



National
College of
Ireland

STATISTICAL FORMULAE AND TABLES

UNDERGRADUATE

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STATISTICAL SYMBOLS

Population Statistical Symbols

Symbol	Meaning
N	Size of the Population
μ	Mean of the Population
σ^2	Variance of the Population
σ	Standard Deviation of the Population
<i>f</i>	Frequency of Occurrence
F	Cumulative Frequency

Sample Statistical Symbols

Symbol	Meaning
n	Size of the Sample
\bar{x}	Mean of the Sample
s^2	Variance of the Sample
<i>s</i>	Standard Deviation of the Sample
<i>f</i>	Frequency of Occurrence
F	Cumulative Frequency

DESCRIPTIVE STATISTICS FORMULAE

Population Parameter and Sample Statistic Formulae when Dealing with Raw Data.

	Population	Sample
Mean	$\mu = \frac{\sum x}{N}$	$\bar{x} = \frac{\sum x}{n}$
Variance	$\sigma^2 = \frac{\sum(x - \mu)^2}{N}$	$s^2 = \frac{\sum(x - \bar{x})^2}{n - 1}$
Standard Deviation	$\sigma = \sqrt{\frac{\sum(x - \mu)^2}{N}}$	$s = \sqrt{\frac{\sum(x - \bar{x})^2}{n - 1}}$

Population Parameter and Sample Statistic Formulae when Dealing with Frequency Distributions.

	Population	Sample
Mean	$\mu = \frac{\sum fx}{\sum f}$	$\bar{x} = \frac{\sum fx}{\sum f}$
Variance	$\sigma^2 = \frac{\sum f(x - \mu)^2}{\sum f}$	$s^2 = \frac{\sum f(x - \bar{x})^2}{\sum f - 1}$
Standard Deviation	$\sigma = \sqrt{\frac{\sum f(x - \mu)^2}{\sum f}}$	$s = \sqrt{\frac{\sum f(x - \bar{x})^2}{\sum f - 1}}$

DESCRIPTIVE STATISTICS FORMULAE CONTINUED

Median and Mode given a Frequency Distribution.

Median	$\text{Median} = L_M + \left(\frac{\frac{\sum f}{2} - F_{M-1}}{f_M} \right) \cdot C_M$
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Mode	$\text{Mode} = L + \left(\frac{D_1}{D_1 + D_2} \right) \cdot C_M$
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First and Third Quartiles given Frequency Distribution.

1 st Quartile	$Q_1 = L_{Q1} + \left(\frac{\frac{\sum f}{4} - F_{Q1-1}}{f_{Q1}} \right) \cdot C_{Q1}$
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3 rd Quartile	$Q_3 = L_{Q3} + \left(\frac{\frac{3\sum f}{4} - F_{Q3-1}}{f_{Q3}} \right) \cdot C_{Q3}$
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RULES OF PROBABILITY

Addition Rule of Probability:

When A and B are not mutually exclusive	$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$
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When A and B are mutually exclusive	$P(A \text{ or } B) = P(A) + P(B)$
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Multiplication Rule of Probability:

When A and B are not independent	$P(A \text{ and } B) = P(A)P(B A)$
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When A and B are independent	$P(A \text{ and } B) = P(A)P(B)$
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Bayes Theorem:

To find the conditional probability of B given A	$P(B A) = \frac{P(A B)P(B)}{P(A)}$
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RULES OF PROBABILITY CONTINUED

Binomial Distribution:

The probability of x successes given the number of observations n and the probability of success p	$P(X = x) = {}^n_x C p^x (1 - p)^{n-x}$
Expected value of the Binomial Distribution	$\mu = E(X) = np$
Variance of the Binomial Distribution	$\sigma^2 = \text{Var}(X) = np(1 - p)$
Standard Deviation of the Binomial Distribution	$\sigma = \sqrt{\text{Var}(X)} = \sqrt{np(1 - p)}$

Poisson Distribution:

The probability of X events occurring given the expected number of events λ	$P(X = x) = \frac{e^{-\lambda} \lambda^x}{x!}$
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Combination Formula:

The number of combinations of selecting x objects from n objects, irrespective of order	${}^n_x C \equiv \binom{n}{x} = \frac{n!}{x!(n-x)!}$
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CORRELATION

Spearman Rank Correlation Coefficient (r_s)

$$r_s = 1 - \frac{6 \sum_{i=1}^n d_i^2}{n(n^2 - 1)}$$

Pearson Product Moment Correlation Coefficient (r)

$$r = \frac{n \sum XY - (\sum X)(\sum Y)}{\sqrt{[n \sum X^2 - (\sum X)^2][n \sum Y^2 - (\sum Y)^2]}}$$

alternatively

$$r = \frac{\sum((X - \bar{X})(Y - \bar{Y}))}{\sqrt{\sum(X - \bar{X})^2 \sum(Y - \bar{Y})^2}}$$

REGRESSION (SINGLE DEPENDENT VARIABLE AND SINGLE INDEPENDENT VARIABLE)

Linear Regression Function	$y = a + bx$
Slope of Regression Line	$b = \frac{n \sum XY - (\sum X)(\sum Y)}{n \sum X^2 - (\sum X)^2}$ <p>alternatively</p> $b = r \frac{s_y}{s_x}$
Y-Intercept of Regression Line	$a = \frac{\sum Y}{n} - b \frac{\sum X}{n}$ <p>alternatively</p> $a = \bar{Y} - b\bar{X}$

INFERENCEAL STATISTICS

Standardised Normal Transformation	$Z = \frac{X - \mu}{\sigma}$
Standardised Normal Transformation for a Sampling Distribution (σ known)	$Z = \frac{\bar{X} - \mu}{\frac{\sigma}{\sqrt{n}}}$
Standardised Normal Transformation for a Sampling Distribution (σ unknown)	$Z = \frac{\bar{X} - \mu}{\frac{s}{\sqrt{n}}}$
Confidence Interval for a Mean (σ known)	$\bar{X} \pm Z \frac{\sigma}{\sqrt{n}}$ <p style="text-align: center;">alternatively</p> $\bar{X} - Z \frac{\sigma}{\sqrt{n}} \leq \mu \leq \bar{X} + Z \frac{\sigma}{\sqrt{n}}$
Confidence Interval for a Mean (σ unknown)	$\bar{X} \pm t_{n-1} \frac{s}{\sqrt{n}}$ <p style="text-align: center;">alternatively</p> $\bar{X} - t_{n-1} \frac{s}{\sqrt{n}} \leq \mu \leq \bar{X} + t_{n-1} \frac{s}{\sqrt{n}}$

