

BOTSWANA OPEN UNIVERSITY
In collaboration with
THE COMMONWEALTH OF LEARNING

Commonwealth Executive Masters in Business Administration

Commonwealth Executive Masters in Public administration

QUANTITATIVE TECHNIQUES

QT312

Sessional Examination

Marks – 100

Time allowed: 3 hours

Instructions to candidates

1. The examination consists of **two** sections: Part A and B
2. Begin each answer to a new question on a new page.
3. Answer questions according to instructions given in each section
4. Write answers in the answer booklet provided
5. Write in grammatical English

SECTION A

[40 MARKS]

ANSWER ALL QUESTIONS IN THIS SECTION

1. Evaluate the following expressions:

a. $[10 \times 4 - 6 + 7 - 8 \div 2 + 3 \times 3 + (4 + 5 - 6 \div 3 + 1) \div 2]$ (5 marks)

b. $((100^{\frac{1}{2}} \times 2 - 10) - (3 \times 5 \div 5))$ (5 marks)

2. Solve the following simple equations for x:

$-3x + 10 = -6x + 70$ (2 marks)

3. Solve the following equations for x, y and z.

$3x + 2y + 4z = 3$ (6 marks)

$2x - 3y + z = -5$

$x + 2y - 4z = 9$

4. State whether the following straight line equation slants backwards or forwards with reason.

$y - 2x = +4$ (2 marks)

5. Determine/derive the equation of a straight line joining the following points:

$A(-2, 8)$ and $B(6, 12)$ (5 marks)

6. Determine/derive the equation of a straight line parallel to a given line and passing through a known point.

$A(-2, 4)$ parallel to Line: $2y = -6x + 2$ (5 marks)

7. Evaluate the following:

$(3^2)^4 + (2^3)^5$ (4 marks)

8. Perform the indicated operation. Express your final answer as a single, fully reduced, simple fraction with positive exponents.

$\left(\frac{q}{9p^{-4}}\right)^{\frac{1}{2}}$ (3 marks)

9. If $3^x = 1$, find the value of x. (3 marks)



SECTION B

[60 MARKS]

ANSWER ANY THREE (3) QUESTIONS IN THIS SECTION

QUESTION 1

[20 marks]

a. Represent the data below in a frequency distribution:

0	3	4	6	8	10	6	7	8	9	
1	5	5	4	3	4	6	10	9	5	
2	8	7	3	6	4	7	3	4	10	
2	4	5	8	6	6	8	7	8	9	
3	5	6	7	5	9	9	5	9	5	(4 marks)

b. Data pertaining to the ages of people in a boat is summarised in the table below.

Class	Frequency (f_i)
35-<45	6
45-<55	12
55-<60	28
60-<65	8
65-<70	6

Calculate the following:

- a. Mean **(4 marks)**
- b. Median **(4 marks)**
- c. Mode **(4 marks)**
- d. Variance **(4 marks)**



QUESTION 2

[20 marks]

For the data in the table below:

Sales (Y)	Expenditure on adverts (X)
20	5.5
22	6.0
25	10.2
30	9.9
28	8.4
32	12
35	11.2
40	15
45	16

- a. Plot the bi-variate relationship. **(5 marks)**
- b. Find the regression coefficients and hence the line of best fit. **(8 marks)**
- c. Superimpose the line on your bi-variate plot. **(4 marks)**
- d. Predict or estimate the sales figure if the advertising expenditure is 30. **(3 marks)**

QUESTION 3

[20 marks]

An investor is planning to start some business venture. The available alternatives are fisheries (F), railway (R) and warehousing (W). The states of nature in the country are poor, stable and good economic conditions with probabilities of these states occurring being 0.25, 0.35 and 0.40 respectively. The payoff values (in thousands of Pula) for each alternative under all states of nature are provided in the table below.

	Economic Condition		
	Poor	Stable	Good
Fisheries (F)	200	-40	700
Railway (R)	1000	100	-100
Warehousing (W)	-150	600	500
Probability	0.25	0.35	0.40

Required

- a. Make a decision under each of the following criteria.
- i. MAXMAX approach (2 marks)
 - ii. MAXMIN approach (2 marks)
 - iii. MINIMAX Regret approach (4 marks)
 - iv. Expected Value approach (4 marks)
- b. If the investor gets some accurate information that will help him yield maximum payoff, calculate how much he would be prepared to pay for that information. (4 marks)
- c. Represent the investor's options using a decision tree. (4 marks)

QUESTION 4

On a certain day, 500 students are cross-classified according to age groups and marks scored in a quiz.

