

EXAM IN STATISTICAL INFERENCE
2022-05-02

Time: 8.00 – 13.00.

Allowed tools: Pocket calculator, tables and formulas attached

The exam consists of five problems. Clear, detailed and well motivated solutions to the problems are expected.

Examples of solutions will be published at Athena shortly after the exam.

Problem 1. (20 p)

Suppose that Y_1, Y_2, \dots, Y_n are independent and identically distributed random variables, $Y_i \sim Po(\lambda)$, $0 < \lambda < \infty$.

- Prove that the Poisson family is an exponential family of distributions.
- Determine a sufficient statistic for λ .
- The natural (canonical) parameter in the Poisson distribution is $\theta = \ln \lambda$. Determine the maximum likelihood estimator $\hat{\theta}$ of θ .
- Determine the asymptotic distribution of $\sqrt{n}(\hat{\theta} - \theta)$ using the Delta method.

Problem 2. (20 p)

Do cats prefer a varied diet or do they always prefer a favorite dish? To find out this a cat could chose between three dishes. This experiment was repeated N times and the number of times the cat chose each meal was recorded, denoted by Y_1 , Y_2 , and Y_3 , respectively. The joint distribution of the random variables Y_1 , Y_2 and Y_3 is of course a trinomial distribution with probability mass function

$$p(y_1, y_2, y_3) = \binom{N}{y_1 \ y_2 \ y_3} \theta_1^{y_1} \theta_2^{y_2} \theta_3^{y_3}, \quad y_1 = 1, \dots, N, y_2 = 1, \dots, N, y_3 = 1, \dots, N, Y_1 + Y_2 + Y_3 = N,$$

where θ_1 , θ_2 , and θ_3 are the probabilities that the cat chooses meal 1, 2, and 3, respectively, $\theta_1 + \theta_2 + \theta_3 = 1$. Assume that the choices are stochastically independent and construct a likelihood ratio test for testing the null hypothesis that the probabilities θ_1 , θ_2 , and θ_3 are equal versus at least one of θ_1 , θ_2 , and θ_3 is different from the other two. If the null hypothesis is true it would be a sign that the cat prefer a varied diet. Derive also a large sample version of the likelihood ratio test statistic and state its asymptotic distribution.

Problem 3 (20 p)

Let X have a binomial distribution with parameters $n = 10$ and $p \in \{p; p = 0.2, 0.5\}$. The simple hypothesis $H_0 : p = 0.5$ is rejected, and the alternative simple hypothesis $H_A : p = 0.2$ is accepted if the observed value of X_1 , a random sample of size 1, is less than or equal to 3. Find the power function of the test.

Problem 4. (20 p)

The Rayleigh distribution has many applications, one of which is as a model describing noise in magnetic resonance imaging (MRI). It can also be derived as the length of a vector (U, V) , where U and V are independent random variables, both normally distributed with zero expectation and variance θ . If X is a random variable with a Rayleigh distribution, the probability density function is

$$f(x) = \frac{x}{\theta^2} e^{-\frac{x^2}{2\theta^2}}, \quad x > 0, \theta > 0.$$

and its expectation and variance are

$$\begin{aligned} E(X) &= \theta \sqrt{\frac{\pi}{2}} \\ V(X) &= \theta^2 \frac{4 - \pi}{2} \end{aligned}$$

- Derive the moment estimator of θ based on a random sample of n observations.
- Is the moment estimator an unbiased estimator of θ ?
- Construct a two-sided asymptotic $100(1 - \alpha)$ confidence interval for θ based on the moment estimator.

Problem 5. (20 p)

The time between two hits of radioactive particles at a certain area is assumed to be an exponentially distributed random variable with expectation β . A box made of lead is supposed to give some protection from the radiation so that the time between hits inside the box is an exponentially distributed random variable with expectation $\gamma\beta$ ($\gamma > 1$). Let X_1, X_2, \dots, X_n be observations on the times between hits outside the box and Y_1, Y_2, \dots, Y_m be observations on the times between hits inside the box. All variables are assumed to be stochastically independent.

- Construct a likelihood ratio test for testing the hypothesis $H_0 : \gamma = 2$ versus $H_A : \gamma \neq 2$.
- Make a convenient transformation of the test statistic in problem a) and determine its asymptotic distribution.

Formelblad inferensteori HT-2021

Gamma function:

$$\Gamma(\alpha) = \int_0^{\infty} t^{\alpha-1} e^{-t} dt \quad ; \quad \Gamma(\alpha + 1) = \alpha \Gamma(\alpha) \quad ; \quad \Gamma\left(\frac{1}{2}\right) = \sqrt{\pi} \quad ; \quad \text{If } \alpha \text{ is an integer: } \Gamma(n) = (n-1)!$$

Conditional pdf:

$$f(y|x) = \frac{f(x,y)}{f_x(x)} \quad ; \quad f(x|y) = \frac{f(x,y)}{f_y(y)}$$

Variance:

$$\text{Var } X = E X^2 - (E X)^2,$$

Mean Squared Error:

$$E_{\theta}(W - \theta)^2 = \text{Var}_{\theta} W + (E_{\theta} W - \theta)^2 = \text{Var}_{\theta} W + (\text{Bias}_{\theta} W)^2$$

Univariate transformation:

$$f_Y(y) = \begin{cases} \sum_{i=1}^k f_X(g_i^{-1}(y)) \left| \frac{d}{dy} g_i^{-1}(y) \right|, & y \in Y \\ 0, & \text{Otherwise} \end{cases}$$

Theorem 3.4.2 If X is a random variable with pdf or pmf of the form (3.4.1), then

$$(3.4.4) \quad E \left(\sum_{i=1}^k \frac{\partial w_i(\theta)}{\partial \theta_j} t_i(X) \right) = -\frac{\partial}{\partial \theta_j} \log c(\theta);$$

$$(3.4.5) \quad \text{Var} \left(\sum_{i=1}^k \frac{\partial w_i(\theta)}{\partial \theta_j} t_i(X) \right) = -\frac{\partial^2}{\partial \theta_j^2} \log c(\theta) - E \left(\sum_{i=1}^k \frac{\partial^2 w_i(\theta)}{\partial \theta_j^2} t_i(X) \right).$$

Theorem 5.5.24 (Delta Method) Let Y_n be a sequence of random variables that satisfies $\sqrt{n}(Y_n - \theta) \rightarrow n(0, \sigma^2)$ in distribution. For a given function g and a specific value of θ , suppose that $g'(\theta)$ exists and is not 0. Then

$$(5.5.10) \quad \sqrt{n}[g(Y_n) - g(\theta)] \rightarrow n(0, \sigma^2 [g'(\theta)]^2) \text{ in distribution.}$$

Theorem 6.2.6 (Factorization Theorem) Let $f(\mathbf{x}|\theta)$ denote the joint pdf or pmf of a sample \mathbf{X} . A statistic $T(\mathbf{X})$ is a sufficient statistic for θ if and only if there exist functions $g(t|\theta)$ and $h(\mathbf{x})$ such that, for all sample points \mathbf{x} and all parameter points θ ,

$$(6.2.3) \quad f(\mathbf{x}|\theta) = g(T(\mathbf{x})|\theta)h(\mathbf{x}).$$

Theorem 6.2.10 Let X_1, \dots, X_n be iid observations from a pdf or pmf $f(x|\theta)$ that belongs to an exponential family given by

$$f(x|\theta) = h(x)c(\theta) \exp \left(\sum_{i=1}^k w_i(\theta)t_i(x) \right),$$

where $\theta = (\theta_1, \theta_2, \dots, \theta_d)$, $d \leq k$. Then

$$T(\mathbf{X}) = \left(\sum_{j=1}^n t_1(X_j), \dots, \sum_{j=1}^n t_k(X_j) \right)$$

is a sufficient statistic for θ .

Theorem 6.2.13 Let $f(\mathbf{x}|\theta)$ be the pmf or pdf of a sample \mathbf{X} . Suppose there exists a function $T(\mathbf{x})$ such that, for every two sample points \mathbf{x} and \mathbf{y} , the ratio $f(\mathbf{x}|\theta)/f(\mathbf{y}|\theta)$ is constant as a function of θ if and only if $T(\mathbf{x}) = T(\mathbf{y})$. Then $T(\mathbf{X})$ is a minimal sufficient statistic for θ .

Definition 6.2.21 Let $f(t|\theta)$ be a family of pdfs or pmfs for a statistic $T(\mathbf{X})$. The family of probability distributions is called *complete* if $E_{\theta}g(T) = 0$ for all θ implies $P_{\theta}(g(T) = 0) = 1$ for all θ . Equivalently, $T(\mathbf{X})$ is called a *complete statistic*.

Theorem 6.2.24 (Basu's Theorem) If $T(\mathbf{X})$ is a complete and minimal sufficient statistic, then $T(\mathbf{X})$ is independent of every ancillary statistic.

Method of moments:

Let X_1, \dots, X_n be a sample from a population with pdf or pmf $f(x|\theta_1, \dots, \theta_k)$. Method of moments estimators are found by equating the first k sample moments to the corresponding k population moments, and solving the resulting system of simultaneous equations. More precisely, define

$$\begin{aligned} m_1 &= \frac{1}{n} \sum_{i=1}^n X_i^1, & \mu'_1 &= EX^1, \\ m_2 &= \frac{1}{n} \sum_{i=1}^n X_i^2, & \mu'_2 &= EX^2, \\ & \vdots & & \\ m_k &= \frac{1}{n} \sum_{i=1}^n X_i^k, & \mu'_k &= EX^k. \end{aligned} \tag{7.2.1}$$

Maximum Likelihood Estimation:

$$(7.2.3) \quad L(\theta|\mathbf{x}) = L(\theta_1, \dots, \theta_k|x_1, \dots, x_n) = \prod_{i=1}^n f(x_i|\theta_1, \dots, \theta_k).$$

Theorem 7.2.10 (Invariance property of MLEs) *If $\hat{\theta}$ is the MLE of θ , then for any function $\tau(\theta)$, the MLE of $\tau(\theta)$ is $\tau(\hat{\theta})$.*

Theorem 7.3.9 (Cramér–Rao Inequality) Let X_1, \dots, X_n be a sample with pdf $f(\mathbf{x}|\theta)$, and let $W(\mathbf{X}) = W(X_1, \dots, X_n)$ be any estimator satisfying

$$(7.3.4) \quad \frac{d}{d\theta} E_{\theta} W(\mathbf{X}) = \int_{\mathbf{x}} \frac{\partial}{\partial \theta} [W(\mathbf{x}) f(\mathbf{x}|\theta)] d\mathbf{x}$$

and

$$\text{Var}_{\theta} W(\mathbf{X}) < \infty.$$

Then

$$(7.3.5) \quad \text{Var}_{\theta} (W(\mathbf{X})) \geq \frac{\left(\frac{d}{d\theta} E_{\theta} W(\mathbf{X})\right)^2}{E_{\theta} \left(\left(\frac{\partial}{\partial \theta} \log f(\mathbf{X}|\theta)\right)^2\right)}.$$

Corollary 7.3.10 (Cramér–Rao Inequality, iid case) If the assumptions of Theorem 7.3.9 are satisfied and, additionally, if X_1, \dots, X_n are iid with pdf $f(x|\theta)$, then

$$\text{Var}_{\theta} W(\mathbf{X}) \geq \frac{\left(\frac{d}{d\theta} E_{\theta} W(\mathbf{X})\right)^2}{n E_{\theta} \left(\left(\frac{\partial}{\partial \theta} \log f(X|\theta)\right)^2\right)}.$$

Lemma 7.3.11 If $f(x|\theta)$ satisfies

$$\frac{d}{d\theta} E_{\theta} \left(\frac{\partial}{\partial \theta} \log f(X|\theta) \right) = \int \frac{\partial}{\partial \theta} \left[\left(\frac{\partial}{\partial \theta} \log f(x|\theta) \right) f(x|\theta) \right] dx$$

(true for an exponential family), then

$$E_{\theta} \left(\left(\frac{\partial}{\partial \theta} \log f(X|\theta) \right)^2 \right) = -E_{\theta} \left(\frac{\partial^2}{\partial \theta^2} \log f(X|\theta) \right).$$

Corollary 7.3.15 (Attainment) Let X_1, \dots, X_n be iid $f(x|\theta)$, where $f(x|\theta)$ satisfies the conditions of the Cramér–Rao Theorem. Let $L(\theta|\mathbf{x}) = \prod_{i=1}^n f(x_i|\theta)$ denote the likelihood function. If $W(\mathbf{X}) = W(X_1, \dots, X_n)$ is any unbiased estimator of $\tau(\theta)$, then $W(\mathbf{X})$ attains the Cramér–Rao Lower Bound if and only if

$$(7.3.12) \quad a(\theta)[W(\mathbf{x}) - \tau(\theta)] = \frac{\partial}{\partial \theta} \log L(\theta|\mathbf{x})$$

for some function $a(\theta)$.

Theorem 7.3.17 (Rao–Blackwell) Let W be any unbiased estimator of $\tau(\theta)$, and let T be a sufficient statistic for θ . Define $\phi(T) = E(W|T)$. Then $E_\theta\phi(T) = \tau(\theta)$ and $\text{Var}_\theta\phi(T) \leq \text{Var}_\theta W$ for all θ ; that is, $\phi(T)$ is a uniformly better unbiased estimator of $\tau(\theta)$.

Theorem 7.3.23 Let T be a complete sufficient statistic for a parameter θ , and let $\phi(T)$ be any estimator based only on T . Then $\phi(T)$ is the unique best unbiased estimator of its expected value.

Likelihood ratio test statistic:

Definition 8.2.1 The likelihood ratio test statistic for testing $H_0: \theta \in \Theta_0$ versus $H_1: \theta \in \Theta_0^c$ is

$$\lambda(\mathbf{x}) = \frac{\sup_{\Theta_0} L(\theta|\mathbf{x})}{\sup_{\Theta} L(\theta|\mathbf{x})}.$$

Theorem 8.3.12 (Neyman–Pearson Lemma) Consider testing $H_0: \theta = \theta_0$ versus $H_1: \theta = \theta_1$, where the pdf or pmf corresponding to θ_i is $f(\mathbf{x}|\theta_i)$, $i = 0, 1$, using a test with rejection region R that satisfies

$$(8.3.1) \quad \begin{aligned} & \mathbf{x} \in R \text{ if } f(\mathbf{x}|\theta_1) > kf(\mathbf{x}|\theta_0) \\ & \text{and} \\ & \mathbf{x} \in R^c \text{ if } f(\mathbf{x}|\theta_1) < kf(\mathbf{x}|\theta_0), \end{aligned}$$

for some $k \geq 0$, and

$$(8.3.2) \quad \alpha = P_{\theta_0}(\mathbf{X} \in R).$$

Then

- a. (Sufficiency) Any test that satisfies (8.3.1) and (8.3.2) is a UMP level α test.
 - b. (Necessity) If there exists a test satisfying (8.3.1) and (8.3.2) with $k > 0$, then every UMP level α test is a size α test (satisfies (8.3.2)) and every UMP level α test satisfies (8.3.1) except perhaps on a set A satisfying $P_{\theta_0}(\mathbf{X} \in A) = P_{\theta_1}(\mathbf{X} \in A) = 0$.
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Neyman-pearsons lemma (NPL)

Antag att vi har två enkla hypoteser:

$H_0: \theta = \theta_0$ och $H_A: \theta = \theta_A$

För ett givet alfa så definieras det starkaste testet av:

Förkasta H_0 om $L(\theta_0)/L(\theta_A) < C$

Där värdet på C väljs så att $P(\underline{X} \leq C; \theta = \theta_0) = \alpha$

Pivot:

Definition 9.2.6 A random variable $Q(\mathbf{X}, \theta) = Q(X_1, \dots, X_n, \theta)$ is a *pivotal quantity* (or *pivot*) if the distribution of $Q(\mathbf{X}, \theta)$ is independent of all parameters. That is, if $\mathbf{X} \sim F(\mathbf{x}|\theta)$, then $Q(\mathbf{X}, \theta)$ has the same distribution for all values of θ .

Pivotmetoden för konfidensintervall

$Q(\underline{X}; \theta)$ är en pivot om det är en funktion av observationerna \underline{X} och av parametern θ , men dess fördelning får inte bero på θ .

Allmänt kan vi då bilda ett konfidensintervall genom:

$$P(a \leq Q(\underline{X}, \theta) \leq b) = 1 - \alpha$$

Finns oändligt många möjligheter att välja a och b men oftast vill man välja det så att intervallet $b - a$ är så litet så möjligt.

Theorem 10.1.12 (Asymptotic efficiency of MLEs) Let X_1, X_2, \dots , be iid $f(x|\theta)$, let $\hat{\theta}$ denote the MLE of θ , and let $\tau(\theta)$ be a continuous function of θ . Under the regularity conditions in Miscellanea 10.6.2 on $f(x|\theta)$ and, hence, $L(\theta|\mathbf{x})$,

$$\sqrt{n}[\tau(\hat{\theta}) - \tau(\theta)] \rightarrow n[0, v(\theta)],$$

where $v(\theta)$ is the Cramér–Rao Lower Bound. That is, $\tau(\hat{\theta})$ is a consistent and asymptotically efficient estimator of $\tau(\theta)$.

ARE – Asymptotic Relative Efficiency:

Definition 10.1.16 If two estimators W_n and V_n satisfy

$$\sqrt{n}[W_n - \tau(\theta)] \rightarrow n[0, \sigma_W^2]$$

$$\sqrt{n}[V_n - \tau(\theta)] \rightarrow n[0, \sigma_V^2]$$

in distribution, the *asymptotic relative efficiency* (ARE) of V_n with respect to W_n is

$$\text{ARE}(V_n, W_n) = \frac{\sigma_W^2}{\sigma_V^2}.$$

Theorem 10.3.1 (Asymptotic distribution of the LRT—simple H_0) For testing $H_0 : \theta = \theta_0$ versus $H_1 : \theta \neq \theta_0$, suppose X_1, \dots, X_n are iid $f(x|\theta)$, $\hat{\theta}$ is the MLE of θ , and $f(x|\theta)$ satisfies the regularity conditions in Miscellanea 10.6.2. Then under H_0 , as $n \rightarrow \infty$,

$$-2 \log \lambda(\mathbf{X}) \rightarrow \chi_1^2 \text{ in distribution,}$$

where χ_1^2 is a χ^2 random variable with 1 degree of freedom.