INFERENCEAL STATISTICS CONTINUED

<p>Test Statistic for Hypothesis Tests of the Population Mean</p> <p>(σ known)</p>	$z = \frac{\bar{X} - \mu_0}{\frac{\sigma}{\sqrt{n}}}$
<p>Test Statistic for Hypothesis Tests of the Population Mean</p> <p>(σ unknown)</p>	$z = \frac{\bar{X} - \mu_0}{\frac{s}{\sqrt{n}}}$
<p>Test Statistic for Hypothesis Tests of the Population Mean</p> <p>(σ known)</p>	$t_{n-1} = \frac{\bar{X} - \mu_0}{\frac{\sigma}{\sqrt{n}}} \quad df = n - 1$
<p>Test Statistic for Hypothesis Tests of the Population Mean</p> <p>(σ unknown)</p>	$t_{n-1} = \frac{\bar{X} - \mu_0}{\frac{s}{\sqrt{n}}} \quad df = n - 1$
<p>Test Statistic for a Test of the Difference between Two Population Means</p> <p>(σ known)</p>	$z = \frac{(\bar{X}_1 - \bar{X}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$

INFERENCEAL STATISTICS CONTINUED

<p>Test Statistic for a Test of the Difference between Two Population Means</p> <p>(σ unknown; assumed equal)</p>	$t = \frac{(\bar{X}_1 - \bar{X}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{s_p^2}{n_1} + \frac{s_p^2}{n_2}}}$ $s_p^2 = \frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}$ $df = n_1 + n_2 - 2$
<p>Test Statistic for a Test of the Difference between Two Population Means</p> <p>(σ unknown; assumed unequal)</p>	$t = \frac{(\bar{X}_1 - \bar{X}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$ $df = \frac{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)^2}{\frac{(s_1^2/n_1)^2}{n_1} + \frac{(s_2^2/n_2)^2}{n_2}}$
<p>Test Statistic for a Test of the Difference between Two Population Proportions</p>	$t = \frac{(p_1 - p_2) - (\pi_1 - \pi_2)}{\sqrt{\bar{p}(1 - \bar{p})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$ $\bar{p} = \frac{X_1 + X_2}{n_1 + n_2} \quad p_1 = \frac{X_1}{n_1} \quad p_2 = \frac{X_2}{n_2}$

INFERENCEAL STATISTICS CONTINUED

<p>Test Statistic for a Test of Mean Differences (σ unknown)</p>	$t = \frac{\bar{d} - \mu_{d0}}{s_{\bar{d}}} \quad df = n - 1$
<p>Test Statistic for Tests Concerning the Value of a Population Variance</p>	$\chi^2 = \frac{(n - 1)s^2}{\sigma_0^2} \quad df = n - 1$
<p>Test Statistic for the Difference between Two Population Variances</p>	$F = \frac{s_1^2}{s_2^2}$ $df_{\text{numerator}} = n_1 - 1$ $df_{\text{denominator}} = n_2 - 1$
<p>Test Statistic for the Spearman Rank Correlation Coefficient (r_s)</p>	$t = \frac{r_s \sqrt{(n - 2)}}{\sqrt{(1 - r_s^2)}} \quad df = n - 2$
<p>Test Statistic for the Pearson Product Moment Correlation Coefficient (r)</p>	$t = \frac{r \sqrt{(n - 2)}}{\sqrt{(1 - r^2)}} \quad df = n - 2$

INFERENCEAL STATISTICS CONTINUED

Test Statistic for Tests of Independence between two Variables (Chi-square)

$$\chi^2 = \sum \left(\frac{(f_o - f_e)^2}{f_e} \right) \quad df = (r - 1)(c - 1)$$

$$f_e = \frac{\text{Row total} \times \text{Column Total}}{n}$$

alternatively

$$\chi^2 = \sum \left(\frac{(O - E)^2}{E} \right)$$

ANALYSIS OF VARIANCE (ANOVA)

Within Groups Mean Sum of Squares	$MSS_W = \frac{\sum_{g \in G} (X - \bar{X}_g)^2}{n - k}$
Between Groups Mean Sum of Squares	$MSS_B = \frac{\sum_{g \in G} n_g (\bar{X}_g - \bar{X}_G)^2}{k - 1}$
Test Statistic for Tests Concerning the Differences between the Variances of Two Populations (Normally Distributed Populations)	$F = \frac{MSS_B}{MSS_W}$ $df_B = k - 1$ $df_W = n - k$

PORTFOLIO CONSTRUCTION

Two Asset Case:

Expected Return	$E(R_p) = w_1E(R_1) + w_2E(R_2)$
Variance	$\sigma_p^2 = w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + 2w_1w_2\rho_{1,2}\sigma_1\sigma_2$

Three Asset Case:

Expected Return	$E(R_p) = w_1E(R_1) + w_2E(R_2) + w_3E(R_3)$
Variance	$\begin{aligned} \sigma_p^2 = & w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + w_3^2\sigma_3^2 + 2w_1w_2\rho_{1,2}\sigma_1\sigma_2 \\ & + 2w_1w_3\rho_{1,3}\sigma_1\sigma_3 \\ & + 2w_2w_3\rho_{2,3}\sigma_2\sigma_3 \end{aligned}$

BOOLEAN ALGEBRA IDENTITIES

Commutative	$A \cdot B = B \cdot A$	$A + B = B + A$
Associative	$(A \cdot B) \cdot C = A \cdot (B \cdot C)$	$A + (B + C) = (A + B) + C$
Distributive	$A \cdot (B + C) = (A \cdot B) + (A \cdot C)$	$A + (B \cdot C) = (A + B) \cdot (A + C)$
Identity	$A \cdot 1 = A$	$A + 0 = A$
Negation	$A \cdot \bar{A} = 0$	$A + \bar{A} = 1$
Double Negation	$\overline{(\bar{A})} = A$	
Idempotent	$A \cdot A = A$	$A + A = A$
Universal Bound	$A \cdot 0 = 0$	$A + 1 = 1$
Absorption	$A \cdot (A + B) = A$	$A + (A \cdot B) = A$
Complements of 1 and 0	$\bar{\bar{1}} = 0$	$\bar{\bar{0}} = 1$
DeMorgan's Laws	$\overline{(A \cdot B)} = \bar{A} + \bar{B}$	$\overline{(A + B)} = \bar{A} \cdot \bar{B}$

