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KEY FORMULAS
Prem S. Mann • Introductory Statistics, Fifth Edition

CHAPTER 2 • ORGANIZING DATA

- Relative frequency of a class $= f/\Sigma f$
- Percentage of a class $=$ (Relative frequency) $\times$ 100
- Class midpoint or mark $=$ (Upper limit $+$ Lower limit)/2
- Class width $=$ Upper boundary $-$ Lower boundary
- Cumulative relative frequency

$$= \frac{\text{Cumulative frequency}}{\text{Total observations in the data set}}$$

- Cumulative percentage

$$= (\text{Cumulative relative frequency}) \times 100$$

- Empirical rule:
  For a specific bell-shaped distribution, about 68% of the observations fall in the interval $(\mu - \sigma)$ to $(\mu + \sigma)$, about 95% fall in the interval $(\mu - 2\sigma)$ to $(\mu + 2\sigma)$, and about 99.7% fall in the interval $(\mu - 3\sigma)$ to $(\mu + 3\sigma)$.
- Interquartile range: $\text{IQR} = Q_3 - Q_1$
  where Q_3 is the third quartile and Q_1 is the first quartile
- The kth percentile:

$$P_k = \text{Value of the } \left(\frac{kn}{100}\right)\text{th term in a ranked data set}$$

- Percentile rank of x_i

$$= \frac{\text{Number of values less than } x_i}{\text{Total number of values in the data set}} \times 100$$

CHAPTER 3 • NUMERICAL DESCRIPTIVE MEASURES

- Mean for ungrouped data: $\mu = \Sigma x/N$ and $\bar{x} = \Sigma x/n$
- Mean for grouped data: $\mu = \Sigma mf/N$ and $\bar{x} = \Sigma mf/n$ where m is the midpoint and f is the frequency of a class
- Median for ungrouped data

$$= \text{Value of the } \left(\frac{n+1}{2}\right)\text{th term in a ranked data set}$$

- Range $=$ Largest value $-$ Smallest value
- Variance for ungrouped data:

$$\sigma^2 = \frac{\Sigma x^2 - \frac{(\Sigma x)^2}{N}}{N} \quad \text{and} \quad s^2 = \frac{\Sigma x^2 - \frac{(\Sigma x)^2}{n}}{n-1}$$

  where σ^2 is the population variance and s^2 is the sample variance
- Standard deviation for ungrouped data:

$$\sigma = \sqrt{\frac{\Sigma x^2 - \frac{(\Sigma x)^2}{N}}{N}} \quad \text{and} \quad s = \sqrt{\frac{\Sigma x^2 - \frac{(\Sigma x)^2}{n}}{n-1}}$$

  where σ and s are the population and sample standard deviations, respectively
- Variance for grouped data:

$$\sigma^2 = \frac{\Sigma m^2 f - \frac{(\Sigma mf)^2}{N}}{N} \quad \text{and} \quad s^2 = \frac{\Sigma m^2 f - \frac{(\Sigma mf)^2}{n}}{n-1}$$

- Standard deviation for grouped data:

$$\sigma = \sqrt{\frac{\Sigma m^2 f - \frac{(\Sigma mf)^2}{N}}{N}} \quad \text{and} \quad s = \sqrt{\frac{\Sigma m^2 f - \frac{(\Sigma mf)^2}{n}}{n-1}}$$

- Chebyshev's theorem:
  For any number k greater than 1, at least $(1 - 1/k^2)$ of the values for any distribution lie within k standard deviations of the mean.

CHAPTER 4 • PROBABILITY

- Classical probability rule for a simple event:

$$P(E_i) = \frac{1}{\text{Total number of outcomes}}$$

- Classical probability rule for a compound event:

$$P(A) = \frac{\text{Number of outcomes in } A}{\text{Total number of outcomes}}$$

- Relative frequency as an approximation of probability:

$$P(A) = \frac{f}{n}$$

- Conditional probability of an event:

$$P(A|B) = \frac{P(A \text{ and } B)}{P(B)} \quad \text{and} \quad P(B|A) = \frac{P(A \text{ and } B)}{P(A)}$$

- Condition for independence of events:

$$P(A) = P(A|B) \quad \text{and/or} \quad P(B) = P(B|A)$$

- For complementary events: $P(A) + P(\bar{A}) = 1$
- Multiplication rule for dependent events:

$$P(A \text{ and } B) = P(A)\,P(B|A)$$

- Multiplication rule for independent events:

$$P(A \text{ and } B) = P(A)\,P(B)$$

- Joint probability of two mutually exclusive events:

$$P(A \text{ and } B) = 0$$

- Addition rule for mutually nonexclusive events:

