



**COLLEGE OF AGRICULTURE, FISHERIES & FORESTRY
SCHOOL OF AGRICULTURAL SCIENCES
DEPARTMENT OF ADMINISTRATION:
AGRICULTURAL ENGINEERING AND STATISTICS**

**Trade Diploma in Agriculture - Year II
Trade Diploma in Applied Fisheries – Year II**

AGS 501: AGRICULTURAL STATISTICS

FINAL EXAMINATION – TRIMESTER 1, 2017

*Time Allowed: 3 hours plus 10 minutes reading
Total marks: 100*

INSTRUCTIONS

1. This paper contains **three** sections and **10** pages.
2. Answer all questions in the Answer Booklet provided.
3. Make sure to indicate your **identification number** in all pages you use.
4. You can use permitted calculators.
5. Statistical Tables are attached with list of formulae.
6. This exam is worth 50% of your overall mark.

SECTION A	20 MULTIPLE CHOICE QUESTIONS	20 MARKS
SECTION B	PART I: 10 TRUE/FALSE QUESTIONS PART II: 10 FILL IN THE BLANKS	10 MARKS 10 MARKS
SECTION C	5 LONG ANSWER QUESTIONS	60 MARKS

SECTION A:**MULTIPLE CHOICE****(20 MARKS)**

This section consists of 20 multiple choice questions worth 1 mark each. Write the letter of your best answer clearly in the Answer Booklet provided.

1. If you classified a quality of fruit as “Excellent”, “Good”, “Satisfactory” and “Poor”, this would be an example of which level of measurement?
(A) Ordinal (B) Nominal (C) Ratio (D) Interval
2. Which of the following is **not** a basic method to obtain samples?
(A) stratified (B) cluster
(C) random (D) irregular
3. The ‘number of lemons AGS501 students have picked during their practical classes’ is an example of which type of variable?
(A) a continuous variable (B) a discrete variable
(C) a qualitative variable (D) a categorical variable
4. A Statistics Lecturer at FNU is interested in the mean number of days an AGS501 student is absent from tutorial classes. She takes her sample by gathering data on 15 randomly selected students from AGS501 unit. The type of sampling she used is:
(A) Cluster sampling (B) Stratified sampling
(C) Random sampling (D) Systematic sampling
5. The process of collection, organization, summarization and analyzing are :
(A) Descriptive statistics (B) Inferential Statistics
(C) Inductive Reasoning (D) Inductive Statistics
6. What are the boundaries of 2.2 – 3.2 ounces?
(A) 2.7 – 3.7 ounces (B) 1.7 – 3.7 ounces
(C) 2.25 - 3.25 ounces (D) 2.15 – 3.25 ounces
7. What is another name for Ogive?
(A) Histogram
(B) Frequency Polygon
(C) Cumulative Frequency Graph
(D) Stem and Leaf Plot
8. Except for rounding errors, relative frequencies should add up to what sum?
(A) 0 (B) 1 (C) 50 (D) 100

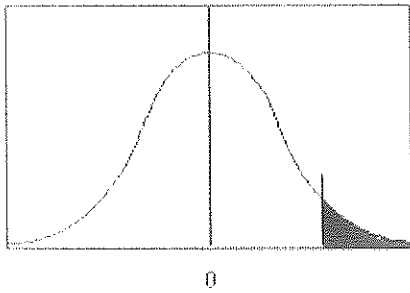
9. Which is the best measure of central tendency with outliers in the data set?
- (A) Mean (B) Median (C) Mode (D) Range
10. What is the special name given when two values are repeated same number of times in a data set?
- (A) no mode
 (B) unimode
 (C) bimode
 (D) trimode
11. The advantage of stem and leaf plots over grouped frequency distribution is that it
- (A) is more reliable.
 (B) can be used when there are lots of data values.
 (C) is a more systematic way to organize data.
 (D) can retain the actual data while showing them in graphical form.
12. Let X be the number of days per week that 20 AGS501 students do a 30 minute work on the Koronivia Farm.