RULES OF DIFFERENTIATION

Derivative of a constant function

The derivative of a constant function $y=c$ where c is a constant, is given by:

$$\frac{dy}{dx} = 0$$

Derivative of a power function

The derivative of a power function $y=x^b$ where b is a constant, is given by:

$$\frac{dy}{dx} = bx^{b-1}$$

Derivative of a power function multiplied by a constant

The derivative of a power function multiplied by a constant $y=ax^b$ where a and b are constants, is given by:

$$\frac{dy}{dx} = bax^{b-1}$$

RULES OF DIFFERENTIATION CONTINUED

Derivative of a product of functions

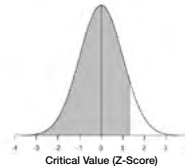
The derivative of a product of functions $y=uv$ where u and v are functions, is given by:

$$\frac{dy}{dx} = \frac{du}{dx}v + u\frac{dv}{dx}$$

Derivative of a quotient of functions

The derivative of a quotient of functions $y=\frac{u}{v}$ where u and v are functions, is given by:

$$\frac{dy}{dx} = \frac{\frac{du}{dx}v - u\frac{dv}{dx}}{v^2}$$



Cumulative Probabilities for a Standard Normal Distribution

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.00	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.10	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.20	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.30	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.40	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.50	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.60	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.70	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.80	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.90	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.00	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.10	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.20	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.30	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.40	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.50	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.60	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.70	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.80	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.90	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.00	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.10	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.20	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.30	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.40	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.50	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.60	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.70	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.80	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.90	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.00	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.10	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.20	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.30	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.40	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998
3.50	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998
3.60	0.9998	0.9998	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.70	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.80	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.90	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
4.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

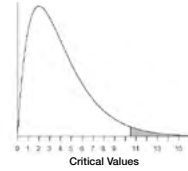


Table of χ^2 Distribution

df	Probability in Right Tail								
	0.99	0.975	0.95	0.9	0.1	0.05	0.025	0.01	0.005
1	0.000	0.001	0.004	0.016	2.706	3.841	5.024	6.635	7.879
2	0.020	0.051	0.103	0.211	4.605	5.991	7.378	9.210	10.597
3	0.115	0.216	0.352	0.584	6.251	7.815	9.348	11.345	12.838
4	0.297	0.484	0.711	1.064	7.779	9.488	11.143	13.277	14.860
5	0.554	0.831	1.145	1.610	9.236	11.070	12.833	15.086	16.750
6	0.872	1.237	1.635	2.204	10.645	12.592	14.449	16.812	18.548
7	1.239	1.690	2.167	2.833	12.017	14.067	16.013	18.475	20.278
8	1.646	2.180	2.733	3.490	13.362	15.507	17.535	20.090	21.955
9	2.088	2.700	3.325	4.168	14.684	16.919	19.023	21.666	23.589
10	2.558	3.247	3.940	4.865	15.987	18.307	20.483	23.209	25.188
11	3.053	3.816	4.575	5.578	17.275	19.675	21.920	24.725	26.757
12	3.571	4.404	5.226	6.304	18.549	21.026	23.337	26.217	28.300
13	4.107	5.009	5.892	7.042	19.812	22.362	24.736	27.688	29.819
14	4.660	5.629	6.571	7.790	21.064	23.685	26.119	29.141	31.319
15	5.229	6.262	7.261	8.547	22.307	24.996	27.488	30.578	32.801
16	5.812	6.908	7.962	9.312	23.542	26.296	28.845	32.000	34.267
17	6.408	7.564	8.672	10.085	24.769	27.587	30.191	33.409	35.718
18	7.015	8.231	9.390	10.865	25.989	28.869	31.526	34.805	37.156
19	7.633	8.907	10.117	11.651	27.204	30.144	32.852	36.191	38.582
20	8.260	9.591	10.851	12.443	28.412	31.410	34.170	37.566	39.997
21	8.897	10.283	11.591	13.240	29.615	32.671	35.479	38.932	41.401
22	9.542	10.982	12.338	14.041	30.813	33.924	36.781	40.289	42.796
23	10.196	11.689	13.091	14.848	32.007	35.172	38.076	41.638	44.181
24	10.856	12.401	13.848	15.659	33.196	36.415	39.364	42.980	45.559
25	11.524	13.120	14.611	16.473	34.382	37.652	40.646	44.314	46.928
26	12.198	13.844	15.379	17.292	35.563	38.885	41.923	45.642	48.290
27	12.879	14.573	16.151	18.114	36.741	40.113	43.195	46.963	49.645
28	13.565	15.308	16.928	18.939	37.916	41.337	44.461	48.278	50.993
29	14.256	16.047	17.708	19.768	39.087	42.557	45.722	49.588	52.336
30	14.953	16.791	18.493	20.599	40.256	43.773	46.979	50.892	53.672
40	22.164	24.433	26.509	29.051	51.805	55.758	59.342	63.691	66.766
50	29.707	32.357	34.764	37.689	63.167	67.505	71.420	76.154	79.490
60	37.485	40.482	43.188	46.459	74.397	79.082	83.298	88.379	91.952
70	45.442	48.758	51.739	55.329	85.527	90.531	95.023	100.425	104.215
80	53.540	57.153	60.391	64.278	96.578	101.879	106.629	112.329	116.321
90	61.754	65.647	69.126	73.291	107.565	113.145	118.136	124.116	128.299
100	70.065	74.222	77.929	82.358	118.498	124.342	129.561	135.807	140.169

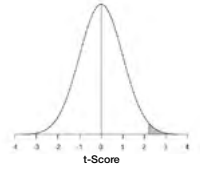


Table of the Student's t-Distribution
Critical values for right-hand tail areas

df	$\alpha = 0.1$	$\alpha = 0.05$	$\alpha = 0.025$	$\alpha = 0.01$	$\alpha = 0.005$
1	3.078	6.314	12.706	31.821	63.657
2	1.886	2.920	4.303	6.965	9.925
3	1.638	2.353	3.182	4.541	5.841
4	1.533	2.132	2.776	3.747	4.604
5	1.476	2.015	2.571	3.365	4.032
6	1.440	1.943	2.447	3.143	3.707
7	1.415	1.895	2.365	2.998	3.499
8	1.397	1.860	2.306	2.896	3.355
9	1.383	1.833	2.262	2.821	3.250
10	1.372	1.812	2.228	2.764	3.169
11	1.363	1.796	2.201	2.718	3.106
12	1.356	1.782	2.179	2.681	3.055
13	1.350	1.771	2.160	2.650	3.012
14	1.345	1.761	2.145	2.624	2.977
15	1.341	1.753	2.131	2.602	2.947
16	1.337	1.746	2.120	2.583	2.921
17	1.333	1.740	2.110	2.567	2.898
18	1.330	1.734	2.101	2.552	2.878
19	1.328	1.729	2.093	2.539	2.861
20	1.325	1.725	2.086	2.528	2.845
21	1.323	1.721	2.080	2.518	2.831
22	1.321	1.717	2.074	2.508	2.819
23	1.319	1.714	2.069	2.500	2.807
24	1.318	1.711	2.064	2.492	2.797
25	1.316	1.708	2.060	2.485	2.787
26	1.315	1.706	2.056	2.479	2.779
27	1.314	1.703	2.052	2.473	2.771
28	1.313	1.701	2.048	2.467	2.763
29	1.311	1.699	2.045	2.462	2.756

