[This question paper contains 16 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 5346 **L**

Unique Paper Code : 2274001202

Name of the Paper : Basic Statistics for Economics

Name of the Course : **GENERIC ELECTIVE**

Semester : II/IV/VI/VIII

Duration : 3 Hours
समय : 3 घण्टे

Maximum Marks : 90
पूर्णांक : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **all** questions from **Section-I** and **two** questions each from **Sections-II, III** and **IV.**
3. Sub-parts of the questions to be attempted together.
4. Questions in **Section I** carry **15** marks and all questions in **Section II, III** and **IV** carry **10** marks.
5. Use of Simple Calculator is allowed.
6. Answers may be written either in English or Hindi; but the same medium should be used throughout the paper.

छात्रों के लिए निर्देश

1. इस प्रश्न-पत्र के मिलते ही ऊपर दिए गए निर्धारित स्थान पर अपना अनुक्रमांक लिखिए।
2. **खंड-I** के **सभी** प्रश्न और **खंड-II, III** तथा **IV** में से प्रत्येक से **दो** प्रश्न हल करें।
3. प्रश्नों के उप-भागों को एक साथ हल किया जाना चाहिए।
4. **खंड I** के प्रश्नों के लिए **15** अंक और **खंड II, III** तथा **IV** के सभी प्रश्नों के लिए **10** अंक निर्धारित हैं।
5. साधारण कैलकुलेटर का उपयोग करने की अनुमति है।
6. इस प्रश्न-पत्र का उत्तर अंग्रेजी या हिंदी किसी एक भाषा में दीजिए, लेकिन सभी उत्तरों का माध्यम एक ही होना चाहिए।

P.T.O.

Section – I

(Attempt **All** *Questions)*

1. (a) Statistics is a backbone of business decisions" Discuss this statement and explain the various application of statistics in business ? (10)

   (b) Calculate mean and median for following sample ? (5)

10, 12, 14, 11, 13, 15 , 12, 16, 14, 18, 16, 17

2. (a) What is data? Explain the various methods of representing qualitative data? (10)

   (b) Describe how mean compares to median and mode for a distribution as follows :

   (i) Skewed to Right

   (ii) Skewed to Left

   (iii) Symmetric (5)

Section II

(Attempt **ANY TWO** *Questions)*

3. A certain disease affects 2% of the population. A test is used to detect the disease. The probability that the test correctly detects the disease is 95%. The probability that the test incorrectly indicates disease in a healthy person is 3%. If a person test positive, what is the probability that they actually have the disease? (10)

4. (a) What are independent and dependent events? (5)

(b) Assume two events A and B such that

$$P(A) = 0.5,\ P(B) = 0.4,\ P(A \cap B) = 0.2$$

(i) Are the events A and B independent?

(ii) Find $P(A \cup B)$? (2.5+2.5)

5. (a) A card is drawn at random from standard Deck of 52 playing cards. Given that the card drawn is red card, what is the probability that it is a king? (5)

(b) In a factory a machine produces 500 parts in a day, out of these 25 parts are found to be defective. What is the probability that a part chosen at random is defective? (5)

Section – III

(Attempt Any **TWO** *Questions)*

6. Two thousand electric bulbs with an average life of 1000 hours and standard deviation of 200 hours are installed in a town. Assuming lives of bulbs are normally distributed. Answer the following

(a) What is the number of bulbs that are expected to fail in the first 100 burning hours?

(b) What is the minimum burning life of the top one quarter of bulbs?

(5+5)

P.T.O.

7. (a) What is binomial distribution? Compare it with Poisson distribution. (5)

   (b) A company is evaluating its employees through a test that include sections with multiple choice questions, each question has four options one randomly guessing answers to questions, what is the probability of getting at least six correct. (5)

8. (a) What is a random variable ? Explain two types of random variables with example. (5)

   (b) In a town the literary rate among individuals is 28.1%. A random sample of 15 people is selected from this population.