X	Number of Students
0	1
1	1
2	2
3	2
4	4
5	7
6	3

The mean is:

- (A) 4 (B) 3 (C) 2 (D) 1
13. If the mode is to the left of the median and the mean is to the right of the median, then the distribution is:
- (A) Right skewed
 (B) Left skewed
 (C) Symmetrical
 (D) Uniformed
14. When the value of α is increased, the probability of committing a type I error is
- (A) Decreased (B) Increased (C) The same (D) None of the above

15. Which type of alternative hypothesis is used in the figure below?



- (A) $H_1: \mu = k$ (B) $H_1: \mu \neq k$ (C) $H_1: \mu > k$ (D) $H_1: \mu < k$

16. If you wish to test the claim that the mean of the population is 100, the appropriate null hypothesis is

- (A) $\mu = 100$
 (B) $\mu \leq 100$
 (C) $\mu \geq 100$
 (D) $\mu \neq 100$

17. For the t-test, the sample size, n is

- (A) $n=30$ (B) $n \leq 30$ (C) $n \geq 30$ (D) $n < 30$

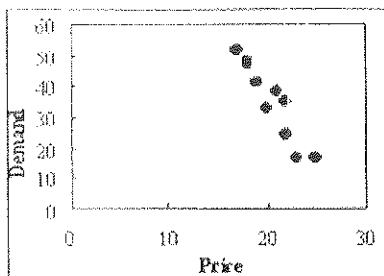
18. The coefficient of determination, r^2 , is in the range:

- (A) $0 < r^2 < 1$ (B) $-1 < r^2 < 1$
 (C) $0 \leq r^2 \leq 1$ (D) $-1 \leq r^2 \leq 1$

19. In regression, the variable being predicted is usually referred to as the

- (A) independent variable (B) dependent variable
 (C) coefficient of correlation (D) coefficient of determination

20. The following scatter plot indicates



- (A) strong positive correlation (B) no correlation
 (C) positive correlation (D) negative correlation

SECTION B:**(20 MARKS)****Part I:****True/False Questions****(10 marks)**

In the Answer Booklet provided write True or False as answers for the following questions.

1. The variable temperature has an Interval Level of measurement.
2. It is important to keep the width of each class the same in a frequency distribution.
3. In construction of an Ogive, the class limits are used for the x-axis.
4. When the mean is computed for individual data, all values in the data set are not used.
5. An outlier affects the mean more than the median.
6. The symbol for population standard deviation is μ .
7. The positive square root of the variance is called standard deviation.
8. An error is committed when the null hypothesis is false and it is rejected.
9. The critical value (CV) separates the rejection region from the non-rejection region.
10. A correlation coefficient of +1 implies a strong positive linear relationship between the variables.

Part II:**Fill in the Blanks****(10 marks)**

Fill in the blanks with (word(s)/phrase/symbol/letter) the appropriate answer in the Answer Booklet.

1. A group of plants selected from the group of all plants under study is called a _____.
2. The three types of frequency distributions are Categorical, _____ and Grouped.
3. Picking every 15th cabbage plant from a large plot for study would be an example of _____ sampling.
4. Two major branches of statistics are _____ and Inferential.
5. A measure obtained from all data values in a population is called a population _____.
6. The symbol for population mean is _____.
7. An extremely high or extremely low data value is called an _____.

8. To test the claim “mean is greater than 87” you would use a (left/right/two)-tailed test.
9. The range of values for correlation coefficient ‘ r ’ is from _____ to _____.
10. Regression line is also called the Line of _____.

SECTION C: LONG ANSWER QUESTIONS (60 MARKS)

This section consists of 5 long answer questions worth 12 marks each. Write your answers in the Answer Booklet provided. Show all necessary working as partial marks will be awarded to partially correct answers.

QUESTION 1 *Start on a new page* [6+4+2 = 12 marks]

A sample of 20 tomato plant heights (in nearest centimeters) was taken by students in Agricultural Statistics class.

Here are the results:

24 27 28 33 36 37 39 39 40 40
41 43 44 45 47 48 53 57 59 63

- (i) Construct a frequency distribution for these data using 6 classes.
(ii) Draw a histogram and a frequency polygon on the same pair of axes.
(iii) Draw an Ogive graph.

QUESTION 2 *Start on a new page* [2+2+1+2+2+2+1= 12 marks]

The following table gives the grouped frequency distribution of the number of fish caught by 40 Fishermen in a village in a fortnight fishing trip.

