



**COLLEGE OF AGRICULTURE, FISHERIES & FORESTRY**  
*SCHOOL OF AGRICULTURAL SCIENCE AND FORESTRY*  
**DEPARTMENT OF SOIL SCIENCE & AGRIL. ENGINEERING**

**FINAL EXAMINATION: 2018**

**Trade Diploma in Agriculture / Trade Diploma in Applied Fisheries - Year 2**

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**AGS 501: AGRICULTURAL STATISTICS**

**FINAL EXAMINATION – TRIMESTER 1, 2018**

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

**INSTRUCTIONS**

1. This paper consists of **three** sections and **11** 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.

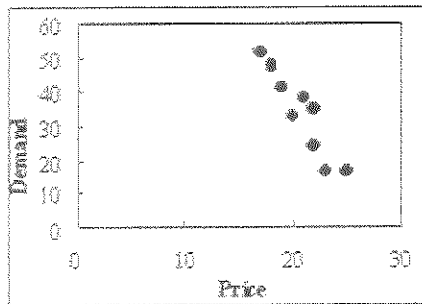
<b>SECTION A</b>	MULTIPLE CHOICE QUESTIONS	12 MARKS
<b>SECTION B</b>	PART I: TRUE/FALSE QUESTIONS	12 MARKS
	PART II: FILL IN THE BLANKS	12 MARKS
	PART III: MATCHING QUESTIONS	12 MARKS
<b>SECTION C</b>	LONG ANSWER QUESTIONS	52 MARKS

**SECTION A:****Multiple Choice****(8 x 1.5 = 12 marks)**

This section consists of 8 multiple choice questions worth 1.5 mark each. Write the letter corresponding to the best answer in the Answer Booklet provided.

1. The 'number of dairy cows in Uni Farm' is an example of which type of variable?  
(A) a discrete variable  
(B) a continuous variable  
(C) a qualitative variable  
(D) none of the above
2. Which of the following is the best measure of central tendency with outliers in the data set?  
(A) Mean  
(B) Median  
(C) Mode  
(D) Average
3. What are the boundaries for 8.6 – 8.8?  
(A) 8 - 9  
(B) 8.5 – 8.9  
(C) 8.55 – 8.85  
(D) 8.65 – 8.75
4. What is another name for Ogive?  
(A) Histogram  
(B) Frequency Polygon  
(C) Relative Frequency Graph  
(D) Cumulative Frequency Graph
5. Except for rounding errors, relative frequencies should add up to what sum?  
(A) 0  
(B) 1  
(C) 50  
(D) 100
6. When a distribution is bell-shaped, approximately what percentage of data values will fall within 1 standard deviation of the mean?  
(A) 50%  
(B) 68%  
(C) 95%  
(D) 99.7%

7. The following scatter plot indicates :



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

8. Assigning of treatments or factors to be tested to the experimental units according to definite laws or probability is technically known as

- (A) Randomization                                      (B) Replication  
(C) Local Control                                        (D) Experimentation

### SECTION B:

**Part I:**                                      **True/False Questions**                                      **(8 x 1.5 = 12 marks)**

In the Answer Booklet provided write true or false for the following questions.

1. The variable temperature is an example of a quantitative variable.
2. It is not important to keep the width of each class the same in a frequency distribution.
3. In construction of a frequency polygon, 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 used.
5. The positive square root of the variance is called standard deviation.
6. No error is committed when the null hypothesis is rejected when it is false.
7. The test value separates the rejection region from the acceptance region.
8. A correlation coefficient of +1 implies a strong positive linear relationship between the variables.

**Part II:****Fill in the Blanks****(8 x 1.5 = 12 marks)**

Fill in the blanks with 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 \_\_\_\_\_, Ungrouped and Grouped.
3. Picking every 10<sup>th</sup> animal from a large area for study would be an example of \_\_\_\_\_ sampling.
4. Two major branches of statistics are Descriptive and \_\_\_\_\_.
5. A measure obtained from sample data is called a sample \_\_\_\_\_.
6. The symbol for population standard deviation is \_\_\_\_\_.
7. The range of 'r' is from \_\_\_\_\_ to \_\_\_\_\_.
8. The regression line is also called the \_\_\_\_\_.

