

[This question paper contains 16 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 5585

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

Maximum Marks : 90

समय : 3 घण्टे

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. For the following data

Rating	Frequency
Excellent	807
Very good	521
Average	200
Poor	107
Terrible	44

- (a) Construct a frequency distribution.
- (b) Construct a percent frequency distribution.
- (c) Construct a bar chart for the percent frequency distribution. (5+5+5)
2. (a) Consider a sample with data
27, 25, 20, 15, 30, 34, 28, 25
Compute Range, Interquartile range, Variance, Standard deviation.
(2.5+2.5+2.5+2.5)
- (b) What is Sampling? What are the different sampling techniques? (5)

Section II*(Attempt ANY TWO Questions)*

3. If $P(A) = 0.4$, $P(B) = 0.6$ and $P(A \cap B) = 0$.

If $P(C/A) = 0.20$ and $P(C/B) = 0.05$

- (a) Compute $P(A \cap C)$ and $P(B \cap C)$ (4)
- (b) Find $P(A/C)$ and $P(B/C)$ (4)

- (c) Are the two events A and B mutually exclusive? Explain. (2)

4. The following are the responses for the question-

Does global warming pose a threat during your lifetime?

Responses	Age	
	18-29	30+
YES	134	293
NO	131	432
UNSURE	2	8

On the basis of this information answer :

- (a) What is the probability that a respondent 18-29 years of age thinks that global warming will not pose a threat during his/her lifetime? (5)
- (b) For a randomly selected respondent, what is the probability that a respondent answer is yes? (5)
6. (a) Compute the probability of randomly drawing five cards from a deck of 52 cards and getting exactly one ace. (5)
- (b) Five boys and five girls have to be seated in a row. Find the probability that two particular boys are always together. (5)

Section – III

(Attempt ANY TWO Questions)

7. (a) The probability of a man hitting a target is $\frac{1}{4}$. If he fires 3 times, what is the probability of his hitting the target at least once. (5)
- (b) Consider a binomial experiment with $n=20$ and $p=0.7$, find $P(x \geq 16)$, $E(x)$. (5)

8. The mean cost of domestic airfare is rupees 385 per ticket, assuming that the airfares are domestically distributed with a standard deviation of Rs. 110

(a) What is the probability that the domestic airfare is Rs., 550 or more? (5)

(b) What is the probability that the domestic airfare is between Rs. 300 and 500? (5)

9. The following table shows the monthly demand for a product

Unit demand	Probability
300	0.20
400	0.30
500	0.35
600	0.15

- (a) If the firm bases monthly orders on the expected value of monthly demand, what should be the firm's monthly order quantity for the product (5)
- (b) Assuming each unit demanded generates a revenue of Rs. 70 and costs Rs. 50. How much will the firm gain or lose in a month if it places an order based on part a. (5)

Section – IV

(Attempt ANY TWO Questions)

9. Annual expenditure for medicines was 838 in the north of a country. A sample of 60 individuals showed a per person annual expenditure of 745 in the west of the country. If standard deviation of population was 300.

Formulate the hypothesis for a test to determine whether the sample data support the conclusion that the population annual expenditure for medicine is lower in west than in North.

- (a) What is the p value?
- (b) At $\alpha = 0.01$, what is your conclusion? (5+5)
10. What are random sampling methods? (10)
11. A simple random sample with $n = 54$ provided a sample mean of 22.5 and a sample deviation of 4.4
- (a) Develop a 95% confidence interval for the population mean.
- (b) Develop a 99% confidence interval for the population mean. What happens to the margin of error and the confidence interval as the confidence level increases? (5+5)

खंड - I

(सभी प्रश्न अनिवार्य हैं)

1. निम्नलिखित आंकड़ों के लिए

रेटिंग	आवृत्ति (Frequency)
उत्कृष्ट (Excellent)	807
बहुत अच्छा (Very good)	521
औसत (Average)	200
खराब (Poor)	107
अत्यंत खराब (Terrible)	44

- (अ) एक आवृत्ति वितरण (frequency distribution) तैयार कीजिए।
- (ब) एक प्रतिशत आवृत्ति वितरण (percent frequency distribution) तैयार कीजिए।
- (स) प्रतिशत आवृत्ति वितरण के लिए एक बार चार्ट (bar chart) बनाएँ। (5 + 5 + 5)