Definition 3.4.5 The *indicator function* of a set A , most often denoted by $I_A(x)$, is the function

$$I_A(x) = \begin{cases} 1 & x \in A \\ 0 & x \notin A. \end{cases}$$

An alternative notation is $I(x \in A)$.

Theorem 6.2.28 *If a minimal sufficient statistic exists, then any complete statistic is also a minimal sufficient statistic.*

Definition 7.3.7 An estimator W^* is a *best unbiased estimator* of $\tau(\theta)$ if it satisfies $E_\theta W^* = \tau(\theta)$ for all θ and, for any other estimator W with $E_\theta W = \tau(\theta)$, we have $\text{Var}_\theta W^* \leq \text{Var}_\theta W$ for all θ . W^* is also called a *uniform minimum variance unbiased estimator* (UMVUE) of $\tau(\theta)$.

Table 8.3.1. *Two types of errors in hypothesis testing*

		Decision	
		Accept H_0	Reject H_0
Truth	H_0	Correct decision	Type I Error
	H_1	Type II Error	Correct decision

Definition 8.3.16 A family of pdfs or pmfs $\{g(t|\theta) : \theta \in \Theta\}$ for a univariate random variable T with real-valued parameter θ has a *monotone likelihood ratio* (MLR) if, for every $\theta_2 > \theta_1$, $g(t|\theta_2)/g(t|\theta_1)$ is a monotone (nonincreasing or nondecreasing) function of t on $\{t : g(t|\theta_1) > 0 \text{ or } g(t|\theta_2) > 0\}$. Note that $c/0$ is defined as ∞ if $0 < c$.

Many common families of distributions have an MLR. For example, the normal (known variance, unknown mean), Poisson, and binomial all have an MLR. Indeed, any regular exponential family with $g(t|\theta) = h(t)c(\theta)e^{w(\theta)t}$ has an MLR if $w(\theta)$ is a nondecreasing function (see Exercise 8.25).

Theorem 8.3.17 (Karlin–Rubin) *Consider testing $H_0 : \theta \leq \theta_0$ versus $H_1 : \theta > \theta_0$. Suppose that T is a sufficient statistic for θ and the family of pdfs or pmfs $\{g(t|\theta) : \theta \in \Theta\}$ of T has an MLR. Then for any t_0 , the test that rejects H_0 if and only if $T > t_0$ is a UMP level α test, where $\alpha = P_{\theta_0}(T > t_0)$.*

Table 9.2.1. *Location-scale pivots*

Form of pdf	Type of pdf	Pivotal quantity
$f(x - \mu)$	Location	$\bar{X} - \mu$
$\frac{1}{\sigma} f\left(\frac{x}{\sigma}\right)$	Scale	$\frac{\bar{X}}{\sigma}$
$\frac{1}{\sigma} f\left(\frac{x - \mu}{\sigma}\right)$	Location-scale	$\frac{\bar{X} - \mu}{S}$

Definition 10.1.11 A sequence of estimators W_n is *asymptotically efficient* for a parameter $\tau(\theta)$ if $\sqrt{n}[W_n - \tau(\theta)] \rightarrow n[0, v(\theta)]$ in distribution and

$$v(\theta) = \frac{[\tau'(\theta)]^2}{\mathbf{E}_\theta \left(\left(\frac{\partial}{\partial \theta} \log f(X|\theta) \right)^2 \right)};$$

that is, the asymptotic variance of W_n achieves the Cramér–Rao Lower Bound.

Theorem 10.3.3 Let X_1, \dots, X_n be a random sample from a pdf or pmf $f(x|\theta)$. Under the regularity conditions in Miscellanea 10.6.2, if $\theta \in \Theta_0$, then the distribution of the statistic $-2 \log \lambda(\mathbf{X})$ converges to a chi squared distribution as the sample size $n \rightarrow \infty$. The degrees of freedom of the limiting distribution is the difference between the number of free parameters specified by $\theta \in \Theta_0$ and the number of free parameters specified by $\theta \in \Theta$.

Table of Common Distributions

Discrete Distributions

Bernoulli(p)

pmf $P(X = x|p) = p^x(1 - p)^{1-x}; \quad x = 0, 1; \quad 0 \leq p \leq 1$

mean and variance $EX = p, \quad \text{Var } X = p(1 - p)$

mgf $M_X(t) = (1 - p) + pe^t$

Binomial(n, p)

pmf $P(X = x|n, p) = \binom{n}{x} p^x (1 - p)^{n-x}; \quad x = 0, 1, 2, \dots, n; \quad 0 \leq p \leq 1$

mean and variance $EX = np, \quad \text{Var } X = np(1 - p)$

mgf $M_X(t) = [pe^t + (1 - p)]^n$

notes Related to Binomial Theorem (Theorem 3.2.2). The *multinomial* distribution (Definition 4.6.2) is a multivariate version of the binomial distribution.

Discrete uniform

pmf $P(X = x|N) = \frac{1}{N}; \quad x = 1, 2, \dots, N; \quad N = 1, 2, \dots$

mean and variance $EX = \frac{N+1}{2}, \quad \text{Var } X = \frac{(N+1)(N-1)}{12}$

mgf $M_X(t) = \frac{1}{N} \sum_{i=1}^N e^{it}$

Geometric(p)

pmf $P(X = x|p) = p(1 - p)^{x-1}; \quad x = 1, 2, \dots; \quad 0 \leq p \leq 1$

mean and variance $EX = \frac{1}{p}, \quad \text{Var } X = \frac{1-p}{p^2}$

mgf $M_X(t) = \frac{pe^t}{1-(1-p)e^t}, \quad t < -\log(1-p)$

notes $Y = X - 1$ is negative binomial(1, p). The distribution is *memoryless*:
 $P(X > s | X > t) = P(X > s - t)$.

Hypergeometric

pmf $P(X = x | N, M, K) = \frac{\binom{M}{x} \binom{N-M}{K-x}}{\binom{N}{K}}; \quad x = 0, 1, 2, \dots, K;$
 $M - (N - K) \leq x \leq M; \quad N, M, K \geq 0$

mean and variance $EX = \frac{KM}{N}, \quad \text{Var } X = \frac{KM}{N} \frac{(N-M)(N-K)}{N(N-1)}$

notes If $K \ll M$ and N , the range $x = 0, 1, 2, \dots, K$ will be appropriate.

Negative binomial(r, p)

pmf $P(X = x | r, p) = \binom{r+x-1}{x} p^r (1-p)^x; \quad x = 0, 1, \dots; \quad 0 \leq p \leq 1$

mean and variance $EX = \frac{r(1-p)}{p}, \quad \text{Var } X = \frac{r(1-p)}{p^2}$

mgf $M_X(t) = \left(\frac{p}{1-(1-p)e^t} \right)^r, \quad t < -\log(1-p)$

notes An alternate form of the pmf is given by $P(Y = y | r, p) = \binom{y-1}{r-1} p^r (1-p)^{y-r}, y = r, r+1, \dots$. The random variable $Y = X + r$. The negative binomial can be derived as a gamma mixture of Poissons. (See Exercise 4.34.)

Poisson(λ)

pmf $P(X = x | \lambda) = \frac{e^{-\lambda} \lambda^x}{x!}; \quad x = 0, 1, \dots; \quad 0 \leq \lambda < \infty$

mean and variance $EX = \lambda, \quad \text{Var } X = \lambda$

mgf $M_X(t) = e^{\lambda(e^t-1)}$

Continuous Distributions

Beta(α, β)

pdf $f(x|\alpha, \beta) = \frac{1}{B(\alpha, \beta)} x^{\alpha-1} (1-x)^{\beta-1}, \quad 0 \leq x \leq 1, \quad \alpha > 0, \quad \beta > 0$

mean and variance $EX = \frac{\alpha}{\alpha+\beta}, \quad \text{Var } X = \frac{\alpha\beta}{(\alpha+\beta)^2(\alpha+\beta+1)}$

mgf $M_X(t) = 1 + \sum_{k=1}^{\infty} \left(\prod_{r=0}^{k-1} \frac{\alpha+r}{\alpha+\beta+r} \right) \frac{t^k}{k!}$

notes The constant in the beta pdf can be defined in terms of gamma functions, $B(\alpha, \beta) = \frac{\Gamma(\alpha)\Gamma(\beta)}{\Gamma(\alpha+\beta)}$. Equation (3.2.18) gives a general expression for the moments.

Cauchy(θ, σ)

pdf $f(x|\theta, \sigma) = \frac{1}{\pi\sigma} \frac{1}{1+(\frac{x-\theta}{\sigma})^2}, \quad -\infty < x < \infty; \quad -\infty < \theta < \infty, \quad \sigma > 0$

mean and variance do not exist

mgf does not exist

notes Special case of Student's t , when degrees of freedom = 1. Also, if X and Y are independent $n(0, 1)$, X/Y is Cauchy.

Chi squared(p)

pdf $f(x|p) = \frac{1}{\Gamma(p/2)2^{p/2}} x^{(p/2)-1} e^{-x/2}; \quad 0 \leq x < \infty; \quad p = 1, 2, \dots$

mean and variance $EX = p, \quad \text{Var } X = 2p$

mgf $M_X(t) = \left(\frac{1}{1-2t} \right)^{p/2}, \quad t < \frac{1}{2}$

notes Special case of the gamma distribution.

Double exponential(μ, σ)

pdf $f(x|\mu, \sigma) = \frac{1}{2\sigma} e^{-|x-\mu|/\sigma}, \quad -\infty < x < \infty, \quad -\infty < \mu < \infty, \quad \sigma > 0$

mean and variance $EX = \mu, \quad \text{Var } X = 2\sigma^2$

mgf $M_X(t) = \frac{e^{\mu t}}{1-(\sigma t)^2}, \quad |t| < \frac{1}{\sigma}$

notes Also known as the *Laplace* distribution.

Exponential(β)

pdf $f(x|\beta) = \frac{1}{\beta}e^{-x/\beta}, \quad 0 \leq x < \infty, \quad \beta > 0$

mean and variance $EX = \beta, \quad \text{Var } X = \beta^2$

mgf $M_X(t) = \frac{1}{1-\beta t}, \quad t < \frac{1}{\beta}$

notes Special case of the gamma distribution. Has the *memoryless* property. Has many special cases: $Y = X^{1/\gamma}$ is *Weibull*, $Y = \sqrt{2X/\beta}$ is *Rayleigh*, $Y = \alpha - \gamma \log(X/\beta)$ is *Gumbel*.

F

pdf $f(x|\nu_1, \nu_2) = \frac{\Gamma(\frac{\nu_1+\nu_2}{2})}{\Gamma(\frac{\nu_1}{2})\Gamma(\frac{\nu_2}{2})} \left(\frac{\nu_1}{\nu_2}\right)^{\nu_1/2} \frac{x^{\nu_1-2}}{(1+(\frac{\nu_1}{\nu_2})x)^{(\nu_1+\nu_2)/2}};$
 $0 \leq x < \infty; \quad \nu_1, \nu_2 = 1, \dots$

mean and variance $EX = \frac{\nu_2}{\nu_2-2}, \quad \nu_2 > 2,$
 $\text{Var } X = 2 \left(\frac{\nu_2}{\nu_2-2}\right)^2 \frac{(\nu_1+\nu_2-2)}{\nu_1(\nu_2-4)}, \quad \nu_2 > 4$

moments (mgf does not exist) $EX^n = \frac{\Gamma(\frac{\nu_1+2n}{2})\Gamma(\frac{\nu_2-2n}{2})}{\Gamma(\frac{\nu_1}{2})\Gamma(\frac{\nu_2}{2})} \left(\frac{\nu_2}{\nu_1}\right)^n, \quad n < \frac{\nu_2}{2}$

notes Related to chi squared ($F_{\nu_1, \nu_2} = \left(\frac{\chi_{\nu_1}^2}{\nu_1}\right) / \left(\frac{\chi_{\nu_2}^2}{\nu_2}\right)$, where the χ^2 s are independent) and t ($F_{1, \nu} = t_\nu^2$).

Gamma(α, β)

pdf $f(x|\alpha, \beta) = \frac{1}{\Gamma(\alpha)\beta^\alpha} x^{\alpha-1} e^{-x/\beta}, \quad 0 \leq x < \infty, \quad \alpha, \beta > 0$

mean and variance $EX = \alpha\beta, \quad \text{Var } X = \alpha\beta^2$

mgf $M_X(t) = \left(\frac{1}{1-\beta t}\right)^\alpha, \quad t < \frac{1}{\beta}$

notes Some special cases are exponential ($\alpha = 1$) and chi squared ($\alpha = p/2, \beta = 2$). If $\alpha = \frac{3}{2}, Y = \sqrt{X/\beta}$ is *Maxwell*. $Y = 1/X$ has the *inverted gamma distribution*. Can also be related to the Poisson (Example 3.2.1).

Logistic(μ, β)

pdf $f(x|\mu, \beta) = \frac{1}{\beta} \frac{e^{-(x-\mu)/\beta}}{[1+e^{-(x-\mu)/\beta}]^2}, \quad -\infty < x < \infty, \quad -\infty < \mu < \infty, \quad \beta > 0$

mean and variance $EX = \mu, \quad \text{Var } X = \frac{\pi^2\beta^2}{3}$

mgf $M_X(t) = e^{\mu t} \Gamma(1 - \beta t) \Gamma(1 + \beta t), \quad |t| < \frac{1}{\beta}$

notes The cdf is given by $F(x|\mu, \beta) = \frac{1}{1 + e^{-(x-\mu)/\beta}}$.

Lognormal(μ, σ^2)

pdf $f(x|\mu, \sigma^2) = \frac{1}{\sqrt{2\pi}\sigma} \frac{e^{-(\log x - \mu)^2 / (2\sigma^2)}}{x}, \quad 0 \leq x < \infty, \quad -\infty < \mu < \infty, \quad \sigma > 0$

mean and variance $EX = e^{\mu + (\sigma^2/2)}, \quad \text{Var } X = e^{2(\mu + \sigma^2)} - e^{2\mu + \sigma^2}$

moments $EX^n = e^{n\mu + n^2\sigma^2/2}$
(mgf does not exist)

notes Example 2.3.5 gives another distribution with the same moments.

Normal(μ, σ^2)

pdf $f(x|\mu, \sigma^2) = \frac{1}{\sqrt{2\pi}\sigma} e^{-(x-\mu)^2 / (2\sigma^2)}, \quad -\infty < x < \infty, \quad -\infty < \mu < \infty, \quad \sigma > 0$

mean and variance $EX = \mu, \quad \text{Var } X = \sigma^2$

mgf $M_X(t) = e^{\mu t + \sigma^2 t^2 / 2}$

notes Sometimes called the *Gaussian* distribution.

Pareto(α, β)

pdf $f(x|\alpha, \beta) = \frac{\beta \alpha^\beta}{x^{\beta+1}}, \quad a < x < \infty, \quad \alpha > 0, \quad \beta > 0$

mean and variance $EX = \frac{\beta \alpha}{\beta - 1}, \quad \beta > 1, \quad \text{Var } X = \frac{\beta \alpha^2}{(\beta - 1)^2 (\beta - 2)}, \quad \beta > 2$

mgf does not exist

t

pdf $f(x|\nu) = \frac{\Gamma(\frac{\nu+1}{2})}{\Gamma(\frac{\nu}{2})} \frac{1}{\sqrt{\nu\pi}} \frac{1}{(1 + \frac{x^2}{\nu})^{(\nu+1)/2}}, \quad -\infty < x < \infty, \quad \nu = 1, \dots$

mean and variance $EX = 0, \quad \nu > 1, \quad \text{Var } X = \frac{\nu}{\nu - 2}, \quad \nu > 2$

moments $EX^n = \frac{\Gamma(\frac{n+1}{2}) \Gamma(\frac{\nu-n}{2})}{\sqrt{\pi} \Gamma(\frac{\nu}{2})} \nu^{n/2}$ if $n < \nu$ and even,
(mgf does not exist) $EX^n = 0$ if $n < \nu$ and odd.

notes Related to F ($F_{1,\nu} = t_\nu^2$).

Uniform(a, b)

pdf $f(x|a, b) = \frac{1}{b-a}, \quad a \leq x \leq b$

mean and variance $EX = \frac{b+a}{2}, \quad \text{Var } X = \frac{(b-a)^2}{12}$

mgf $M_X(t) = \frac{e^{bt} - e^{at}}{(b-a)t}$

notes If $a = 0$ and $b = 1$, this is a special case of the beta ($\alpha = \beta = 1$).