**Part III:****Matching Questions****(8 x 1.5 = 12 marks)**

**Agricultural Statistics uses formulas with the associated names. Match the following names correctly with the formulas on the right.**

1.	Ungrouped sample mean	A.	$\frac{\sum f(X - \mu)^2}{N}$
2.	Grouped Population mean	B.	$\frac{N + 1}{2}$
3.	Grouped Sample variance	C.	$\frac{f}{N}$
4.	Ungrouped Population variance	D.	$\frac{\sum fX_m}{N}$
5.	Sample size	E.	$\frac{\sum fX}{n}$
6.	Coefficient of Variation	F.	$n$
7.	Relative Frequency	G.	$\frac{\sum f(X_m - \bar{X})^2}{n - 1}$
8.	Ungrouped median	H.	$\frac{s}{\bar{X}} \times 100$

**SECTION C:****LONG ANSWER QUESTIONS****(52 MARKS)**

This section consists of 5 long answer questions. 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***[2+2+2+2+2=10 marks]**

The data shown here represent the number of kilogram for tomatoes harvested by 30 selected farmers in Nausori.

12	17	12	14	16	18
16	18	12	16	17	15
15	16	12	15	16	16
12	14	15	12	15	15
19	13	16	18	16	14

- Were the data obtained from a population or a sample? Explain your answer.
- What was the lowest yield of the farmers?
- What was the maximum yield of the farmers?
- Construct an ungrouped frequency distribution for the data.
- Draw a histogram for the data.

**QUESTION 2****[4+2+4+2=12 marks]**

The following data give the marks of 21 AGS501 students at FNU CAFF.

41	54	22	28	31	39	58
63	48	67	47	58	37	26
55	61	47	59	36	48	54

- Construct a frequency distribution table. Take 5 classes.
- Calculate the relative frequencies and percentages for all classes.
- Construct a frequency polygon for the frequency distribution.
- Construct an Ogive.

**QUESTION 3****[2x5 = 10 marks]**

The following table gives the grouped frequency distribution of the amounts of grower (in kg) fed for a sample of 50 pigs.

Grower (kg)	40-70	70-100	100-130	130-160	160-190
Frequency	9	11	16	10	4

Calculate the following:

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

**QUESTION 4****[ 8 marks]**

Eight animals were fed on diet A and other set of eight on B.

The gain in weight (in Kg) due to these diets are given below:-

Gain in wt. on diet A	25	29	27	33	24	24	13	32
Gain in wt. on diet B	44	34	22	47	31	40	30	32

Discuss the superiority of either diet.

**QUESTION 5****[6+6=12 marks]**

A lecturer wishes to know whether there is any relationship between the marks obtained by students in Agriculture(x) and Statistics(y). The following table shows the 8 students with their results for a given test in both subjects:

Student	A	B	C	D	E	F	G	H
Agriculture	25	30	32	35	37	40	42	45
Statistics	8	10	15	17	20	22	24	25

- A. Compute the value of the correlation coefficient and interpret.
- B. Determine the regression line equation.
- C. Estimate the Agriculture mark 'x', when Statistics mark 'y' is 35.

**THE END**

**LIST OF FORMULAE:**

1.  $\bar{X} = \frac{\sum f \cdot X_m}{n}$  and  $S^2 = \frac{\sum f(X_m - \bar{X})^2}{n-1}$

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

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

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

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

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

5.  $z = \frac{\bar{X} - \mu}{\sigma/\sqrt{n}}; \quad t = \frac{\bar{X} - \mu}{s/\sqrt{n}}$

6. Binomial:

$$b(x, n, p) = \binom{n}{x} \cdot p^x \cdot (1-p)^{n-x}$$

7. Poisson:

$$P(x, \mu) = \frac{\mu^x \cdot (e^{-\mu})}{x!}; e = 2.71828$$

8.

