



JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF HEALTH SCIENCES

UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE

COMMUNITY HEALTH AND DEVELOPMENT

4TH YEAR 1ST SEMESTER 2024/2025 ACADEMIC YEAR

KISUMU CAMPUS

COURSE CODE:	SBB 1409
COURSE TITLE:	BIOSTATISTICS 11
EXAM VENUE:	STREAM: BSc Public/ Comm. Hlth & Dev

DATE: 7/1/25

EXAM SESSION: 14-16.00 HRS

TIME: 2.00 HOURS

Instructions:

- 1. Answer all the questions in Section A and 2 questions in Section B.**
- 2. Candidates are advised not to write on the question paper.**
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room.**

SECTION A

Answer all questions (30 Marks)

Question 1

- a) (i) Explain Four roles of statistics **(4 Marks)**
- (ii) Using diagrams, differentiate between histogram and polygon. **(4 Marks)**
- b) The following data relates to marks of eight students in Science exam.
- | Student | Science |
|---------|---------|
| 1 | 31 |
| 2 | 25 |
| 3 | 52 |
| 4 | 96 |
| 5 | 48 |
| 6 | 60 |
| 7 | 63 |
| 8 | 79 |
- Calculate the standard error of the means in the Science test. **(5 Marks)**
- c) A data set on money spent on fast food by a sample of 200 households has a lowest value of KSh1 and a highest value of KSh1167. Group the data into six classes of equal widths with the lower limit of the first class as KSh1.
- i) Calculate the approximate class width. **(1 Mark)**
- ii) Write the class limits for all six classes. **(3 Marks)**
- iii) What are the class boundaries and class midpoints for each class? **(3 Marks)**
- d) In village Y, 17 patients with angina pectoris from a sample mean, $\bar{X} = 5.81$ with a sample standard deviation: $s=1.21$ was observed. Calculate the approximate 95% CI of the sampled participants with angina pectoris in Village X. **(3 Marks)**
- e) A workshop produces 2500 drugs per day. The mean weight of drugs 125kg with a variance of 100kg. assuming normal distribution, how many drugs are less than 142kg. **(2 Marks)**
- f) Maxwel's company produces drugs. The company claims that 25% of the drugs are Astrazeneca (AZ), 60% Moderna and 15% Pfizer. A random sample of 150 drugs has 60 AZ, 55 Moderna and 45 Pfizer. Is this consistent with Maxwel company's claim. Use alpha 0.025 level of significance. **(5 Marks)**

SECTION B

Answer any two Questions (40 Marks)

Question 2.

- a) The prices of a drug on different days of a month were recorded as follows:

66 65 68 70 69 71 70 65 65 68

Test whether the mean prices of the drug in the month is 65 at $\alpha=0.05$. **(6 Marks)**

- b) There were 1500 students who sat for an end year examination. The mean mark was 68; with a variance of 16. Find the number of students who got marks between 72 and 75, assuming a normal distribution. **(4 Marks)**

- c) Consider the following scores of students in a Biostatistics exam from two groups.

Biostatistics I		Biostatistics II	
Class interval	Number of students	Class interval	Number of students
5-20	5	5-20	5
20-35	5	20-35	5
35-50	15	35-50	15
50-65	13	50-65	7
65-80	7	65-80	12
80-95	5	80-95	6

Based on the values of (i) Mean, (ii) Mode and (iii) Median, comment in each case which group have the better average scores. **(10 Marks)**

Question 3.

- a) Define the following terms: **(5 Marks)**

- i) Type II error
- ii) Null hypothesis
- iii) Chi-square test of Goodness of fit
- iv) Z- score
- v) Analysis of Variance

- b) The data manager at a company that manufactures drugs wants to determine whether there are differences in the quality of workmanship among the three daily shifts. She randomly selects 496 drugs and carefully inspects them. Each drug is either classified as perfect, satisfactory, or defective and the shift that produced it is also recorded. The data is summarized in the two-way table below.