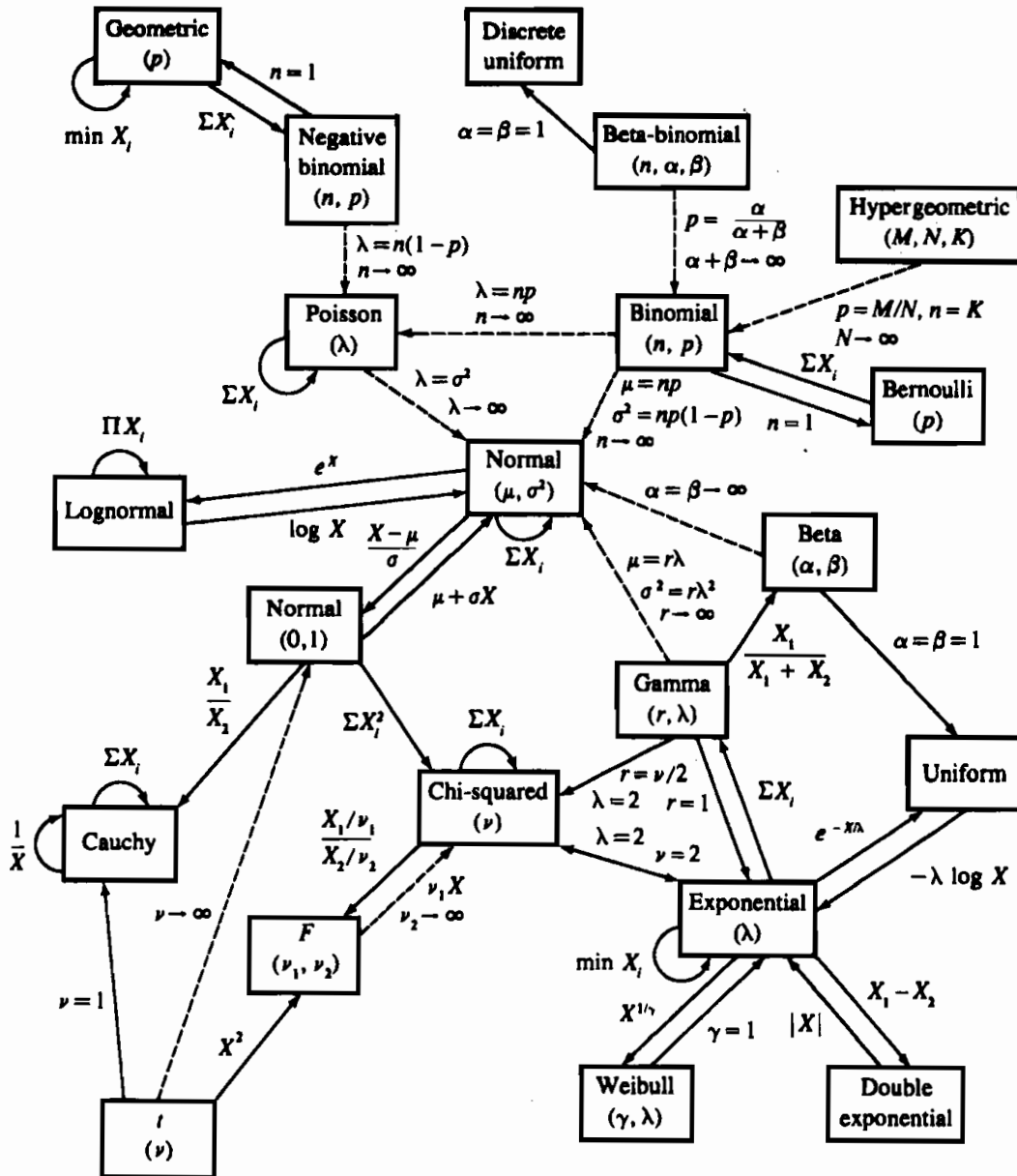
Weibull(γ, β)

pdf $f(x|\gamma, \beta) = \frac{\gamma}{\beta} x^{\gamma-1} e^{-x^\gamma/\beta}, \quad 0 \leq x < \infty, \quad \gamma > 0, \quad \beta > 0$

mean and variance $EX = \beta^{1/\gamma} \Gamma\left(1 + \frac{1}{\gamma}\right), \quad \text{Var } X = \beta^{2/\gamma} \left[\Gamma\left(1 + \frac{2}{\gamma}\right) - \Gamma^2\left(1 + \frac{1}{\gamma}\right) \right]$

moments $EX^n = \beta^{n/\gamma} \Gamma\left(1 + \frac{n}{\gamma}\right)$

notes The mgf exists only for $\gamma \geq 1$. Its form is not very useful. A special case is exponential ($\gamma = 1$).

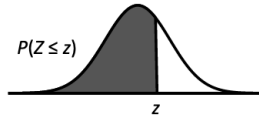


Relationships among common distributions. Solid lines represent transformations and special cases, dashed lines represent limits. Adapted from Leemis (1986).

TABELL 1. Normalfördelningen, standardiserad

$\Phi(z) = P(Z \leq z)$ där $Z \in N(0, 1)$.

För negativa värden, utnyttja att $\Phi(-z) = 1 - \Phi(z)$.



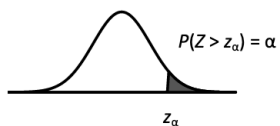
$$\Phi(z) = P(Z \leq z) \text{ with } Z \in N(0, 1)$$

z	0	.01	.02	.03	.04	.05	.06	.07	.08	.09
0	.5	.50399	.50798	.51197	.51595	.51994	.52392	.5279	.53188	.53586
.1	.53983	.5438	.54776	.55172	.55567	.55962	.56356	.56749	.57142	.57535
.2	.57926	.58317	.58706	.59095	.59483	.59871	.60257	.60642	.61026	.61409
.3	.61791	.62172	.62552	.6293	.63307	.63683	.64058	.64431	.64803	.65173
.4	.65542	.6591	.66276	.6664	.67003	.67364	.67724	.68082	.68439	.68793
.5	.69146	.69497	.69847	.70194	.7054	.70884	.71226	.71566	.71904	.7224
.6	.72575	.72907	.73237	.73565	.73891	.74215	.74537	.74857	.75175	.7549
.7	.75804	.76115	.76424	.7673	.77035	.77337	.77637	.77935	.7823	.78524
.8	.78814	.79103	.79389	.79673	.79955	.80234	.80511	.80785	.81057	.81327
.9	.81594	.81859	.82121	.82381	.82639	.82894	.83147	.83398	.83646	.83891
1	.84134	.84375	.84614	.84849	.85083	.85314	.85543	.85769	.85993	.86214
1.1	.86433	.8665	.86864	.87076	.87286	.87493	.87698	.879	.881	.88298
1.2	.88493	.88686	.88877	.89065	.89251	.89435	.89617	.89796	.89973	.90147
1.3	.9032	.9049	.90658	.90824	.90988	.91149	.91309	.91466	.91621	.91774
1.4	.91924	.92073	.9222	.92364	.92507	.92647	.92785	.92922	.93056	.93189
1.5	.93319	.93448	.93574	.93699	.93822	.93943	.94062	.94179	.94295	.94408
1.6	.9452	.9463	.94738	.94845	.9495	.95053	.95154	.95254	.95352	.95449
1.7	.95543	.95637	.95728	.95818	.95907	.95994	.9608	.96164	.96246	.96327
1.8	.96407	.96485	.96562	.96638	.96712	.96784	.96856	.96926	.96995	.97062
1.9	.97128	.97193	.97257	.9732	.97381	.97441	.975	.97558	.97615	.9767
2	.97725	.97778	.97831	.97882	.97932	.97982	.9803	.98077	.98124	.98169
2.1	.98214	.98257	.983	.98341	.98382	.98422	.98461	.985	.98537	.98574
2.2	.9861	.98645	.98679	.98713	.98745	.98778	.98809	.9884	.9887	.98899
2.3	.98928	.98956	.98983	.9901	.99036	.99061	.99086	.99111	.99134	.99158
2.4	.9918	.99202	.99224	.99245	.99266	.99286	.99305	.99324	.99343	.99361
2.5	.99379	.99396	.99413	.9943	.99446	.99461	.99477	.99492	.99506	.9952
2.6	.99534	.99547	.9956	.99573	.99585	.99598	.99609	.99621	.99632	.99643
2.7	.99653	.99664	.99674	.99683	.99693	.99702	.99711	.9972	.99728	.99736
2.8	.99744	.99752	.9976	.99767	.99774	.99781	.99788	.99795	.99801	.99807
2.9	.99813	.99819	.99825	.99831	.99836	.99841	.99846	.99851	.99856	.99861
3	.99865	.99869	.99874	.99878	.99882	.99886	.99889	.99893	.99896	.999
3.1	.99903	.99906	.9991	.99913	.99916	.99918	.99921	.99924	.99926	.99929
3.2	.99931	.99934	.99936	.99938	.9994	.99942	.99944	.99946	.99948	.9995
3.3	.99952	.99953	.99955	.99957	.99958	.9996	.99961	.99962	.99964	.99965
3.4	.99966	.99968	.99969	.9997	.99971	.99972	.99973	.99974	.99975	.99976
3.5	.99977	.99978	.99978	.99979	.9998	.99981	.99981	.99982	.99983	.99983
3.6	.99984	.99985	.99985	.99986	.99986	.99987	.99987	.99988	.99988	.99989
3.7	.99989	.9999	.9999	.9999	.99991	.99991	.99992	.99992	.99992	.99992
3.8	.99993	.99993	.99993	.99994	.99994	.99994	.99994	.99995	.99995	.99995
3.9	.99995	.99995	.99996	.99996	.99996	.99996	.99996	.99996	.99997	.99997
4	.99997	.99997	.99997	.99997	.99997	.99997	.99998	.99998	.99998	.99998

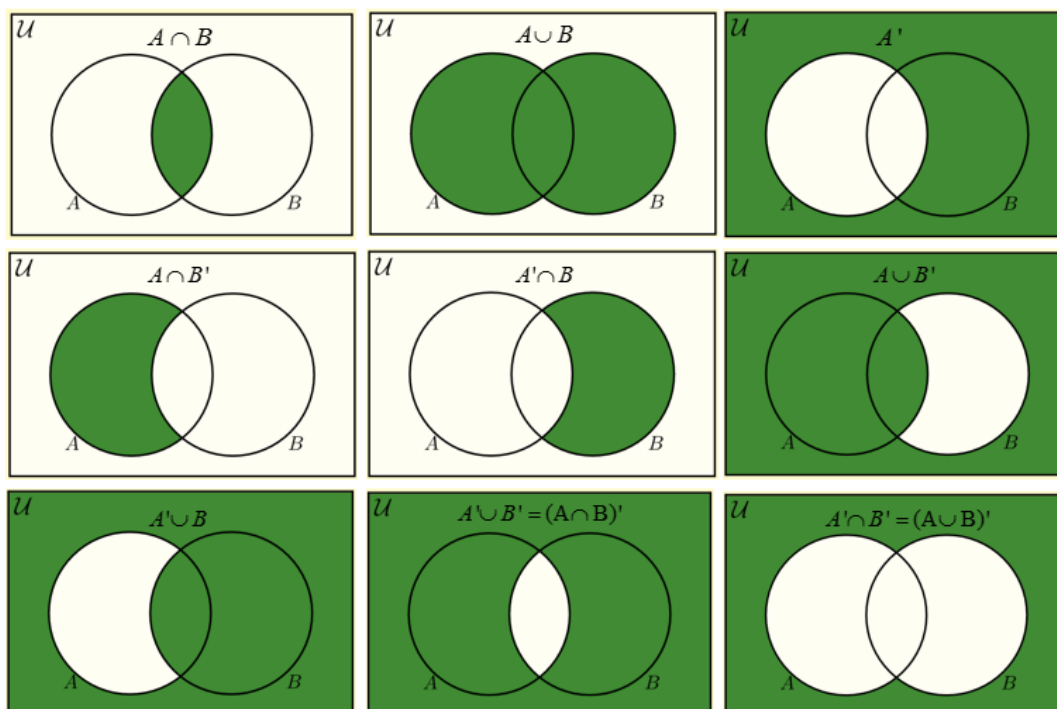
TABELL 2. Normalfördelningens kvantiler, standardiserad

$Z \in N(0, 1)$. Vilket värde har z_α om $P(Z > z_\alpha) = \alpha$ där α är en given sannolikhet.

Utnyttja även $\Phi(-z) = 1 - \Phi(z)$ för $P(Z \leq -z_\alpha)$.



α	z_α
0,25	0,6745
0,10	1,2816
0,05	1,6449
0,025	1,9600
0,010	2,3263
0,005	2,5758
0,0025	2,8070
0,0010	3,0902
0,0005	3,2905
0,00025	3,4808
0,00010	3,7190
0,00005	3,8906
0,000025	4,0556
0,000010	4,2649
0,000005	4,4172





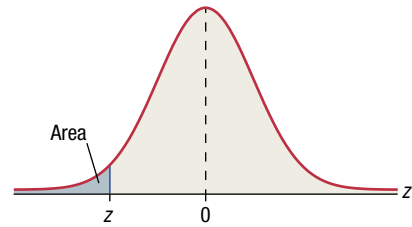
Statistical Tables

- A Standard Normal Distribution
- B Standard Normal Distribution
- C Standard Normal Distribution
- D Critical Values of t
- E Binomial Probabilities
- F Cumulative Binomial Probabilities
- G Poisson Probabilities
- H Critical Values of χ^2
- I Critical Values of F
- J Critical Values of the Pearson Correlation Coefficient

A Standard Normal Distribution

Numerical entries represent the probability that a standard normal

random variable is between $-\infty$ and z where $z = \frac{x - \mu}{\sigma}$.

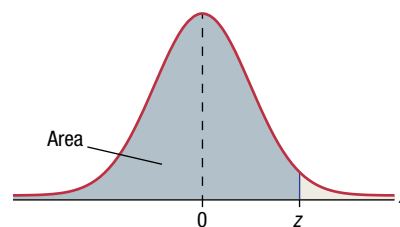


<i>z</i>	0.09	0.08	0.07	0.06	0.05	0.04	0.03	0.02	0.01	0.00
-3.4	0.0002	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
-3.3	0.0003	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0005	0.0005	0.0005
-3.2	0.0005	0.0005	0.0005	0.0006	0.0006	0.0006	0.0006	0.0006	0.0007	0.0007
-3.1	0.0007	0.0007	0.0008	0.0008	0.0008	0.0008	0.0009	0.0009	0.0009	0.0010
-3.0	0.0010	0.0010	0.0011	0.0011	0.0011	0.0012	0.0012	0.0013	0.0013	0.0013
-2.9	0.0014	0.0014	0.0015	0.0015	0.0016	0.0016	0.0017	0.0018	0.0018	0.0019
-2.8	0.0019	0.0020	0.0021	0.0021	0.0022	0.0023	0.0023	0.0024	0.0025	0.0026
-2.7	0.0026	0.0027	0.0028	0.0029	0.0030	0.0031	0.0032	0.0033	0.0034	0.0035
-2.6	0.0036	0.0037	0.0038	0.0039	0.0040	0.0041	0.0043	0.0044	0.0045	0.0047
-2.5	0.0048	0.0049	0.0051	0.0052	0.0054	0.0055	0.0057	0.0059	0.0060	0.0062
-2.4	0.0064	0.0066	0.0068	0.0069	0.0071	0.0073	0.0075	0.0078	0.0080	0.0082
-2.3	0.0084	0.0087	0.0089	0.0091	0.0094	0.0096	0.0099	0.0102	0.0104	0.0107
-2.2	0.0110	0.0113	0.0116	0.0119	0.0122	0.0125	0.0129	0.0132	0.0136	0.0139
-2.1	0.0143	0.0146	0.0150	0.0154	0.0158	0.0162	0.0166	0.0170	0.0174	0.0179
-2.0	0.0183	0.0188	0.0192	0.0197	0.0202	0.0207	0.0212	0.0217	0.0222	0.0228
-1.9	0.0233	0.0239	0.0244	0.0250	0.0256	0.0262	0.0268	0.0274	0.0281	0.0287
-1.8	0.0294	0.0301	0.0307	0.0314	0.0322	0.0329	0.0336	0.0344	0.0351	0.0359
-1.7	0.0367	0.0375	0.0384	0.0392	0.0401	0.0409	0.0418	0.0427	0.0436	0.0446
-1.6	0.0455	0.0465	0.0475	0.0485	0.0495	0.0505	0.0516	0.0526	0.0537	0.0548
-1.5	0.0559	0.0571	0.0582	0.0594	0.0606	0.0618	0.0630	0.0643	0.0655	0.0668
-1.4	0.0681	0.0694	0.0708	0.0721	0.0735	0.0749	0.0764	0.0778	0.0793	0.0808
-1.3	0.0823	0.0838	0.0853	0.0869	0.0885	0.0901	0.0918	0.0934	0.0951	0.0968
-1.2	0.0985	0.1003	0.1020	0.1038	0.1056	0.1075	0.1093	0.1112	0.1131	0.1151
-1.1	0.1170	0.1190	0.1210	0.1230	0.1251	0.1271	0.1292	0.1314	0.1335	0.1357
-1.0	0.1379	0.1401	0.1423	0.1446	0.1469	0.1492	0.1515	0.1539	0.1562	0.1587
-0.9	0.1611	0.1635	0.1660	0.1685	0.1711	0.1736	0.1762	0.1788	0.1814	0.1841
-0.8	0.1867	0.1894	0.1922	0.1949	0.1977	0.2005	0.2033	0.2061	0.2090	0.2119
-0.7	0.2148	0.2177	0.2206	0.2236	0.2266	0.2296	0.2327	0.2358	0.2389	0.2420
-0.6	0.2451	0.2483	0.2514	0.2546	0.2578	0.2611	0.2643	0.2676	0.2709	0.2743
-0.5	0.2776	0.2810	0.2843	0.2877	0.2912	0.2946	0.2981	0.3015	0.3050	0.3085
-0.4	0.3121	0.3156	0.3192	0.3228	0.3264	0.3300	0.3336	0.3372	0.3409	0.3446
-0.3	0.3483	0.3520	0.3557	0.3594	0.3632	0.3669	0.3707	0.3745	0.3783	0.3821
-0.2	0.3859	0.3897	0.3936	0.3974	0.4013	0.4052	0.4090	0.4129	0.4168	0.4207
-0.1	0.4247	0.4286	0.4325	0.4364	0.4404	0.4443	0.4483	0.4522	0.4562	0.4602
-0.0	0.4641	0.4681	0.4721	0.4761	0.4801	0.4840	0.4880	0.4920	0.4960	0.5000

B Standard Normal Distribution

Numerical entries represent the probability that a standard normal

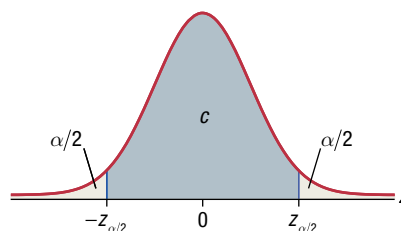
random variable is between $-\infty$ and z where $z = \frac{x - \mu}{\sigma}$.