$$9. \quad S_B^2 = \frac{\sum n_i (\bar{X}_i - \bar{X}_{GM})^2}{k-1},$$

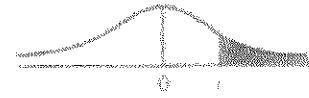
$$S_W^2 = \frac{\sum (n_i - 1) S_i^2}{\sum (n_i - 1)},$$

$$F = \frac{S_B^2}{S_W^2}$$

10.  $\chi^2 = \sum \frac{(O-E)^2}{E}; df = (r-1)(c-1)$

**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.



df	Area in the Right Tail under the $t$ 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	22.327
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	3.358	4.501
9	1.383	1.833	2.262	2.821	3.250	4.297
10	1.372	1.812	2.228	2.764	3.169	4.144
11	1.363	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
20	1.328	1.729	2.093	2.539	2.861	3.579
25	1.325	1.725	2.086	2.528	2.845	3.553
30	1.324	1.721	2.080	2.518	2.831	3.527
40	1.321	1.717	2.074	2.508	2.819	3.505
50	1.319	1.714	2.069	2.500	2.807	3.485
60	1.318	1.711	2.064	2.492	2.797	3.467
70	1.316	1.709	2.060	2.485	2.787	3.450
80	1.315	1.708	2.056	2.479	2.779	3.435
90	1.314	1.707	2.052	2.473	2.771	3.421
100	1.313	1.706	2.049	2.467	2.764	3.408
120	1.311	1.704	2.045	2.462	2.756	3.396
140	1.310	1.703	2.041	2.457	2.750	3.385
160	1.309	1.702	2.040	2.453	2.744	3.375
180	1.309	1.701	2.037	2.449	2.738	3.366
200	1.308	1.700	2.035	2.445	2.733	3.356
250	1.307	1.699	2.033	2.441	2.728	3.348
300	1.306	1.698	2.031	2.438	2.724	3.340

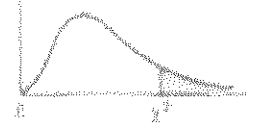


TABLE 2: Areas under Standard Normal Probability Curve (Source: Eton Table)

z	Area to the Left of z										Area to the Right of z								
	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359	4	3	2	16	20	24	28	32	36
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0754	3	2	1	15	19	23	27	31	35
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141	2	1	0	14	18	22	26	30	34
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517	1	0	0	13	17	21	25	29	33
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879	0	0	0	12	16	20	24	28	32
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224	0	0	0	11	15	19	23	27	31
0.6	.2258	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2518	.2549	0	0	0	10	14	18	22	26	30
0.7	.2580	.2612	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852	0	0	0	9	13	17	21	25	29
0.8	.2881	.2910	.2939	.2967	.2996	.3023	.3051	.3078	.3106	.3133	0	0	0	8	12	16	20	24	28
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389	0	0	0	7	11	15	19	23	27
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621	0	0	0	6	10	14	18	22	26
1.1	.3643	.3665	.3686	.3707	.3729	.3749	.3770	.3790	.3810	.3830	0	0	0	5	9	13	17	21	25
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015	0	0	0	4	8	12	16	20	24
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177	0	0	0	3	7	11	15	19	23
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319	0	0	0	2	6	10	14	18	22
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441	0	0	0	1	5	9	13	17	21
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545	0	0	0	0	4	8	12	16	20
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633	0	0	0	0	3	7	11	15	19
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706	0	0	0	0	2	6	10	14	18
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767	0	0	0	0	1	5	9	13	17
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817	0	0	0	0	0	4	8	12	16
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857	0	0	0	0	0	3	7	11	15
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890	0	0	0	0	0	2	6	10	14
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916	0	0	0	0	0	1	5	9	13
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936	0	0	0	0	0	0	4	8	12
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952	0	0	0	0	0	0	3	7	11
2.6	.4953	.4955	.4956	.4957	.4958	.4960	.4961	.4962	.4963	.4964	0	0	0	0	0	0	2	6	10
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974	0	0	0	0	0	0	1	5	9
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981	0	0	0	0	0	0	0	4	8
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986	0	0	0	0	0	0	0	3	7
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990	0	0	0	0	0	0	0	2	6
3.1	.4990	.4991	.4991	.4991	.4992	.4992	.4992	.4992	.4993	.4993	0	0	0	0	0	0	0	1	5
3.2	.4993	.4993	.4994	.4994	.4994	.4994	.4994	.4995	.4995	.4995	0	0	0	0	0	0	0	0	4
3.3	.4995	.4995	.4995	.4996	.4996	.4996	.4996	.4996	.4996	.4997	0	0	0	0	0	0	0	0	3
3.4	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4998	0	0	0	0	0	0	0	0	2
3.5	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	0	0	0	0	0	0	0	0	1
3.6	.4998	.4998	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	0	0	0	0	0	0	0	0	0
3.7	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	0	0	0	0	0	0	0	0	0
3.8	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	0	0	0	0	0	0	0	0	0
3.9	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	0	0	0	0	0	0	0	0	0