   Calculate the mean and Standard deviation of the distribution. (5)

Section – IV

(Attempt Any **TWO** *Questions)*

9. (a) What is the level of significance in hypothesis testing and how does it influence the decision to reject or not reject the hypothesis? (5)

   (b) In a hypothesis testing, the probability of rejecting true null hypothesis is 0.05%, What type of error does this explain? (5)

10. The average weight of product is claimed to be 50 kg in a sample of 16 items which has a mean weight of 47 kg and standard deviation 8 kg. Test the claim at 5% level using

(a) Critical value method

(b) p-value method (5+5)

11. (a) A random sample of 110 observations has mean 0.81 and Standard deviation of 0.34. Calculate 99% confidence interval for population mean. (5)

(b) Do you think confidence interval helps in taking statistical decision? Explain. (5)

खंड – I

(सभी प्रश्न अनिवार्य हैं)

1. (क) "सांख्यिकी (Statistics) व्यावसायिक निर्णयों की रीढ़ है" इस कथन की चर्चा कीजिए और व्यवसाय में सांख्यिकी के विभिन्न अनुप्रयोगों की व्याख्या कीजिए? (10)

(ख) निम्नलिखित नमूने (sample) के लिए माध्य (mean) और माध्यिका (median) की गणना कीजिए? (5)

10, 12, 14, 11, 13, 15, 12, 16, 14, 18, 16, 17

2. (क) डेटा (Data) क्या है? गुणात्मक डेटा (qualitative data) को प्रस्तुत करने की विभिन्न विधियों की व्याख्या कीजिए? (10)

(ख) वर्णन कीजिए कि निम्नलिखित वितरणों (distributions) के लिए माध्य (mean), माध्यिका (median) और बहुलक (mode) की तुलना कैसे की जाती है :

(i) दाईं ओर विषम (Skewed to Right)

(ii) बाईं ओर विषम (Skewed to Left)

(iii) सममित (Symmetric) (5)

खंड – II

(किन्हीं **दो** *प्रश्नों के उत्तर दें)*

3. एक निश्चित बीमारी जनसंख्या के 2% हिस्से को प्रभावित करती है। बीमारी का पता लगाने के लिए एक परीक्षण का उपयोग किया जाता है। परीक्षण द्वारा बीमारी का सही पता लगाने की प्रायिकता (probability) 95% है। एक स्वस्थ व्यक्ति में परीक्षण द्वारा गलत तरीके से बीमारी दर्शाने की प्रायिकता 3% है। यदि किसी व्यक्ति का परीक्षण सकारात्मक (positive) आता है, तो इसकी क्या प्रायिकता है कि उसे वास्तव में बीमारी है? (10)

4. (क) स्वतंत्र (independent) और आश्रित (dependent) घटनाएं क्या हैं? (5)

(ख) मान लें कि दो घटनाएं A और B इस प्रकार हैं कि

$$P(A) = 0.5,\ P(B) = 0.4,\ P(A \cap B) = 0.2$$

(i) क्या घटनाएं A और B स्वतंत्र हैं?

(ii) $P(A \cup B)$ ज्ञात कीजिए? (2.5 + 2.5)

5. (क) 52 ताश के पत्तों की एक मानक गड्डी से यादृच्छिक रूप से एक पत्ता निकाला जाता है। यह देखते हुए कि निकाला गया पत्ता लाल रंग का है, इसकी क्या प्रायिकता है कि वह किंग है? (5)

(ख) एक कारखाने में एक मशीन एक दिन में 500 पुर्जे बनाती है, जिनमें से 25 पुर्जे दोषपूर्ण पाए जाते हैं। इसकी क्या प्रायिकता है कि यादृच्छिक रूप से चुना गया पुर्जा दोषपूर्ण है? (5)

खंड – III

(किन्हीं **दो** *प्रश्नों के उत्तर दें)*

6. एक शहर में औसत 1000 घंटे के जीवनकाल और 200 घंटे के मानक विचलन (standard deviation) वाले दो हजार बिजली के बल्ब लगाए गए हैं। यह मानते हुए कि बल्बों का जीवनकाल सामान्य रूप से वितरित (normally distributed) है, निम्नलिखित के उत्तर दें :

(क) जलने के पहले 100 घंटों में कितने बल्बों के खराब होने की उम्मीद है?

(ख) शीर्ष एक चौथाई (top one quarter) बल्बों का न्यूनतम जलने का जीवनकाल क्या है?

