
CERTIFIED PUBLIC ACCOUNTANT

FOUNDATION 1 EXAMINATIONS

F1.1: BUSINESS MATHEMATICS AND QUANTITATIVE METHODS

THURSDAY: 11 JUNE 2015

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, where applicable.**

QUESTION ONE

(a) In a Local Market, the Demand and Supply Functions for maize are respectively given as $Q_d = 500 - 2P$ and $Q_s = 200 + 4P$ where P is the price in Frw per Kg and Q is the Quantity in Metric Tons:

REQUIRED:

(i) Calculate the Equilibrium Price and Quantity in this Market (4 Marks)

(ii) Calculate the excess Supply in Kg if the Market Price $P = \text{Frw } 60$ per Kg (4 Marks)

(b) The total revenue and cost function of a food processing cooperative union are given as

$TC = 4000 + 25x$ and $TR = 625x - 4x^2$ respectively where x represents the number of terms of food processed.

Required :

Using differential calculus, find

(i) The Marginal Cost (MC) and Marginal Revenue (MR) (4 Marks)

(ii) The profit maximizing output when $MC = MR$ (4 Marks)

(iii) The revenue maximizing output ($MR = 0$ when TR is at its Maximum) (4 Marks)

(Total 20 Marks)

QUESTION TWO

The following sales data was provided by a firm in media industry

Quarterly data for television set sales:

Year	Quarter	Sales (Frw 000)
One	1	4.8
	2	4.1
	3	6.0
	4	6.5
Two	1	5.8
	2	5.2
	3	6.8
	4	7.4
Three	1	6.0
	2	5.6
	3	7.5
	4	7.8
Four	1	6.3
	2	5.9
	3	8.0
	4	8.4

REQUIRED:

- a) Four point moving trend (10 Marks)
 - b) Deseasonalised data assuming multiplicative model (10 Marks)
- (Total 20 Marks)**

QUESTION THREE

- a) State four assumption of linear programming. (2 Marks)
- b) Sonny Smart Television Limited makes two types of Television Models (Media) and (Samsung). The amount of labour hours, the variable costs required to produce each model and profit contribution from each model is given below:

	Media	Samsung
Labour - Hour	1 ½	2
Variable Costs (Frw)	2,000	1,700
Profits	2,100	2,500

At the moment, the company can sell as many models as it can produce. However, it only has available 600 labour hours per month and a budget on total variable cost per month is Frw. 600,000

REQUIRED:

- (i) Formulate the problem as linear programming to determine the number of each model that should be manufactured in order to maximize the profit and solve the problem graphically. (12 Marks)
 - (ii) Due to contractual obligations, there are outstanding orders which must be met of 150 Media and 100 Samsung Models. Show graphically how this affects your situation. (5 Marks)
- (Total 20 Marks)**

QUESTION FOUR

- a) Below is represented the frequency distribution of commissions earned, in thousands Frw by a sample of 100 accountants employed at several branches of a large chain.

Class limits	Frequency
150 - 158	5
159 - 167	16
168 - 176	20
177 - 185	21
186 - 194	20
195 - 203	15
204 - 212	3

You required to:

- (i) Calculate the mean and standard deviation of the commission earned. (8 Marks)
- (ii) Calculate the mode and median commissions, and hence deduce if the distribution of commissions is approximately normal or not. (8 Marks)
- (iii) Determine the 90% confidence interval within the mean commission lies. (4 Marks)

(TOTAL 20 Marks)

QUESTION FIVE

- a) A research is conducted to find out if there is any relationship between the ages (X) and the blood pressure (Y) of 10 women. The data are presented in the following table

Age (X)	56	42	36	47	49	42	72	63	55	60
Blood Pressure (Y)	147	125	118	128	145	140	155	160	149	150

- (i) Find the correlation coefficient between X and Y. **(4 Marks)**
- (ii) Determine the regression line of Y on X. **(4 Marks)**
- (iii) Estimate the blood pressure of a woman whose age is 45 years. **(2 Marks)**
- b) Network analysis incorporates a variety of techniques used to help plan, manage, allocate resources and review costs. The following is the table representing the plan of activities to achieve a task :

Activity	Immediately Preceding Activity	Duration (Weeks)
A	-	5
B	-	4
C	A	2
D	B	1
E	B	5
F	B	5
G	C,D	4
H	F	3
I	F	2

- (i) Construct a network of the above activities. **(8 Marks)**
- (ii) What are the paths through the network. **(1 Mark)**
- (iii) Estimate the maximum time available to complete the project and show the critical path. **(1 Mark)**
- (Total 20 Marks)**

QUESTION SIX

- a) What is game theory? **(1 mark)**
- b) State three assumption in game theory **(3 marks)**
- c) Discuss the importance of game theory in business decisions **(6 Marks)**
- d) A professional athlete, Pierre Rwigizamana is negotiating his contract with Eugene Mushimana, the manager of Rwanda athletes grand prix circuit. The various outcomes for the contract negotiations are shown below:

	Eugene's strategies		
Pierre's Strategies	A	B	C
1	Frw 500,000	Frw 350,000	Frw 300,000
2	Frw 600,000	Frw 400,000	Frw 200,000

REQUIRED:

What is the pure strategy game result for the contract negotiation? **(10 Marks)**

(Total 20 Marks)

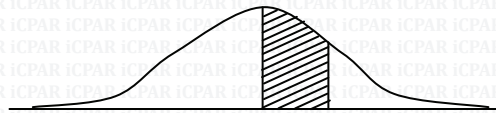
QUESTION SEVEN

- a) Under what circumstances can the Poisson Probability Distribution be used as an approximation to the Binomial Probability Distribution? **(3 Marks)**
- b) It is suspected that 0.4% of the people in one of the countries in West Africa have contracted the Ebola Virus. Calculate the probability that in a simple random sample of 750 people selected from the population of this Country:
 - (i) None of them has the Virus **(5 Marks)**
 - (ii) Only one of them has the Virus **(4 Marks)**
 - (iii) At least 2 of them have the Virus **(4 Marks)**
 - (iv) At most 3 of them have the Virus **(4 Marks)**

(Total 20 Marks)

End of question paper

Normal table



Area between 0 and z

z	0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0	0	0.004	0.008	0.012	0.016	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.091	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.148	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.17	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.195	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.219	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.258	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.291	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.334	0.3365	0.3389
1	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.377	0.379	0.381	0.383
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.398	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.437	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.475	0.4756	0.4761	0.4767
2	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.483	0.4834	0.4838	0.4842	0.4846	0.485	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.489
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.492	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.494	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.496	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.497	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.498	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.499	0.499

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