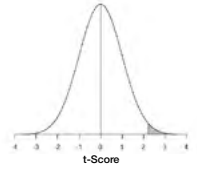


Table of the Student's t-Distribution
 Critical values for right-hand tail areas

df	p = 0.1	p = 0.05	p = 0.025	p = 0.01	p = 0.005
30	1.310	1.697	2.042	2.457	2.750
31	1.309	1.696	2.040	2.453	2.744
32	1.309	1.694	2.037	2.449	2.738
33	1.308	1.692	2.035	2.445	2.733
34	1.307	1.691	2.032	2.441	2.728
35	1.306	1.690	2.030	2.438	2.724
36	1.306	1.688	2.028	2.434	2.719
37	1.305	1.687	2.026	2.431	2.715
38	1.304	1.686	2.024	2.429	2.712
39	1.304	1.685	2.023	2.426	2.708
40	1.303	1.684	2.021	2.423	2.704
41	1.303	1.683	2.020	2.421	2.701
42	1.302	1.682	2.018	2.418	2.698
43	1.302	1.681	2.017	2.416	2.695
44	1.301	1.680	2.015	2.414	2.692
45	1.301	1.679	2.014	2.412	2.690
46	1.300	1.679	2.013	2.410	2.687
47	1.300	1.678	2.012	2.408	2.685
48	1.299	1.677	2.011	2.407	2.682
49	1.299	1.677	2.010	2.405	2.680
50	1.299	1.676	2.009	2.403	2.678
60	1.296	1.671	2.000	2.390	2.660
70	1.294	1.667	1.994	2.381	2.648
80	1.292	1.664	1.990	2.374	2.639
90	1.291	1.662	1.987	2.368	2.632
100	1.290	1.660	1.984	2.364	2.626
110	1.289	1.659	1.982	2.361	2.621
120	1.289	1.658	1.980	2.358	2.617
200	1.286	1.653	1.972	2.345	2.601

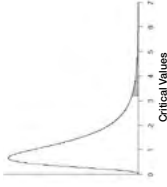


Table of the F-Distribution
Critical values for right-hand tail area equal to 0.10

df1:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
df2: 1	39.9	49.5	53.6	55.8	57.2	58.2	58.9	59.4	59.9	60.2	60.5	60.7	60.9	61.1	61.2
2	8.53	9.00	9.16	9.24	9.29	9.33	9.35	9.37	9.38	9.39	9.40	9.41	9.41	9.42	9.42
3	5.54	5.46	5.39	5.34	5.31	5.28	5.27	5.25	5.24	5.23	5.22	5.22	5.21	5.20	5.20
4	4.54	4.32	4.19	4.11	4.05	4.01	3.98	3.95	3.94	3.92	3.91	3.90	3.89	3.88	3.87
5	4.06	3.78	3.62	3.52	3.45	3.40	3.37	3.34	3.32	3.30	3.28	3.27	3.26	3.25	3.24
6	3.78	3.46	3.29	3.18	3.11	3.05	3.01	2.98	2.96	2.94	2.92	2.90	2.89	2.88	2.87
7	3.59	3.26	3.07	2.96	2.88	2.83	2.78	2.75	2.72	2.70	2.68	2.67	2.65	2.64	2.63
8	3.46	3.11	2.92	2.81	2.73	2.67	2.62	2.59	2.56	2.54	2.52	2.50	2.49	2.48	2.46
9	3.36	3.01	2.81	2.69	2.61	2.55	2.51	2.47	2.44	2.42	2.40	2.38	2.36	2.35	2.34
10	3.29	2.92	2.73	2.61	2.52	2.46	2.41	2.38	2.35	2.32	2.30	2.28	2.27	2.26	2.24
11	3.23	2.86	2.66	2.54	2.45	2.39	2.34	2.30	2.27	2.25	2.23	2.21	2.19	2.18	2.17
12	3.18	2.81	2.61	2.48	2.39	2.33	2.28	2.24	2.21	2.19	2.17	2.15	2.13	2.12	2.10
13	3.14	2.76	2.56	2.43	2.35	2.28	2.23	2.20	2.16	2.14	2.12	2.10	2.08	2.07	2.05
14	3.10	2.73	2.52	2.39	2.31	2.24	2.19	2.15	2.12	2.10	2.07	2.05	2.04	2.02	2.01
15	3.07	2.70	2.49	2.36	2.27	2.21	2.16	2.12	2.09	2.06	2.04	2.02	2.00	1.99	1.97
16	3.05	2.67	2.46	2.33	2.24	2.18	2.13	2.09	2.06	2.03	2.01	1.99	1.97	1.95	1.94
17	3.03	2.64	2.44	2.31	2.22	2.15	2.10	2.06	2.03	2.00	1.98	1.96	1.94	1.93	1.91
18	3.01	2.62	2.42	2.29	2.20	2.13	2.08	2.04	2.00	1.98	1.95	1.93	1.92	1.90	1.89
19	2.99	2.61	2.40	2.27	2.18	2.11	2.06	2.02	1.98	1.96	1.93	1.91	1.89	1.88	1.86
20	2.97	2.59	2.38	2.25	2.16	2.09	2.04	2.00	1.96	1.94	1.91	1.89	1.87	1.86	1.84
21	2.96	2.57	2.36	2.23	2.14	2.08	2.02	1.98	1.95	1.92	1.90	1.87	1.86	1.84	1.83
22	2.95	2.56	2.35	2.22	2.13	2.06	2.01	1.97	1.93	1.90	1.88	1.86	1.84	1.83	1.81
23	2.94	2.55	2.34	2.21	2.11	2.05	1.99	1.95	1.92	1.89	1.87	1.84	1.83	1.81	1.80
24	2.93	2.54	2.33	2.19	2.10	2.04	1.98	1.94	1.91	1.88	1.85	1.83	1.81	1.80	1.78
25	2.92	2.53	2.32	2.18	2.09	2.02	1.97	1.93	1.89	1.87	1.84	1.82	1.80	1.79	1.77
30	2.88	2.49	2.28	2.14	2.05	1.98	1.93	1.88	1.85	1.82	1.79	1.77	1.75	1.74	1.72
40	2.84	2.44	2.23	2.09	2.00	1.93	1.87	1.83	1.79	1.76	1.74	1.71	1.70	1.68	1.66
60	2.79	2.39	2.18	2.04	1.95	1.87	1.82	1.77	1.74	1.71	1.68	1.66	1.64	1.62	1.60
120	2.75	2.35	2.13	1.99	1.90	1.82	1.77	1.72	1.68	1.65	1.63	1.60	1.58	1.56	1.55