(5+5)

7. (क) द्विपद वितरण (Binomial distribution) क्या है? इसकी तुलना पॉइसन वितरण (Poisson distribution) से कीजिए। (5)

(ख) एक कंपनी एक परीक्षण के माध्यम से अपने कर्मचारियों का मूल्यांकन कर रही है जिसमें बहुविकल्पीय प्रश्नों वाले खंड शामिल हैं। प्रत्येक प्रश्न के चार विकल्प हैं। यदि कोई व्यक्ति प्रश्नों के उत्तरों का यादृच्छिक रूप से अनुमान लगाता है, तो कम से कम छह सही उत्तर प्राप्त करने की प्रायिकता क्या है? (5)

P.T.O.

8. (क) यादृच्छिक चर (Random variable) क्या है? उदाहरण सहित यादृच्छिक चरों के दो प्रकारों की व्याख्या कीजिए। (5)

(ख) एक शहर में व्यक्तियों के बीच साक्षरता दर 28.1% है। इस जनसंख्या से 15 लोगों का एक यादृच्छिक नमूना चुना जाता है। वितरण के माध्य (mean) और मानक विचलन (Standard deviation) की गणना कीजिए। (5)

खंड – IV

(किन्हीं **दो** *प्रश्नों के उत्तर दें)*

9. (क) परिकल्पना परीक्षण (hypothesis testing) में सार्थकता का स्तर (level of significance) क्या है और यह परिकल्पना को स्वीकार या अस्वीकार करने के निर्णय को कैसे प्रभावित करता है? (5)

(ख) एक परिकल्पना परीक्षण में, सही शून्य परिकल्पना (true null hypothesis) को अस्वीकार करने की प्रायिकता 0.05% है। यह किस प्रकार की त्रुटि (error) की व्याख्या करता है? (5)

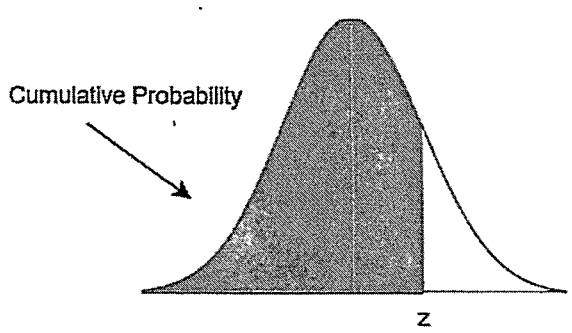
10. उत्पाद का औसत वजन 50 किलोग्राम होने का दावा किया गया है। 16 वस्तुओं के एक नमूने का औसत वजन 47 किलोग्राम और मानक विचलन 8 किलोग्राम है। 5% स्तर पर दावे का परीक्षण कीजिए :

(क) क्रांतिक मूल्य विधि (Critical value method)

(ख) p-वैल्यू विधि (p-value method) (5+5)

11. (क) 110 प्रेक्षणों (observations) के एक यादृच्छिक नमूने का माध्य 0.81 और मानक विचलन 0.34 है। जनसंख्या माध्य के लिए 99% विश्वास अंतराल (confidence interval) की गणना कीजिए। (5)

(ख) क्या आपको लगता है कि विश्वास अंतराल सांख्यिकीय निर्णय लेने में मदद करता है? व्याख्या कीजिए। (5)



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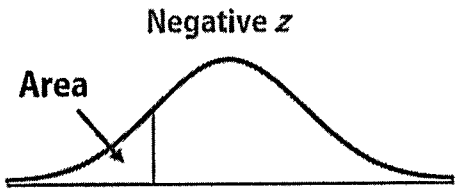
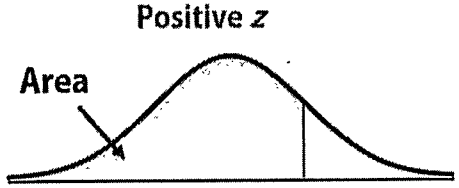
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998



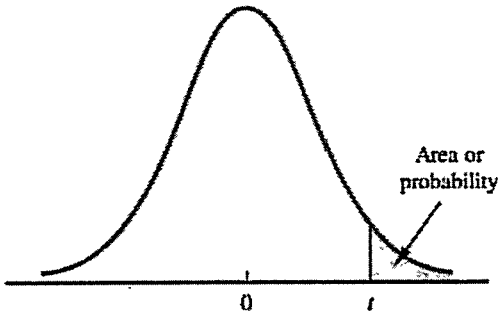
LESS THAN
Cumulative



z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.
-2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
-2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
-2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
-2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
-2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
-2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
-1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
-1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
-1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
-1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
-1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
-1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
-1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
-1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
-1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
-1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
-0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
-0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
-0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
-0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
-0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
-0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
-0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
-0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
-0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
-0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
.	.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.	.