	Perfect	Satisfactory	Defective
Shift 1	106	120	5
Shift 2	67	79	7
Shift 3	37	69	6

Do these data provide sufficient evidence at 5% significance level to infer that there are differences in quality among the three shifts? **(15 Marks)**

Question 4.

- a) A sample of 200 COVID-19 patients is selected. Out of these, 100 are given a drug and others are not given any drug. The results of the clinical trial are shown below.

	Number of people		Row totals
	Given drug	Not given drug	
Cured	65	55	
Not cured	35	45	
Column totals	100	100	

At 5% level of significance, test the hypothesis that the drug is effective in curing COVID-19. **(10 Marks)**

- b) The test scores in a QT examination are normally distributed, with a population mean of 100. Suppose 20 people are randomly selected and tested. The standard deviation in the sample group is 15. Test the hypothesis that the average test score in the sample group will be less than 110. **(3 Marks)**
- c) JOOUST has conducted a survey on the relationship between the age of students (x) and their weight, kg (y). A sample of eight students indicated below.

Age (x)	19	16	14	13	15	16	18	14
Weight (y)	65	60	55	45	58	63	75	53

Fit a regression equation for the data then estimate the average weight of a student aged 20 years. **(7 Marks)**

Question 5.

The following data describes the number of orders received by a drug company each week over a period of 50 weeks.

- a) Classify the data using the exclusive method with a class interval of 10 then display it using a frequency polygon. **(6 Marks)**

24	13	28	15	25	29	15	46	23	17
9	10	17	22	23	17	16	32	13	21
11	12	18	20	13	27	18	22	28	23
20	14	26	14	19	19	40	31	15	26
17	21	23	26	18	24	21	27	25	18

- b) By using the Karl Pearson correlation coefficient, examine whether the input of the drugs and the output of success can be said to be correlated. **(10 Marks)**

Drug input	6.9	8.2	7.9	4.8	9.6	8.1	7.8
Success Outcome	1.9	3.5	6.5	1.4	5.8	3.9	2.7

- c) Using illustrations, describe. **(4 Marks)**
- Symmetrical distribution
 - Positively skewed distribution
 - Negatively skewed distribution
 - Uniform or rectangular distribution.

Formulas

- Population mean (μ)
- Sample mean (\bar{X} or M)

$$\mu = \frac{\sum X}{N}$$

$$\bar{X} = \frac{\sum X}{n}$$

- Population variance (σ^2) and standard deviation (σ)

Note: SS = Sum of Squares

$$\sigma^2 = \frac{SS}{N} \quad \text{or} \quad \sigma^2 = \frac{\sum(X-\mu)^2}{N}$$

$$\sigma = \sqrt{\frac{SS}{N}} \quad \text{or} \quad \sigma = \sqrt{\frac{\sum(X-\mu)^2}{N}}$$

- Sample variance (s^2) and standard deviation (s or SD)

$$s^2 = \frac{SS}{n-1} \quad \text{or} \quad s^2 = \frac{\sum(X-\bar{X})^2}{n-1}$$

$$s = \sqrt{\frac{SS}{n-1}} \quad \text{or} \quad s = \sqrt{\frac{\sum(X-\bar{X})^2}{n-1}}$$

- Z scores (or standard scores)

Sample: $z = \frac{X-\bar{X}}{s}$ Population: $z = \frac{X-\mu}{\sigma}$

- z-test

$$z = \frac{M-\mu}{\sigma_M}, \text{ where}$$

$$\sigma_M = \frac{\sigma}{\sqrt{n}}$$

- Correlation coefficient

$$r = \frac{SP}{\sqrt{SS_X SS_Y}} \text{ where, } \quad SP = \sum(X - M_X)(Y - M_Y)$$