No. of Fish	40-70	70-100	100-130	130-160	160-190
Fishermen	7	10	13	7	3

Calculate the following:

- (i) Mean
(ii) Median
(iii) Mode
(iv) Variance
(v) Standard Deviation
(vi) Coefficient of Variation
(vii) Skewness

QUESTION 3*Start on a new page***[3+(1+2+1+1)+4 = 12 marks]**

The result on the grain yield of paddy (kg/plot) under the ammonium chloride treatment is given below:

14.5 11.9 11.2 12.8 14.0 15.3 14.2 12.6 10.0 16.2

- A. Draw a stem and leaf plot for the data above.
- B. Calculate the following:
- Range
 - Median, Q_2 .
 - Lower quartile, Q_1 .
 - Upper quartile, Q_3 .
- C. Calculate the Mean Deviation.

QUESTION 4*Start on a new page***[6+6 = 12 marks]**

- A. From a field of Co.33 paddy, a sample of 40 plants was selected at random. From these plants the panicle lengths were observed. The mean and standard deviation of these measurements were 18.7cm, and 1.25cm, respectively. Test at 2.5% level of significance whether the mean length of panicle of Co.33 paddy is greater than 19cm.
- B. Ten plants are chosen from a population at random whose heights in inches are given below:

51 54 58 62 63 65 68 69 70 72

At $\alpha = 0.05$, test the claim that the mean heights of plants is 60 inches.

QUESTION 5*Start on a new page***[4+3+3+2 = 12 marks]**

A group of Agricultural Statistics students for a survey recorded their height (in centimeters) (x) and weight (in kilograms) (y) as shown in the following table:

Student height (in cm), x	158	162	170	154	167	177	170	179	179	163
Student weight (in kg), y	48	57	60	45	55	62	65	70	68	57

- Compute the value of the correlation coefficient, r , and interpret.
- Calculate the coefficient of determination, r^2 , and interpret what it means.
- Find the regression line equation.
- Predict the student weight, y , when the student height, x , is 185cm.

THE END

LIST OF FORMULAE:

1. Sample mean, $\bar{X} = \frac{\sum f \cdot X_m}{n}$

2. Sample variance, $s^2 = \frac{\sum f(X_m - \bar{X})^2}{n - 1}$

3. Median: $MD = l + \frac{N/2 - m}{f} \times c$

4. Coefficient of Variation = $\frac{\text{Standard Deviation}}{\text{Mean}}$

5. Correlation coefficient, $r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{n(\sum x^2) - (\sum x)^2} \cdot \sqrt{n(\sum y^2) - (\sum y)^2}}$

6. The regression line $y' = a + bx$, where

$$a = \frac{(\sum y)(\sum x^2) - (\sum x)(\sum xy)}{n(\sum x^2) - (\sum x)^2}; \quad b = \frac{n(\sum xy) - (\sum x)(\sum y)}{n(\sum x^2) - (\sum x)^2}$$

7. $z = \frac{\bar{X} - \mu}{\sigma / \sqrt{n}}$

8. $t = \frac{\bar{X} - \mu}{s / \sqrt{n}}$

TABLE 1: The t-Distribution Table

The entries in this table give the critical values of *t* for the specified number of degrees of freedom and areas in the right tail.



<i>df</i>	Area in the Right Tail under the <i>t</i> Distribution Curve					
	.10	.05	.025	.01	.005	.001
1	3.078	6.314	12.706	31.821	63.657	318.309
2	1.886	2.920	4.303	6.965	9.925	27.327
3	1.638	2.353	3.182	4.541	5.841	10.215
4	1.533	2.132	2.776	3.747	4.604	7.173
5	1.476	2.015	2.571	3.365	4.032	5.893
6	1.440	1.943	2.447	3.143	3.707	5.208
7	1.415	1.895	2.365	2.998	3.499	4.785
8	1.397	1.860	2.306	2.896	3.355	4.501
9	1.383	1.833	2.262	2.821	3.250	4.297
10	1.377	1.812	2.238	2.764	3.169	4.144
11	1.365	1.796	2.201	2.718	3.106	4.025
12	1.356	1.782	2.179	2.681	3.055	3.930
13	1.350	1.771	2.160	2.650	3.012	3.852
14	1.345	1.761	2.145	2.624	2.977	3.787
15	1.341	1.753	2.131	2.602	2.947	3.733
16	1.337	1.746	2.120	2.583	2.921	3.686
17	1.333	1.740	2.110	2.567	2.898	3.646
18	1.330	1.734	2.101	2.552	2.878	3.610
19	1.328	1.729	2.093	2.539	2.861	3.579
20	1.325	1.725	2.086	2.528	2.845	3.552
21	1.323	1.721	2.080	2.518	2.831	3.527
22	1.321	1.717	2.074	2.508	2.819	3.505
23	1.319	1.714	2.069	2.500	2.807	3.485
24	1.318	1.711	2.064	2.492	2.797	3.467
25	1.316	1.708	2.060	2.485	2.787	3.450
26	1.315	1.706	2.056	2.479	2.779	3.435
27	1.313	1.704	2.052	2.473	2.771	3.421
28	1.312	1.701	2.048	2.467	2.763	3.408
29	1.311	1.699	2.045	2.462	2.756	3.396
30	1.310	1.697	2.042	2.457	2.750	3.385
31	1.309	1.695	2.040	2.453	2.744	3.374
32	1.308	1.693	2.037	2.449	2.738	3.363
33	1.308	1.692	2.035	2.445	2.733	3.353
34	1.307	1.691	2.033	2.441	2.728	3.343
35	1.306	1.690	2.030	2.438	2.723	3.333