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
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

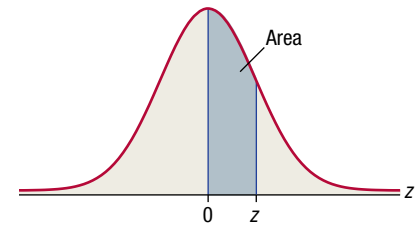
Critical Values of z

Level of Confidence, c	$\alpha = 1 - c$	$z_{\alpha/2}$
0.80	0.20	1.28
0.85	0.15	1.44
0.90	0.10	1.645
0.95	0.05	1.96
0.98	0.02	2.33
0.99	0.01	2.575



C Standard Normal Distribution

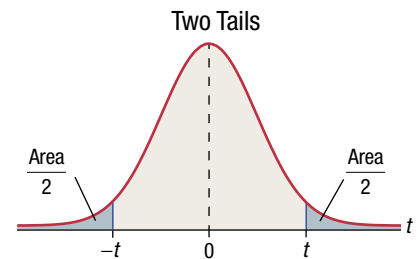
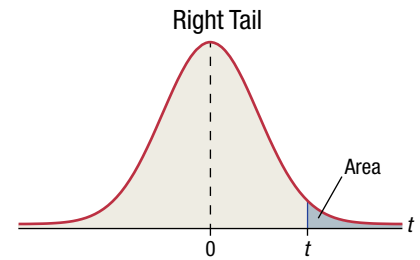
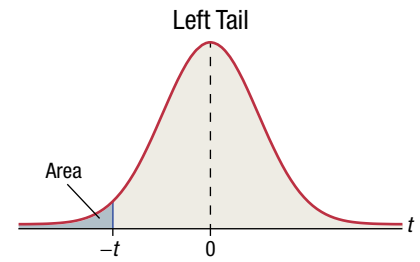
Numerical entries represent the probability that a standard normal random variable is between 0 and z where $z = \frac{x - \mu}{\sigma}$.



z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990
3.1	0.4990	0.4991	0.4991	0.4991	0.4992	0.4992	0.4992	0.4992	0.4993	0.4993
3.2	0.4993	0.4993	0.4994	0.4994	0.4994	0.4994	0.4994	0.4995	0.4995	0.4995
3.3	0.4995	0.4995	0.4995	0.4996	0.4996	0.4996	0.4996	0.4996	0.4996	0.4997
3.4	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4998

D Critical Values of t

df	Area in One Tail				
	0.100	0.050	0.025	0.010	0.005
	Area in Two Tails				
	0.200	0.100	0.050	0.020	0.010
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
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
34	1.307	1.691	2.032	2.441	2.728
36	1.306	1.688	2.028	2.434	2.719
38	1.304	1.686	2.024	2.429	2.712
40	1.303	1.684	2.021	2.423	2.704
45	1.301	1.679	2.014	2.412	2.690
50	1.299	1.676	2.009	2.403	2.678
55	1.297	1.673	2.004	2.396	2.668
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
120	1.289	1.658	1.980	2.358	2.617
200	1.286	1.653	1.972	2.345	2.601
300	1.284	1.650	1.968	2.339	2.592
400	1.284	1.649	1.966	2.336	2.588
500	1.283	1.648	1.965	2.334	2.586
750	1.283	1.647	1.963	2.331	2.582
1000	1.282	1.646	1.962	2.330	2.581
∞	1.282	1.645	1.960	2.326	2.576



E Binomial Probabilities

Numerical entries represent $P(X = x)$.

n	x	p								
		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
1	0	0.9000	0.8000	0.7000	0.6000	0.5000	0.4000	0.3000	0.2000	0.1000
	1	0.1000	0.2000	0.3000	0.4000	0.5000	0.6000	0.7000	0.8000	0.9000
2	0	0.8100	0.6400	0.4900	0.3600	0.2500	0.1600	0.0900	0.0400	0.0100
	1	0.1800	0.3200	0.4200	0.4800	0.5000	0.4800	0.4200	0.3200	0.1800
	2	0.0100	0.0400	0.0900	0.1600	0.2500	0.3600	0.4900	0.6400	0.8100
3	0	0.7290	0.5120	0.3430	0.2160	0.1250	0.0640	0.0270	0.0080	0.0010
	1	0.2430	0.3840	0.4410	0.4320	0.3750	0.2880	0.1890	0.0960	0.0270
	2	0.0270	0.0960	0.1890	0.2880	0.3750	0.4320	0.4410	0.3840	0.2430
	3	0.0010	0.0080	0.0270	0.0640	0.1250	0.2160	0.3430	0.5120	0.7290
4	0	0.6561	0.4096	0.2401	0.1296	0.0625	0.0256	0.0081	0.0016	0.0001
	1	0.2916	0.4096	0.4116	0.3456	0.2500	0.1536	0.0756	0.0256	0.0036
	2	0.0486	0.1536	0.2646	0.3456	0.3750	0.3456	0.2646	0.1536	0.0486
	3	0.0036	0.0256	0.0756	0.1536	0.2500	0.3456	0.4116	0.4096	0.2916
	4	0.0001	0.0016	0.0081	0.0256	0.0625	0.1296	0.2401	0.4096	0.6561
5	0	0.5905	0.3277	0.1681	0.0778	0.0313	0.0102	0.0024	0.0003	0.0000
	1	0.3281	0.4096	0.3602	0.2592	0.1563	0.0768	0.0284	0.0064	0.0005
	2	0.0729	0.2048	0.3087	0.3456	0.3125	0.2304	0.1323	0.0512	0.0081
	3	0.0081	0.0512	0.1323	0.2304	0.3125	0.3456	0.3087	0.2048	0.0729
	4	0.0005	0.0064	0.0284	0.0768	0.1563	0.2592	0.3602	0.4096	0.3281
	5	0.0000	0.0003	0.0024	0.0102	0.0313	0.0778	0.1681	0.3277	0.5905
6	0	0.5314	0.2621	0.1176	0.0467	0.0156	0.0041	0.0007	0.0001	0.0000
	1	0.3543	0.3932	0.3025	0.1866	0.0938	0.0369	0.0102	0.0015	0.0001
	2	0.0984	0.2458	0.3241	0.3110	0.2344	0.1382	0.0595	0.0154	0.0012
	3	0.0146	0.0819	0.1852	0.2765	0.3125	0.2765	0.1852	0.0819	0.0146
	4	0.0012	0.0154	0.0595	0.1382	0.2344	0.3110	0.3241	0.2458	0.0984
	5	0.0001	0.0015	0.0102	0.0369	0.0938	0.1866	0.3025	0.3932	0.3543
	6	0.0000	0.0001	0.0007	0.0041	0.0156	0.0467	0.1176	0.2621	0.5314
7	0	0.4783	0.2097	0.0824	0.0280	0.0078	0.0016	0.0002	0.0000	0.0000
	1	0.3720	0.3670	0.2471	0.1306	0.0547	0.0172	0.0036	0.0004	0.0000
	2	0.1240	0.2753	0.3177	0.2613	0.1641	0.0774	0.0250	0.0043	0.0002
	3	0.0230	0.1147	0.2269	0.2903	0.2734	0.1935	0.0972	0.0287	0.0026
	4	0.0026	0.0287	0.0972	0.1935	0.2734	0.2903	0.2269	0.1147	0.0230
	5	0.0002	0.0043	0.0250	0.0774	0.1641	0.2613	0.3177	0.2753	0.1240
	6	0.0000	0.0004	0.0036	0.0172	0.0547	0.1306	0.2471	0.3670	0.3720
	7	0.0000	0.0000	0.0002	0.0016	0.0078	0.0280	0.0824	0.2097	0.4783

E

Binomial Probabilities (cont.)

<i>n</i>	<i>x</i>	<i>p</i>								
		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
8	0	0.4305	0.1678	0.0576	0.0168	0.0039	0.0007	0.0001	0.0000	0.0000
	1	0.3826	0.3355	0.1977	0.0896	0.0313	0.0079	0.0012	0.0001	0.0000
	2	0.1488	0.2936	0.2965	0.2090	0.1094	0.0413	0.0100	0.0011	0.0000
	3	0.0331	0.1468	0.2541	0.2787	0.2188	0.1239	0.0467	0.0092	0.0004
	4	0.0046	0.0459	0.1361	0.2322	0.2734	0.2322	0.1361	0.0459	0.0046
	5	0.0004	0.0092	0.0467	0.1239	0.2188	0.2787	0.2541	0.1468	0.0331
	6	0.0000	0.0011	0.0100	0.0413	0.1094	0.2090	0.2965	0.2936	0.1488
	7	0.0000	0.0001	0.0012	0.0079	0.0313	0.0896	0.1977	0.3355	0.3826
	8	0.0000	0.0000	0.0001	0.0007	0.0039	0.0168	0.0576	0.1678	0.4305
9	0	0.3874	0.1342	0.0404	0.0101	0.0020	0.0003	0.0000	0.0000	0.0000
	1	0.3874	0.3020	0.1556	0.0605	0.0176	0.0035	0.0004	0.0000	0.0000
	2	0.1722	0.3020	0.2668	0.1612	0.0703	0.0212	0.0039	0.0003	0.0000
	3	0.0446	0.1762	0.2668	0.2508	0.1641	0.0743	0.0210	0.0028	0.0001
	4	0.0074	0.0661	0.1715	0.2508	0.2461	0.1672	0.0735	0.0165	0.0008
	5	0.0008	0.0165	0.0735	0.1672	0.2461	0.2508	0.1715	0.0661	0.0074
	6	0.0001	0.0028	0.0210	0.0743	0.1641	0.2508	0.2668	0.1762	0.0446
	7	0.0000	0.0003	0.0039	0.0212	0.0703	0.1612	0.2668	0.3020	0.1722
	8	0.0000	0.0000	0.0004	0.0035	0.0176	0.0605	0.1556	0.3020	0.3874
9	0.0000	0.0000	0.0000	0.0003	0.0020	0.0101	0.0404	0.1342	0.3874	
10	0	0.3487	0.1074	0.0282	0.0060	0.0010	0.0001	0.0000	0.0000	0.0000
	1	0.3874	0.2684	0.1211	0.0403	0.0098	0.0016	0.0001	0.0000	0.0000
	2	0.1937	0.3020	0.2335	0.1209	0.0439	0.0106	0.0014	0.0001	0.0000
	3	0.0574	0.2013	0.2668	0.2150	0.1172	0.0425	0.0090	0.0008	0.0000
	4	0.0112	0.0881	0.2001	0.2508	0.2051	0.1115	0.0368	0.0055	0.0001
	5	0.0015	0.0264	0.1029	0.2007	0.2461	0.2007	0.1029	0.0264	0.0015
	6	0.0001	0.0055	0.0368	0.1115	0.2051	0.2508	0.2001	0.0881	0.0112
	7	0.0000	0.0008	0.0090	0.0425	0.1172	0.2150	0.2668	0.2013	0.0574
	8	0.0000	0.0001	0.0014	0.0106	0.0439	0.1209	0.2335	0.3020	0.1937
	9	0.0000	0.0000	0.0001	0.0016	0.0098	0.0403	0.1211	0.2684	0.3874
	10	0.0000	0.0000	0.0000	0.0001	0.0010	0.0060	0.0282	0.1074	0.3487
11	0	0.3138	0.0859	0.0198	0.0036	0.0005	0.0000	0.0000	0.0000	0.0000
	1	0.3835	0.2362	0.0932	0.0266	0.0054	0.0007	0.0000	0.0000	0.0000
	2	0.2131	0.2953	0.1998	0.0887	0.0269	0.0052	0.0005	0.0000	0.0000
	3	0.0710	0.2215	0.2568	0.1774	0.0806	0.0234	0.0037	0.0002	0.0000
	4	0.0158	0.1107	0.2201	0.2365	0.1611	0.0701	0.0173	0.0017	0.0000
	5	0.0025	0.0388	0.1321	0.2207	0.2256	0.1471	0.0566	0.0097	0.0003
	6	0.0003	0.0097	0.0566	0.1471	0.2256	0.2207	0.1321	0.0388	0.0025
	7	0.0000	0.0017	0.0173	0.0701	0.1611	0.2365	0.2201	0.1107	0.0158
	8	0.0000	0.0002	0.0037	0.0234	0.0806	0.1774	0.2568	0.2215	0.0710
	9	0.0000	0.0000	0.0005	0.0052	0.0269	0.0887	0.1998	0.2953	0.2131
	10	0.0000	0.0000	0.0000	0.0007	0.0054	0.0266	0.0932	0.2362	0.3835
11	0.0000	0.0000	0.0000	0.0000	0.0005	0.0036	0.0198	0.0859	0.3138	

E

Binomial Probabilities (cont.)

<i>n</i>	<i>x</i>	<i>p</i>								
		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
12	0	0.2824	0.0687	0.0138	0.0022	0.0002	0.0000	0.0000	0.0000	0.0000
	1	0.3766	0.2062	0.0712	0.0174	0.0029	0.0003	0.0000	0.0000	0.0000
	2	0.2301	0.2835	0.1678	0.0639	0.0161	0.0025	0.0002	0.0000	0.0000
	3	0.0852	0.2362	0.2397	0.1419	0.0537	0.0125	0.0015	0.0001	0.0000
	4	0.0213	0.1329	0.2311	0.2128	0.1208	0.0420	0.0078	0.0005	0.0000
	5	0.0038	0.0532	0.1585	0.2270	0.1934	0.1009	0.0291	0.0033	0.0000
	6	0.0005	0.0155	0.0792	0.1766	0.2256	0.1766	0.0792	0.0155	0.0005
	7	0.0000	0.0033	0.0291	0.1009	0.1934	0.2270	0.1585	0.0532	0.0038
	8	0.0000	0.0005	0.0078	0.0420	0.1208	0.2128	0.2311	0.1329	0.0213
	9	0.0000	0.0001	0.0015	0.0125	0.0537	0.1419	0.2397	0.2362	0.0852
	10	0.0000	0.0000	0.0002	0.0025	0.0161	0.0639	0.1678	0.2835	0.2301
	11	0.0000	0.0000	0.0000	0.0003	0.0029	0.0174	0.0712	0.2062	0.3766
	12	0.0000	0.0000	0.0000	0.0000	0.0002	0.0022	0.0138	0.0687	0.2824
13	0	0.2542	0.0550	0.0097	0.0013	0.0001	0.0000	0.0000	0.0000	0.0000
	1	0.3672	0.1787	0.0540	0.0113	0.0016	0.0001	0.0000	0.0000	0.0000
	2	0.2448	0.2680	0.1388	0.0453	0.0095	0.0012	0.0001	0.0000	0.0000
	3	0.0997	0.2457	0.2181	0.1107	0.0349	0.0065	0.0006	0.0000	0.0000
	4	0.0277	0.1535	0.2337	0.1845	0.0873	0.0243	0.0034	0.0001	0.0000
	5	0.0055	0.0691	0.1803	0.2214	0.1571	0.0656	0.0142	0.0011	0.0000
	6	0.0008	0.0230	0.1030	0.1968	0.2095	0.1312	0.0442	0.0058	0.0001
	7	0.0001	0.0058	0.0442	0.1312	0.2095	0.1968	0.1030	0.0230	0.0008
	8	0.0000	0.0011	0.0142	0.0656	0.1571	0.2214	0.1803	0.0691	0.0055
	9	0.0000	0.0001	0.0034	0.0243	0.0873	0.1845	0.2337	0.1535	0.0277
	10	0.0000	0.0000	0.0006	0.0065	0.0349	0.1107	0.2181	0.2457	0.0997
	11	0.0000	0.0000	0.0001	0.0012	0.0095	0.0453	0.1388	0.2680	0.2448
	12	0.0000	0.0000	0.0000	0.0001	0.0016	0.0113	0.0540	0.1787	0.3672
13	0.0000	0.0000	0.0000	0.0000	0.0001	0.0013	0.0097	0.0550	0.2542	
14	0	0.2288	0.0440	0.0068	0.0008	0.0001	0.0000	0.0000	0.0000	0.0000
	1	0.3559	0.1539	0.0407	0.0073	0.0009	0.0001	0.0000	0.0000	0.0000
	2	0.2570	0.2501	0.1134	0.0317	0.0056	0.0005	0.0000	0.0000	0.0000
	3	0.1142	0.2501	0.1943	0.0845	0.0222	0.0033	0.0002	0.0000	0.0000
	4	0.0349	0.1720	0.2290	0.1549	0.0611	0.0136	0.0014	0.0000	0.0000
	5	0.0078	0.0860	0.1963	0.2066	0.1222	0.0408	0.0066	0.0003	0.0000
	6	0.0013	0.0322	0.1262	0.2066	0.1833	0.0918	0.0232	0.0020	0.0000
	7	0.0002	0.0092	0.0618	0.1574	0.2095	0.1574	0.0618	0.0092	0.0002
	8	0.0000	0.0020	0.0232	0.0918	0.1833	0.2066	0.1262	0.0322	0.0013
	9	0.0000	0.0003	0.0066	0.0408	0.1222	0.2066	0.1963	0.0860	0.0078
	10	0.0000	0.0000	0.0014	0.0136	0.0611	0.1549	0.2290	0.1720	0.0349
	11	0.0000	0.0000	0.0002	0.0033	0.0222	0.0845	0.1943	0.2501	0.1142
	12	0.0000	0.0000	0.0000	0.0005	0.0056	0.0317	0.1134	0.2501	0.2570
	13	0.0000	0.0000	0.0000	0.0001	0.0009	0.0073	0.0407	0.1539	0.3559
14	0.0000	0.0000	0.0000	0.0000	0.0001	0.0008	0.0068	0.0440	0.2288	

E Binomial Probabilities (cont.)

<i>n</i>	<i>x</i>	<i>p</i>								
		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
15	0	0.2059	0.0352	0.0047	0.0005	0.0000	0.0000	0.0000	0.0000	0.0000
	1	0.3432	0.1319	0.0305	0.0047	0.0005	0.0000	0.0000	0.0000	0.0000
	2	0.2669	0.2309	0.0916	0.0219	0.0032	0.0003	0.0000	0.0000	0.0000
	3	0.1285	0.2501	0.1700	0.0634	0.0139	0.0016	0.0001	0.0000	0.0000
	4	0.0428	0.1876	0.2186	0.1268	0.0417	0.0074	0.0006	0.0000	0.0000
	5	0.0105	0.1032	0.2061	0.1859	0.0916	0.0245	0.0030	0.0001	0.0000
	6	0.0019	0.0430	0.1472	0.2066	0.1527	0.0612	0.0116	0.0007	0.0000
	7	0.0003	0.0138	0.0811	0.1771	0.1964	0.1181	0.0348	0.0035	0.0000
	8	0.0000	0.0035	0.0348	0.1181	0.1964	0.1771	0.0811	0.0138	0.0003
	9	0.0000	0.0007	0.0116	0.0612	0.1527	0.2066	0.1472	0.0430	0.0019
	10	0.0000	0.0001	0.0030	0.0245	0.0916	0.1859	0.2061	0.1032	0.0105
	11	0.0000	0.0000	0.0006	0.0074	0.0417	0.1268	0.2186	0.1876	0.0428
	12	0.0000	0.0000	0.0001	0.0016	0.0139	0.0634	0.1700	0.2501	0.1285
	13	0.0000	0.0000	0.0000	0.0003	0.0032	0.0219	0.0916	0.2309	0.2669
	14	0.0000	0.0000	0.0000	0.0000	0.0005	0.0047	0.0305	0.1319	0.3432
	15	0.0000	0.0000	0.0000	0.0000	0.0000	0.0005	0.0047	0.0352	0.2059
16	0	0.1853	0.0281	0.0033	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000
	1	0.3294	0.1126	0.0228	0.0030	0.0002	0.0000	0.0000	0.0000	0.0000
	2	0.2745	0.2111	0.0732	0.0150	0.0018	0.0001	0.0000	0.0000	0.0000
	3	0.1423	0.2463	0.1465	0.0468	0.0085	0.0008	0.0000	0.0000	0.0000
	4	0.0514	0.2001	0.2040	0.1014	0.0278	0.0040	0.0002	0.0000	0.0000
	5	0.0137	0.1201	0.2099	0.1623	0.0667	0.0142	0.0013	0.0000	0.0000
	6	0.0028	0.0550	0.1649	0.1983	0.1222	0.0392	0.0056	0.0002	0.0000
	7	0.0004	0.0197	0.1010	0.1889	0.1746	0.0840	0.0185	0.0012	0.0000
	8	0.0001	0.0055	0.0487	0.1417	0.1964	0.1417	0.0487	0.0055	0.0001
	9	0.0000	0.0012	0.0185	0.0840	0.1746	0.1889	0.1010	0.0197	0.0004
	10	0.0000	0.0002	0.0056	0.0392	0.1222	0.1983	0.1649	0.0550	0.0028
	11	0.0000	0.0000	0.0013	0.0142	0.0667	0.1623	0.2099	0.1201	0.0137
	12	0.0000	0.0000	0.0002	0.0040	0.0278	0.1014	0.2040	0.2001	0.0514
	13	0.0000	0.0000	0.0000	0.0008	0.0085	0.0468	0.1465	0.2463	0.1423
	14	0.0000	0.0000	0.0000	0.0001	0.0018	0.0150	0.0732	0.2111	0.2745
	15	0.0000	0.0000	0.0000	0.0000	0.0002	0.0030	0.0228	0.1126	0.3294
16	0.0000	0.0000	0.0000	0.0000	0.0000	0.0003	0.0033	0.0281	0.1853	

E

Binomial Probabilities (cont.)