**TABLE 3: The Chi-Distribution Table**

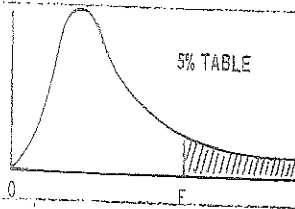
The entries in this table give the critical values of  $\chi^2$  for the specified number of degrees of freedom and areas in the right tail.



df	Area in the Right Tail under the Chi-square Distribution Curve									
	.995	.990	.975	.950	.900	.800	.700	.600	.500	.400
1	0.000	0.000	0.001	0.004	0.016	0.708	3.841	5.024	6.635	7.879
2	0.010	0.020	0.051	0.103	0.211	4.605	5.991	7.378	9.210	10.591
3	0.072	0.113	0.216	0.352	0.584	6.251	7.879	9.348	11.344	12.838
4	0.207	0.297	0.484	0.711	1.064	7.779	9.488	11.143	12.737	14.860
5	0.412	0.554	0.853	1.235	1.840	9.236	11.070	12.833	14.860	16.750
6	0.676	0.872	1.237	1.635	2.204	10.645	12.592	14.449	16.812	18.548
7	0.989	1.239	1.690	2.167	2.833	12.017	14.067	16.013	18.475	20.278
8	1.244	1.646	2.180	2.733	3.490	13.362	15.507	17.535	20.090	21.954
9	1.735	2.088	2.700	3.329	4.168	14.684	16.919	19.023	21.666	23.589
10	2.156	2.558	3.247	3.940	4.865	15.987	18.307	20.483	23.209	25.188
11	2.603	3.053	3.816	4.575	5.578	17.275	19.675	21.920	24.725	26.754
12	3.078	3.571	4.404	5.226	6.304	18.549	21.026	23.337	26.217	28.304
13	3.569	4.107	5.000	5.892	7.042	19.812	22.362	24.736	27.688	29.819
14	4.075	4.660	5.624	6.571	7.790	21.064	23.685	26.119	29.141	31.319
15	4.601	5.229	6.262	7.261	8.547	22.302	25.000	27.488	30.578	32.801
16	5.142	5.812	6.920	7.962	9.312	23.542	26.296	28.845	32.000	34.267
17	5.697	6.408	7.594	8.672	10.085	24.769	27.587	30.191	33.409	35.718
18	6.265	7.015	8.283	9.390	10.865	25.989	28.869	31.526	34.805	37.156
19	6.844	7.633	8.987	10.117	11.651	27.204	30.144	32.852	36.191	38.582
20	7.434	8.260	9.691	10.851	12.443	28.412	31.410	34.170	37.566	39.997
21	8.034	8.897	10.403	11.591	13.240	29.615	32.671	35.479	38.932	41.401
22	8.643	9.542	11.113	12.338	14.041	30.813	33.924	36.781	40.289	42.796
23	9.260	10.196	11.840	13.041	14.848	32.007	35.172	38.079	41.638	44.181
24	9.884	10.856	12.571	13.748	15.659	33.196	36.414	39.364	42.980	45.556
25	10.523	11.524	13.305	14.459	16.474	34.382	37.651	40.646	44.314	46.922
26	11.166	12.198	14.044	15.173	17.292	35.563	38.883	41.923	45.642	48.279
27	11.813	12.879	14.771	15.891	18.114	36.741	40.113	43.193	46.963	49.617
28	12.461	13.563	15.500	16.612	18.940	37.916	41.337	44.451	48.278	50.937
29	13.121	14.250	16.231	17.336	19.768	39.087	42.557	45.721	49.583	52.240
30	13.787	14.941	16.964	18.033	20.599	40.256	43.777	46.979	50.892	53.572
40	20.707	21.664	24.433	26.560	29.153	51.805	55.758	59.342	63.691	68.706
50	27.991	29.797	32.907	34.764	37.566	63.167	67.505	71.420	76.154	80.982
60	35.534	37.481	40.482	43.188	45.989	74.397	79.082	83.298	88.379	93.027
70	43.275	45.442	48.758	51.736	54.578	85.527	90.531	95.023	100.425	105.213
80	51.172	53.640	57.153	60.391	63.238	96.578	101.879	106.629	112.329	117.171
90	59.196	61.754	65.657	69.156	71.979	107.565	113.145	118.136	124.116	128.999
100	67.328	70.065	74.222	77.929	80.756	118.498	124.342	129.561	135.807	140.169