TABLE 2 t DISTRIBUTION



Entries in the table give t values for an area or probability in the upper tail of the t distribution. For example, with 10 degrees of freedom and a .05 area in the upper tail, $t_{.05} = 1.812$.

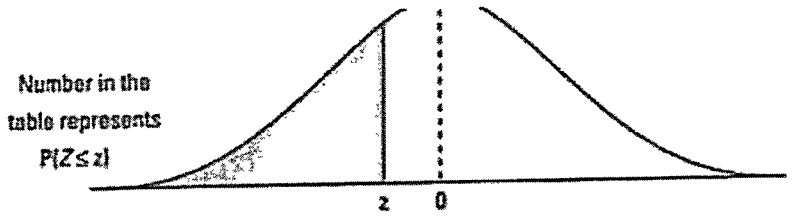
Degrees of Freedom	Area in Upper Tail					
	.20	.10	.05	.025	.01	.005
1	1.376	3.078	6.314	12.706	31.821	63.656
2	1.061	1.886	2.920	4.303	6.965	9.925
3	.978	1.638	2.353	3.182	4.541	5.841
4	.941	1.533	2.132	2.776	3.747	4.604
5	.920	1.476	2.015	2.571	3.365	4.032
6	.906	1.440	1.943	2.447	3.143	3.707
7	.896	1.415	1.895	2.365	2.998	3.499
8	.889	1.397	1.860	2.306	2.896	3.355
9	.883	1.383	1.833	2.262	2.821	3.250
10	.879	1.372	1.812	2.228	2.764	3.169
11	.876	1.363	1.796	2.201	2.718	3.106
12	.873	1.356	1.782	2.179	2.681	3.055
13	.870	1.350	1.771	2.160	2.650	3.012
14	.868	1.345	1.761	2.145	2.624	2.977
15	.866	1.341	1.753	2.131	2.602	2.947
16	.865	1.337	1.746	2.120	2.583	2.921
17	.863	1.333	1.740	2.110	2.567	2.898
18	.862	1.330	1.734	2.101	2.552	2.878
19	.861	1.328	1.729	2.093	2.539	2.861
20	.860	1.325	1.725	2.086	2.528	2.845
21	.859	1.323	1.721	2.080	2.518	2.831
22	.858	1.321	1.717	2.074	2.508	2.819
23	.858	1.319	1.714	2.069	2.500	2.807
24	.857	1.318	1.711	2.064	2.492	2.797
25	.856	1.316	1.708	2.060	2.485	2.787
26	.856	1.315	1.706	2.056	2.479	2.779
27	.855	1.314	1.703	2.052	2.473	2.771
28	.855	1.313	1.701	2.048	2.467	2.763
29	.854	1.311	1.699	2.045	2.462	2.756
30	.854	1.310	1.697	2.042	2.457	2.750
31	.853	1.309	1.696	2.040	2.453	2.744
32	.853	1.309	1.694	2.037	2.449	2.738
33	.853	1.308	1.692	2.035	2.445	2.733
34	.852	1.307	1.691	2.032	2.441	2.728

Appendix B Tables

TABLE 2 t DISTRIBUTION (*Continued*)