TABLE B.1 THE UNIT NORMAL TABLE*

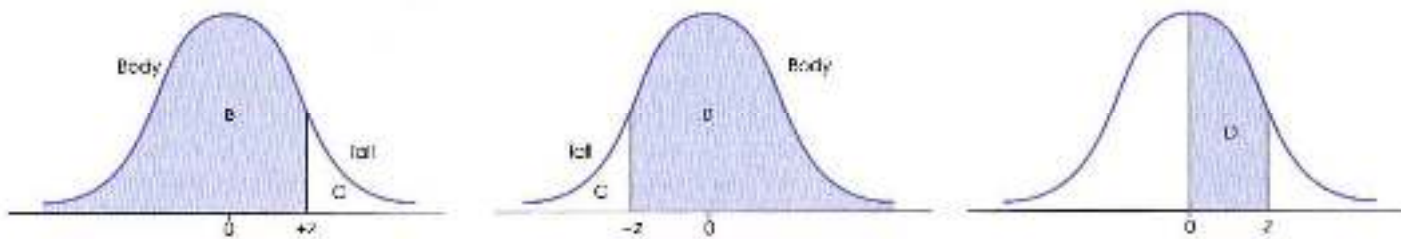
*Column A lists z-score values. A vertical line drawn through a normal distribution at a z-score location divides the distribution into two sections.

Column B identifies the proportion in the larger section, called the *body*.

Column C identifies the proportion in the smaller section, called the *tail*.

Column D identifies the proportion between the mean and the z-score.

Note: Because the normal distribution is symmetrical, the proportions for negative z-scores are the same as those for positive z-scores.



(A) z	(B) Proportion in Body	(C) Proportion in Tail	(D) Proportion Between Mean and z	(A) z	(B) Proportion in Body	(C) Proportion in Tail	(D) Proportion Between Mean and z
0.00	.5000	.5000	.0000	0.25	.5987	.4013	.0987
0.01	.5040	.4960	.0040	0.26	.6026	.3974	.1026
0.02	.5080	.4920	.0080	0.27	.6064	.3936	.1064
0.03	.5120	.4880	.0120	0.28	.6103	.3897	.1103
0.04	.5160	.4840	.0160	0.29	.6141	.3859	.1141
0.05	.5199	.4801	.0199	0.30	.6179	.3821	.1179
0.06	.5239	.4761	.0239	0.31	.6217	.3783	.1217
0.07	.5279	.4721	.0279	0.32	.6255	.3745	.1255
0.08	.5319	.4681	.0319	0.33	.6293	.3707	.1293
0.09	.5359	.4641	.0359	0.34	.6331	.3669	.1331
0.10	.5398	.4602	.0398	0.35	.6368	.3632	.1368
0.11	.5438	.4562	.0438	0.36	.6406	.3594	.1406
0.12	.5478	.4522	.0478	0.37	.6443	.3557	.1443
0.13	.5517	.4483	.0517	0.38	.6480	.3520	.1480
0.14	.5557	.4443	.0557	0.39	.6517	.3483	.1517
0.15	.5596	.4404	.0596	0.40	.6554	.3446	.1554
0.16	.5636	.4364	.0636	0.41	.6591	.3409	.1591
0.17	.5675	.4325	.0675	0.42	.6628	.3372	.1628
0.18	.5714	.4286	.0714	0.43	.6664	.3336	.1664
0.19	.5753	.4247	.0753	0.44	.6700	.3300	.1700
0.20	.5793	.4207	.0793	0.45	.6736	.3264	.1736
0.21	.5832	.4168	.0832	0.46	.6772	.3228	.1772
0.22	.5871	.4129	.0871	0.47	.6808	.3192	.1808
0.23	.5910	.4090	.0910	0.48	.6844	.3156	.1844
0.24	.5948	.4052	.0948	0.49	.6879	.3121	.1879