2. (अ) एक नमूने (sample) के आंकड़ों पर विचार कीजिए :

27, 25, 20, 15, 30, 34, 28, 25

गणना कीजिए : रेंज (Range), इंटरक्वाटाइल रेंज (IQR), प्रसरण (Variance), मानक विचलन (Standard deviation)। (2.5 + 2.5 + 2.5 + 2.5)

- (ब) प्रतिचयन (Sampling) क्या है? विभिन्न प्रतिचयन तकनीकें (sampling techniques) क्या हैं? (5)

खंड - II

(किन्हीं दो प्रश्नों के उत्तर दें)

3. यदि $P(A) = 0.4$, $P(B) = 0.6$ and $P(A \cap B) = 0$ हो।

यदि $P(C/A) = 0.20$ and $P(C/B) = 0.05$ हो, तो :

- (अ) $P(A \cap C)$ और $P(B \cap C)$ की गणना कीजिए। (4)

- (ब) $P(A/C)$ और $P(B/C)$ ज्ञात कीजिए। (4)

- (स) क्या दो घटनाएँ A और B परस्पर अपवर्जी (mutually exclusive) हैं? व्याख्या कीजिए। (2)

4. “क्या ग्लोबल वार्मिंग आपके जीवनकाल के दौरान खतरा पैदा करती है?” प्रश्न के लिए निम्नलिखित प्रतिक्रियाएँ प्राप्त हुई हैं :

प्रतिक्रिया	आयु	
	18 – 29	आयु 30 +
हाँ (YES)	134	293
नहीं (NO)	131	432
अनिश्चित (UNSURE)	2	8

इस जानकारी के आधार पर उत्तर दें :

- (अ) इसकी क्या प्रायिकता है कि 18-29 वर्ष की आयु का एक प्रतिवादी यह सोचता है कि ग्लोबल वार्मिंग उसके जीवनकाल के दौरान खतरा पैदा नहीं करेगी? (5)
- (ब) बेतरतीब ढंग से चुने गए एक प्रतिवादी के लिए, इसकी क्या प्रायिकता है कि प्रतिवादी का उत्तर “हाँ” है? (5)
6. (अ) 52 ताश के पत्तों की एक गद्दी से यादृच्छिक रूप से पांच कार्ड निकालने और ठीक एक इक्का (ace) प्राप्त करने की प्रायिकता की गणना कीजिए। (5)
- (ब) पांच लड़कों और पांच लड़कियों को एक पक्ति में बैठाया जाना है। इसकी प्रायिकता ज्ञात कीजिए कि दो विशेष लड़के हमेशा साथ रहें। (5)

खंड - III

(किन्हीं दो प्रश्नों के उत्तर दें)

7. (अ) एक व्यक्ति के लक्ष्य पर निशाना लगाने की प्रायिकता $\frac{1}{4}$ है। यदि वह 3 बार गोली चलाता है, तो उसके कम से कम एक बार लक्ष्य पर निशाना लगाने की क्या प्रायिकता है? (5)
- (ब) $n=20$ और $p=0.7$ के साथ एक द्विपद प्रयोग (binomial experiment) पर विचार कीजिए, $P(x \geq 16)$ और $E(x)$ ज्ञात कीजिए। (5)
8. घरेलू हवाई किराए की औसत लागत 385 रुपये प्रति टिकट है। यह मानते हुए कि हवाई किराए 110 रुपये के मानक विचलन के साथ वितरित हैं:
- (अ) इसकी क्या प्रायिकता है कि घरेलू हवाई किराया 550 रुपये या उससे अधिक हो? (5)
- (ब) इसकी क्या प्रायिकता है कि घरेलू हवाई किराया 300 रुपये और 500 रुपये के बीच हो? (5)

9. निम्नलिखित तालिका किसी उत्पाद की मासिक मांग को दर्शाती है :

इकाई मांग (Unit demand)	प्रायिकता (Probability)
300	0.20
400	0.30
500	0.35
600	0.15