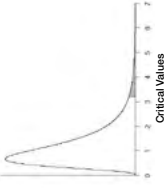


Table of the F-Distribution
Critical values for right-hand tail area equal to 0.10

df1:	16	17	18	19	20	21	22	23	24	25	30	40	50	60	120
df2: 1	61.3	61.5	61.6	61.7	61.7	61.8	61.9	61.9	62.0	62.1	62.3	62.5	62.7	62.8	63.1
2	9.43	9.43	9.44	9.44	9.44	9.44	9.45	9.45	9.45	9.45	9.46	9.47	9.47	9.47	9.48
3	5.20	5.19	5.19	5.19	5.18	5.18	5.18	5.18	5.18	5.17	5.17	5.16	5.15	5.15	5.14
4	3.86	3.86	3.85	3.85	3.84	3.84	3.84	3.83	3.83	3.83	3.82	3.80	3.80	3.79	3.78
5	3.23	3.22	3.22	3.21	3.21	3.20	3.20	3.19	3.19	3.19	3.17	3.16	3.15	3.14	3.12
6	2.86	2.85	2.85	2.84	2.84	2.83	2.83	2.82	2.82	2.81	2.80	2.78	2.77	2.76	2.74
7	2.62	2.61	2.61	2.60	2.59	2.59	2.58	2.58	2.58	2.57	2.56	2.54	2.52	2.51	2.49
8	2.45	2.45	2.44	2.43	2.42	2.41	2.41	2.40	2.40	2.39	2.38	2.36	2.35	2.34	2.32
9	2.33	2.32	2.31	2.30	2.30	2.29	2.29	2.28	2.28	2.27	2.25	2.23	2.22	2.21	2.18
10	2.23	2.22	2.22	2.21	2.20	2.19	2.19	2.18	2.18	2.17	2.16	2.13	2.12	2.11	2.08
11	2.16	2.15	2.14	2.13	2.12	2.12	2.11	2.11	2.10	2.10	2.08	2.05	2.04	2.03	2.00
12	2.09	2.08	2.08	2.07	2.06	2.05	2.05	2.04	2.04	2.03	2.01	1.99	1.97	1.96	1.93
13	2.04	2.03	2.02	2.01	2.01	2.00	1.99	1.99	1.98	1.98	1.96	1.93	1.92	1.90	1.88
14	2.00	1.99	1.98	1.97	1.96	1.96	1.95	1.94	1.94	1.93	1.91	1.89	1.87	1.86	1.83
15	1.96	1.95	1.94	1.93	1.92	1.92	1.91	1.90	1.90	1.89	1.87	1.85	1.83	1.82	1.79
16	1.93	1.92	1.91	1.90	1.89	1.88	1.88	1.87	1.87	1.86	1.84	1.81	1.79	1.78	1.75
17	1.90	1.89	1.88	1.87	1.86	1.86	1.85	1.84	1.84	1.83	1.81	1.78	1.76	1.75	1.72
18	1.87	1.86	1.85	1.84	1.84	1.83	1.82	1.82	1.81	1.80	1.78	1.75	1.74	1.72	1.69
19	1.85	1.84	1.83	1.82	1.81	1.81	1.80	1.79	1.79	1.78	1.76	1.73	1.71	1.70	1.67
20	1.83	1.82	1.81	1.80	1.79	1.79	1.78	1.77	1.77	1.76	1.74	1.71	1.69	1.68	1.64
21	1.81	1.80	1.79	1.78	1.78	1.77	1.76	1.75	1.75	1.74	1.72	1.69	1.67	1.66	1.62
22	1.80	1.79	1.78	1.77	1.76	1.75	1.74	1.74	1.73	1.73	1.70	1.67	1.65	1.64	1.60
23	1.78	1.77	1.76	1.75	1.74	1.74	1.73	1.72	1.72	1.71	1.69	1.66	1.64	1.62	1.59
24	1.77	1.76	1.75	1.74	1.73	1.72	1.71	1.71	1.70	1.70	1.67	1.64	1.62	1.61	1.57
25	1.76	1.75	1.74	1.73	1.72	1.71	1.70	1.70	1.69	1.68	1.66	1.63	1.61	1.59	1.56
30	1.71	1.70	1.69	1.68	1.67	1.66	1.65	1.64	1.64	1.63	1.61	1.57	1.55	1.54	1.50
40	1.65	1.64	1.62	1.61	1.61	1.60	1.59	1.58	1.57	1.57	1.54	1.51	1.48	1.47	1.42
60	1.59	1.58	1.56	1.55	1.54	1.53	1.53	1.52	1.51	1.50	1.48	1.44	1.41	1.40	1.35
120	1.53	1.52	1.50	1.49	1.48	1.47	1.46	1.46	1.45	1.44	1.41	1.37	1.34	1.32	1.26

Critical Values for Right-Hand Tail Areas: F-Distribution

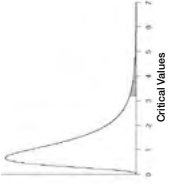


Table of the F-Distribution
Critical values for right-hand tail area equal to 0.05