(A) z	(B) Proportion in Body	(C) Proportion in Tail	(D) Proportion Between Mean and z	(A) z	(B) Proportion in Body	(C) Proportion in Tail	(D) Proportion Between Mean and z
0.50	.6915	.3085	.1915	1.00	.8413	.1587	.3413
0.51	.6950	.3050	.1950	1.01	.8438	.1562	.3438
0.52	.6985	.3015	.1985	1.02	.8461	.1539	.3461
0.53	.7019	.2981	.2019	1.03	.8485	.1515	.3485
0.54	.7054	.2946	.2054	1.04	.8508	.1492	.3508
0.55	.7088	.2912	.2088	1.05	.8531	.1469	.3531
0.56	.7123	.2877	.2123	1.06	.8554	.1446	.3554
0.57	.7157	.2843	.2157	1.07	.8577	.1423	.3577
0.58	.7190	.2810	.2190	1.08	.8599	.1401	.3599
0.59	.7226	.2776	.2226	1.09	.8621	.1379	.3621
0.60	.7257	.2743	.2257	1.10	.8643	.1357	.3643
0.61	.7291	.2709	.2291	1.11	.8665	.1335	.3665
0.62	.7324	.2676	.2324	1.12	.8686	.1314	.3686
0.63	.7357	.2643	.2357	1.13	.8708	.1292	.3708
0.64	.7389	.2611	.2389	1.14	.8729	.1271	.3729
0.65	.7422	.2578	.2422	1.15	.8749	.1251	.3749
0.66	.7454	.2546	.2454	1.16	.8770	.1230	.3770
0.67	.7486	.2514	.2486	1.17	.8790	.1210	.3790
0.68	.7517	.2482	.2517	1.18	.8810	.1190	.3810
0.69	.7549	.2451	.2549	1.19	.8830	.1170	.3830
0.70	.7580	.2420	.2580	1.20	.8849	.1151	.3849
0.71	.7611	.2389	.2611	1.21	.8869	.1131	.3869
0.72	.7642	.2358	.2642	1.22	.8888	.1112	.3888
0.73	.7673	.2327	.2673	1.23	.8907	.1093	.3907
0.74	.7704	.2296	.2704	1.24	.8925	.1075	.3925
0.75	.7734	.2266	.2734	1.25	.8944	.1056	.3944
0.76	.7764	.2236	.2764	1.26	.8962	.1038	.3962
0.77	.7794	.2206	.2794	1.27	.8980	.1020	.3980
0.78	.7823	.2177	.2823	1.28	.8997	.1003	.3997
0.79	.7852	.2148	.2852	1.29	.9015	.0985	.4015
0.80	.7881	.2119	.2881	1.30	.9032	.0968	.4032
0.81	.7910	.2090	.2910	1.31	.9049	.0951	.4049
0.82	.7939	.2061	.2939	1.32	.9065	.0934	.4066
0.83	.7967	.2033	.2967	1.33	.9082	.0918	.4082
0.84	.7995	.2005	.2995	1.34	.9099	.0901	.4099
0.85	.8023	.1977	.3023	1.35	.9115	.0885	.4115
0.86	.8051	.1949	.3051	1.36	.9131	.0869	.4131
0.87	.8078	.1922	.3078	1.37	.9147	.0853	.4147
0.88	.8105	.1894	.3106	1.38	.9162	.0838	.4162
0.89	.8133	.1867	.3133	1.39	.9177	.0823	.4177
0.90	.8159	.1841	.3159	1.40	.9192	.0808	.4192
0.91	.8186	.1814	.3186	1.41	.9207	.0793	.4207
0.92	.8212	.1788	.3212	1.42	.9222	.0778	.4222
0.93	.8238	.1762	.3238	1.43	.9236	.0764	.4236
0.94	.8264	.1736	.3264	1.44	.9251	.0749	.4251
0.95	.8289	.1711	.3289	1.45	.9265	.0735	.4265
0.96	.8315	.1685	.3315	1.46	.9279	.0721	.4279
0.97	.8340	.1660	.3340	1.47	.9293	.0708	.4292
0.98	.8365	.1635	.3365	1.48	.9306	.0694	.4305
0.99	.8389	.1611	.3389	1.49	.9319	.0681	.4319