TABLE 2: Areas under Standard Normal Probability Curve (Source: Eton Table)

z	Area under the curve										Area to the left of z								
	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359	4	5	12	16	20	24	28	32	36
0.1	0.5038	0.5078	0.5118	0.5157	0.5197	0.5236	0.5276	0.5315	0.5354	0.5394	4	5	12	16	20	24	28	32	36
0.2	0.5075	0.5115	0.5154	0.5193	0.5232	0.5271	0.5310	0.5349	0.5388	0.5427	4	5	12	15	19	22	27	31	35
0.3	0.5112	0.5151	0.5190	0.5228	0.5267	0.5305	0.5343	0.5381	0.5419	0.5457	4	5	11	15	19	22	26	30	34
0.4	0.5150	0.5188	0.5226	0.5264	0.5301	0.5339	0.5376	0.5413	0.5450	0.5487	6	7	11	14	18	22	25	29	33
0.5	0.5188	0.5225	0.5262	0.5299	0.5336	0.5372	0.5408	0.5444	0.5479	0.5514	5	7	10	14	17	21	24	27	31
0.6	0.5226	0.5262	0.5298	0.5334	0.5369	0.5404	0.5439	0.5474	0.5509	0.5543	3	6	10	13	16	19	23	26	29
0.7	0.5264	0.5299	0.5334	0.5369	0.5403	0.5438	0.5472	0.5506	0.5540	0.5574	3	6	9	12	15	18	21	24	27
0.8	0.5299	0.5334	0.5368	0.5402	0.5436	0.5469	0.5503	0.5536	0.5569	0.5602	3	6	8	11	14	17	20	23	26
0.9	0.5334	0.5368	0.5401	0.5434	0.5467	0.5499	0.5532	0.5564	0.5596	0.5628	3	5	8	10	13	16	18	20	23
1.0	0.5374	0.5406	0.5438	0.5469	0.5500	0.5531	0.5561	0.5591	0.5621	0.5651	2	5	7	9	11	14	16	18	21
1.1	0.5413	0.5444	0.5475	0.5505	0.5535	0.5565	0.5595	0.5625	0.5654	0.5684	7	9	6	8	10	12	14	16	19
1.2	0.5450	0.5480	0.5510	0.5540	0.5569	0.5599	0.5628	0.5657	0.5686	0.5715	2	4	5	7	9	11	13	15	18
1.3	0.5487	0.5516	0.5545	0.5574	0.5603	0.5632	0.5661	0.5689	0.5718	0.5746	2	4	5	6	8	10	11	13	16
1.4	0.5524	0.5552	0.5580	0.5608	0.5636	0.5664	0.5692	0.5720	0.5747	0.5775	1	3	4	5	7	9	11	13	16
1.5	0.5560	0.5588	0.5615	0.5643	0.5670	0.5697	0.5724	0.5751	0.5778	0.5805	1	2	3	4	6	8	10	11	14
1.6	0.5596	0.5623	0.5650	0.5677	0.5704	0.5730	0.5757	0.5783	0.5810	0.5836	1	2	3	4	5	7	9	11	13
1.7	0.5632	0.5658	0.5684	0.5710	0.5736	0.5762	0.5787	0.5813	0.5839	0.5864	1	2	3	4	5	6	8	10	12
1.8	0.5668	0.5693	0.5718	0.5743	0.5768	0.5793	0.5818	0.5843	0.5868	0.5893	1	1	2	3	4	5	6	8	10
