GWANDA STATE UNIVERSITY

FACULTY OF NATURAL RESOURCES MANAGEMENT AND AGRICULTURE

DEPARTMENT OF HORTICULTURE AND CROP PRODUCTION

BACHELOR OF SCIENCE HONOURS DEGREE IN HORTICULTURE AND CROP PRODUCTION

NHC 1202 INTRODUCTION TO STATISTICS

SECOND SEMESTER EXAMINATION

JUNE 2025

NHC 1202 Introduction to statistics

Time Allowed:	**Three (3) hours**
Total Marks:	**100**
Special Requirements:	**A scientific calculator and a mathematical set.**
Examiner's Name:	**Dr. P. Zanamwe**

INSTRUCTIONS

1. Answer **all** questions in Section A
2. Answer **TWO (2)** questions in Section B
3. Find Appendix 3 for a t- table

MARK ALLOCATION

QUASTION	MARKS
SECTION A	60
SECTION B	40
TOTAL ATTAINABLE MARKS	100

SECTION A: ANSWER ALL QUESTIONS IN SECTION A

QUESTION ONE

a. Explain, giving examples, the difference between parameters and statistics (4 Marks)

b. Explain the following terms, giving specific examples

i. Qualitative variables (5 Marks)

ii. Quantitative variables (5 Marks)

c. Define the following terms as they are used in statistics.

i. Skewness (3 Marks)

ii. Kurtosis (3 Marks)

OUESTION TWO

The number of days in a year that employees in a certain company were away from work due to illness is given in the following table.

Sick days	**Number of employees**
5-6	67
7-8	91
9-10	67
11-12	5

Calculate

i. The mode using the formula $\text{Mode} = \text{I} + [\frac{\text{f1}-\text{f0}}{(\text{f1}-\text{f0})+(\text{f1}-\text{f2})}]\ x\ c$ (5 Marks)

ii. The medium using the formula $Median = l + \left(\frac{\frac{n}{2}-cf}{f}\right) x\ c$ (5 Marks)

iii. Mean using the formula $\bar{x} = \frac{\sum xf}{\sum f}$ (5 Marks)

iv. Variance using the formula $\mathbf{s^2} = \frac{\sum \boldsymbol{f}\ (\boldsymbol{m} - \bar{\boldsymbol{x}})^2}{\boldsymbol{n-1}}$ (5 Marks)

QUESTION THREE

The number of students arriving at a takeaway every 15 minutes is a Poisson random variable with parameter $\lambda = 0.2$.

a. Find the probability

i. that zero arrive at the takeaway (5 Marks)

ii. at most one arrive at the takeaway (5 Marks)

iii. more than two students arrive at the takeaway (5 Marks)

b. Calculate the mean (5 Marks)

SECTION B: ANSWER TWO QUESTIONS IN SECTION B

QUESTION FOUR

The following numbers represent the heights (cm) of 10 plants taken at random from a plot,

72.3, 78.9, 82.6, 71.8, 86.1, 80.5, 72.0, 91.8, 77.3, 88.2

Calculate 95% and 99% confidence intervals for the mean height of all the plants. (20 Marks)

QUESTION FIVE

Two varieties of wheat were tested using two similar plots on eight different farms. One plot on each farm was selected at random to receive variety A, and the other variety B. All plots were planted on the same day and managed identically. The yields (kg/plot) and plot differences are shown in Table 1. Test the null hypothesis that the population mean difference is zero versus the alternative that the mean difference is not equal to zero. (20 Marks)

Table 1. Yields (kg) from plots grown with two wheat varieties on eight farms

Farm	1	2	3	4	5	6	7	8	Total
Variety A	17.8	18.5	12.2	19.7	10.8	11.9	15.6	12.5	119.0
Variety B	14.7	15.2	12.9	18.3	10.1	12.2	13.5	9.9	106.8
Difference (*d*)	3.1	3.3	-0.7	1.4	0.7	-0.3	2.1	2.6	12.2

QUESTION SIX

Discuss the following terms

i. Null hypothesis (5 Marks)

ii. Alternative Hypothesis (6 Marks)

iii. Type 1 error (4 Marks)

iv. Type 11 error (4 Marks)

Appendix 3

Percentage Points of the *t*-distribution

	Percentage in top tail						
df	10	5	2.5	1	0.5	0.1	0.05
1	3.078	6.314	12.71	31.82	63.66	318.3	636.6
2	1.886	2.920	4.303	6.965	9.925	22.33	31.60
3	1.638	2.353	3.182	4.541	5.841	10.21	12.92
4	1.533	2.132	2.776	3.747	4.604	7.173	8.610
5	1.476	2.015	2.571	3.365	4.032	5.894	6.869
6	1.440	1.943	2.447	3.143	3.707	5.208	5.959
7	1.415	1.895	2.365	2.998	3.499	4.785	5.408
8	1.397	1.860	2.306	2.896	3.355	4.501	5.041
9	1.383	1.833	2.262	2.821	3.250	4.297	4.781
10	1.372	1.812	2.228	2.764	3.169	4.144	4.587
11	1.363	1.796	2.201	2.718	3.106	4.025	4.437
12	1.356	1.782	2.179	2.681	3.055	3.930	4.318
13	1.350	1.771	2.160	2.650	3.012	3.852	4.221
14	1.345	1.761	2.145	2.624	2.977	3.787	4.140
15	1.341	1.753	2.131	2.602	2.947	3.733	4.073
16	1.337	1.746	2.120	2.583	2.921	3.686	4.015
17	1.333	1.740	2.110	2.567	2.898	3.646	3.965
18	1.330	1.734	2.101	2.552	2.878	3.610	3.922
19	1.328	1.729	2.093	2.539	2.861	3.579	3.883
20	1.325	1.725	2.086	2.528	2.845	3.552	3.850
21	1.323	1.721	2.080	2.518	2.831	3.527	3.819
22	1.321	1.717	2.074	2.508	2.819	3.505	3.792
23	1.319	1.714	2.069	2.500	2.807	3.485	3.768
24	1.318	1.711	2.064	2.492	2.797	3.467	3.745
25	1.316	1.708	2.060	2.485	2.787	3.450	3.725
26	1.315	1.706	2.056	2.479	2.779	3.435	3.707
27	1.314	1.703	2.052	2.473	2.771	3.421	3.689
28	1.313	1.701	2.048	2.467	2.763	3.408	3.674
29	1.311	1.699	2.045	2.462	2.756	3.396	3.660
30	1.310	1.697	2.042	2.457	2.750	3.385	3.646
35	1.306	1.690	2.030	2.438	2.724	3.340	3.591
40	1.303	1.684	2.021	2.423	2.704	3.307	3.551
50	1.299	1.676	2.009	2.403	2.678	3.261	3.496
60	1.296	1.671	2.000	2.390	2.660	3.232	3.460
80	1.292	1.664	1.990	2.374	2.639	3.195	3.416
100	1.290	1.660	1.984	2.364	2.626	3.174	3.390
120	1.289	1.658	1.980	2.358	2.617	3.160	3.373
∞	1.282	1.645	1.960	2.326	2.576	3.090	3.291

Example: $t_{(9,2.5\%)} = 2.262$ means that the probability of a *t*-value greater than 2.262 is 2.5% for 9 df and the probability of a *t*-value outside the range -2.262 to $+2.262$ is 5% for 9 df.