(A) z	(B) Proportion in Body	(C) Proportion in Tail	(D) Proportion Between Mean and z	(A) z	(B) Proportion in Body	(C) Proportion in Tail	(D) Proportion Between Mean and z
1.50	.9332	.0668	.4332	2.00	.9772	.0228	.4772
1.51	.9345	.0655	.4345	2.01	.9778	.0222	.4778
1.52	.9357	.0643	.4357	2.02	.9783	.0217	.4783
1.53	.9370	.0630	.4370	2.03	.9788	.0212	.4788
1.54	.9382	.0618	.4382	2.04	.9793	.0207	.4793
1.55	.9394	.0606	.4394	2.05	.9798	.0202	.4798
1.56	.9406	.0594	.4406	2.06	.9803	.0197	.4803
1.57	.9418	.0582	.4418	2.07	.9808	.0192	.4808
1.58	.9429	.0571	.4429	2.08	.9812	.0188	.4812
1.59	.9441	.0559	.4441	2.09	.9817	.0183	.4817
1.60	.9452	.0548	.4452	2.10	.9821	.0179	.4821
1.61	.9463	.0537	.4463	2.11	.9826	.0174	.4826
1.62	.9474	.0526	.4474	2.12	.9830	.0170	.4830
1.63	.9484	.0516	.4484	2.13	.9834	.0166	.4834
1.64	.9495	.0505	.4495	2.14	.9838	.0162	.4838
1.65	.9505	.0495	.4505	2.15	.9842	.0158	.4842
1.66	.9515	.0485	.4515	2.16	.9846	.0154	.4846
1.67	.9525	.0475	.4525	2.17	.9850	.0150	.4850
1.68	.9535	.0466	.4535	2.18	.9854	.0146	.4854
1.69	.9545	.0455	.4545	2.19	.9857	.0143	.4857
1.70	.9554	.0446	.4554	2.20	.9861	.0139	.4861
1.71	.9564	.0436	.4564	2.21	.9864	.0136	.4864
1.72	.9573	.0427	.4573	2.22	.9868	.0132	.4868
1.73	.9582	.0418	.4582	2.23	.9871	.0129	.4871
1.74	.9591	.0409	.4591	2.24	.9875	.0125	.4875
1.75	.9599	.0401	.4599	2.25	.9878	.0122	.4878
1.76	.9608	.0392	.4608	2.26	.9881	.0119	.4881
1.77	.9616	.0384	.4616	2.27	.9884	.0116	.4884
1.78	.9625	.0375	.4625	2.28	.9887	.0113	.4887
1.79	.9633	.0367	.4633	2.29	.9890	.0110	.4890
1.80	.9641	.0359	.4641	2.30	.9893	.0107	.4893
1.81	.9649	.0351	.4649	2.31	.9896	.0104	.4896
1.82	.9656	.0344	.4656	2.32	.9898	.0102	.4898
1.83	.9664	.0336	.4664	2.33	.9901	.0099	.4901
1.84	.9671	.0329	.4671	2.34	.9904	.0096	.4904
1.85	.9678	.0322	.4678	2.35	.9906	.0094	.4906
1.86	.9686	.0314	.4686	2.36	.9909	.0091	.4909
1.87	.9693	.0307	.4693	2.37	.9911	.0089	.4911
1.88	.9699	.0301	.4699	2.38	.9913	.0087	.4913
1.89	.9706	.0294	.4706	2.39	.9916	.0084	.4916
1.90	.9713	.0287	.4713	2.40	.9918	.0082	.4918
1.91	.9719	.0281	.4719	2.41	.9920	.0080	.4920
1.92	.9726	.0274	.4726	2.42	.9922	.0078	.4922
1.93	.9732	.0268	.4732	2.43	.9925	.0075	.4925
1.94	.9738	.0262	.4738	2.44	.9927	.0073	.4927
1.95	.9744	.0256	.4744	2.45	.9929	.0071	.4929
1.96	.9750	.0250	.4750	2.46	.9931	.0069	.4931
1.97	.9756	.0244	.4756	2.47	.9932	.0068	.4932
1.98	.9761	.0239	.4761	2.48	.9934	.0066	.4934
1.99	.9767	.0233	.4767	2.49	.9936	.0064	.4936