		Age Group		
		Below 18	18 to 21	22 plus
Marks	Less than 51	30	31	25
	51 - 70	60	40	46
	71 - 90	80	20	100
	91 - 100	26	2	40

- a. State and explain any **two** non-mutually exclusive events. (2 marks)
- b. State and explain any **two** mutually exclusive events. (2 marks)
- c. Calculate the probability that a randomly selected student:
- i. Scored 95%. (3 marks)
 - ii. Is aged 23 years. (3 marks)
 - iii. Is aged 17 years or scored 75%. (3 marks)
 - iv. Scored 44% and is aged 19 years. (3 marks)
- d. Given that a randomly selected student scored 60%, calculate the probability that the student is aged 20 years. (4 marks)



QUESTION 5

- a. From experience, 3 out of every 5 students who sit for CIN1207 test pass it. A sample of 8 was taken. Calculate the probability that:
- i. at most 6 students will fail the test. **(6 marks)**
 - ii. no student will pass the test. **(2 marks)**
- b. BTV circle experiences rare car accidents at a rate of 3 per week. Calculate the probability of experiencing at least 2 accidents per week. **(6 marks)**
- c. Using the normal distribution tables, calculate the value of the following:
- i. $P(z \geq 1.67)$ **(2 marks)**
 - ii. $P(-1.16 \leq z \leq 2.18)$ **(4 marks)**

END OF EXAMINATION

0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2703	0.2734	0.2764	0.2793	0.2823	0.2852
0.8	0.2881	0.2910	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	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3557	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	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	0.4370	0.4380	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4514	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	0.4750	0.4756	0.4761	0.4767
2.0	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	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4884	0.4884	0.4887	0.4890
2.3	0.48928	0.49956	0.48983	0.49010	0.49036	0.49061	0.49086	0.49111	0.49134	0.49158
2.4	0.49180	0.49202	0.49224	0.49245	0.49266	0.49286	0.49305	0.49324	0.49343	0.49361
2.5	0.49379	0.49396	0.49413	0.49430	0.49446	0.49461	0.49477	0.49492	0.49506	0.49520
2.6	0.49534	0.49547	0.49560	0.49573	0.49585	0.49598	0.49609	0.49621	0.49632	0.49643
2.6	0.49653	0.49664	0.49674	0.49683	0.49693	0.49702	0.49711	0.49720	0.49728	0.49736
2.7	0.49653	0.49664	0.49674	0.49683	0.49693	0.49702	0.49711	0.49720	0.49728	0.49736
2.8	0.49744	0.49752	0.49760	0.49767	0.49774	0.49781	0.49788	0.49795	0.49801	0.49807
2.9	0.49813	0.49819	0.49825	0.49831	0.49836	0.49841	0.49846	0.49851	0.49856	0.49861
3.0	0.49865	0.49869	0.49874	0.49878	0.49882	0.49886	0.49889	0.49893	0.49897	0.49900
3.1	0.49903	0.49906	0.49910	0.49913	0.49916	0.49918	0.49921	0.49924	0.49926	0.49929
3.2	0.49931	0.49934	0.49936	0.39938	0.49940	0.49942	0.49944	0.49946	0.49948	0.49950
3.3	0.49952	0.49953	0.49955	0.49957	0.49958	0.49960	0.49961	0.49962	0.49964	0.49965
3.4	0.49966	0.49968	0.49969	0.49970	0.49971	0.49972	0.49973	0.49974	0.49975	0.49976
3.5	0.49977	0.49978	0.49978	0.49979	0.49980	0.49981	0.49981	0.49982	0.49983	0.49983
3.6	0.49984	0.49985	0.49985	0.49986	0.49986	0.49987	0.49987	0.49988	0.49988	0.49989
3.7	0.49989	0.49990	0.49990	0.49990	0.49991	0.49991	0.49991	0.49992	0.49992	0.49992
3.8	0.49993	0.49993	0.49993	0.49994	0.49994	0.49994	0.49994	0.49995	0.49995	0.49995
3.9	0.49995	0.49995	0.49996	0.49996	0.49996	0.49996	0.49996	0.49996	0.49997	0.49997

4.0	0.49997	0.49997	0.49997	0.49997	0.49997	0.49997	0.49998	0.49998	0.49998	0.49998
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