df1:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
df2: 1	161	200	216	225	230	234	237	239	241	242	243	244	245	245	246
2	18.5	19.0	19.2	19.2	19.3	19.3	19.4	19.4	19.4	19.4	19.4	19.4	19.4	19.4	19.4
3	10.1	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81	8.79	8.76	8.74	8.73	8.71	8.70
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00	5.96	5.94	5.91	5.89	5.87	5.86
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77	4.74	4.70	4.68	4.66	4.64	4.62
6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10	4.06	4.03	4.00	3.98	3.96	3.94
7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68	3.64	3.60	3.57	3.55	3.53	3.51
8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39	3.35	3.31	3.28	3.26	3.24	3.22
9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18	3.14	3.10	3.07	3.05	3.03	3.01
10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02	2.98	2.94	2.91	2.89	2.86	2.85
11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90	2.85	2.82	2.79	2.76	2.74	2.72
12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80	2.75	2.72	2.69	2.66	2.64	2.62
13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71	2.67	2.63	2.60	2.58	2.55	2.53
14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65	2.60	2.57	2.53	2.51	2.48	2.46
15	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59	2.54	2.51	2.48	2.45	2.42	2.40
16	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54	2.49	2.46	2.42	2.40	2.37	2.35
17	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49	2.45	2.41	2.38	2.35	2.33	2.31
18	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46	2.41	2.37	2.34	2.31	2.29	2.27
19	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42	2.38	2.34	2.31	2.28	2.26	2.23
20	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39	2.35	2.31	2.28	2.25	2.22	2.20
21	4.32	3.47	3.07	2.84	2.68	2.57	2.49	2.42	2.37	2.32	2.28	2.25	2.22	2.20	2.18
22	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34	2.30	2.26	2.23	2.20	2.17	2.15
23	4.28	3.42	3.03	2.80	2.64	2.53	2.44	2.37	2.32	2.27	2.24	2.20	2.18	2.15	2.13
24	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30	2.25	2.22	2.18	2.15	2.13	2.11
25	4.24	3.39	2.99	2.76	2.60	2.49	2.40	2.34	2.28	2.24	2.20	2.16	2.14	2.11	2.09
30	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21	2.16	2.13	2.09	2.06	2.04	2.01
40	4.08	3.23	2.84	2.61	2.45	2.34	2.25	2.18	2.12	2.08	2.04	2.00	1.97	1.95	1.92
60	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10	2.04	1.99	1.95	1.92	1.89	1.86	1.84
120	3.92	3.07	2.68	2.45	2.29	2.18	2.09	2.02	1.96	1.91	1.87	1.83	1.80	1.78	1.75

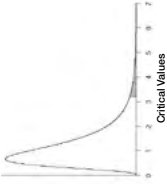


Table of the F-Distribution
Critical values for right-hand tail area equal to 0.05

df1:	16	17	18	19	20	21	22	23	24	25	30	40	50	60	120
df2: 1	2.46	2.47	2.47	2.48	2.48	2.48	2.49	2.49	2.49	2.49	2.50	2.51	2.52	2.52	2.53
2	19.4	19.4	19.4	19.4	19.4	19.4	19.5	19.5	19.5	19.5	19.5	19.5	19.5	19.5	19.5
3	8.69	8.68	8.67	8.67	8.66	8.65	8.65	8.64	8.64	8.63	8.62	8.59	8.58	8.57	8.55
4	5.84	5.83	5.82	5.81	5.80	5.79	5.79	5.78	5.77	5.77	5.75	5.72	5.70	5.69	5.66
5	4.60	4.59	4.58	4.57	4.56	4.55	4.54	4.53	4.53	4.52	4.50	4.46	4.44	4.43	4.40
6	3.92	3.91	3.90	3.88	3.87	3.86	3.86	3.85	3.84	3.83	3.81	3.77	3.75	3.74	3.70
7	3.49	3.48	3.47	3.46	3.44	3.43	3.43	3.42	3.41	3.40	3.38	3.34	3.32	3.30	3.27
8	3.20	3.19	3.17	3.16	3.15	3.14	3.13	3.12	3.12	3.11	3.08	3.04	3.02	3.01	2.97
9	2.99	2.97	2.96	2.95	2.94	2.93	2.92	2.91	2.90	2.89	2.86	2.83	2.80	2.79	2.75
10	2.83	2.81	2.80	2.79	2.77	2.76	2.75	2.74	2.73	2.73	2.70	2.66	2.64	2.62	2.58
11	2.70	2.69	2.67	2.66	2.65	2.64	2.63	2.62	2.61	2.60	2.57	2.53	2.51	2.49	2.45
12	2.60	2.58	2.57	2.56	2.54	2.53	2.52	2.51	2.51	2.50	2.47	2.43	2.40	2.38	2.34
13	2.51	2.50	2.48	2.47	2.46	2.45	2.44	2.43	2.42	2.41	2.38	2.34	2.31	2.30	2.25
14	2.44	2.43	2.41	2.40	2.39	2.38	2.37	2.36	2.35	2.34	2.31	2.27	2.24	2.22	2.18
15	2.38	2.37	2.35	2.34	2.33	2.32	2.31	2.30	2.29	2.28	2.25	2.20	2.18	2.16	2.11
16	2.33	2.32	2.30	2.29	2.28	2.26	2.25	2.24	2.24	2.23	2.19	2.15	2.12	2.11	2.06
17	2.29	2.27	2.26	2.24	2.23	2.22	2.21	2.20	2.19	2.18	2.15	2.10	2.08	2.06	2.01
18	2.25	2.23	2.22	2.20	2.19	2.18	2.17	2.16	2.15	2.14	2.11	2.06	2.04	2.02	1.97
19	2.21	2.20	2.18	2.17	2.16	2.14	2.13	2.12	2.11	2.11	2.07	2.03	2.00	1.98	1.93
20	2.18	2.17	2.15	2.14	2.12	2.11	2.10	2.09	2.08	2.07	2.04	1.99	1.97	1.95	1.90
21	2.16	2.14	2.12	2.11	2.10	2.08	2.07	2.06	2.05	2.05	2.01	1.96	1.94	1.92	1.87
22	2.13	2.11	2.10	2.08	2.07	2.06	2.05	2.04	2.03	2.02	1.98	1.94	1.91	1.89	1.84
23	2.11	2.09	2.08	2.06	2.05	2.04	2.02	2.01	2.01	2.00	1.96	1.91	1.88	1.86	1.81
24	2.09	2.07	2.05	2.04	2.03	2.01	2.00	1.99	1.98	1.97	1.94	1.89	1.86	1.84	1.79
25	2.07	2.05	2.04	2.02	2.01	2.00	1.98	1.97	1.96	1.96	1.92	1.87	1.84	1.82	1.77
30	1.99	1.98	1.96	1.95	1.93	1.92	1.91	1.90	1.89	1.88	1.84	1.79	1.76	1.74	1.68
40	1.90	1.89	1.87	1.85	1.84	1.83	1.81	1.80	1.79	1.78	1.74	1.69	1.66	1.64	1.58
60	1.82	1.80	1.78	1.76	1.75	1.73	1.72	1.71	1.70	1.69	1.65	1.59	1.56	1.53	1.47
120	1.73	1.71	1.69	1.67	1.66	1.64	1.63	1.62	1.61	1.60	1.55	1.50	1.46	1.43	1.35

