



FACULTY OF SCIENCE AND ENGINEERING

DEPARTMENT OF MATHEMATICS AND STATISTICS

MID-TERM ASSESSMENT EXAMINATION 1

MODULE TITLE: Applied Statistic for Administration DURATION OF EXAM: 45 minutes

LECTURER: Mr. Kevin O'Brien

GRADING SCHEME: 15 marks

INSTRUCTIONS TO CANDIDATES

- This exam will start at 12:05, and will last 45 minutes.
- Each question will be worth either 1 or 2 Marks. There are 15 Marks worth of questions.
- All questions must be attempted (LENS students please see below)
- Write all of your answers in the exam script. Write the script number on any other documents you submit.
- It is your responsibility to return the script to collection box. An audit of scripts will take place immediately after the exam. If your script is account for in that audit, you are deemed to be absent, and will receive no marks.
- **IMPORTANT for LENS Student:** Specifically approved LENS students have to answer any selection of questions that have an aggregate mark of 12 Marks.
 - They may skip any three of the 1-Mark Questions
 - OR - They may skip a 1-Mark Question and a 2-Mark Question
 - The mark will be rescaled by 125 %.
 - They are advised to skip questions that are indicated by an asterisk symbol (“*”), but it is not compulsory that they do so.

Attempt ALL questions

Q1. Theory for Inference Procedures (2 Marks)

Answer the following short questions. Each correct answer will be awarded 1 mark.

- i. (1 Marks)[*] What is meant by a Type I error?
- ii. (1 Marks)[*] What is meant by a Type II error?

Q2. Normal Distribution (5 Marks)

Assume that the diameter of a critical component is normally distributed with a Mean of 100mm and a Standard Deviation of 5mm. You are required to estimate the approximate probability of the following measurements occurring on an individual component.

- i. (1 Mark) Greater than 103mm
- ii. (2 Marks) Less than 94.2 mm
- iii. (2 Marks)[*] Between 94.2 and 103 mm

Use the normal tables to determine the probabilities for the above exercises. You are required to show all of your workings.

(Write Your Answers Here)

Q3. Chi-Square Test (8 Marks)

A market research survey was carried out to assess preferences for three brands of chocolate bar, A, B, and C. The study group was categorised by gender to determine any difference in preferences.

	A	B	C	Total
Females	50	70	80	200
Males	90	50	20	160
Total	140	120	100	360

- i. (1 Mark)[*] Formally state the null and alternative hypotheses.
- ii. (2 Marks) Compute the cell values expected under the null hypothesis. Show your workings for two cells.
- iii. (3 Marks) Compute the Test Statistic.
- iv. (1 Mark)[*] State the appropriate Critical Value for this hypothesis test.
- v. (1 Mark)[*] Discuss your conclusion to this test, supporting your statement with reference to appropriate values.

(Write Your Answers Here)

Formulae and Tables

Critical Values for Dixon Q Test

N	$\alpha = 0.10$	$\alpha = 0.05$	$\alpha = 0.01$
3	0.941	0.970	0.994
4	0.765	0.829	0.926
5	0.642	0.710	0.821
6	0.560	0.625	0.740
7	0.507	0.568	0.680
8	0.468	0.526	0.634
9	0.437	0.493	0.598
10	0.412	0.466	0.568
11	0.392	0.444	0.542
12	0.376	0.426	0.522
13	0.361	0.410	0.503
14	0.349	0.396	0.488
15	0.338	0.384	0.475
16	0.329	0.374	0.463

Critical Values for Chi Square Test

d.f.	$\alpha = 0.10$	$\alpha = 0.05$	$\alpha = 0.01$	$\alpha = 0.001$
1	2.705	3.841	6.634	10.827
2	4.605	5.991	7.378	9.21
3	6.251	7.815	9.348	11.345
4	7.779	9.488	11.143	13.277
5	9.236	11.07	12.833	15.086
6	10.645	12.592	14.449	16.812
7	12.017	14.067	16.013	18.475
8	13.362	15.507	17.535	20.09
9	14.684	16.919	19.023	21.666
10	15.987	18.307	20.483	23.209

Test Statistic for Chi-Square Test

$$\chi_{TS}^2 = \sum \frac{(\text{Observed} - \text{Expected})^2}{\text{Expected}}$$