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

- Addition rule for mutually exclusive events:

$$P(A \text{ or } B) = P(A) + P(B)$$

CHAPTER 5 • DISCRETE RANDOM VARIABLES AND THEIR PROBABILITY DISTRIBUTIONS

- Mean of a discrete random variable x: $\mu = \Sigma x P(x)$
- Standard deviation of a discrete random variable x:

$$\sigma = \sqrt{\Sigma x^2 P(x) - \mu^2}$$

- n factorial: $n! = n(n-1)(n-2)\ldots 3 \cdot 2 \cdot 1$
- Number of combinations of n items selected x at a time:

$${}_nC_x = \frac{n!}{x!(n-x)!}$$

- Binomial probability formula: $P(x) = {}_nC_x p^x q^{n-x}$
- Mean and standard deviation of the binomial distribution:

$$\mu = np \quad \text{and} \quad \sigma = \sqrt{npq}$$

- Hypergeometric probability formula:

$$P(x) = \frac{{}_rC_x \; {}_{N-r}C_{n-x}}{{}_NC_n}$$

- Poisson probability formula: $P(x) = \dfrac{\lambda^x e^{-\lambda}}{x!}$
- Mean, variance, and standard deviation of the Poisson probability distribution:

$$\mu = \lambda, \quad \sigma^2 = \lambda, \quad \text{and} \quad \sigma = \sqrt{\lambda}$$

CHAPTER 6 • CONTINUOUS RANDOM VARIABLES AND THE NORMAL DISTRIBUTION

- z value for an x value: $z = \dfrac{x - \mu}{\sigma}$
- Value of x when μ, σ, and z are known: $x = \mu + z\sigma$

CHAPTER 7 • SAMPLING DISTRIBUTIONS

- Mean of $\bar{x}$: $\mu_{\bar{x}} = \mu$
- Standard deviation of $\bar{x}$ when $n/N \le .05$: $\sigma_{\bar{x}} = \sigma/\sqrt{n}$
- z value for $\bar{x}$: $z = \dfrac{\bar{x} - \mu}{\sigma_{\bar{x}}}$
- Population proportion: $p = X/N$
- Sample proportion: $\hat{p} = x/n$
- Mean of $\hat{p}$: $\mu_{\hat{p}} = p$
- Standard deviation of $\hat{p}$ when $n/N \le .05$: $\sigma_{\hat{p}} = \sqrt{pq/n}$
- z value for $\hat{p}$: $z = \dfrac{\hat{p} - p}{\sigma_{\hat{p}}}$

CHAPTER 8 • ESTIMATION OF THE MEAN AND PROPORTION

- Margin of error for the point estimation of μ:

$$\pm 1.96\sigma_{\bar{x}} \quad \text{or} \quad \pm 1.96 s_{\bar{x}}$$

  where $\sigma_{\bar{x}} = \sigma/\sqrt{n}$ and $s_{\bar{x}} = s/\sqrt{n}$
- Confidence interval for μ for a large sample:

$$\bar{x} \pm z\sigma_{\bar{x}} \quad \text{if } \sigma \text{ is known}$$
$$\bar{x} \pm z s_{\bar{x}} \quad \text{if } \sigma \text{ is not known}$$

  where $\sigma_{\bar{x}} = \sigma/\sqrt{n}$ and $s_{\bar{x}} = s/\sqrt{n}$
- Confidence interval for μ for a small sample:

$$\bar{x} \pm t s_{\bar{x}} \quad \text{where} \quad s_{\bar{x}} = s/\sqrt{n}$$

- Margin of error for the point estimation of p:

$$\pm 1.96 s_{\hat{p}} \quad \text{where} \quad s_{\hat{p}} = \sqrt{\hat{p}\hat{q}/n}$$

- Confidence interval for p for a large sample:

$$\hat{p} \pm z s_{\hat{p}} \quad \text{where} \quad s_{\hat{p}} = \sqrt{\hat{p}\hat{q}/n}$$

- Maximum error of the estimate for μ:

$$E = z\sigma_{\bar{x}} \quad \text{or} \quad z s_{\bar{x}}$$

- Determining sample size for estimating μ: $n = z^2\sigma^2/E^2$
- Maximum error of the estimate for p:

$$E = z s_{\hat{p}} \quad \text{where} \quad s_{\hat{p}} = \sqrt{\hat{p}\hat{q}/n}$$