TABLE 4: F-DISTRIBUTION

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The tabulated value is the value of F with  $v_1, v_2$  degrees of freedom which is exceeded with a probability of 5%.  
 e.g.  $P\{F_{13,7} > 3.5103\} = 5\%$ .

For other notes see 1st table

$v_1$	1	2	3	4	5	6	7	8	9	10	12	15	20	30	60	$\infty$
1	161.45	199.50	215.71	224.58	230.16	233.99	236.77	238.88	240.54	241.88	243.91	245.95	248.01	250.09	252.20	254.32
2	18.513	19.000	19.164	19.247	19.296	19.330	19.353	19.371	19.385	19.396	19.413	19.429	19.446	19.462	19.479	19.496
3	10.128	9.5521	9.2766	9.1172	9.0135	8.9406	8.8868	8.8452	8.8123	8.7855	8.7446	8.7029	8.6602	8.6166	8.5720	8.5265
4	7.7086	6.9443	6.5914	6.3883	6.2560	6.1631	6.0942	6.0410	5.9988	5.9644	5.9117	5.8578	5.8025	5.7459	5.6878	5.6281
5	6.6079	5.7861	5.4095	5.1922	5.0503	4.9503	4.8759	4.8183	4.7725	4.7351	4.6777	4.6188	4.5581	4.4957	4.4314	4.3650
6	5.9874	5.1433	4.7571	4.5337	4.3874	4.2839	4.2066	4.1468	4.0990	4.0600	3.9999	3.9381	3.8742	3.8082	3.7398	3.6688
7	5.5914	4.7374	4.3468	4.1203	3.9715	3.8660	3.7870	3.7257	3.6767	3.6365	3.5747	3.5108	3.4445	3.3758	3.3043	3.2298
8	5.3177	4.4590	4.0662	3.8378	3.6875	3.5806	3.5005	3.4381	3.3881	3.3472	3.2840	3.2184	3.1503	3.0794	3.0053	2.9276
9	5.1174	4.2565	3.8626	3.6331	3.4817	3.3738	3.2927	3.2296	3.1789	3.1373	3.0729	3.0061	2.9365	2.8637	2.7872	2.7067
10	4.9646	4.1028	3.7083	3.4780	3.3258	3.2172	3.1355	3.0717	3.0204	2.9782	2.9130	2.8450	2.7740	2.6996	2.6211	2.5379
11	4.8443	3.9823	3.5874	3.3567	3.2039	3.0946	3.0123	2.9480	2.8962	2.8536	2.7876	2.7186	2.6464	2.5705	2.4901	2.4045
12	4.7472	3.8853	3.4903	3.2592	3.1059	2.9961	2.9134	2.8486	2.7964	2.7534	2.6866	2.6169	2.5436	2.4663	2.3842	2.2962
13	4.6672	3.8056	3.4105	3.1791	3.0254	2.9153	2.8321	2.7669	2.7144	2.6710	2.6037	2.5331	2.4589	2.3803	2.2966	2.2064
14	4.6001	3.7389	3.3439	3.1122	2.9582	2.8477	2.7642	2.6987	2.6458	2.6021	2.5342	2.4630	2.3879	2.3082	2.2230	2.1307
15	4.5431	3.6823	3.2874	3.0556	2.9013	2.7905	2.7066	2.6408	2.5876	2.5437	2.4753	2.4035	2.3275	2.2468	2.1601	2.0658
16	4.4940	3.6337	3.2389	3.0069	2.8524	2.7413	2.6572	2.5911	2.5377	2.4935	2.4247	2.3522	2.2756	2.1938	2.1058	2.0096