<i>n</i>	<i>x</i>	<i>p</i>								
		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
17	0	0.1668	0.0225	0.0023	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000
	1	0.3150	0.0957	0.0169	0.0019	0.0001	0.0000	0.0000	0.0000	0.0000
	2	0.2800	0.1914	0.0581	0.0102	0.0010	0.0001	0.0000	0.0000	0.0000
	3	0.1556	0.2393	0.1245	0.0341	0.0052	0.0004	0.0000	0.0000	0.0000
	4	0.0605	0.2093	0.1868	0.0796	0.0182	0.0021	0.0001	0.0000	0.0000
	5	0.0175	0.1361	0.2081	0.1379	0.0472	0.0081	0.0006	0.0000	0.0000
	6	0.0039	0.0680	0.1784	0.1839	0.0944	0.0242	0.0026	0.0001	0.0000
	7	0.0007	0.0267	0.1201	0.1927	0.1484	0.0571	0.0095	0.0004	0.0000
	8	0.0001	0.0084	0.0644	0.1606	0.1855	0.1070	0.0276	0.0021	0.0000
	9	0.0000	0.0021	0.0276	0.1070	0.1855	0.1606	0.0644	0.0084	0.0001
	10	0.0000	0.0004	0.0095	0.0571	0.1484	0.1927	0.1201	0.0267	0.0007
	11	0.0000	0.0001	0.0026	0.0242	0.0944	0.1839	0.1784	0.0680	0.0039
	12	0.0000	0.0000	0.0006	0.0081	0.0472	0.1379	0.2081	0.1361	0.0175
	13	0.0000	0.0000	0.0001	0.0021	0.0182	0.0796	0.1868	0.2093	0.0605
	14	0.0000	0.0000	0.0000	0.0004	0.0052	0.0341	0.1245	0.2393	0.1556
	15	0.0000	0.0000	0.0000	0.0001	0.0010	0.0102	0.0581	0.1914	0.2800
	16	0.0000	0.0000	0.0000	0.0000	0.0001	0.0019	0.0169	0.0957	0.3150
17	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002	0.0023	0.0225	0.1668	
18	0	0.1501	0.0180	0.0016	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
	1	0.3002	0.0811	0.0126	0.0012	0.0001	0.0000	0.0000	0.0000	0.0000
	2	0.2835	0.1723	0.0458	0.0069	0.0006	0.0000	0.0000	0.0000	0.0000
	3	0.1680	0.2297	0.1046	0.0246	0.0031	0.0002	0.0000	0.0000	0.0000
	4	0.0700	0.2153	0.1681	0.0614	0.0117	0.0011	0.0000	0.0000	0.0000
	5	0.0218	0.1507	0.2017	0.1146	0.0327	0.0045	0.0002	0.0000	0.0000
	6	0.0052	0.0816	0.1873	0.1655	0.0708	0.0145	0.0012	0.0000	0.0000
	7	0.0010	0.0350	0.1376	0.1892	0.1214	0.0374	0.0046	0.0001	0.0000
	8	0.0002	0.0120	0.0811	0.1734	0.1669	0.0771	0.0149	0.0008	0.0000
	9	0.0000	0.0033	0.0386	0.1284	0.1855	0.1284	0.0386	0.0033	0.0000
	10	0.0000	0.0008	0.0149	0.0771	0.1669	0.1734	0.0811	0.0120	0.0002
	11	0.0000	0.0001	0.0046	0.0374	0.1214	0.1892	0.1376	0.0350	0.0010
	12	0.0000	0.0000	0.0012	0.0145	0.0708	0.1655	0.1873	0.0816	0.0052
	13	0.0000	0.0000	0.0002	0.0045	0.0327	0.1146	0.2017	0.1507	0.0218
	14	0.0000	0.0000	0.0000	0.0011	0.0117	0.0614	0.1681	0.2153	0.0700
	15	0.0000	0.0000	0.0000	0.0002	0.0031	0.0246	0.1046	0.2297	0.1680
	16	0.0000	0.0000	0.0000	0.0000	0.0006	0.0069	0.0458	0.1723	0.2835
17	0.0000	0.0000	0.0000	0.0000	0.0001	0.0012	0.0126	0.0811	0.3002	
18	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0016	0.0180	0.1501	

E Binomial Probabilities (cont.)

<i>n</i>	<i>x</i>	<i>p</i>								
		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
19	0	0.1351	0.0144	0.0011	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
	1	0.2852	0.0685	0.0093	0.0008	0.0000	0.0000	0.0000	0.0000	0.0000
	2	0.2852	0.1540	0.0358	0.0046	0.0003	0.0000	0.0000	0.0000	0.0000
	3	0.1796	0.2182	0.0869	0.0175	0.0018	0.0001	0.0000	0.0000	0.0000
	4	0.0798	0.2182	0.1491	0.0467	0.0074	0.0005	0.0000	0.0000	0.0000
	5	0.0266	0.1636	0.1916	0.0933	0.0222	0.0024	0.0001	0.0000	0.0000
	6	0.0069	0.0955	0.1916	0.1451	0.0518	0.0085	0.0005	0.0000	0.0000
	7	0.0014	0.0443	0.1525	0.1797	0.0961	0.0237	0.0022	0.0000	0.0000
	8	0.0002	0.0166	0.0981	0.1797	0.1442	0.0532	0.0077	0.0003	0.0000
	9	0.0000	0.0051	0.0514	0.1464	0.1762	0.0976	0.0220	0.0013	0.0000
	10	0.0000	0.0013	0.0220	0.0976	0.1762	0.1464	0.0514	0.0051	0.0000
	11	0.0000	0.0003	0.0077	0.0532	0.1442	0.1797	0.0981	0.0166	0.0002
	12	0.0000	0.0000	0.0022	0.0237	0.0961	0.1797	0.1525	0.0443	0.0014
	13	0.0000	0.0000	0.0005	0.0085	0.0518	0.1451	0.1916	0.0955	0.0069
	14	0.0000	0.0000	0.0001	0.0024	0.0222	0.0933	0.1916	0.1636	0.0266
	15	0.0000	0.0000	0.0000	0.0005	0.0074	0.0467	0.1491	0.2182	0.0798
	16	0.0000	0.0000	0.0000	0.0001	0.0018	0.0175	0.0869	0.2182	0.1796
	17	0.0000	0.0000	0.0000	0.0000	0.0003	0.0046	0.0358	0.1540	0.2852
	18	0.0000	0.0000	0.0000	0.0000	0.0000	0.0008	0.0093	0.0685	0.2852
19	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0011	0.0144	0.1351	
20	0	0.1216	0.0115	0.0008	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	1	0.2702	0.0576	0.0068	0.0005	0.0000	0.0000	0.0000	0.0000	0.0000
	2	0.2852	0.1369	0.0278	0.0031	0.0002	0.0000	0.0000	0.0000	0.0000
	3	0.1901	0.2054	0.0716	0.0123	0.0011	0.0000	0.0000	0.0000	0.0000
	4	0.0898	0.2182	0.1304	0.0350	0.0046	0.0003	0.0000	0.0000	0.0000
	5	0.0319	0.1746	0.1789	0.0746	0.0148	0.0013	0.0000	0.0000	0.0000
	6	0.0089	0.1091	0.1916	0.1244	0.0370	0.0049	0.0002	0.0000	0.0000
	7	0.0020	0.0545	0.1643	0.1659	0.0739	0.0146	0.0010	0.0000	0.0000
	8	0.0004	0.0222	0.1144	0.1797	0.1201	0.0355	0.0039	0.0001	0.0000
	9	0.0001	0.0074	0.0654	0.1597	0.1602	0.0710	0.0120	0.0005	0.0000
	10	0.0000	0.0020	0.0308	0.1171	0.1762	0.1171	0.0308	0.0020	0.0000
	11	0.0000	0.0005	0.0120	0.0710	0.1602	0.1597	0.0654	0.0074	0.0001
	12	0.0000	0.0001	0.0039	0.0355	0.1201	0.1797	0.1144	0.0222	0.0004
	13	0.0000	0.0000	0.0010	0.0146	0.0739	0.1659	0.1643	0.0545	0.0020
	14	0.0000	0.0000	0.0002	0.0049	0.0370	0.1244	0.1916	0.1091	0.0089
	15	0.0000	0.0000	0.0000	0.0013	0.0148	0.0746	0.1789	0.1746	0.0319
	16	0.0000	0.0000	0.0000	0.0003	0.0046	0.0350	0.1304	0.2182	0.0898
	17	0.0000	0.0000	0.0000	0.0000	0.0011	0.0123	0.0716	0.2054	0.1901
	18	0.0000	0.0000	0.0000	0.0000	0.0002	0.0031	0.0278	0.1369	0.2852
19	0.0000	0.0000	0.0000	0.0000	0.0000	0.0005	0.0068	0.0576	0.2702	
20	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0008	0.0115	0.1216	

F Cumulative Binomial Probabilities

Numerical entries represent $P(X \leq x)$.

<i>n</i>	<i>x</i>	<i>p</i>								
		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
1	0	0.9000	0.8000	0.7000	0.6000	0.5000	0.4000	0.3000	0.2000	0.1000
	1	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	0	0.8100	0.6400	0.4900	0.3600	0.2500	0.1600	0.0900	0.0400	0.0100
	1	0.9900	0.9600	0.9100	0.8400	0.7500	0.6400	0.5100	0.3600	0.1900
	2	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
3	0	0.7290	0.5120	0.3430	0.2160	0.1250	0.0640	0.0270	0.0080	0.0010
	1	0.9720	0.8960	0.7840	0.6480	0.5000	0.3520	0.2160	0.1040	0.0280
	2	0.9990	0.9920	0.9730	0.9360	0.8750	0.7840	0.6570	0.4880	0.2710
	3	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
4	0	0.6561	0.4096	0.2401	0.1296	0.0625	0.0256	0.0081	0.0016	0.0001
	1	0.9477	0.8192	0.6517	0.4752	0.3125	0.1792	0.0837	0.0272	0.0037
	2	0.9963	0.9728	0.9163	0.8208	0.6875	0.5248	0.3483	0.1808	0.0523
	3	0.9999	0.9984	0.9919	0.9744	0.9375	0.8704	0.7599	0.5904	0.3439
	4	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
5	0	0.5905	0.3277	0.1681	0.0778	0.0313	0.0102	0.0024	0.0003	0.0000
	1	0.9185	0.7373	0.5282	0.3370	0.1875	0.0870	0.0308	0.0067	0.0005
	2	0.9914	0.9421	0.8369	0.6826	0.5000	0.3174	0.1631	0.0579	0.0086
	3	0.9995	0.9933	0.9692	0.9130	0.8125	0.6630	0.4718	0.2627	0.0815
	4	1.0000	0.9997	0.9976	0.9898	0.9688	0.9222	0.8319	0.6723	0.4095
	5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
6	0	0.5314	0.2621	0.1176	0.0467	0.0156	0.0041	0.0007	0.0001	0.0000
	1	0.8857	0.6554	0.4202	0.2333	0.1094	0.0410	0.0109	0.0016	0.0001
	2	0.9842	0.9011	0.7443	0.5443	0.3438	0.1792	0.0705	0.0170	0.0013
	3	0.9987	0.9830	0.9295	0.8208	0.6563	0.4557	0.2557	0.0989	0.0159
	4	0.9999	0.9984	0.9891	0.9590	0.8906	0.7667	0.5798	0.3446	0.1143
	5	1.0000	0.9999	0.9993	0.9959	0.9844	0.9533	0.8824	0.7379	0.4686
	6	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
7	0	0.4783	0.2097	0.0824	0.0280	0.0078	0.0016	0.0002	0.0000	0.0000
	1	0.8503	0.5767	0.3294	0.1586	0.0625	0.0188	0.0038	0.0004	0.0000
	2	0.9743	0.8520	0.6471	0.4199	0.2266	0.0963	0.0288	0.0047	0.0002
	3	0.9973	0.9667	0.8740	0.7102	0.5000	0.2898	0.1260	0.0333	0.0027
	4	0.9998	0.9953	0.9712	0.9037	0.7734	0.5801	0.3529	0.1480	0.0257
	5	1.0000	0.9996	0.9962	0.9812	0.9375	0.8414	0.6706	0.4233	0.1497
	6	1.0000	1.0000	0.9998	0.9984	0.9922	0.9720	0.9176	0.7903	0.5217
	7	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

F Cumulative Binomial Probabilities (cont.)

<i>n</i>	<i>x</i>	<i>p</i>								
		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
8	0	0.4305	0.1678	0.0576	0.0168	0.0039	0.0007	0.0001	0.0000	0.0000
	1	0.8131	0.5033	0.2553	0.1064	0.0352	0.0085	0.0013	0.0001	0.0000
	2	0.9619	0.7969	0.5518	0.3154	0.1445	0.0498	0.0113	0.0012	0.0000
	3	0.9950	0.9437	0.8059	0.5941	0.3633	0.1737	0.0580	0.0104	0.0004
	4	0.9996	0.9896	0.9420	0.8263	0.6367	0.4059	0.1941	0.0563	0.0050
	5	1.0000	0.9988	0.9887	0.9502	0.8555	0.6846	0.4482	0.2031	0.0381
	6	1.0000	0.9999	0.9987	0.9915	0.9648	0.8936	0.7447	0.4967	0.1869
	7	1.0000	1.0000	0.9999	0.9993	0.9961	0.9832	0.9424	0.8322	0.5695
	8	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
9	0	0.3874	0.1342	0.0404	0.0101	0.0020	0.0003	0.0000	0.0000	0.0000
	1	0.7748	0.4362	0.1960	0.0705	0.0195	0.0038	0.0004	0.0000	0.0000
	2	0.9470	0.7382	0.4628	0.2318	0.0898	0.0250	0.0043	0.0003	0.0000
	3	0.9917	0.9144	0.7297	0.4826	0.2539	0.0994	0.0253	0.0031	0.0001
	4	0.9991	0.9804	0.9012	0.7334	0.5000	0.2666	0.0988	0.0196	0.0009
	5	0.9999	0.9969	0.9747	0.9006	0.7461	0.5174	0.2703	0.0856	0.0083
	6	1.0000	0.9997	0.9957	0.9750	0.9102	0.7682	0.5372	0.2618	0.0530
	7	1.0000	1.0000	0.9996	0.9962	0.9805	0.9295	0.8040	0.5638	0.2252
	8	1.0000	1.0000	1.0000	0.9997	0.9980	0.9899	0.9596	0.8658	0.6126
9	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
10	0	0.3487	0.1074	0.0282	0.0060	0.0010	0.0001	0.0000	0.0000	0.0000
	1	0.7361	0.3758	0.1493	0.0464	0.0107	0.0017	0.0001	0.0000	0.0000
	2	0.9298	0.6778	0.3828	0.1673	0.0547	0.0123	0.0016	0.0001	0.0000
	3	0.9872	0.8791	0.6496	0.3823	0.1719	0.0548	0.0106	0.0009	0.0000
	4	0.9984	0.9672	0.8497	0.6331	0.3770	0.1662	0.0473	0.0064	0.0001
	5	0.9999	0.9936	0.9527	0.8338	0.6230	0.3669	0.1503	0.0328	0.0016
	6	1.0000	0.9991	0.9894	0.9452	0.8281	0.6177	0.3504	0.1209	0.0128
	7	1.0000	0.9999	0.9984	0.9877	0.9453	0.8327	0.6172	0.3222	0.0702
	8	1.0000	1.0000	0.9999	0.9983	0.9893	0.9536	0.8507	0.6242	0.2639
	9	1.0000	1.0000	1.0000	0.9999	0.9990	0.9940	0.9718	0.8926	0.6513
	10	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
11	0	0.3138	0.0859	0.0198	0.0036	0.0005	0.0000	0.0000	0.0000	0.0000
	1	0.6974	0.3221	0.1130	0.0302	0.0059	0.0007	0.0000	0.0000	0.0000
	2	0.9104	0.6174	0.3127	0.1189	0.0327	0.0059	0.0006	0.0000	0.0000
	3	0.9815	0.8389	0.5696	0.2963	0.1133	0.0293	0.0043	0.0002	0.0000
	4	0.9972	0.9496	0.7897	0.5328	0.2744	0.0994	0.0216	0.0020	0.0000
	5	0.9997	0.9883	0.9218	0.7535	0.5000	0.2465	0.0782	0.0117	0.0003
	6	1.0000	0.9980	0.9784	0.9006	0.7256	0.4672	0.2103	0.0504	0.0028
	7	1.0000	0.9998	0.9957	0.9707	0.8867	0.7037	0.4304	0.1611	0.0185
	8	1.0000	1.0000	0.9994	0.9941	0.9673	0.8811	0.6873	0.3826	0.0896
	9	1.0000	1.0000	1.0000	0.9993	0.9941	0.9698	0.8870	0.6779	0.3026
	10	1.0000	1.0000	1.0000	1.0000	0.9995	0.9964	0.9802	0.9141	0.6862
11	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	

F Cumulative Binomial Probabilities (cont.)