- Determining sample size for estimating p: $n = z^2pq/E^2$

CHAPTER 9 • HYPOTHESIS TESTS ABOUT THE MEAN AND PROPORTION

- Test statistic z for a test of hypothesis about μ for a large sample:

$$z = \frac{\bar{x} - \mu}{\sigma_{\bar{x}}} \quad \text{if } \sigma \text{ is known, where } \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$$

  or

$$z = \frac{\bar{x} - \mu}{s_{\bar{x}}} \quad \text{if } \sigma \text{ is not known, where } s_{\bar{x}} = \frac{s}{\sqrt{n}}$$

- Test statistic for a test of hypothesis about μ for a small sample:

$$t = \frac{\bar{x} - \mu}{s_{\bar{x}}} \quad \text{where} \quad s_{\bar{x}} = \frac{s}{\sqrt{n}}$$

- Test statistic for a test of hypothesis about p for a large sample:

$$z = \frac{\hat{p} - p}{\sigma_{\hat{p}}} \quad \text{where} \quad \sigma_{\hat{p}} = \sqrt{\frac{pq}{n}}$$

CHAPTER 10 • ESTIMATION AND HYPOTHESIS TESTING: TWO POPULATIONS

- Mean of the sampling distribution of $\bar{x}_1 - \bar{x}_2$:

$$\mu_{\bar{x}_1 - \bar{x}_2} = \mu_1 - \mu_2$$

- Confidence interval for $\mu_1 - \mu_2$ for two large and independent samples:

$$(\bar{x}_1 - \bar{x}_2) \pm z\sigma_{\bar{x}_1 - \bar{x}_2} \quad \text{if } \sigma_1 \text{ and } \sigma_2 \text{ are known}$$

  or

$$(\bar{x}_1 - \bar{x}_2) \pm z s_{\bar{x}_1 - \bar{x}_2} \quad \text{if } \sigma_1 \text{ and } \sigma_2 \text{ are not known}$$

  where

$$\sigma_{\bar{x}_1 - \bar{x}_2} = \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}} \quad \text{and} \quad s_{\bar{x}_1 - \bar{x}_2} = \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$$

- Test statistic for a test of hypothesis about $\mu_1 - \mu_2$ for two large and independent samples:

$$z = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sigma_{\bar{x}_1 - \bar{x}_2}}$$

  If σ_1 and σ_2 are not known, then replace $\sigma_{\bar{x}_1 - \bar{x}_2}$ by its point estimator $s_{\bar{x}_1 - \bar{x}_2}$.
- For two small and independent samples taken from two populations with equal standard deviations:
  Pooled standard deviation:

$$s_p = \sqrt{\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}}$$

  Estimate of the standard deviation of $\bar{x}_1 - \bar{x}_2$:

$$s_{\bar{x}_1 - \bar{x}_2} = s_p\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}$$

  Confidence interval for $\mu_1 - \mu_2$: $(\bar{x}_1 - \bar{x}_2) \pm t s_{\bar{x}_1 - \bar{x}_2}$

  Test statistic: $t = \dfrac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{s_{\bar{x}_1 - \bar{x}_2}}$
- For two small and independent samples selected from two populations with unequal standard deviations:

  Degrees of freedom: $df = \dfrac{\left(\dfrac{s_1^2}{n_1} + \dfrac{s_2^2}{n_2}\right)^2}{\dfrac{\left(\dfrac{s_1^2}{n_1}\right)^2}{n_1 - 1} + \dfrac{\left(\dfrac{s_2^2}{n_2}\right)^2}{n_2 - 1}}$

  Estimate of the standard deviation of $\bar{x}_1 - \bar{x}_2$:

$$s_{\bar{x}_1 - \bar{x}_2} = \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$$

  Confidence interval for $\mu_1 - \mu_2$: $(\bar{x}_1 - \bar{x}_2) \pm t s_{\bar{x}_1 - \bar{x}_2}$

  Test statistic: $t = \dfrac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{s_{\bar{x}_1 - \bar{x}_2}}$
- For two paired or matched samples:
  Sample mean for paired differences: $\bar{d} = \Sigma d/n$
  Sample standard deviation for paired differences:

$$s_d = \sqrt{\frac{\Sigma d^2 - \frac{(\Sigma d)^2}{n}}{n-1}}$$

  Mean and standard deviation of the sampling distribution of $\bar{d}$:

$$\mu_{\bar{d}} = \mu_d \quad \text{and} \quad s_{\bar{d}} = s_d/\sqrt{n}$$

  Confidence interval for μ_d:

$$\bar{d} \pm t s_{\bar{d}} \quad \text{where} \quad s_{\bar{d}} = s_d/\sqrt{n}$$