(A) z	(B) Proportion in Body	(C) Proportion in Tail	(D) Proportion Between Mean and z	(A) z	(B) Proportion in Body	(C) Proportion in Tail	(D) Proportion Between Mean and z
2.50	.9938	.0062	.4938	2.55	.9984	.0016	.4984
2.51	.9940	.0060	.4940	2.56	.9985	.0015	.4985
2.52	.9941	.0059	.4941	2.57	.9985	.0015	.4985
2.53	.9943	.0057	.4943	2.58	.9986	.0014	.4986
2.54	.9945	.0055	.4945	2.59	.9986	.0014	.4986
2.55	.9946	.0054	.4946	3.00	.9987	.0013	.4987
2.56	.9948	.0052	.4948	3.01	.9987	.0013	.4987
2.57	.9949	.0051	.4949	3.02	.9987	.0013	.4987
2.58	.9951	.0049	.4951	3.03	.9988	.0012	.4988
2.59	.9952	.0048	.4952	3.04	.9988	.0012	.4988
2.60	.9953	.0047	.4953	3.05	.9989	.0011	.4989
2.61	.9955	.0045	.4955	3.06	.9989	.0011	.4989
2.62	.9956	.0044	.4956	3.07	.9989	.0011	.4989
2.63	.9957	.0043	.4957	3.08	.9990	.0010	.4990
2.64	.9959	.0041	.4959	3.09	.9990	.0010	.4990
2.65	.9960	.0040	.4960	3.10	.9990	.0010	.4990
2.66	.9961	.0039	.4961	3.11	.9991	.0009	.4991
2.67	.9962	.0038	.4962	3.12	.9991	.0009	.4991
2.68	.9963	.0037	.4963	3.13	.9991	.0009	.4991
2.69	.9964	.0036	.4964	3.14	.9992	.0008	.4992
2.70	.9965	.0035	.4965	3.15	.9992	.0008	.4992
2.71	.9966	.0034	.4966	3.16	.9992	.0008	.4992
2.72	.9967	.0033	.4967	3.17	.9992	.0008	.4992
2.73	.9968	.0032	.4968	3.18	.9992	.0007	.4992
2.74	.9969	.0031	.4969	3.19	.9992	.0007	.4992
2.75	.9970	.0030	.4970	3.20	.9993	.0007	.4992
2.76	.9971	.0029	.4971	3.21	.9993	.0007	.4992
2.77	.9972	.0028	.4972	3.22	.9994	.0006	.4994
2.78	.9973	.0027	.4973	3.23	.9994	.0006	.4994
2.79	.9974	.0026	.4974	3.24	.9994	.0006	.4994
2.80	.9974	.0026	.4974	3.30	.9995	.0005	.4995
2.81	.9975	.0025	.4975	3.40	.9997	.0003	.4997
2.82	.9976	.0024	.4976	3.50	.9998	.0002	.4998
2.83	.9977	.0023	.4977	3.60	.9998	.0002	.4998
2.84	.9977	.0023	.4977	3.70	.9999	.0001	.4999
2.85	.9978	.0022	.4978	3.80	.9999	.0000	.4999
2.86	.9979	.0021	.4979	3.90	.9999	.0000	.4999
2.87	.9979	.0021	.4979	4.00	.9999	.0000	.4999
2.88	.9980	.0020	.4980				
2.89	.9981	.0019	.4981				
2.90	.9981	.0019	.4981				
2.91	.9982	.0018	.4982				
2.92	.9982	.0018	.4982				
2.93	.9983	.0017	.4983				
2.94	.9984	.0016	.4984				