<i>n</i>	<i>x</i>	<i>p</i>								
		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
12	0	0.2824	0.0687	0.0138	0.0022	0.0002	0.0000	0.0000	0.0000	0.0000
	1	0.6590	0.2749	0.0850	0.0196	0.0032	0.0003	0.0000	0.0000	0.0000
	2	0.8891	0.5583	0.2528	0.0834	0.0193	0.0028	0.0002	0.0000	0.0000
	3	0.9744	0.7946	0.4925	0.2253	0.0730	0.0153	0.0017	0.0001	0.0000
	4	0.9957	0.9274	0.7237	0.4382	0.1938	0.0573	0.0095	0.0006	0.0000
	5	0.9995	0.9806	0.8822	0.6652	0.3872	0.1582	0.0386	0.0039	0.0001
	6	0.9999	0.9961	0.9614	0.8418	0.6128	0.3348	0.1178	0.0194	0.0005
	7	1.0000	0.9994	0.9905	0.9427	0.8062	0.5618	0.2763	0.0726	0.0043
	8	1.0000	0.9999	0.9983	0.9847	0.9270	0.7747	0.5075	0.2054	0.0256
	9	1.0000	1.0000	0.9998	0.9972	0.9807	0.9166	0.7472	0.4417	0.1109
	10	1.0000	1.0000	1.0000	0.9997	0.9968	0.9804	0.9150	0.7251	0.3410
	11	1.0000	1.0000	1.0000	1.0000	0.9998	0.9978	0.9862	0.9313	0.7176
	12	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
13	0	0.2542	0.0550	0.0097	0.0013	0.0001	0.0000	0.0000	0.0000	0.0000
	1	0.6213	0.2336	0.0637	0.0126	0.0017	0.0001	0.0000	0.0000	0.0000
	2	0.8661	0.5017	0.2025	0.0579	0.0112	0.0013	0.0001	0.0000	0.0000
	3	0.9658	0.7473	0.4206	0.1686	0.0461	0.0078	0.0007	0.0000	0.0000
	4	0.9935	0.9009	0.6543	0.3530	0.1334	0.0321	0.0040	0.0002	0.0000
	5	0.9991	0.9700	0.8346	0.5744	0.2905	0.0977	0.0182	0.0012	0.0000
	6	0.9999	0.9930	0.9376	0.7712	0.5000	0.2288	0.0624	0.0070	0.0001
	7	1.0000	0.9988	0.9818	0.9023	0.7095	0.4256	0.1654	0.0300	0.0009
	8	1.0000	0.9998	0.9960	0.9679	0.8666	0.6470	0.3457	0.0991	0.0065
	9	1.0000	1.0000	0.9993	0.9922	0.9539	0.8314	0.5794	0.2527	0.0342
	10	1.0000	1.0000	0.9999	0.9987	0.9888	0.9421	0.7975	0.4983	0.1339
	11	1.0000	1.0000	1.0000	0.9999	0.9983	0.9874	0.9363	0.7664	0.3787
	12	1.0000	1.0000	1.0000	1.0000	0.9999	0.9987	0.9903	0.9450	0.7458
13	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
14	0	0.2288	0.0440	0.0068	0.0008	0.0001	0.0000	0.0000	0.0000	0.0000
	1	0.5846	0.1979	0.0475	0.0081	0.0009	0.0001	0.0000	0.0000	0.0000
	2	0.8416	0.4481	0.1608	0.0398	0.0065	0.0006	0.0000	0.0000	0.0000
	3	0.9559	0.6982	0.3552	0.1243	0.0287	0.0039	0.0002	0.0000	0.0000
	4	0.9908	0.8702	0.5842	0.2793	0.0898	0.0175	0.0017	0.0000	0.0000
	5	0.9985	0.9561	0.7805	0.4859	0.2120	0.0583	0.0083	0.0004	0.0000
	6	0.9998	0.9884	0.9067	0.6925	0.3953	0.1501	0.0315	0.0024	0.0000
	7	1.0000	0.9976	0.9685	0.8499	0.6047	0.3075	0.0933	0.0116	0.0002
	8	1.0000	0.9996	0.9917	0.9417	0.7880	0.5141	0.2195	0.0439	0.0015
	9	1.0000	1.0000	0.9983	0.9825	0.9102	0.7207	0.4158	0.1298	0.0092
	10	1.0000	1.0000	0.9998	0.9961	0.9713	0.8757	0.6448	0.3018	0.0441
	11	1.0000	1.0000	1.0000	0.9994	0.9935	0.9602	0.8392	0.5519	0.1584
	12	1.0000	1.0000	1.0000	0.9999	0.9991	0.9919	0.9525	0.8021	0.4154
	13	1.0000	1.0000	1.0000	1.0000	0.9999	0.9992	0.9932	0.9560	0.7712
14	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	

F Cumulative Binomial Probabilities (cont.)

<i>n</i>	<i>x</i>	<i>p</i>								
		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
15	0	0.2059	0.0352	0.0047	0.0005	0.0000	0.0000	0.0000	0.0000	0.0000
	1	0.5490	0.1671	0.0353	0.0052	0.0005	0.0000	0.0000	0.0000	0.0000
	2	0.8159	0.3980	0.1268	0.0271	0.0037	0.0003	0.0000	0.0000	0.0000
	3	0.9444	0.6482	0.2969	0.0905	0.0176	0.0019	0.0001	0.0000	0.0000
	4	0.9873	0.8358	0.5155	0.2173	0.0592	0.0093	0.0007	0.0000	0.0000
	5	0.9978	0.9389	0.7216	0.4032	0.1509	0.0338	0.0037	0.0001	0.0000
	6	0.9997	0.9819	0.8689	0.6098	0.3036	0.0950	0.0152	0.0008	0.0000
	7	1.0000	0.9958	0.9500	0.7869	0.5000	0.2131	0.0500	0.0042	0.0000
	8	1.0000	0.9992	0.9848	0.9050	0.6964	0.3902	0.1311	0.0181	0.0003
	9	1.0000	0.9999	0.9963	0.9662	0.8491	0.5968	0.2784	0.0611	0.0022
	10	1.0000	1.0000	0.9993	0.9907	0.9408	0.7827	0.4845	0.1642	0.0127
	11	1.0000	1.0000	0.9999	0.9981	0.9824	0.9095	0.7031	0.3518	0.0556
	12	1.0000	1.0000	1.0000	0.9997	0.9963	0.9729	0.8732	0.6020	0.1841
	13	1.0000	1.0000	1.0000	1.0000	0.9995	0.9948	0.9647	0.8329	0.4510
	14	1.0000	1.0000	1.0000	1.0000	1.0000	0.9995	0.9953	0.9648	0.7941
	15	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
16	0	0.1853	0.0281	0.0033	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000
	1	0.5147	0.1407	0.0261	0.0033	0.0003	0.0000	0.0000	0.0000	0.0000
	2	0.7892	0.3518	0.0994	0.0183	0.0021	0.0001	0.0000	0.0000	0.0000
	3	0.9316	0.5981	0.2459	0.0651	0.0106	0.0009	0.0000	0.0000	0.0000
	4	0.9830	0.7982	0.4499	0.1666	0.0384	0.0049	0.0003	0.0000	0.0000
	5	0.9967	0.9183	0.6598	0.3288	0.1051	0.0191	0.0016	0.0000	0.0000
	6	0.9995	0.9733	0.8247	0.5272	0.2272	0.0583	0.0071	0.0002	0.0000
	7	0.9999	0.9930	0.9256	0.7161	0.4018	0.1423	0.0257	0.0015	0.0000
	8	1.0000	0.9985	0.9743	0.8577	0.5982	0.2839	0.0744	0.0070	0.0001
	9	1.0000	0.9998	0.9929	0.9417	0.7728	0.4728	0.1753	0.0267	0.0005
	10	1.0000	1.0000	0.9984	0.9809	0.8949	0.6712	0.3402	0.0817	0.0033
	11	1.0000	1.0000	0.9997	0.9951	0.9616	0.8334	0.5501	0.2018	0.0170
	12	1.0000	1.0000	1.0000	0.9991	0.9894	0.9349	0.7541	0.4019	0.0684
	13	1.0000	1.0000	1.0000	0.9999	0.9979	0.9817	0.9006	0.6482	0.2108
	14	1.0000	1.0000	1.0000	1.0000	0.9997	0.9967	0.9739	0.8593	0.4853
	15	1.0000	1.0000	1.0000	1.0000	1.0000	0.9997	0.9967	0.9719	0.8147
16	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	

F

Cumulative Binomial Probabilities (cont.)

<i>n</i>	<i>x</i>	<i>p</i>								
		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
17	0	0.1668	0.0225	0.0023	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000
	1	0.4818	0.1182	0.0193	0.0021	0.0001	0.0000	0.0000	0.0000	0.0000
	2	0.7618	0.3096	0.0774	0.0123	0.0012	0.0001	0.0000	0.0000	0.0000
	3	0.9174	0.5489	0.2019	0.0464	0.0064	0.0005	0.0000	0.0000	0.0000
	4	0.9779	0.7582	0.3887	0.1260	0.0245	0.0025	0.0001	0.0000	0.0000
	5	0.9953	0.8943	0.5968	0.2639	0.0717	0.0106	0.0007	0.0000	0.0000
	6	0.9992	0.9623	0.7752	0.4478	0.1662	0.0348	0.0032	0.0001	0.0000
	7	0.9999	0.9891	0.8954	0.6405	0.3145	0.0919	0.0127	0.0005	0.0000
	8	1.0000	0.9974	0.9597	0.8011	0.5000	0.1989	0.0403	0.0026	0.0000
	9	1.0000	0.9995	0.9873	0.9081	0.6855	0.3595	0.1046	0.0109	0.0001
	10	1.0000	0.9999	0.9968	0.9652	0.8338	0.5522	0.2248	0.0377	0.0008
	11	1.0000	1.0000	0.9993	0.9894	0.9283	0.7361	0.4032	0.1057	0.0047
	12	1.0000	1.0000	0.9999	0.9975	0.9755	0.8740	0.6113	0.2418	0.0221
	13	1.0000	1.0000	1.0000	0.9995	0.9936	0.9536	0.7981	0.4511	0.0826
	14	1.0000	1.0000	1.0000	0.9999	0.9988	0.9877	0.9226	0.6904	0.2382
	15	1.0000	1.0000	1.0000	1.0000	0.9999	0.9979	0.9807	0.8818	0.5182
	16	1.0000	1.0000	1.0000	1.0000	1.0000	0.9998	0.9977	0.9775	0.8332
17	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
18	0	0.1501	0.0180	0.0016	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
	1	0.4503	0.0991	0.0142	0.0013	0.0001	0.0000	0.0000	0.0000	0.0000
	2	0.7338	0.2713	0.0600	0.0082	0.0007	0.0000	0.0000	0.0000	0.0000
	3	0.9018	0.5010	0.1646	0.0328	0.0038	0.0002	0.0000	0.0000	0.0000
	4	0.9718	0.7164	0.3327	0.0942	0.0154	0.0013	0.0000	0.0000	0.0000
	5	0.9936	0.8671	0.5344	0.2088	0.0481	0.0058	0.0003	0.0000	0.0000
	6	0.9988	0.9487	0.7217	0.3743	0.1189	0.0203	0.0014	0.0000	0.0000
	7	0.9998	0.9837	0.8593	0.5634	0.2403	0.0576	0.0061	0.0002	0.0000
	8	1.0000	0.9957	0.9404	0.7368	0.4073	0.1347	0.0210	0.0009	0.0000
	9	1.0000	0.9991	0.9790	0.8653	0.5927	0.2632	0.0596	0.0043	0.0000
	10	1.0000	0.9998	0.9939	0.9424	0.7597	0.4366	0.1407	0.0163	0.0002
	11	1.0000	1.0000	0.9986	0.9797	0.8811	0.6257	0.2783	0.0513	0.0012
	12	1.0000	1.0000	0.9997	0.9942	0.9519	0.7912	0.4656	0.1329	0.0064
	13	1.0000	1.0000	1.0000	0.9987	0.9846	0.9058	0.6673	0.2836	0.0282
	14	1.0000	1.0000	1.0000	0.9998	0.9962	0.9672	0.8354	0.4990	0.0982
	15	1.0000	1.0000	1.0000	1.0000	0.9993	0.9918	0.9400	0.7287	0.2662
	16	1.0000	1.0000	1.0000	1.0000	0.9999	0.9987	0.9858	0.9009	0.5497
17	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9984	0.9820	0.8499	
18	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	

F Cumulative Binomial Probabilities (cont.)

<i>n</i>	<i>x</i>	<i>p</i>								
		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
19	0	0.1351	0.0144	0.0011	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
	1	0.4203	0.0829	0.0104	0.0008	0.0000	0.0000	0.0000	0.0000	0.0000
	2	0.7054	0.2369	0.0462	0.0055	0.0004	0.0000	0.0000	0.0000	0.0000
	3	0.8850	0.4551	0.1332	0.0230	0.0022	0.0001	0.0000	0.0000	0.0000
	4	0.9648	0.6733	0.2822	0.0696	0.0096	0.0006	0.0000	0.0000	0.0000
	5	0.9914	0.8369	0.4739	0.1629	0.0318	0.0031	0.0001	0.0000	0.0000
	6	0.9983	0.9324	0.6655	0.3081	0.0835	0.0116	0.0006	0.0000	0.0000
	7	0.9997	0.9767	0.8180	0.4878	0.1796	0.0352	0.0028	0.0000	0.0000
	8	1.0000	0.9933	0.9161	0.6675	0.3238	0.0885	0.0105	0.0003	0.0000
	9	1.0000	0.9984	0.9674	0.8139	0.5000	0.1861	0.0326	0.0016	0.0000
	10	1.0000	0.9997	0.9895	0.9115	0.6762	0.3325	0.0839	0.0067	0.0000
	11	1.0000	1.0000	0.9972	0.9648	0.8204	0.5122	0.1820	0.0233	0.0003
	12	1.0000	1.0000	0.9994	0.9884	0.9165	0.6919	0.3345	0.0676	0.0017
	13	1.0000	1.0000	0.9999	0.9969	0.9682	0.8371	0.5261	0.1631	0.0086
	14	1.0000	1.0000	1.0000	0.9994	0.9904	0.9304	0.7178	0.3267	0.0352
	15	1.0000	1.0000	1.0000	0.9999	0.9978	0.9770	0.8668	0.5449	0.1150
	16	1.0000	1.0000	1.0000	1.0000	0.9996	0.9945	0.9538	0.7631	0.2946
	17	1.0000	1.0000	1.0000	1.0000	1.0000	0.9992	0.9896	0.9171	0.5797
	18	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9989	0.9856	0.8649
19	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
20	0	0.1216	0.0115	0.0008	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	1	0.3917	0.0692	0.0076	0.0005	0.0000	0.0000	0.0000	0.0000	0.0000
	2	0.6769	0.2061	0.0355	0.0036	0.0002	0.0000	0.0000	0.0000	0.0000
	3	0.8670	0.4114	0.1071	0.0160	0.0013	0.0000	0.0000	0.0000	0.0000
	4	0.9568	0.6296	0.2375	0.0510	0.0059	0.0003	0.0000	0.0000	0.0000
	5	0.9887	0.8042	0.4164	0.1256	0.0207	0.0016	0.0000	0.0000	0.0000
	6	0.9976	0.9133	0.6080	0.2500	0.0577	0.0065	0.0003	0.0000	0.0000
	7	0.9996	0.9679	0.7723	0.4159	0.1316	0.0210	0.0013	0.0000	0.0000
	8	0.9999	0.9900	0.8867	0.5956	0.2517	0.0565	0.0051	0.0001	0.0000
	9	1.0000	0.9974	0.9520	0.7553	0.4119	0.1275	0.0171	0.0006	0.0000
	10	1.0000	0.9994	0.9829	0.8725	0.5881	0.2447	0.0480	0.0026	0.0000
	11	1.0000	0.9999	0.9949	0.9435	0.7483	0.4044	0.1133	0.0100	0.0001
	12	1.0000	1.0000	0.9987	0.9790	0.8684	0.5841	0.2277	0.0321	0.0004
	13	1.0000	1.0000	0.9997	0.9935	0.9423	0.7500	0.3920	0.0867	0.0024
	14	1.0000	1.0000	1.0000	0.9984	0.9793	0.8744	0.5836	0.1958	0.0113
	15	1.0000	1.0000	1.0000	0.9997	0.9941	0.9490	0.7625	0.3704	0.0432
	16	1.0000	1.0000	1.0000	1.0000	0.9987	0.9840	0.8929	0.5886	0.1330
	17	1.0000	1.0000	1.0000	1.0000	0.9998	0.9964	0.9645	0.7939	0.3231
	18	1.0000	1.0000	1.0000	1.0000	1.0000	0.9995	0.9924	0.9308	0.6083
19	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9992	0.9885	0.8784	
20	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	

G Poisson Probabilities

Numerical entries represent $P(X = x)$.