Critical Values for Right-Hand Tail Areas: F-Distribution

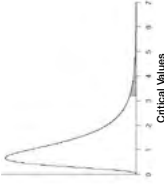


Table of the F-Distribution

Critical values for right-hand tail area equal to 0.025

df1:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
df2:1	648	800	864	900	922	937	948	957	963	969	973	977	980	983	985
2	38.5	39.0	39.2	39.3	39.3	39.3	39.4	39.4	39.4	39.4	39.4	39.4	39.4	39.4	39.4
3	17.4	16.0	15.4	15.1	14.9	14.7	14.6	14.5	14.5	14.4	14.4	14.3	14.3	14.3	14.3
4	12.2	10.6	9.98	9.60	9.36	9.20	9.07	8.98	8.90	8.84	8.79	8.75	8.71	8.68	8.66
5	10.0	8.43	7.76	7.39	7.15	6.98	6.85	6.76	6.68	6.62	6.57	6.52	6.49	6.46	6.43
6	8.81	7.26	6.60	6.23	5.99	5.82	5.70	5.60	5.52	5.46	5.41	5.37	5.33	5.30	5.27
7	8.07	6.54	5.89	5.52	5.29	5.12	4.99	4.90	4.82	4.76	4.71	4.67	4.63	4.60	4.57
8	7.57	6.06	5.42	5.05	4.82	4.65	4.53	4.43	4.36	4.30	4.24	4.20	4.16	4.13	4.10
9	7.21	5.71	5.08	4.72	4.48	4.32	4.20	4.10	4.03	3.96	3.91	3.87	3.83	3.80	3.77
10	6.94	5.46	4.83	4.47	4.24	4.07	3.95	3.85	3.78	3.72	3.66	3.62	3.58	3.55	3.52
11	6.72	5.26	4.63	4.28	4.04	3.88	3.76	3.66	3.59	3.53	3.47	3.43	3.39	3.36	3.33
12	6.55	5.10	4.47	4.12	3.89	3.73	3.61	3.51	3.44	3.37	3.32	3.28	3.24	3.21	3.18
13	6.41	4.97	4.35	4.00	3.77	3.60	3.48	3.39	3.31	3.25	3.20	3.15	3.12	3.08	3.05
14	6.30	4.86	4.24	3.89	3.66	3.50	3.38	3.29	3.21	3.15	3.09	3.05	3.01	2.98	2.95
15	6.20	4.77	4.15	3.80	3.58	3.41	3.29	3.20	3.12	3.06	3.01	2.96	2.92	2.89	2.86
16	6.12	4.69	4.08	3.73	3.50	3.34	3.22	3.12	3.05	2.99	2.93	2.89	2.85	2.82	2.79
17	6.04	4.62	4.01	3.66	3.44	3.28	3.16	3.06	2.98	2.92	2.87	2.82	2.79	2.75	2.72
18	5.98	4.56	3.95	3.61	3.38	3.22	3.10	3.01	2.93	2.87	2.81	2.77	2.73	2.70	2.67
19	5.92	4.51	3.90	3.56	3.33	3.17	3.05	2.96	2.88	2.82	2.76	2.72	2.68	2.65	2.62
20	5.87	4.46	3.86	3.51	3.29	3.13	3.01	2.91	2.84	2.77	2.72	2.68	2.64	2.60	2.57
21	5.83	4.42	3.82	3.48	3.25	3.09	2.97	2.87	2.80	2.73	2.68	2.64	2.60	2.56	2.53
22	5.79	4.38	3.78	3.44	3.22	3.05	2.93	2.84	2.76	2.70	2.65	2.60	2.56	2.53	2.50
23	5.75	4.35	3.75	3.41	3.18	3.02	2.90	2.81	2.73	2.67	2.62	2.57	2.53	2.50	2.47
24	5.72	4.32	3.72	3.38	3.15	2.99	2.87	2.78	2.70	2.64	2.59	2.54	2.50	2.47	2.44
25	5.69	4.29	3.69	3.35	3.13	2.97	2.85	2.75	2.68	2.61	2.56	2.51	2.48	2.44	2.41
30	5.57	4.18	3.59	3.25	3.03	2.87	2.75	2.65	2.57	2.51	2.46	2.41	2.37	2.34	2.31
40	5.42	4.05	3.46	3.13	2.90	2.74	2.62	2.53	2.45	2.39	2.33	2.29	2.25	2.21	2.18
60	5.29	3.93	3.34	3.01	2.79	2.63	2.51	2.41	2.33	2.27	2.22	2.17	2.13	2.09	2.06
120	5.15	3.80	3.23	2.89	2.67	2.52	2.39	2.30	2.22	2.16	2.10	2.05	2.01	1.98	1.94

Critical Values for Right-Hand Tail Areas: F-Distribution

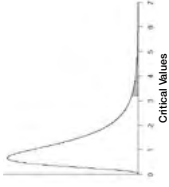


Table of the F-Distribution
Critical values for right-hand tail area equal to 0.025