- (अ) यदि फर्म मासिक ऑर्डर को मासिक मांग के अपेक्षित मूल्य (expected value) पर आधारित करती है, तो उत्पाद के लिए फर्म की मासिक ऑर्डर मात्रा क्या होनी चाहिए? (5)
- (ब) यह मानते हुए कि मांग की गई प्रत्येक इकाई 70 रुपये का राजस्व उत्पन्न करती है और इसकी लागत 50 रुपये है। यदि फर्म भाग 3अ के आधार पर ऑर्डर देती है, तो उसे एक महीने में कितना लाभ या हानि होगी? (5)

खंड - IV

(किन्हीं दो प्रश्नों के उत्तर दें)

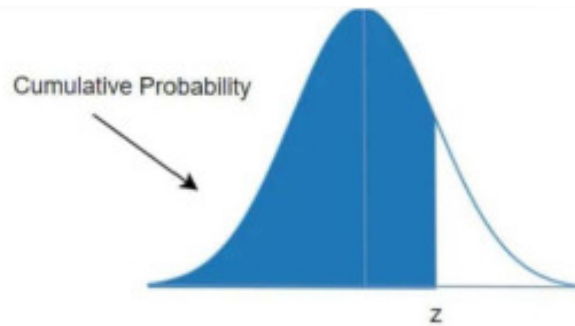
9. देश के उत्तर में दवाओं के लिए वार्षिक व्यय 838 था। 60 व्यक्तियों के एक नमूने ने देश के पश्चिम में प्रति व्यक्ति वार्षिक व्यय 745 दिखाया। यदि जनसंख्या का मानक विचलन 300 था :

यह निर्धारित करने के लिए एक परीक्षण की परिकल्पना तैयार कीजिए कि क्या नमूना डेटा इस निष्कर्ष का समर्थन करता है कि दवाओं के लिए जनसंख्या का वार्षिक व्यय उत्तर की तुलना में पश्चिम में कम है।

(अ) p -वैल्यू क्या है?

(ब) $\alpha = 0.01$ पर, आपका निष्कर्ष क्या है? (5 + 5)

10. यादृच्छिक प्रतिचयन विधियाँ (Random sampling methods) क्या हैं? (10)
11. $n=54$ वाले एक सरल यादृच्छिक नमूने ने 22.5 का नमूना माध्य और 4.4 का नमूना विचलन प्रदान किया :
- (अ) जनसंख्या माध्य के लिए 95% विश्वास अंतराल (confidence interval) विकसित कीजिए।
- (ब) जनसंख्या माध्य के लिए 99% विश्वास अंतराल विकसित कीजिए। जैसे-जैसे विश्वास का स्तर (confidence level) बढ़ता है, त्रुटि सीमा (margin of error) और विश्वास अंतराल का क्या होता है? (5 + 5)

[illegible]

