of different

colours, otherwise the player loses. Given that the 'magic bag' contains 5 blue and 7 white marbles

REQUIRED:

(i) Construct a probability tree diagram. **(4 Marks)**

(ii) Find the probability that a player losses the game. **(2 Marks)**

(iii) Find the number of people who won the game out of the 915 who took part in it. **(3 Marks)**

(Total 20 Marks)

QUESTION THREE

(a) Explain the term 'Pareto chart' as used in quality management. **(3 Marks)**

(b) In examining the quality of products, samples were taken from a day's production and the types of defects ranked from A to G of the samples were recorded as follows:

Type of defect	A	B	C	D	E	F	G
Frequency	20	14	2	18	12	8	6

REQUIRED:

Prepare a Pareto chart for the data. **(5 Marks)**

(c) A new mosquito net was launched to the community at Gisagara district headquarters recently. The people who attended the launch had their ages recorded on registration as shown in the table below:

5	17	23	18	34	52	34	21	15	34
45	42	41	30	28	24	25	23	43	34
35	13	15	43	46	65	53	34	37	23
36	37	38	23	26	26	34	54	39	6
55	62	66	58	60	63	65	71	10	47

REQUIRED:

(i) Construct a grouped frequency table for the age distribution with equal classes starting with 5 - 14. **(2 Marks)**

(ii) Hence calculate the mean age. **(4 Marks)**

(iii) Plot an O-give curve and hence estimate the median age. **(6 Marks)**

(Total 20 Marks)

QUESTION FOUR

(a) Distinguish between a scatter diagram with inverse relationship and a scatter diagram with direct relationship. **(2 Marks)**

(b) The following data relates to sales as a result of TV advertising by a car Mart.

Number of advert spots (x)	5	15	12	20	0	9	18
Number of cars sold (y)	15	20	19	32	10	18	25

Given that $\sum x = 91$, $\sum y = 139$, $\sum xy = 1{,}855$ *and* $\sum x^2 = 1{,}199$ and using the equations

$\sum y = na + m\sum x$ and $\sum xy = a\sum x + m^2$:

REQUIRED:

Find the regression line in the form $y = mx + a$. **(6 Marks)**

(c) The following data shows the daily income of a group of 10 nutritionists working in Kigali and their daily expenditure on food.

Daily income	Amount spent on food
Frw '000'	Frw '000'
13.2	4.2
14.0	3.7
15.0	3.3
16.0	3.2
17.0	3.0
17.0	2.7
18.2	2.5
20.0	2.3
21.0	2.2
22.0	2.0

REQUIRED:

(i) Compute Pearson's correlation coefficient. **(10 Marks)**
(ii) Comment on the relationship between the income and expenditure on food. **(2 Marks)**

(Total 20 Marks)

QUESTION FIVE

The table below shows the number of passengers (in hundreds of thousands) who travelled by bus from Kigali to Kampala over a period of three years.

	Quarter			
Year	1	2	3	4
2013	42	78	118	58
2014	50	86	124	60
2015	58	96	138	66

REQUIRED:

(a) Calculate the four centered moving averages. **(8 Marks)**
(b) Calculate the seasonal variations for each quarter. **(8 Marks)**
(c) Comment on the movement of passengers from Kigali to Kampala. **(4 Marks)**

(Total 20 Marks)

QUESTION SIX

(a) A bricklaying project by a group of youth in the outskirts of Kibuye for 4 years has the following nominal cash flows (NCF):

Year	0	1	2	3
NCF (Frw million)	(11)	4	5	6

REQUIRED:

(i) Calculate the discount factors (DCF) at 5%, 10%, 15% and 20%. **(4 Marks)**

(ii) Calculate the net present value of the project at each of the discount rates in (i) above. **(8 Marks)**

(iii) Use the graphical method to determine the internal rate of return (IRR) for the project. **(6 Marks)**

NB. $\text{DCF} = \frac{1}{(1+i)^n}$

(b) The youth group is interested in knowing if the investment in bricklaying in (a) above is a better option to investing in making tiles which would return 15% benefits.

REQUIRED:

Advise the group on which investment to take on. **(2 Marks)**

(Total 20 Marks)

QUESTION SEVEN

(a) Explain the concept 'spread sheet', bringing out its main features. **(4 Marks)**

(b) Mugabo and Ndezi bought different quantities of commodities A and B. Mugabo bought 6 kg of commodity A and 2 kg of commodity B spending a total of Frw 4,300. Ndezi bought 2 kg of commodity A and 3 kg of commodity B spending a total of Frw 1,900.

REQUIRED:

(i) Formulate two equations for their expenditure. **(2 Marks)**

(ii) Using the substitution method, determine the price of each kg of the commodities A and B. **(3 Marks)**

(c) iCPAR deposited Frw 20 million in one of the leading local banks offering a compound interest rate of 10% per annum for a period of 3 years.

REQUIRED:

(i) Determine the total amount of amount iCPAR received at the end of the period. **(4 Marks)**

(ii) Calculate the interest iCPAR realised at the end of the period. **(1 Mark)**

(d) At Kigali national referral hospital, a human resource manager has established that the number of workers in a newly set up wing will be according to the equation $N = 2000(0.6)^{0.5t}$, where t represents the number of years after opening the hospital and N is number of workers.

REQUIRED:

(i) Find the number of workers that are required when the new wing is opened. **(3 Marks)**

(ii) Find how many workers will be required in the new wing after one year. **(3 Marks)**

(Total 20 Marks)

End of question paper

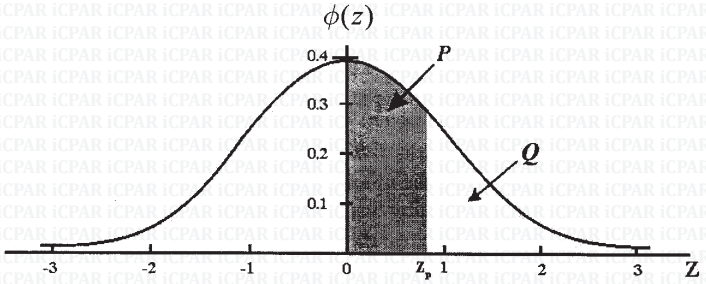
CUMULATIVE NORMAL DISTRIBUTION $P(z)$

Z	0	1	2	3	4	5	6	7	8	9	ADD 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	4957	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. $P(o < Z < z_p) = P$(Shaded Area)
2. $P(Z > Z_p) = Q = ½ - P$
3. $P(Z > |Z_p|) = 1 - 2P = 2Q$



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