Degrees of Freedom	Area in Upper Tail					
	.20	.10	.05	.025	.01	.005
80	.846	1.292	1.664	1.990	2.374	2.639
81	.846	1.292	1.664	1.990	2.373	2.638
82	.846	1.292	1.664	1.989	2.373	2.637
83	.846	1.292	1.663	1.989	2.372	2.636
84	.846	1.292	1.663	1.989	2.372	2.636
85	.846	1.292	1.663	1.988	2.371	2.635
86	.846	1.291	1.663	1.988	2.370	2.634
87	.846	1.291	1.663	1.988	2.370	2.634
88	.846	1.291	1.662	1.987	2.369	2.633
89	.846	1.291	1.662	1.987	2.369	2.632
90	.846	1.291	1.662	1.987	2.368	2.632
91	.846	1.291	1.662	1.986	2.368	2.631
92	.846	1.291	1.662	1.986	2.368	2.630
93	.846	1.291	1.661	1.986	2.367	2.630
94	.845	1.291	1.661	1.986	2.367	2.629
95	.845	1.291	1.661	1.985	2.366	2.629
96	.845	1.290	1.661	1.985	2.366	2.628
97	.845	1.290	1.661	1.985	2.365	2.627
98	.845	1.290	1.661	1.984	2.365	2.627
99	.845	1.290	1.660	1.984	2.364	2.626
100	.845	1.290	1.660	1.984	2.364	2.626
∞	.842	1.282	1.645	1.960	2.326	2.576

P.T.O.



z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
-3.6	.0002	.0002	.0001	.0001	0001	.0001	.0001	.0001	.0001	.0001
-3.5	.0002	.0002	.0002	.0002	.0002	.0002	.0002	.0002	.0002	.0002
-3.4	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0002
-3.3	.0005	.0005	.0005	.0004	0004	.0004	.0004	.0004	.0004	.0003
-3.2	0007	.0007	.0006	.0006	0006	.0006	0006	.0005	.0005	.0005
-3.1	.0010	.0009	.0009	.0009	.0008	.0008	0008	.0008	.0007	.0007
-3.0	.0013	.0013	.0013	.0012	.0012	.0011	.0011	.0011	.0010	.0010
-2.9	.0019	.0018	.0018	.0017	0016	.0016	.0015	.0015	.0014	.0014
-2.8	0026	.0025	.0024	.0023	0023	.0022	.0021	.0021	.0020	.0019
-2.7	.0035	.0034	.0033	.0032	.0031	.0030	0029	0028	.0027	.0026
-2.6	.0047	.0045	.0044	.0043	.0041	.0040	.0039	.0038	.0037	.0036
-2.5	.0062	.0060	.0059	.0057	.0055	.0054	.0052	.0051	.0049	.0048
-2.4	.0082	.0080	.0078	.0075	.0073	.0071	.0069	.0068	.0066	.0064
-2.3	.0107	.0104	.0102	.0099	0096	0094	.0091	.0089	.0087	.0084
-2.2	.0139	.0136	.0132	.0129	.0125	.0122	.0119	.0116	.0113	.0110
-2.1	.0179	.0174	.0170	.0166	.0162	.0158	.0154	.0150	.0146	.0143
-2.0	0228	.0222	.0217	.0212	.0207	.0202	.0197	.0192	.0188	.0183
-1.9	.0287	.0281	.0274	.0268	.0262	.0256	0250	.0244	.0239	.0233
-1.8	.0359	.0351	.0344	.0336	.0329	.0322	.0314	.0307	.0301	0294
-1.7	.0446	0436	.0427	.0418	0409	.0401	.0392	.0384	.0375	.0357
-1.6	0548	0537	.0526	.0516	.0505	0495	0485	.0475	.0465	0455
-1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559
-1.4	0808	.0793	.0778	.0764	.0749	.0735	.0721	0708	0694	0681
-1.3	0968	0951	.0934	.0918	.0901	0885	0869	.0853	0838	.0823
-1.2	.1151	.1131	.1112	.1093	1075	.1056	.1038	,1020	.1003	0985
-1.1	.1357	.1335	.1314	1292	1271	.1251	1230	.1210	.1190	1170
-1.0	.1587	1562	.1539	1515	.1492	.1469	.1446	.1423	1401	.1379
-0.9	.1841	.1814	.1788	.1762	1736	.1711	1685	.1660	1635	.1611
-0.8	.2119	2090	.2061	.2033	2005	.1977	.1949	.1922	.1894	.1867
-0.7	.2420	.2389	.2358	.2327	.2296	.2266	.2236	.2206	.2177	.2148
-0.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451
-0.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776
-0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
-0.3	.3821	.3783	.3745	.3707	3669	.3632	.3594	.3557	.3520	.3483
-0.2	.4207	.4168	.4129	.4090	4052	.4013	.3974	.3936	.3897	.3859
-0.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247
-0.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641