Table: Chi-Square Probabilities

The areas given across the top are the areas to the right of the critical value. To look up an area on the left, subtract it from one, and then look it up (ie: 0.05 on the left is 0.95 on the right)

df	0.99 5	0.99 5	0.97 5	0.95	0.90	0.10	0.05	0.02 5	0.01	0.00 5
1	---	---	0.00 1	0.00 4	0.01 6	2.70 6	3.84 1	5.02 4	6.63 5	7.87 9
2	0.01 0	0.02 0	0.05 1	0.10 3	0.21 1	4.60 5	5.99 1	7.37 8	9.21 0	10.5 97
3	0.07 2	0.11 5	0.21 6	0.35 2	0.58 4	6.25 1	7.81 5	9.34 8	11.3 45	12.8 38
4	0.20 7	0.29 7	0.48 4	0.71 1	1.06 4	7.77 9	9.48 8	11.1 43	13.2 77	14.8 60
5	0.41 2	0.55 4	0.83 1	1.14 5	1.61 0	9.23 6	11.0 70	12.8 33	15.0 86	16.7 50
6	0.67 6	0.87 2	1.23 7	1.63 5	2.20 4	10.6 45	12.5 92	14.4 49	16.8 12	18.5 48
7	0.98 9	1.23 9	1.69 0	2.16 7	2.83 3	12.0 17	14.0 67	16.0 13	18.4 75	20.2 78
8	1.34 4	1.64 6	2.18 0	2.73 3	3.49 0	13.3 62	15.5 07	17.5 35	20.0 90	21.9 55
9	1.73 5	2.08 8	2.70 0	3.32 5	4.16 8	14.6 84	16.9 19	19.0 23	21.6 66	23.5 89
10	2.15 6	2.55 8	3.24 7	3.94 0	4.86 5	15.9 87	18.3 07	20.4 83	23.2 09	25.1 88
11	2.60 3	3.05 3	3.81 6	4.57 5	5.57 8	17.2 75	19.6 75	21.9 20	24.7 25	26.7 57
12	3.07 4	3.57 1	4.40 4	5.22 6	6.30 4	18.5 49	21.0 26	23.3 37	26.2 17	28.3 00
13	3.56 5	4.10 7	5.00 9	5.89 2	7.04 2	19.8 12	22.3 62	24.7 36	27.6 88	29.8 19
14	4.07 5	4.66 0	5.62 9	6.57 1	7.79 0	21.0 64	23.6 85	26.1 19	29.1 41	31.3 19
15	4.60 1	5.22 9	6.26 2	7.26 1	8.54 7	22.3 07	24.9 96	27.4 88	30.5 78	32.8 01
16	5.14 2	5.81 2	6.90 8	7.96 2	9.31 2	23.5 42	26.2 96	28.8 45	32.0 00	34.2 67
17	5.69 7	6.40 8	7.56 4	8.67 2	10.0 85	24.7 69	27.5 87	30.1 91	33.4 09	35.7 18
18	6.26 5	7.01 5	8.23 1	9.39 0	10.8 65	25.9 89	28.8 69	31.5 26	34.8 05	37.1 56