17	4.4513	3.5915	3.1968	2.9647	2.8100	2.6987	2.6143	2.5480	2.4943	2.4499	2.3807	2.3077	2.2304	2.1477	2.0584	1.9604
18	4.4139	3.5546	3.1599	2.9277	2.7729	2.6613	2.5767	2.5102	2.4563	2.4117	2.3421	2.2686	2.1906	2.1071	2.0166	1.9168
19	4.3808	3.5219	3.1274	2.8951	2.7401	2.6283	2.5435	2.4768	2.4227	2.3779	2.3080	2.2341	2.1555	2.0712	1.9796	1.8780
20	4.3513	3.4928	3.0984	2.8661	2.7109	2.5990	2.5140	2.4471	2.3928	2.3479	2.2776	2.2033	2.1242	2.0391	1.9464	1.8432
21	4.3248	3.4668	3.0725	2.8401	2.6848	2.5727	2.4876	2.4205	2.3661	2.3210	2.2504	2.1757	2.0960	2.0102	1.9165	1.8117
22	4.3009	3.4434	3.0491	2.8167	2.6613	2.5491	2.4638	2.3965	2.3419	2.2967	2.2258	2.1508	2.0707	1.9842	1.8895	1.7831
23	4.2793	3.4221	3.0280	2.7955	2.6400	2.5277	2.4422	2.3748	2.3201	2.2747	2.2036	2.1282	2.0476	1.9605	1.8649	1.7570
24	4.2597	3.4028	3.0088	2.7763	2.6207	2.5082	2.4226	2.3551	2.3002	2.2547	2.1834	2.1077	2.0267	1.9390	1.8424	1.7331
25	4.2417	3.3852	2.9912	2.7587	2.6030	2.4904	2.4047	2.3371	2.2821	2.2365	2.1649	2.0889	2.0075	1.9192	1.8217	1.7110
26	4.2252	3.3690	2.9751	2.7426	2.5868	2.4741	2.3883	2.3205	2.2655	2.2197	2.1479	2.0716	1.9898	1.9010	1.8027	1.6906
27	4.2100	3.3541	2.9604	2.7278	2.5719	2.4591	2.3732	2.3053	2.2501	2.2043	2.1323	2.0558	1.9736	1.8842	1.7851	1.6717
28	4.1960	3.3404	2.9467	2.7141	2.5581	2.4453	2.3593	2.2913	2.2360	2.1900	2.1179	2.0411	1.9586	1.8687	1.7689	1.6541
29	4.1830	3.3277	2.9340	2.7014	2.5454	2.4324	2.3463	2.2782	2.2229	2.1768	2.1045	2.0275	1.9446	1.8543	1.7537	1.6377
30	4.1709	3.3158	2.9223	2.6896	2.5336	2.4205	2.3343	2.2662	2.2107	2.1646	2.0921	2.0148	1.9317	1.8409	1.7396	1.6223
40	4.0848	3.2317	2.8387	2.6060	2.4495	2.3359	2.2490	2.1802	2.1240	2.0772	2.0035	1.9245	1.8389	1.7444	1.6373	1.5089
60	4.0012	3.1504	2.7581	2.5252	2.3683	2.2540	2.1665	2.0970	2.0401	1.9926	1.9174	1.8364	1.7480	1.6491	1.5343	1.3893
120	3.9201	3.0718	2.6802	2.4472	2.2900	2.1750	2.0867	2.0164	1.9588	1.9105	1.8337	1.7505	1.6587	1.5543	1.4290	1.2539
$\infty$	3.8415	2.9957	2.6049	2.3719	2.2141	2.0986	2.0101	1.9401	1.8820	1.8337	1.7565	1.6705	1.5746	1.4673	1.3390	1.1539

F-DISTRIBUTION