df \ α	0.25	0.1	0.05	0.025	0.01	0.005	0.0025	0.001	0.0005
1	1.000	3.078	6.314	12.706	31.821	63.656	127.321	318.289	636.578
2	0.816	1.886	2.920	4.303	6.965	9.925	14.089	22.328	31.600
3	0.765	1.638	2.353	3.182	4.541	5.841	7.453	10.214	12.924
4	0.741	1.533	2.132	2.776	3.747	4.604	5.598	7.173	8.610
5	0.727	1.476	2.015	2.571	3.365	4.032	4.773	5.894	6.869
6	0.718	1.440	1.943	2.447	3.143	3.707	4.317	5.208	5.959
7	0.711	1.415	1.895	2.365	2.998	3.499	4.029	4.785	5.408
8	0.706	1.397	1.860	2.306	2.896	3.355	3.833	4.501	5.041
9	0.703	1.383	1.833	2.262	2.821	3.250	3.690	4.297	4.781
10	0.700	1.372	1.812	2.228	2.764	3.169	3.581	4.144	4.587
11	0.697	1.363	1.796	2.201	2.718	3.106	3.497	4.025	4.437
12	0.695	1.356	1.782	2.179	2.681	3.055	3.428	3.930	4.318
13	0.694	1.350	1.771	2.160	2.650	3.012	3.372	3.852	4.221
14	0.692	1.345	1.761	2.145	2.624	2.977	3.326	3.787	4.140
15	0.691	1.341	1.753	2.131	2.602	2.947	3.286	3.733	4.073
16	0.690	1.337	1.746	2.120	2.583	2.921	3.252	3.686	4.015
17	0.689	1.333	1.740	2.110	2.567	2.898	3.222	3.646	3.965
18	0.688	1.330	1.734	2.101	2.552	2.878	3.197	3.610	3.922
19	0.688	1.328	1.729	2.093	2.539	2.861	3.174	3.579	3.883
20	0.687	1.325	1.725	2.086	2.528	2.845	3.153	3.552	3.850
21	0.686	1.323	1.721	2.080	2.518	2.831	3.135	3.527	3.819
22	0.686	1.321	1.717	2.074	2.508	2.819	3.119	3.505	3.792
23	0.685	1.319	1.714	2.069	2.500	2.807	3.104	3.485	3.768
24	0.685	1.318	1.711	2.064	2.492	2.797	3.091	3.467	3.745
25	0.684	1.316	1.708	2.060	2.485	2.787	3.078	3.450	3.725
26	0.684	1.315	1.706	2.056	2.479	2.779	3.067	3.435	3.707
27	0.684	1.314	1.703	2.052	2.473	2.771	3.057	3.421	3.689
28	0.683	1.313	1.701	2.048	2.467	2.763	3.047	3.408	3.674
29	0.683	1.311	1.699	2.045	2.462	2.756	3.038	3.396	3.660
[illegible]	0.683	1.310	1.697	2.042	2.457	2.750	3.030	3.385	3.646
[illegible]	0.681	1.303	1.684	2.021	2.423	2.704	2.971	3.307	3.551
[illegible]	0.679	1.296	1.671	2.000	2.390	2.660	2.915	3.232	3.460
120	0.677	1.289	1.658	1.980	2.358	2.617	2.860	3.160	3.373

P.T.O.