df	0.99 5	0.99	0.97 5	0.95	0.90	0.10	0.05	0.02 5	0.01	0.00 5
19	6.84 4	7.63 3	8.90 7	10.1 17	11.6 51	27.2 04	30.1 44	32.8 52	36.1 91	38.5 82
20	7.43 4	8.26 0	9.59 1	10.8 51	12.4 43	28.4 12	31.4 10	34.1 70	37.5 66	39.9 97
21	8.03 4	8.89 7	10.2 83	11.5 91	13.2 40	29.6 15	32.6 71	35.4 79	38.9 32	41.4 01
22	8.64 3	9.54 2	10.9 82	12.3 38	14.0 41	30.8 13	33.9 24	36.7 81	40.2 89	42.7 96
23	9.26 0	10.1 96	11.6 89	13.0 91	14.8 48	32.0 07	35.1 72	38.0 76	41.6 38	44.1 81
24	9.88 6	10.8 56	12.4 01	13.8 48	15.6 59	33.1 96	36.4 15	39.3 64	42.9 80	45.5 59
25	10.5 20	11.5 24	13.1 20	14.6 11	16.4 73	34.3 82	37.6 52	40.6 46	44.3 14	46.9 28
26	11.1 60	12.1 98	13.8 44	15.3 79	17.2 92	35.5 63	38.8 85	41.9 23	45.6 42	48.2 90
27	11.8 08	12.8 79	14.5 73	16.1 51	18.1 14	36.7 41	40.1 13	43.1 95	46.9 63	49.6 45
28	12.4 61	13.5 65	15.3 08	16.9 28	18.9 39	37.9 16	41.3 37	44.4 61	48.2 78	50.9 93
29	13.1 21	14.2 56	16.0 47	17.7 08	19.7 68	39.0 87	42.5 57	45.7 22	49.5 88	52.3 36
30	13.7 87	14.9 53	16.7 91	18.4 93	20.5 99	40.2 56	43.7 73	46.9 79	50.8 92	53.6 72
40	20.7 07	22.1 64	24.4 33	26.5 09	29.0 51	51.8 05	55.7 58	59.3 42	63.6 91	66.7 66
50	27.9 91	29.7 07	32.3 57	34.7 64	37.6 89	63.1 67	67.5 05	71.4 20	76.1 54	79.4 90
60	35.5 34	37.4 85	40.4 82	43.1 88	46.4 59	74.3 97	79.0 82	83.2 98	88.3 79	91.9 52
70	43.2 75	45.4 42	48.7 58	51.7 39	55.3 29	85.5 27	90.5 31	95.0 23	100. 425	104. 215
80	51.1 72	53.5 40	57.1 53	60.3 91	64.2 78	96.5 78	101. 879	106. 629	112. 329	116. 321
90	59.1 96	61.7 54	65.6 47	69.1 26	73.2 91	107. 565	113. 145	118. 136	124. 116	128. 299
100	67.3 28	70.0 65	74.2 22	77.9 29	82.3 58	118. 498	124. 342	129. 561	135. 807	140. 169

TABLE B.6 CRITICAL VALUES FOR THE PEARSON CORRELATION*

*To be significant, the sample correlation, r , must be greater than or equal to the critical value in the table.

$n - 1$	Level of Significance for One-Tailed Test			
	.05	.025	.01	.005
	Level of Significance for Two-Tailed Test			
	.10	.05	.02	.01
1	.988	.997	.9995	.9999
2	.900	.950	.980	.990
3	.805	.878	.934	.959
4	.729	.811	.882	.917
5	.669	.754	.833	.874
6	.622	.707	.789	.834
7	.582	.666	.750	.798
8	.549	.632	.716	.765
9	.521	.602	.685	.735
10	.497	.576	.658	.708
11	.476	.553	.634	.684
12	.458	.532	.612	.661
13	.441	.514	.592	.641
14	.426	.497	.574	.623
15	.412	.482	.558	.606
16	.400	.468	.542	.590
17	.389	.456	.528	.575
18	.378	.444	.516	.561
19	.369	.433	.503	.549
20	.360	.423	.492	.537
21	.352	.413	.482	.526
22	.344	.404	.472	.515
23	.337	.396	.462	.505
24	.330	.388	.453	.496
25	.323	.381	.445	.487
26	.317	.374	.437	.479
27	.311	.367	.430	.471
28	.306	.361	.423	.463
29	.301	.355	.416	.456
30	.296	.349	.409	.449
35	.275	.325	.381	.418
40	.257	.304	.358	.393
45	.243	.288	.338	.372
50	.231	.273	.322	.354
60	.211	.250	.295	.325
70	.195	.232	.274	.302
80	.183	.217	.256	.283
90	.173	.205	.242	.267
100	.164	.195	.230	.254

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