x	λ										
	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.20	0.30
0	0.9802	0.9704	0.9608	0.9512	0.9418	0.9324	0.9231	0.9139	0.9048	0.8187	0.7408
1	0.0196	0.0291	0.0384	0.0476	0.0565	0.0653	0.0738	0.0823	0.0905	0.1637	0.2222
2	0.0002	0.0004	0.0008	0.0012	0.0017	0.0023	0.0030	0.0037	0.0045	0.0164	0.0333
3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002	0.0011	0.0033
4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0003
x	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30	1.40
0	0.6703	0.6065	0.5488	0.4966	0.4493	0.4066	0.3679	0.3329	0.3012	0.2725	0.2466
1	0.2681	0.3033	0.3293	0.3476	0.3595	0.3659	0.3679	0.3662	0.3614	0.3543	0.3452
2	0.0536	0.0758	0.0988	0.1217	0.1438	0.1647	0.1839	0.2014	0.2169	0.2303	0.2417
3	0.0072	0.0126	0.0198	0.0284	0.0383	0.0494	0.0613	0.0738	0.0867	0.0998	0.1128
4	0.0007	0.0016	0.0030	0.0050	0.0077	0.0111	0.0153	0.0203	0.0260	0.0324	0.0395
5	0.0001	0.0002	0.0004	0.0007	0.0012	0.0020	0.0031	0.0045	0.0062	0.0084	0.0111
6	0.0000	0.0000	0.0000	0.0001	0.0002	0.0003	0.0005	0.0008	0.0012	0.0018	0.0026
7	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002	0.0003	0.0005
8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
x	1.50	1.60	1.70	1.80	1.90	2.00	2.10	2.20	2.30	2.40	2.50
0	0.2231	0.2019	0.1827	0.1653	0.1496	0.1353	0.1225	0.1108	0.1003	0.0907	0.0821
1	0.3347	0.3230	0.3106	0.2975	0.2842	0.2707	0.2572	0.2438	0.2306	0.2177	0.2052
2	0.2510	0.2584	0.2640	0.2678	0.2700	0.2707	0.2700	0.2681	0.2652	0.2613	0.2565
3	0.1255	0.1378	0.1496	0.1607	0.1710	0.1804	0.1890	0.1966	0.2033	0.2090	0.2138
4	0.0471	0.0551	0.0636	0.0723	0.0812	0.0902	0.0992	0.1082	0.1169	0.1254	0.1336
5	0.0141	0.0176	0.0216	0.0260	0.0309	0.0361	0.0417	0.0476	0.0538	0.0602	0.0668
6	0.0035	0.0047	0.0061	0.0078	0.0098	0.0120	0.0146	0.0174	0.0206	0.0241	0.0278
7	0.0008	0.0011	0.0015	0.0020	0.0027	0.0034	0.0044	0.0055	0.0068	0.0083	0.0099
8	0.0001	0.0002	0.0003	0.0005	0.0006	0.0009	0.0011	0.0015	0.0019	0.0025	0.0031
9	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002	0.0003	0.0004	0.0005	0.0007	0.0009
10	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002	0.0002
x	2.60	2.70	2.80	2.90	3.00	3.10	3.20	3.30	3.40	3.50	3.60
0	0.0743	0.0672	0.0608	0.0550	0.0498	0.0450	0.0408	0.0369	0.0334	0.0302	0.0273
1	0.1931	0.1815	0.1703	0.1596	0.1494	0.1397	0.1304	0.1217	0.1135	0.1057	0.0984
2	0.2510	0.2450	0.2384	0.2314	0.2240	0.2165	0.2087	0.2008	0.1929	0.1850	0.1771
3	0.2176	0.2205	0.2225	0.2237	0.2240	0.2237	0.2226	0.2209	0.2186	0.2158	0.2125
4	0.1414	0.1488	0.1557	0.1622	0.1680	0.1733	0.1781	0.1823	0.1858	0.1888	0.1912
5	0.0735	0.0804	0.0872	0.0940	0.1008	0.1075	0.1140	0.1203	0.1264	0.1322	0.1377
6	0.0319	0.0362	0.0407	0.0455	0.0504	0.0555	0.0608	0.0662	0.0716	0.0771	0.0826
7	0.0118	0.0139	0.0163	0.0188	0.0216	0.0246	0.0278	0.0312	0.0348	0.0385	0.0425
8	0.0038	0.0047	0.0057	0.0068	0.0081	0.0095	0.0111	0.0129	0.0148	0.0169	0.0191
9	0.0011	0.0014	0.0018	0.0022	0.0027	0.0033	0.0040	0.0047	0.0056	0.0066	0.0076
10	0.0003	0.0004	0.0005	0.0006	0.0008	0.0010	0.0013	0.0016	0.0019	0.0023	0.0028
11	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0009
12	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003
13	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001

G Poisson Probabilities (cont.)

x	λ										
	3.70	3.80	3.90	4.00	4.10	4.20	4.30	4.40	4.50	4.60	4.70
0	0.0247	0.0224	0.0202	0.0183	0.0166	0.0150	0.0136	0.0123	0.0111	0.0101	0.0091
1	0.0915	0.0850	0.0789	0.0733	0.0679	0.0630	0.0583	0.0540	0.0500	0.0462	0.0427
2	0.1692	0.1615	0.1539	0.1465	0.1393	0.1323	0.1254	0.1188	0.1125	0.1063	0.1005
3	0.2087	0.2046	0.2001	0.1954	0.1904	0.1852	0.1798	0.1743	0.1687	0.1631	0.1574
4	0.1931	0.1944	0.1951	0.1954	0.1951	0.1944	0.1933	0.1917	0.1898	0.1875	0.1849
5	0.1429	0.1477	0.1522	0.1563	0.1600	0.1633	0.1662	0.1687	0.1708	0.1725	0.1738
6	0.0881	0.0936	0.0989	0.1042	0.1093	0.1143	0.1191	0.1237	0.1281	0.1323	0.1362
7	0.0466	0.0508	0.0551	0.0595	0.0640	0.0686	0.0732	0.0778	0.0824	0.0869	0.0914
8	0.0215	0.0241	0.0269	0.0298	0.0328	0.0360	0.0393	0.0428	0.0463	0.0500	0.0537
9	0.0089	0.0102	0.0116	0.0132	0.0150	0.0168	0.0188	0.0209	0.0232	0.0255	0.0281
10	0.0033	0.0039	0.0045	0.0053	0.0061	0.0071	0.0081	0.0092	0.0104	0.0118	0.0132
11	0.0011	0.0013	0.0016	0.0019	0.0023	0.0027	0.0032	0.0037	0.0043	0.0049	0.0056
12	0.0003	0.0004	0.0005	0.0006	0.0008	0.0009	0.0011	0.0013	0.0016	0.0019	0.0022
13	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008
14	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003
15	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001
x	4.80	4.90	5.00	5.10	5.20	5.30	5.40	5.50	5.60	5.70	5.80
0	0.0082	0.0074	0.0067	0.0061	0.0055	0.0050	0.0045	0.0041	0.0037	0.0033	0.0030
1	0.0395	0.0365	0.0337	0.0311	0.0287	0.0265	0.0244	0.0225	0.0207	0.0191	0.0176
2	0.0948	0.0894	0.0842	0.0793	0.0746	0.0701	0.0659	0.0618	0.0580	0.0544	0.0509
3	0.1517	0.1460	0.1404	0.1348	0.1293	0.1239	0.1185	0.1133	0.1082	0.1033	0.0985
4	0.1820	0.1789	0.1755	0.1719	0.1681	0.1641	0.1600	0.1558	0.1515	0.1472	0.1428
5	0.1747	0.1753	0.1755	0.1753	0.1748	0.1740	0.1728	0.1714	0.1697	0.1678	0.1656
6	0.1398	0.1432	0.1462	0.1490	0.1515	0.1537	0.1555	0.1571	0.1584	0.1594	0.1601
7	0.0959	0.1002	0.1044	0.1086	0.1125	0.1163	0.1200	0.1234	0.1267	0.1298	0.1326
8	0.0575	0.0614	0.0653	0.0692	0.0731	0.0771	0.0810	0.0849	0.0887	0.0925	0.0962
9	0.0307	0.0334	0.0363	0.0392	0.0423	0.0454	0.0486	0.0519	0.0552	0.0586	0.0620
10	0.0147	0.0164	0.0181	0.0200	0.0220	0.0241	0.0262	0.0285	0.0309	0.0334	0.0359
11	0.0064	0.0073	0.0082	0.0093	0.0104	0.0116	0.0129	0.0143	0.0157	0.0173	0.0190
12	0.0026	0.0030	0.0034	0.0039	0.0045	0.0051	0.0058	0.0065	0.0073	0.0082	0.0092
13	0.0009	0.0011	0.0013	0.0015	0.0018	0.0021	0.0024	0.0028	0.0032	0.0036	0.0041
14	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0011	0.0013	0.0015	0.0017
15	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0003	0.0004	0.0005	0.0006	0.0007
16	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002
17	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001
x	5.90	6.00	6.10	6.20	6.30	6.40	6.50	6.60	6.70	6.80	6.90
0	0.0027	0.0025	0.0022	0.0020	0.0018	0.0017	0.0015	0.0014	0.0012	0.0011	0.0010
1	0.0162	0.0149	0.0137	0.0126	0.0116	0.0106	0.0098	0.0090	0.0082	0.0076	0.0070
2	0.0477	0.0446	0.0417	0.0390	0.0364	0.0340	0.0318	0.0296	0.0276	0.0258	0.0240
3	0.0938	0.0892	0.0848	0.0806	0.0765	0.0726	0.0688	0.0652	0.0617	0.0584	0.0552
4	0.1383	0.1339	0.1294	0.1249	0.1205	0.1162	0.1118	0.1076	0.1034	0.0992	0.0952
5	0.1632	0.1606	0.1579	0.1549	0.1519	0.1487	0.1454	0.1420	0.1385	0.1349	0.1314

G Poisson Probabilities (cont.)

x	λ										
	5.90	6.00	6.10	6.20	6.30	6.40	6.50	6.60	6.70	6.80	6.90
6	0.1605	0.1606	0.1605	0.1601	0.1595	0.1586	0.1575	0.1562	0.1546	0.1529	0.1511
7	0.1353	0.1377	0.1399	0.1418	0.1435	0.1450	0.1462	0.1472	0.1480	0.1486	0.1489
8	0.0998	0.1033	0.1066	0.1099	0.1130	0.1160	0.1188	0.1215	0.1240	0.1263	0.1284
9	0.0654	0.0688	0.0723	0.0757	0.0791	0.0825	0.0858	0.0891	0.0923	0.0954	0.0985
10	0.0386	0.0413	0.0441	0.0469	0.0498	0.0528	0.0558	0.0588	0.0618	0.0649	0.0679
11	0.0207	0.0225	0.0244	0.0265	0.0285	0.0307	0.0330	0.0353	0.0377	0.0401	0.0426
12	0.0102	0.0113	0.0124	0.0137	0.0150	0.0164	0.0179	0.0194	0.0210	0.0227	0.0245
13	0.0046	0.0052	0.0058	0.0065	0.0073	0.0081	0.0089	0.0099	0.0108	0.0119	0.0130
14	0.0019	0.0022	0.0025	0.0029	0.0033	0.0037	0.0041	0.0046	0.0052	0.0058	0.0064
15	0.0008	0.0009	0.0010	0.0012	0.0014	0.0016	0.0018	0.0020	0.0023	0.0026	0.0029
16	0.0003	0.0003	0.0004	0.0005	0.0005	0.0006	0.0007	0.0008	0.0010	0.0011	0.0013
17	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0003	0.0004	0.0004	0.0005
18	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002
19	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001
x	7.00	7.10	7.20	7.30	7.40	7.50	7.60	7.70	7.80	7.90	8.00
0	0.0009	0.0008	0.0007	0.0007	0.0006	0.0006	0.0005	0.0005	0.0004	0.0004	0.0003
1	0.0064	0.0059	0.0054	0.0049	0.0045	0.0041	0.0038	0.0035	0.0032	0.0029	0.0027
2	0.0223	0.0208	0.0194	0.0180	0.0167	0.0156	0.0145	0.0134	0.0125	0.0116	0.0107
3	0.0521	0.0492	0.0464	0.0438	0.0413	0.0389	0.0366	0.0345	0.0324	0.0305	0.0286
4	0.0912	0.0874	0.0836	0.0799	0.0764	0.0729	0.0696	0.0663	0.0632	0.0602	0.0573
5	0.1277	0.1241	0.1204	0.1167	0.1130	0.1094	0.1057	0.1021	0.0986	0.0951	0.0916
6	0.1490	0.1468	0.1445	0.1420	0.1394	0.1367	0.1339	0.1311	0.1282	0.1252	0.1221
7	0.1490	0.1489	0.1486	0.1481	0.1474	0.1465	0.1454	0.1442	0.1428	0.1413	0.1396
8	0.1304	0.1321	0.1337	0.1351	0.1363	0.1373	0.1381	0.1388	0.1392	0.1395	0.1396
9	0.1014	0.1042	0.1070	0.1096	0.1121	0.1144	0.1167	0.1187	0.1207	0.1224	0.1241
10	0.0710	0.0740	0.0770	0.0800	0.0829	0.0858	0.0887	0.0914	0.0941	0.0967	0.0993
11	0.0452	0.0478	0.0504	0.0531	0.0558	0.0585	0.0613	0.0640	0.0667	0.0695	0.0722
12	0.0263	0.0283	0.0303	0.0323	0.0344	0.0366	0.0388	0.0411	0.0434	0.0457	0.0481
13	0.0142	0.0154	0.0168	0.0181	0.0196	0.0211	0.0227	0.0243	0.0260	0.0278	0.0296
14	0.0071	0.0078	0.0086	0.0095	0.0104	0.0113	0.0123	0.0134	0.0145	0.0157	0.0169
15	0.0033	0.0037	0.0041	0.0046	0.0051	0.0057	0.0062	0.0069	0.0075	0.0083	0.0090
16	0.0014	0.0016	0.0019	0.0021	0.0024	0.0026	0.0030	0.0033	0.0037	0.0041	0.0045
17	0.0006	0.0007	0.0008	0.0009	0.0010	0.0012	0.0013	0.0015	0.0017	0.0019	0.0021
18	0.0002	0.0003	0.0003	0.0004	0.0004	0.0005	0.0006	0.0006	0.0007	0.0008	0.0009
19	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0003	0.0003	0.0003	0.0004
20	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002
21	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
x	8.10	8.20	8.30	8.40	8.50	8.60	8.70	8.80	8.90	9.00	9.10
0	0.0003	0.0003	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001
1	0.0025	0.0023	0.0021	0.0019	0.0017	0.0016	0.0014	0.0013	0.0012	0.0011	0.0010
2	0.0100	0.0092	0.0086	0.0079	0.0074	0.0068	0.0063	0.0058	0.0054	0.0050	0.0046
3	0.0269	0.0252	0.0237	0.0222	0.0208	0.0195	0.0183	0.0171	0.0160	0.0150	0.0140
4	0.0544	0.0517	0.0491	0.0466	0.0443	0.0420	0.0398	0.0377	0.0357	0.0337	0.0319

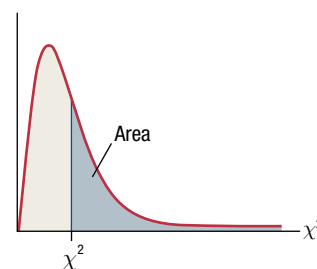
G Poisson Probabilities (cont.)

x	λ										
	8.10	8.20	8.30	8.40	8.50	8.60	8.70	8.80	8.90	9.00	9.10
5	0.0882	0.0849	0.0816	0.0784	0.0752	0.0722	0.0692	0.0663	0.0635	0.0607	0.0581
6	0.1191	0.1160	0.1128	0.1097	0.1066	0.1034	0.1003	0.0972	0.0941	0.0911	0.0881
7	0.1378	0.1358	0.1338	0.1317	0.1294	0.1271	0.1247	0.1222	0.1197	0.1171	0.1145
8	0.1395	0.1392	0.1388	0.1382	0.1375	0.1366	0.1356	0.1344	0.1332	0.1318	0.1302
9	0.1256	0.1269	0.1280	0.1290	0.1299	0.1306	0.1311	0.1315	0.1317	0.1318	0.1317
10	0.1017	0.1040	0.1063	0.1084	0.1104	0.1123	0.1140	0.1157	0.1172	0.1186	0.1198
11	0.0749	0.0776	0.0802	0.0828	0.0853	0.0878	0.0902	0.0925	0.0948	0.0970	0.0991
12	0.0505	0.0530	0.0555	0.0579	0.0604	0.0629	0.0654	0.0679	0.0703	0.0728	0.0752
13	0.0315	0.0334	0.0354	0.0374	0.0395	0.0416	0.0438	0.0459	0.0481	0.0504	0.0526
14	0.0182	0.0196	0.0210	0.0225	0.0240	0.0256	0.0272	0.0289	0.0306	0.0324	0.0342
15	0.0098	0.0107	0.0116	0.0126	0.0136	0.0147	0.0158	0.0169	0.0182	0.0194	0.0208
16	0.0050	0.0055	0.0060	0.0066	0.0072	0.0079	0.0086	0.0093	0.0101	0.0109	0.0118
17	0.0024	0.0026	0.0029	0.0033	0.0036	0.0040	0.0044	0.0048	0.0053	0.0058	0.0063
18	0.0011	0.0012	0.0014	0.0015	0.0017	0.0019	0.0021	0.0024	0.0026	0.0029	0.0032
19	0.0005	0.0005	0.0006	0.0007	0.0008	0.0009	0.0010	0.0011	0.0012	0.0014	0.0015
20	0.0002	0.0002	0.0002	0.0003	0.0003	0.0004	0.0004	0.0005	0.0005	0.0006	0.0007
21	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002	0.0003	0.0003
22	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
x	9.20	9.30	9.40	9.50	9.60	9.70	9.80	9.90	10.00	11.00	12.00
0	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0000	0.0000	0.0000
1	0.0009	0.0009	0.0008	0.0007	0.0007	0.0006	0.0005	0.0005	0.0005	0.0002	0.0001
2	0.0043	0.0040	0.0037	0.0034	0.0031	0.0029	0.0027	0.0025	0.0023	0.0010	0.0004
3	0.0131	0.0123	0.0115	0.0107	0.0100	0.0093	0.0087	0.0081	0.0076	0.0037	0.0018
4	0.0302	0.0285	0.0269	0.0254	0.0240	0.0226	0.0213	0.0201	0.0189	0.0102	0.0053
5	0.0555	0.0530	0.0506	0.0483	0.0460	0.0439	0.0418	0.0398	0.0378	0.0224	0.0127
6	0.0851	0.0822	0.0793	0.0764	0.0736	0.0709	0.0682	0.0656	0.0631	0.0411	0.0255
7	0.1118	0.1091	0.1064	0.1037	0.1010	0.0982	0.0955	0.0928	0.0901	0.0646	0.0437
8	0.1286	0.1269	0.1251	0.1232	0.1212	0.1191	0.1170	0.1148	0.1126	0.0888	0.0655
9	0.1315	0.1311	0.1306	0.1300	0.1293	0.1284	0.1274	0.1263	0.1251	0.1085	0.0874
10	0.1210	0.1219	0.1228	0.1235	0.1241	0.1245	0.1249	0.1250	0.1251	0.1194	0.1048
11	0.1012	0.1031	0.1049	0.1067	0.1083	0.1098	0.1112	0.1125	0.1137	0.1194	0.1144
12	0.0776	0.0799	0.0822	0.0844	0.0866	0.0888	0.0908	0.0928	0.0948	0.1094	0.1144
13	0.0549	0.0572	0.0594	0.0617	0.0640	0.0662	0.0685	0.0707	0.0729	0.0926	0.1056
14	0.0361	0.0380	0.0399	0.0419	0.0439	0.0459	0.0479	0.0500	0.0521	0.0728	0.0905
15	0.0221	0.0235	0.0250	0.0265	0.0281	0.0297	0.0313	0.0330	0.0347	0.0534	0.0724
16	0.0127	0.0137	0.0147	0.0157	0.0168	0.0180	0.0192	0.0204	0.0217	0.0367	0.0543
17	0.0069	0.0075	0.0081	0.0088	0.0095	0.0103	0.0111	0.0119	0.0128	0.0237	0.0383
18	0.0035	0.0039	0.0042	0.0046	0.0051	0.0055	0.0060	0.0065	0.0071	0.0145	0.0255
19	0.0017	0.0019	0.0021	0.0023	0.0026	0.0028	0.0031	0.0034	0.0037	0.0084	0.0161
20	0.0008	0.0009	0.0010	0.0011	0.0012	0.0014	0.0015	0.0017	0.0019	0.0046	0.0097
21	0.0003	0.0004	0.0004	0.0005	0.0006	0.0006	0.0007	0.0008	0.0009	0.0024	0.0055
22	0.0001	0.0002	0.0002	0.0002	0.0002	0.0003	0.0003	0.0004	0.0004	0.0012	0.0030
23	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0006	0.0016
24	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0003	0.0008