t Table

cum. prob	$t_{.50}$	$t_{.75}$	$t_{.80}$	$t_{.85}$	$t_{.90}$	$t_{.95}$	$t_{.975}$	$t_{.99}$	$t_{.995}$	$t_{.999}$	$t_{.9995}$
one-tail	0.50	0.25	0.20	0.15	0.10	0.05	0.025	0.01	0.005	0.001	0.0005
two-tails	1.00	0.50	0.40	0.30	0.20	0.10	0.05	0.02	0.01	0.002	0.001
df											
1	0.000	1.000	1.376	1.963	3.078	6.314	12.71	31.82	63.66	318.31	636.62
2	0.000	0.816	1.061	1.386	1.886	2.920	4.303	6.965	9.925	22.327	31.599
3	0.000	0.765	0.978	1.250	1.638	2.353	3.182	4.541	5.841	10.215	12.924
4	0.000	0.741	0.941	1.190	1.533	2.132	2.776	3.747	4.604	7.173	8.610
5	0.000	0.727	0.920	1.156	1.476	2.015	2.571	3.365	4.032	5.893	6.869
6	0.000	0.718	0.906	1.134	1.440	1.943	2.447	3.143	3.707	5.208	5.959
7	0.000	0.711	0.896	1.119	1.415	1.895	2.365	2.998	3.499	4.785	5.408
8	0.000	0.706	0.889	1.108	1.397	1.860	2.306	2.896	3.355	4.501	5.041
9	0.000	0.703	0.883	1.100	1.383	1.833	2.262	2.821	3.250	4.297	4.781
10	0.000	0.700	0.879	1.093	1.372	1.812	2.228	2.764	3.169	4.144	4.587
11	0.000	0.697	0.876	1.088	1.363	1.796	2.201	2.718	3.106	4.025	4.437
12	0.000	0.695	0.873	1.083	1.356	1.782	2.179	2.681	3.055	3.930	4.318
13	0.000	0.694	0.870	1.079	1.350	1.771	2.160	2.650	3.012	3.852	4.221
14	0.000	0.692	0.868	1.076	1.345	1.761	2.145	2.624	2.977	3.787	4.140
15	0.000	0.691	0.866	1.074	1.341	1.753	2.131	2.602	2.947	3.733	4.073
16	0.000	0.690	0.865	1.071	1.337	1.746	2.120	2.583	2.921	3.686	4.015
17	0.000	0.689	0.863	1.069	1.333	1.740	2.110	2.567	2.898	3.646	3.965
18	0.000	0.688	0.862	1.067	1.330	1.734	2.101	2.552	2.878	3.610	3.922
19	0.000	0.688	0.861	1.066	1.328	1.729	2.093	2.539	2.861	3.579	3.883
20	0.000	0.687	0.860	1.064	1.325	1.725	2.086	2.528	2.845	3.552	3.850
21	0.000	0.686	0.859	1.063	1.323	1.721	2.080	2.518	2.831	3.527	3.819
22	0.000	0.686	0.858	1.061	1.321	1.717	2.074	2.508	2.819	3.505	3.792
23	0.000	0.685	0.858	1.060	1.319	1.714	2.069	2.500	2.807	3.485	3.768
24	0.000	0.685	0.857	1.059	1.318	1.711	2.064	2.492	2.797	3.467	3.745
25	0.000	0.684	0.856	1.058	1.316	1.708	2.060	2.485	2.787	3.450	3.725
26	0.000	0.684	0.856	1.058	1.315	1.706	2.056	2.479	2.779	3.435	3.707
27	0.000	0.684	0.855	1.057	1.314	1.703	2.052	2.473	2.771	3.421	3.690
28	0.000	0.683	0.855	1.056	1.313	1.701	2.048	2.467	2.763	3.408	3.674
29	0.000	0.683	0.854	1.055	1.311	1.699	2.045	2.462	2.756	3.396	3.659
30	0.000	0.683	0.854	1.055	1.310	1.697	2.042	2.457	2.750	3.385	3.646
40	0.000	0.681	0.851	1.050	1.303	1.684	2.021	2.423	2.704	3.307	3.551
60	0.000	0.679	0.848	1.045	1.296	1.671	2.000	2.390	2.660	3.232	3.460
80	0.000	0.678	0.846	1.043	1.292	1.664	1.990	2.374	2.639	3.195	3.416
∞	0.000	0.677	0.845	1.042	1.290	1.660	1.984	2.364	2.626	3.174	3.390
	0.000	0.675	0.842	1.037	1.282	1.646	1.962	2.330	2.581	3.098	3.300
	0.000	0.674	0.842	1.036	1.282	1.645	1.960	2.326	2.576	3.090	3.291
	0%	50%	60%	70%	80%	90%	95%	98%	99%	99.8%	99.9%
	Confidence Level										