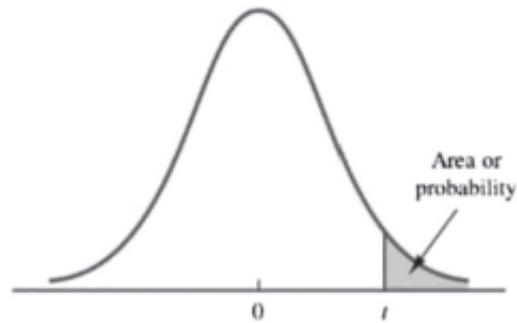


LESS THAN
Cumulative

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	0.0062	0.0060	0.0058	0.0055	0.0053	0.0051	0.0049	0.0048	0.0046	0.0044
-2.3	0.0062	0.0060	0.0058	0.0055	0.0053	0.0051	0.0049	0.0048	0.0046	0.0044
-2.2	0.0062	0.0060	0.0058	0.0055	0.0053	0.0051	0.0049	0.0048	0.0046	0.0044
-2.1	0.0062	0.0060	0.0058	0.0055	0.0053	0.0051	0.0049	0.0048	0.0046	0.0044
-2.0	0.0062	0.0060	0.0058	0.0055	0.0053	0.0051	0.0049	0.0048	0.0046	0.0044
-1.9	0.0062	0.0060	0.0058	0.0055	0.0053	0.0051	0.0049	0.0048	0.0046	0.0044
-1.8	0.0062	0.0060	0.0058	0.0055	0.0053	0.0051	0.0049	0.0048	0.0046	0.0044
-1.7	0.0062	0.0060	0.0058	0.0055	0.0053	0.0051	0.0049	0.0048	0.0046	0.0044
-1.6	0.0062	0.0060	0.0058	0.0055	0.0053	0.0051	0.0049	0.0048	0.0046	0.0044
-1.5	0.0062	0.0060	0.0058	0.0055	0.0053	0.0051	0.0049	0.0048	0.0046	0.0044
-1.4	0.0062	0.0060	0.0058	0.0055	0.0053	0.0051	0.0049	0.0048	0.0046	0.0044
-1.3	0.0062	0.0060	0.0058	0.0055	0.0053	0.0051	0.0049	0.0048	0.0046	0.0044
-1.2	0.0062	0.0060	0.0058	0.0055	0.0053	0.0051	0.0049	0.0048	0.0046	0.0044
-1.1	0.0062	0.0060	0.0058	0.0055	0.0053	0.0051	0.0049	0.0048	0.0046	0.0044
-1.0	0.0062	0.0060	0.0058	0.0055	0.0053	0.0051	0.0049	0.0048	0.0046	0.0044
-0.9	0.0062	0.0060	0.0058	0.0055	0.0053	0.0051	0.0049	0.0048	0.0046	0.0044
-0.8	0.0062	0.0060	0.0058	0.0055	0.0053	0.0051	0.0049	0.0048	0.0046	0.0044
-0.7	0.0062	0.0060	0.0058	0.0055	0.0053	0.0051	0.0049	0.0048	0.0046	0.0044
-0.6	0.0062	0.0060	0.0058	0.0055	0.0053	0.0051	0.0049	0.0048	0.0046	0.0044
-0.5	0.0062	0.0060	0.0058	0.0055	0.0053	0.0051	0.0049	0.0048	0.0046	0.0044
-0.4	0.0062	0.0060	0.0058	0.0055	0.0053	0.0051	0.0049	0.0048	0.0046	0.0044
-0.3	0.0062	0.0060	0.0058	0.0055	0.0053	0.0051	0.0049	0.0048	0.0046	0.0044
-0.2	0.0062	0.0060	0.0058	0.0055	0.0053	0.0051	0.0049	0.0048	0.0046	0.0044
-0.1	0.0062	0.0060	0.0058	0.0055	0.0053	0.0051	0.0049	0.0048	0.0046	0.0044
-0.0	0.0062	0.0060	0.0058	0.0055	0.0053	0.0051	0.0049	0.0048	0.0046	0.0044

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

Appendix B Tables

TABLE 2 *t* DISTRIBUTION

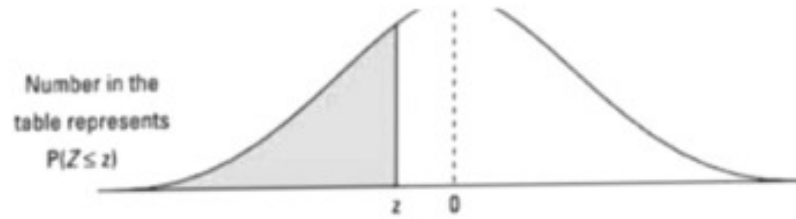
Entries in the table give *t* values for an area or probability in the upper tail of the *t* distribution. For example, with 10 degrees of freedom and a .05 area in the upper tail, $t_{.05} = 1.812$.