  Test statistic for a test of hypothesis about μ_d:

$$t = \frac{\bar{d} - \mu_d}{s_{\bar{d}}}$$

- For two large and independent samples, confidence interval for $p_1 - p_2$:

$$(\hat{p}_1 - \hat{p}_2) \pm z s_{\hat{p}_1 - \hat{p}_2}$$

  where $s_{\hat{p}_1 - \hat{p}_2} = \sqrt{\dfrac{\hat{p}_1\hat{q}_1}{n_1} + \dfrac{\hat{p}_2\hat{q}_2}{n_2}}$
- For two large and independent samples, for a test of hypothesis about $p_1 - p_2$ with H_0: $p_1 - p_2 = 0$:
  Pooled sample proportion:

$$\bar{p} = \frac{x_1 + x_2}{n_1 + n_2} \quad \text{or} \quad \frac{n_1\hat{p}_1 + n_2\hat{p}_2}{n_1 + n_2}$$

  Estimate of the standard deviation of $\hat{p}_1 - \hat{p}_2$:

$$s_{\hat{p}_1 - \hat{p}_2} = \sqrt{\bar{p}\,\bar{q}\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}$$

  Test statistic: $z = \dfrac{(\hat{p}_1 - \hat{p}_2) - (p_1 - p_2)}{s_{\hat{p}_1 - \hat{p}_2}}$

CHAPTER 11 • CHI-SQUARE TESTS

- Expected frequency for a category for a goodness-of-fit test:

$$E = np$$

- Degrees of freedom for a goodness-of-fit test:

$$df = k - 1 \quad \text{where } k \text{ is the number of categories}$$

- Expected frequency for a cell for an independence or homogeneity test:

$$E = \frac{(\text{Row total})(\text{Column total})}{\text{Sample size}}$$

- Degrees of freedom for a test of independence or homogeneity:

$$df = (R - 1)(C - 1)$$

  where R and C are the total number of rows and columns, respectively, in the contingency table
- Test statistic for a goodness-of-fit test and a test of independence or homogeneity:

$$\chi^2 = \Sigma\frac{(O - E)^2}{E}$$

- Confidence interval for the population variance σ^2:

$$\frac{(n-1)s^2}{\chi^2_{\alpha/2}} \quad \text{to} \quad \frac{(n-1)s^2}{\chi^2_{1-\alpha/2}}$$

- Test statistic for a test of hypothesis about σ^2:

$$\chi^2 = \frac{(n-1)s^2}{\sigma^2}$$

CHAPTER 12 • ANALYSIS OF VARIANCE

Let:

k = the number of different samples (or treatments)
n_i = the size of sample i
T_i = the sum of the values in sample i
n = the number of values in all samples
$= n_1 + n_2 + n_3 + \cdots$
Σx = the sum of the values in all samples
$= T_1 + T_2 + T_3 + \cdots$
Σx^2 = the sum of the squares of values in all samples

- For the F distribution:

  Degrees of freedom for the numerator $= k - 1$

  Degrees of freedom for the denominator $= n - k$

- Between-samples sum of squares:

$$\text{SSB} = \left(\frac{T_1^2}{n_1} + \frac{T_2^2}{n_2} + \frac{T_3^2}{n_3} + \cdots\right) - \frac{(\Sigma x)^2}{n}$$

- Within-samples sum of squares:

$$\text{SSW} = \Sigma x^2 - \left(\frac{T_1^2}{n_1} + \frac{T_2^2}{n_2} + \frac{T_3^2}{n_3} + \cdots\right)$$

- Total sum of squares: $\text{SST} = \text{SSB} + \text{SSW} = \Sigma x^2 - \frac{(\Sigma x)^2}{n}$
- Variance between samples: $\text{MSB} = \text{SSB}/(k - 1)$
- Variance within samples: $\text{MSW} = \text{SSW}/(n - k)$
- Test statistic for a one-way ANOVA test: $F = \text{MSB}/\text{MSW}$