1.9	0.5704	0.5728	0.5752	0.5776	0.5800	0.5824	0.5848	0.5872	0.5896	0.5920	1	1	2	2	3	4	5	6	8
2.0	0.5740	0.5764	0.5787	0.5811	0.5834	0.5857	0.5880	0.5903	0.5926	0.5948	0	1	1	2	2	3	4	4	6
2.1	0.5774	0.5797	0.5820	0.5843	0.5865	0.5888	0.5910	0.5932	0.5954	0.5976	0	1	1	2	2	3	3	4	5
2.2	0.5808	0.5830	0.5852	0.5874	0.5896	0.5917	0.5938	0.5959	0.5979	0.5999	0	1	1	1	2	2	3	3	4
2.3	0.5841	0.5862	0.5883	0.5904	0.5925	0.5945	0.5965	0.5985	0.6005	0.6025	0	0	1	1	1	2	2	2	3
2.4	0.5874	0.5894	0.5914	0.5934	0.5954	0.5973	0.5992	0.6011	0.6030	0.6049	0	0	1	1	1	1	2	2	2
2.5	0.5906	0.5925	0.5944	0.5963	0.5982	0.6000	0.6019	0.6037	0.6055	0.6073	0	0	0	1	1	1	1	1	1
2.6	0.5937	0.5955	0.5973	0.5991	0.6009	0.6026	0.6043	0.6060	0.6077	0.6094	0	0	0	0	0	1	1	1	1
2.7	0.5967	0.5984	0.6001	0.6018	0.6035	0.6052	0.6068	0.6084	0.6100	0.6116	0	0	0	0	0	0	0	0	1
2.8	0.5996	0.6012	0.6028	0.6044	0.6059	0.6075	0.6090	0.6105	0.6120	0.6135	0	0	0	0	0	0	0	0	1
2.9	0.6025	0.6040	0.6055	0.6070	0.6085	0.6100	0.6114	0.6129	0.6143	0.6157	0	0	0	0	0	0	0	0	1
3.0	0.6054	0.6068	0.6082	0.6096	0.6109	0.6123	0.6136	0.6149	0.6162	0.6175	0	0	0	0	0	0	0	0	1
3.1	0.6082	0.6095	0.6108	0.6121	0.6134	0.6146	0.6158	0.6170	0.6182	0.6194	0	0	0	0	0	0	0	0	0
3.2	0.6099	0.6111	0.6123	0.6135	0.6146	0.6157	0.6168	0.6179	0.6190	0.6201	0	0	0	0	0	0	0	0	0
3.3	0.6115	0.6126	0.6137	0.6147	0.6157	0.6167	0.6177	0.6187	0.6197	0.6207	0	0	0	0	0	0	0	0	0
3.4	0.6131	0.6141	0.6151	0.6161	0.6170	0.6179	0.6188	0.6197	0.6206	0.6215	0	0	0	0	0	0	0	0	0
3.5	0.6146	0.6155	0.6164	0.6173	0.6182	0.6190	0.6199	0.6207	0.6215	0.6223	0	0	0	0	0	0	0	0	0
3.6	0.6159	0.6167	0.6175	0.6183	0.6191	0.6199	0.6206	0.6214	0.6221	0.6228	0	0	0	0	0	0	0	0	0
3.7	0.6171	0.6179	0.6186	0.6193	0.6200	0.6207	0.6214	0.6221	0.6227	0.6234	0	0	0	0	0	0	0	0	0
3.8	0.6183	0.6190	0.6196	0.6203	0.6209	0.6215	0.6221	0.6227	0.6232	0.6238	0	0	0	0	0	0	0	0	0
3.9	0.6194	0.6200	0.6206	0.6212	0.6217	0.6223	0.6228	0.6233	0.6238	0.6243	0	0	0	0	0	0	0	0	0
4.0	0.6205	0.6210	0.6215	0.6220	0.6225	0.6230	0.6235	0.6240	0.6245	0.6250	0	0	0	0	0	0	0	0	0