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



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	.0367
-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

α df	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
30	0.683	1.310	1.697	2.042	2.457	2.750	3.030	3.385	3.646
40	0.681	1.303	1.684	2.021	2.423	2.704	2.971	3.307	3.551
60	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

t Table

cum. prob	<i>t</i> ₅₀	<i>t</i> ₇₅	<i>t</i> ₉₀	<i>t</i> ₉₅	<i>t</i> ₉₈	<i>t</i> ₉₉	<i>t</i> ₉₉₅	<i>t</i> ₉₉₇₅	<i>t</i> ₉₉₉₀	<i>t</i> ₉₉₉₅
one-tail	0.50	0.25	0.20	0.15	0.10	0.05	0.025	0.01	0.005	0.001
two-tails	1.00	0.50	0.40	0.30	0.20	0.10	0.05	0.02	0.01	0.002
df										
1	0.000	1.000	1.376	1.963	3.078	6.314	12.71	31.82	63.66	318.31
2	0.000	0.816	1.061	1.386	1.886	2.920	4.303	6.965	9.925	22.327
3	0.000	0.765	0.978	1.250	1.638	2.353	3.182	4.541	5.841	10.215
4	0.000	0.741	0.941	1.190	1.533	2.132	2.776	3.747	4.604	7.173
5	0.000	0.727	0.920	1.156	1.476	2.015	2.571	3.365	4.032	5.893
6	0.000	0.718	0.906	1.134	1.440	1.943	2.447	3.143	3.707	5.208
7	0.000	0.711	0.896	1.119	1.415	1.895	2.365	2.998	3.499	4.785
8	0.000	0.706	0.889	1.108	1.397	1.860	2.306	2.896	3.355	4.501
9	0.000	0.703	0.883	1.100	1.383	1.833	2.262	2.821	3.250	4.297
10	0.000	0.700	0.879	1.093	1.372	1.812	2.228	2.764	3.169	4.144
11	0.000	0.697	0.876	1.088	1.363	1.796	2.201	2.718	3.106	4.025
12	0.000	0.695	0.873	1.083	1.356	1.782	2.179	2.681	3.055	3.930
13	0.000	0.694	0.870	1.079	1.350	1.771	2.160	2.650	3.012	3.852
14	0.000	0.692	0.868	1.076	1.345	1.761	2.145	2.624	2.977	3.787
15	0.000	0.691	0.866	1.074	1.341	1.753	2.131	2.602	2.947	3.733
16	0.000	0.690	0.865	1.071	1.337	1.746	2.120	2.583	2.921	3.686
17	0.000	0.689	0.863	1.069	1.333	1.740	2.110	2.567	2.898	3.646
18	0.000	0.688	0.862	1.067	1.330	1.734	2.101	2.552	2.878	3.610
19	0.000	0.688	0.861	1.066	1.328	1.729	2.093	2.539	2.861	3.579
20	0.000	0.687	0.860	1.064	1.325	1.725	2.086	2.528	2.845	3.552
21	0.000	0.686	0.859	1.063	1.323	1.721	2.080	2.518	2.831	3.527
22	0.000	0.686	0.858	1.061	1.321	1.717	2.074	2.508	2.819	3.505
23	0.000	0.685	0.858	1.060	1.319	1.714	2.069	2.500	2.807	3.485
24	0.000	0.685	0.857	1.059	1.318	1.711	2.064	2.492	2.797	3.467
25	0.000	0.684	0.856	1.058	1.316	1.708	2.060	2.485	2.787	3.450
26	0.000	0.684	0.856	1.058	1.315	1.706	2.056	2.479	2.779	3.435
27	0.000	0.684	0.855	1.057	1.314	1.703	2.052	2.473	2.771	3.421
28	0.000	0.683	0.855	1.056	1.313	1.701	2.048	2.467	2.763	3.408
29	0.000	0.683	0.854	1.055	1.311	1.699	2.045	2.462	2.756	3.396
30	0.000	0.683	0.854	1.055	1.310	1.697	2.042	2.457	2.750	3.385
40	0.000	0.681	0.851	1.050	1.303	1.684	2.021	2.423	2.704	3.307
60	0.000	0.679	0.848	1.045	1.296	1.671	2.000	2.390	2.660	3.232
80	0.000	0.678	0.846	1.043	1.292	1.664	1.990	2.374	2.639	3.195
100	0.000	0.677	0.845	1.042	1.290	1.660	1.984	2.364	2.626	3.174
100	0.000	0.675	0.842	1.037	1.282	1.646	1.962	2.330	2.581	3.098
100	0.000	0.674	0.842	1.036	1.282	1.645	1.960	2.326	2.576	3.090
	0%	50%	60%	70%	80%	90%	95%	98%	99%	99.8%
	Confidence Level									