CHAPTER 13 • SIMPLE LINEAR REGRESSION

- Simple linear regression model: $y = A + Bx + \epsilon$
- Estimated simple linear regression model: $\hat{y} = a + bx$
- Sum of squares of xy, xx, and yy:

$$\text{SS}_{xy} = \Sigma xy - \frac{(\Sigma x)(\Sigma y)}{n}$$

$$\text{SS}_{xx} = \Sigma x^2 - \frac{(\Sigma x)^2}{n} \quad \text{and} \quad \text{SS}_{yy} = \Sigma y^2 - \frac{(\Sigma y)^2}{n}$$

- Least squares estimates of A and B:

$$b = \text{SS}_{xy}/\text{SS}_{xx} \quad \text{and} \quad a = \bar{y} - b\bar{x}$$

- Standard deviation of the sample errors:

$$s_e = \sqrt{\frac{\text{SS}_{yy} - b\,\text{SS}_{xy}}{n - 2}}$$

- Error sum of squares: $\text{SSE} = \Sigma e^2 = \Sigma(y - \hat{y})^2$
- Total sum of squares: $\text{SST} = \Sigma y^2 - \frac{(\Sigma y)^2}{n}$
- Regression sum of squares: $\text{SSR} = \text{SST} - \text{SSE}$
- Coefficient of determination: $r^2 = b\,\text{SS}_{xy}/\text{SS}_{yy}$
- Confidence interval for B:

$$b \pm t s_b \quad \text{where} \quad s_b = s_e/\sqrt{\text{SS}_{xx}}$$

- Test statistic for a test of hypothesis about B: $t = \frac{b - B}{s_b}$
- Linear correlation coefficient: $r = \frac{\text{SS}_{xy}}{\sqrt{\text{SS}_{xx}\,\text{SS}_{yy}}}$
- Test statistic for a test of hypothesis about ρ: $t = r\sqrt{\frac{n - 2}{1 - r^2}}$
- Confidence interval for $\mu_{y|x}$:

$$\hat{y} \pm t s_{\hat{y}_m} \quad \text{where} \quad s_{\hat{y}_m} = s_e\sqrt{\frac{1}{n} + \frac{(x_0 - \bar{x})^2}{\text{SS}_{xx}}}$$

- Prediction interval for y_p:

$$\hat{y} \pm t s_{\hat{y}_p} \quad \text{where} \quad s_{\hat{y}_p} = s_e\sqrt{1 + \frac{1}{n} + \frac{(x_0 - \bar{x})^2}{\text{SS}_{xx}}}$$

CHAPTER 14 • NONPARAMETRIC METHODS

- Test statistic for a sign test about the population proportion for a large sample:

$$z = \frac{(X \pm .5) - \mu}{\sigma} \quad \text{where} \quad \mu = np \quad \text{and} \quad \sigma = \sqrt{npq}$$

  Here, use $(X + .5)$ if $X \le n/2$ and $(X - .5)$ if $X > n/2$

- Test statistic for a sign test about the median for a large sample and the sign test about the median difference between paired data for a large sample:

$$z = \frac{(X \pm .5) - \mu}{\sigma}$$

$$\text{where} \quad \mu = np, \quad p = .5, \quad \text{and} \quad \sigma = \sqrt{npq}$$

  Let X_1 be the number of plus signs and X_2 the number of minus signs in a test about the median. Then, if the test is two-tailed, either of the two values can be assigned to X; if the test is left-tailed, X = smaller of the values of X_1 and X_2; if the test is right-tailed, X = larger of the values of X_1 and X_2. Also, we use $(x + .5)$ if $x \le n/2$, and $(x - .5)$ if $x > n/2$.

- Test statistic for the Wilcoxon signed-rank test for a large sample:

$$z = \frac{T - \mu_T}{\sigma_T}$$

$$\text{where} \quad \mu_T = \frac{n(n+1)}{4} \quad \text{and} \quad \sigma_T = \sqrt{\frac{n(n+1)(2n+1)}{24}}$$

- Test statistic for the Wilcoxon rank sum test for large and independent samples:

$$z = \frac{T - \mu_T}{\sigma_T}$$

$$\text{where} \quad \mu_T = \frac{n_1(n_1 + n_2 + 1)}{2} \quad \text{and} \quad \sigma_T = \sqrt{\frac{n_1 n_2(n_1 + n_2 + 1)}{12}}$$

- Test statistic for the Kruskal-Wallis test:

$$H = \frac{12}{n(n+1)}\left[\frac{R_1^2}{n_1} + \frac{R_2^2}{n_2} + \cdots + \frac{R_k^2}{n_k}\right] - 3(n+1)$$

  where n_i = size of ith sample, $n = n_1 + n_2 + \cdots + n_k$, k = number of samples, and R_i = sum of ranks for ith sample