df1:	16	17	18	19	20	21	22	23	24	25	30	40	50	60	120
df2: 1	987	989	990	992	993	994	995	996	997	998	1001	1006	1008	1010	1014
2	39.4	39.4	39.4	39.4	39.4	39.5	39.5	39.5	39.5	39.5	39.5	39.5	39.5	39.5	39.5
3	14.2	14.2	14.2	14.2	14.2	14.2	14.1	14.1	14.1	14.1	14.1	14.0	14.0	14.0	13.9
4	8.63	8.61	8.59	8.58	8.56	8.55	8.53	8.52	8.51	8.50	8.46	8.41	8.38	8.36	8.31
5	6.40	6.38	6.36	6.34	6.33	6.31	6.30	6.29	6.28	6.27	6.23	6.18	6.14	6.12	6.07
6	5.24	5.22	5.20	5.18	5.17	5.15	5.14	5.13	5.12	5.11	5.07	5.01	4.98	4.96	4.90
7	4.54	4.52	4.50	4.48	4.47	4.45	4.44	4.43	4.42	4.40	4.36	4.31	4.28	4.25	4.20
8	4.08	4.05	4.03	4.02	4.00	3.98	3.97	3.96	3.95	3.94	3.89	3.84	3.81	3.78	3.73
9	3.74	3.72	3.70	3.68	3.67	3.65	3.64	3.63	3.61	3.60	3.56	3.51	3.47	3.45	3.39
10	3.50	3.47	3.45	3.44	3.42	3.40	3.39	3.38	3.37	3.35	3.31	3.26	3.22	3.20	3.14
11	3.30	3.28	3.26	3.24	3.23	3.21	3.20	3.18	3.17	3.16	3.12	3.06	3.03	3.00	2.94
12	3.15	3.13	3.11	3.09	3.07	3.06	3.04	3.03	3.02	3.01	2.96	2.91	2.87	2.85	2.79
13	3.03	3.00	2.98	2.96	2.95	2.93	2.92	2.91	2.89	2.88	2.84	2.78	2.74	2.72	2.66
14	2.92	2.90	2.88	2.86	2.84	2.83	2.81	2.80	2.79	2.78	2.73	2.67	2.64	2.61	2.55
15	2.84	2.81	2.79	2.77	2.76	2.74	2.73	2.71	2.70	2.69	2.64	2.59	2.55	2.52	2.46
16	2.76	2.74	2.72	2.70	2.68	2.67	2.65	2.64	2.63	2.61	2.57	2.51	2.47	2.45	2.38
17	2.70	2.67	2.65	2.63	2.62	2.60	2.59	2.57	2.56	2.55	2.50	2.44	2.41	2.38	2.32
18	2.64	2.62	2.60	2.58	2.56	2.54	2.53	2.52	2.50	2.49	2.44	2.38	2.35	2.32	2.26
19	2.59	2.57	2.55	2.53	2.51	2.49	2.48	2.46	2.45	2.44	2.39	2.33	2.30	2.27	2.20
20	2.55	2.52	2.50	2.48	2.46	2.45	2.43	2.42	2.41	2.40	2.35	2.29	2.25	2.22	2.16
21	2.51	2.48	2.46	2.44	2.42	2.41	2.39	2.38	2.37	2.36	2.31	2.25	2.21	2.18	2.11
22	2.47	2.45	2.43	2.41	2.39	2.37	2.36	2.34	2.33	2.32	2.27	2.21	2.17	2.14	2.08
23	2.44	2.42	2.39	2.37	2.36	2.34	2.33	2.31	2.30	2.29	2.24	2.18	2.14	2.11	2.04
24	2.41	2.39	2.36	2.35	2.33	2.31	2.30	2.28	2.27	2.26	2.21	2.15	2.11	2.08	2.01
25	2.38	2.36	2.34	2.32	2.30	2.28	2.27	2.26	2.24	2.23	2.18	2.12	2.08	2.05	1.98
30	2.28	2.26	2.23	2.21	2.20	2.18	2.16	2.15	2.14	2.12	2.07	2.01	1.97	1.94	1.87
40	2.15	2.13	2.11	2.09	2.07	2.05	2.03	2.02	2.01	1.99	1.94	1.88	1.83	1.80	1.72
60	2.03	2.01	1.98	1.96	1.94	1.93	1.91	1.90	1.88	1.87	1.82	1.74	1.70	1.67	1.58
120	1.92	1.89	1.87	1.84	1.82	1.81	1.79	1.77	1.76	1.75	1.69	1.61	1.56	1.53	1.43

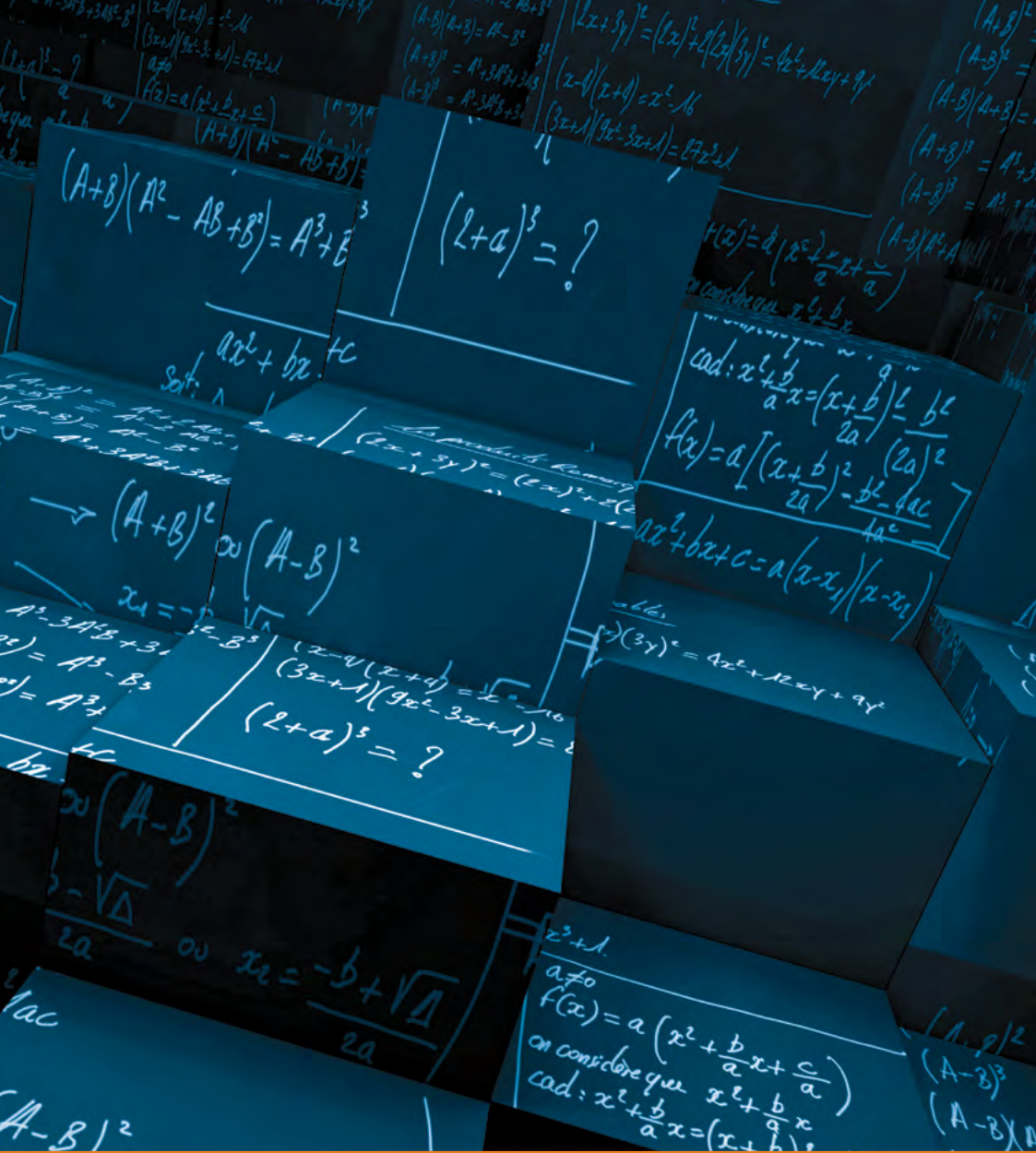
NOTES

Lined area for taking notes.



NOTES

Handwriting practice area consisting of 20 horizontal dotted lines.



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