- Test statistic for the Spearman rho rank correlation coefficient test:

$$r_s = 1 - \frac{6\Sigma d^2}{n(n^2 - 1)}$$

  where d_i = difference in ranks of x_i and y_i

- Test statistic for the runs test for randomness for a large sample:

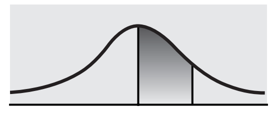
$$z = \frac{R - \mu_R}{\sigma_R}$$

  where R is the number of runs in the sequence

$$\mu_R = \frac{2n_1 n_2}{n_1 + n_2} + 1 \quad \text{and} \quad \sigma_R = \sqrt{\frac{2n_1 n_2(2n_1 n_2 - n_1 - n_2)}{(n_1 + n_2)^2(n_1 + n_2 - 1)}}$$

Table VII Standard Normal Distribution Table[†]

The entries in this table give the areas under the standard normal curve from 0 to z.

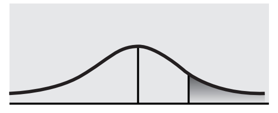


z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990

[†]This table is the same as Table VII of Appendix C.

Table VIII The t Distribution Table[†]

The entries in the table give the critical values of t for the specified number of degrees of freedom and areas in the right tail.



	Area in the Right Tail under the t Distribution Curve					
df	.10	.05	.025	.01	.005	.001
1	3.078	6.314	12.706	31.821	63.657	318.309
2	1.886	2.920	4.303	6.965	9.925	22.327
3	1.638	2.353	3.182	4.541	5.841	10.215
4	1.533	2.132	2.776	3.747	4.604	7.173
5	1.476	2.015	2.571	3.365	4.032	5.893
6	1.440	1.943	2.447	3.143	3.707	5.208
7	1.415	1.895	2.365	2.998	3.499	4.785
8	1.397	1.860	2.306	2.896	3.355	4.501
9	1.383	1.833	2.262	2.821	3.250	4.297
10	1.372	1.812	2.228	2.764	3.169	4.144
11	1.363	1.796	2.201	2.718	3.106	4.025
12	1.356	1.782	2.179	2.681	3.055	3.930
13	1.350	1.771	2.160	2.650	3.012	3.852
14	1.345	1.761	2.145	2.624	2.977	3.787
15	1.341	1.753	2.131	2.602	2.947	3.733
16	1.337	1.746	2.120	2.583	2.921	3.686
17	1.333	1.740	2.110	2.567	2.898	3.646
18	1.330	1.734	2.101	2.552	2.878	3.610
19	1.328	1.729	2.093	2.539	2.861	3.579
20	1.325	1.725	2.086	2.528	2.845	3.552
21	1.323	1.721	2.080	2.518	2.831	3.527
22	1.321	1.717	2.074	2.508	2.819	3.505
23	1.319	1.714	2.069	2.500	2.807	3.485
24	1.318	1.711	2.064	2.492	2.797	3.467
25	1.316	1.708	2.060	2.485	2.787	3.450
26	1.315	1.706	2.056	2.479	2.779	3.435
27	1.314	1.703	2.052	2.473	2.771	3.421
28	1.313	1.701	2.048	2.467	2.763	3.408
29	1.311	1.699	2.045	2.462	2.756	3.396
30	1.310	1.697	2.042	2.457	2.750	3.385
31	1.309	1.696	2.040	2.453	2.744	3.375
32	1.309	1.694	2.037	2.449	2.738	3.365
33	1.308	1.692	2.035	2.445	2.733	3.356
34	1.307	1.691	2.032	2.441	2.728	3.348
35	1.306	1.690	2.030	2.438	2.724	3.340
36	1.306	1.688	2.028	2.434	2.719	3.333
37	1.305	1.687	2.026	2.431	2.715	3.326
38	1.304	1.686	2.024	2.429	2.712	3.319
39	1.304	1.685	2.023	2.426	2.708	3.313
40	1.303	1.684	2.021	2.423	2.704	3.307
∞	1.282	1.645	1.960	2.326	2.576	3.090

[†]This table is an abbreviated version of Table VIII that appears in Appendix C. This table goes up to 40 degrees of freedom. For degrees of freedom from 41 to 70, use Table VIII of Appendix C.