G Poisson Probabilities (cont.)

x	λ										
	13.00	14.00	15.00	16.00	17.00	18.00	19.00	20.00	21.00	22.00	23.00
0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.0002	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.0008	0.0004	0.0002	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	0.0027	0.0013	0.0006	0.0003	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
5	0.0070	0.0037	0.0019	0.0010	0.0005	0.0002	0.0001	0.0001	0.0000	0.0000	0.0000
6	0.0152	0.0087	0.0048	0.0026	0.0014	0.0007	0.0004	0.0002	0.0001	0.0000	0.0000
7	0.0281	0.0174	0.0104	0.0060	0.0034	0.0019	0.0010	0.0005	0.0003	0.0001	0.0001
8	0.0457	0.0304	0.0194	0.0120	0.0072	0.0042	0.0024	0.0013	0.0007	0.0004	0.0002
9	0.0661	0.0473	0.0324	0.0213	0.0135	0.0083	0.0050	0.0029	0.0017	0.0009	0.0005
10	0.0859	0.0663	0.0486	0.0341	0.0230	0.0150	0.0095	0.0058	0.0035	0.0020	0.0012
11	0.1015	0.0844	0.0663	0.0496	0.0355	0.0245	0.0164	0.0106	0.0067	0.0041	0.0024
12	0.1099	0.0984	0.0829	0.0661	0.0504	0.0368	0.0259	0.0176	0.0116	0.0075	0.0047
13	0.1099	0.1060	0.0956	0.0814	0.0658	0.0509	0.0378	0.0271	0.0188	0.0127	0.0083
14	0.1021	0.1060	0.1024	0.0930	0.0800	0.0655	0.0514	0.0387	0.0282	0.0199	0.0136
15	0.0885	0.0989	0.1024	0.0992	0.0906	0.0786	0.0650	0.0516	0.0395	0.0292	0.0209
16	0.0719	0.0866	0.0960	0.0992	0.0963	0.0884	0.0772	0.0646	0.0518	0.0401	0.0301
17	0.0550	0.0713	0.0847	0.0934	0.0963	0.0936	0.0863	0.0760	0.0640	0.0520	0.0407
18	0.0397	0.0554	0.0706	0.0830	0.0909	0.0936	0.0911	0.0844	0.0747	0.0635	0.0520
19	0.0272	0.0409	0.0557	0.0699	0.0814	0.0887	0.0911	0.0888	0.0826	0.0735	0.0629
20	0.0177	0.0286	0.0418	0.0559	0.0692	0.0798	0.0866	0.0888	0.0867	0.0809	0.0724
21	0.0109	0.0191	0.0299	0.0426	0.0560	0.0684	0.0783	0.0846	0.0867	0.0847	0.0793
22	0.0065	0.0121	0.0204	0.0310	0.0433	0.0560	0.0676	0.0769	0.0828	0.0847	0.0829
23	0.0037	0.0074	0.0133	0.0216	0.0320	0.0438	0.0559	0.0669	0.0756	0.0810	0.0829
24	0.0020	0.0043	0.0083	0.0144	0.0226	0.0328	0.0442	0.0557	0.0661	0.0743	0.0794
25	0.0010	0.0024	0.0050	0.0092	0.0154	0.0237	0.0336	0.0446	0.0555	0.0654	0.0731
26	0.0005	0.0013	0.0029	0.0057	0.0101	0.0164	0.0246	0.0343	0.0449	0.0553	0.0646
27	0.0002	0.0007	0.0016	0.0034	0.0063	0.0109	0.0173	0.0254	0.0349	0.0451	0.0551
28	0.0001	0.0003	0.0009	0.0019	0.0038	0.0070	0.0117	0.0181	0.0262	0.0354	0.0452
29	0.0001	0.0002	0.0004	0.0011	0.0023	0.0044	0.0077	0.0125	0.0190	0.0269	0.0359
30	0.0000	0.0001	0.0002	0.0006	0.0013	0.0026	0.0049	0.0083	0.0133	0.0197	0.0275
31	0.0000	0.0000	0.0001	0.0003	0.0007	0.0015	0.0030	0.0054	0.0090	0.0140	0.0204
32	0.0000	0.0000	0.0001	0.0001	0.0004	0.0009	0.0018	0.0034	0.0059	0.0096	0.0147
33	0.0000	0.0000	0.0000	0.0001	0.0002	0.0005	0.0010	0.0020	0.0038	0.0064	0.0102
34	0.0000	0.0000	0.0000	0.0000	0.0001	0.0002	0.0006	0.0012	0.0023	0.0041	0.0069
35	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0003	0.0007	0.0014	0.0026	0.0045
36	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0002	0.0004	0.0008	0.0016	0.0029
37	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0002	0.0005	0.0009	0.0018
38	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0003	0.0005	0.0011
39	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0003	0.0006
40	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0002	0.0004
41	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0002
42	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
43	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001

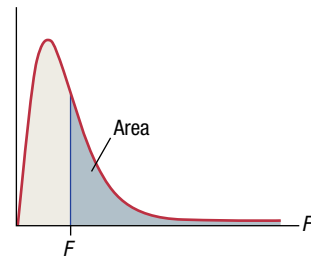
H Critical Values of χ^2



Area to the Right of the Critical Value of χ^2

<i>df</i>	0.995	0.990	0.975	0.950	0.900	0.100	0.050	0.025	0.010	0.005
1	0.000	0.000	0.001	0.004	0.016	2.706	3.841	5.024	6.635	7.879
2	0.010	0.020	0.051	0.103	0.211	4.605	5.991	7.378	9.210	10.597
3	0.072	0.115	0.216	0.352	0.584	6.251	7.815	9.348	11.345	12.838
4	0.207	0.297	0.484	0.711	1.064	7.779	9.488	11.143	13.277	14.860
5	0.412	0.554	0.831	1.145	1.610	9.236	11.070	12.833	15.086	16.750
6	0.676	0.872	1.237	1.635	2.204	10.645	12.592	14.449	16.812	18.548
7	0.989	1.239	1.690	2.167	2.833	12.017	14.067	16.013	18.475	20.278
8	1.344	1.646	2.180	2.733	3.490	13.362	15.507	17.535	20.090	21.955
9	1.735	2.088	2.700	3.325	4.168	14.684	16.919	19.023	21.666	23.589
10	2.156	2.558	3.247	3.940	4.865	15.987	18.307	20.483	23.209	25.188
11	2.603	3.053	3.816	4.575	5.578	17.275	19.675	21.920	24.725	26.757
12	3.074	3.571	4.404	5.226	6.304	18.549	21.026	23.337	26.217	28.300
13	3.565	4.107	5.009	5.892	7.042	19.812	22.362	24.736	27.688	29.819
14	4.075	4.660	5.629	6.571	7.790	21.064	23.685	26.119	29.141	31.319
15	4.601	5.229	6.262	7.261	8.547	22.307	24.996	27.488	30.578	32.801
16	5.142	5.812	6.908	7.962	9.312	23.542	26.296	28.845	32.000	34.267
17	5.697	6.408	7.564	8.672	10.085	24.769	27.587	30.191	33.409	35.718
18	6.265	7.015	8.231	9.390	10.865	25.989	28.869	31.526	34.805	37.156
19	6.844	7.633	8.907	10.117	11.651	27.204	30.144	32.852	36.191	38.582
20	7.434	8.260	9.591	10.851	12.443	28.412	31.410	34.170	37.566	39.997
21	8.034	8.897	10.283	11.591	13.240	29.615	32.671	35.479	38.932	41.401
22	8.643	9.542	10.982	12.338	14.041	30.813	33.924	36.781	40.289	42.796
23	9.260	10.196	11.689	13.091	14.848	32.007	35.172	38.076	41.638	44.181
24	9.886	10.856	12.401	13.848	15.659	33.196	36.415	39.364	42.980	45.559
25	10.520	11.524	13.120	14.611	16.473	34.382	37.652	40.646	44.314	46.928
26	11.160	12.198	13.844	15.379	17.292	35.563	38.885	41.923	45.642	48.290
27	11.808	12.879	14.573	16.151	18.114	36.741	40.113	43.195	46.963	49.645
28	12.461	13.565	15.308	16.928	18.939	37.916	41.337	44.461	48.278	50.993
29	13.121	14.256	16.047	17.708	19.768	39.087	42.557	45.722	49.588	52.336
30	13.787	14.953	16.791	18.493	20.599	40.256	43.773	46.979	50.892	53.672
40	20.707	22.164	24.433	26.509	29.051	51.805	55.758	59.342	63.691	66.766
50	27.991	29.707	32.357	34.764	37.689	63.167	67.505	71.420	76.154	79.490
60	35.534	37.485	40.482	43.188	46.459	74.397	79.082	83.298	88.379	91.952
70	43.275	45.442	48.758	51.739	55.329	85.527	90.531	95.023	100.425	104.215
80	51.172	53.540	57.153	60.391	64.278	96.578	101.879	106.629	112.329	116.321
90	59.196	61.754	65.647	69.126	73.291	107.565	113.145	118.136	124.116	128.299
100	67.328	70.065	74.222	77.929	82.358	118.498	124.342	129.561	135.807	140.169

I Critical Values of F (Area = 0.995)



		Numerator Degrees of Freedom								
		1	2	3	4	5	6	7	8	9
Denominator Degrees of Freedom	1	0.0001	0.0050	0.0180	0.0319	0.0439	0.0537	0.0616	0.0681	0.0735
	2	0.0001	0.0050	0.0201	0.0380	0.0546	0.0688	0.0806	0.0906	0.0989
	3	0.0000	0.0050	0.0211	0.0412	0.0605	0.0774	0.0919	0.1042	0.1147
	4	0.0000	0.0050	0.0216	0.0432	0.0643	0.0831	0.0995	0.1136	0.1257
	5	0.0000	0.0050	0.0220	0.0445	0.0669	0.0872	0.1050	0.1205	0.1338
	6	0.0000	0.0050	0.0223	0.0455	0.0689	0.0903	0.1092	0.1258	0.1402
	7	0.0000	0.0050	0.0225	0.0462	0.0704	0.0927	0.1125	0.1300	0.1452
	8	0.0000	0.0050	0.0227	0.0468	0.0716	0.0946	0.1152	0.1334	0.1494
	9	0.0000	0.0050	0.0228	0.0473	0.0726	0.0962	0.1175	0.1363	0.1529
	10	0.0000	0.0050	0.0229	0.0477	0.0734	0.0976	0.1193	0.1387	0.1558
	11	0.0000	0.0050	0.0230	0.0480	0.0741	0.0987	0.1209	0.1408	0.1584
	12	0.0000	0.0050	0.0230	0.0483	0.0747	0.0997	0.1223	0.1426	0.1606
	13	0.0000	0.0050	0.0231	0.0485	0.0752	0.1005	0.1235	0.1441	0.1625
	14	0.0000	0.0050	0.0232	0.0487	0.0757	0.1012	0.1246	0.1455	0.1642
	15	0.0000	0.0050	0.0232	0.0489	0.0761	0.1019	0.1255	0.1468	0.1658
	16	0.0000	0.0050	0.0233	0.0491	0.0764	0.1025	0.1263	0.1479	0.1671
	17	0.0000	0.0050	0.0233	0.0492	0.0767	0.1030	0.1271	0.1489	0.1684
	18	0.0000	0.0050	0.0233	0.0494	0.0770	0.1035	0.1278	0.1498	0.1695
	19	0.0000	0.0050	0.0234	0.0495	0.0773	0.1039	0.1284	0.1506	0.1705
	20	0.0000	0.0050	0.0234	0.0496	0.0775	0.1043	0.1290	0.1513	0.1715
	21	0.0000	0.0050	0.0234	0.0497	0.0777	0.1046	0.1295	0.1520	0.1723
	22	0.0000	0.0050	0.0234	0.0498	0.0779	0.1050	0.1300	0.1526	0.1731
	23	0.0000	0.0050	0.0234	0.0499	0.0781	0.1053	0.1304	0.1532	0.1739
	24	0.0000	0.0050	0.0235	0.0499	0.0782	0.1055	0.1308	0.1538	0.1745
	25	0.0000	0.0050	0.0235	0.0500	0.0784	0.1058	0.1312	0.1543	0.1752
	26	0.0000	0.0050	0.0235	0.0501	0.0785	0.1060	0.1315	0.1547	0.1758
	27	0.0000	0.0050	0.0235	0.0501	0.0787	0.1063	0.1319	0.1552	0.1763
	28	0.0000	0.0050	0.0235	0.0502	0.0788	0.1065	0.1322	0.1556	0.1768
	29	0.0000	0.0050	0.0235	0.0502	0.0789	0.1067	0.1325	0.1560	0.1773
30	0.0000	0.0050	0.0235	0.0503	0.0790	0.1069	0.1327	0.1563	0.1778	
40	0.0000	0.0050	0.0236	0.0506	0.0798	0.1082	0.1347	0.1590	0.1812	
60	0.0000	0.0050	0.0237	0.0510	0.0806	0.1096	0.1368	0.1619	0.1848	
120	0.0000	0.0050	0.0238	0.0514	0.0815	0.1111	0.1390	0.1649	0.1887	
∞	0.0000	0.0050	0.0239	0.0517	0.0823	0.1126	0.1413	0.1681	0.1928	

I Critical Values of F (Area = 0.995) (cont.)

		Numerator Degrees of Freedom								
		10	11	12	13	14	15	16	17	18
Denominator Degrees of Freedom	1	0.0780	0.0818	0.0851	0.0879	0.0904	0.0926	0.0946	0.0963	0.0979
	2	0.1061	0.1122	0.1175	0.1222	0.1262	0.1299	0.1331	0.1360	0.1386
	3	0.1238	0.1316	0.1384	0.1444	0.1497	0.1544	0.1586	0.1625	0.1659
	4	0.1362	0.1453	0.1533	0.1604	0.1667	0.1723	0.1774	0.1819	0.1861
	5	0.1455	0.1557	0.1647	0.1727	0.1798	0.1861	0.1919	0.1971	0.2018
	6	0.1528	0.1639	0.1737	0.1824	0.1902	0.1972	0.2035	0.2093	0.2145
	7	0.1587	0.1705	0.1810	0.1904	0.1988	0.2063	0.2131	0.2193	0.2250
	8	0.1635	0.1760	0.1871	0.1970	0.2059	0.2139	0.2212	0.2278	0.2339
	9	0.1676	0.1806	0.1922	0.2026	0.2120	0.2204	0.2281	0.2351	0.2415
	10	0.1710	0.1846	0.1966	0.2075	0.2172	0.2261	0.2341	0.2414	0.2481
	11	0.1740	0.1880	0.2005	0.2117	0.2218	0.2310	0.2393	0.2469	0.2539
	12	0.1766	0.1910	0.2038	0.2154	0.2258	0.2353	0.2439	0.2518	0.2591
	13	0.1789	0.1936	0.2068	0.2187	0.2294	0.2392	0.2481	0.2562	0.2637
	14	0.1810	0.1960	0.2094	0.2216	0.2326	0.2426	0.2517	0.2601	0.2678
	15	0.1828	0.1981	0.2118	0.2242	0.2355	0.2457	0.2551	0.2636	0.2715
	16	0.1844	0.2000	0.2139	0.2266	0.2381	0.2485	0.2581	0.2669	0.2749
	17	0.1859	0.2017	0.2159	0.2287	0.2404	0.2511	0.2608	0.2698	0.2780
	18	0.1873	0.2032	0.2177	0.2307	0.2426	0.2534	0.2634	0.2725	0.2809
	19	0.1885	0.2047	0.2193	0.2325	0.2446	0.2556	0.2657	0.2749	0.2835
	20	0.1896	0.2060	0.2208	0.2342	0.2464	0.2576	0.2678	0.2772	0.2859
	21	0.1906	0.2072	0.2221	0.2357	0.2481	0.2594	0.2698	0.2793	0.2881
	22	0.1916	0.2083	0.2234	0.2371	0.2496	0.2611	0.2716	0.2813	0.2902
	23	0.1925	0.2093	0.2246	0.2384	0.2511	0.2627	0.2733	0.2831	0.2922
	24	0.1933	0.2103	0.2257	0.2397	0.2524	0.2641	0.2749	0.2848	0.2940
	25	0.1941	0.2112	0.2267	0.2408	0.2537	0.2655	0.2764	0.2864	0.2957
	26	0.1948	0.2120	0.2276	0.2419	0.2549	0.2668	0.2778	0.2879	0.2973
	27	0.1954	0.2128	0.2285	0.2429	0.2560	0.2680	0.2791	0.2893	0.2988
	28	0.1961	0.2135	0.2294	0.2438	0.2570	0.2692	0.2803	0.2906	0.3002
	29	0.1967	0.2142	0.2302	0.2447	0.2580	0.2702	0.2815	0.2919	0.3015
	30	0.1972	0.2149	0.2309	0.2455	0.2589	0.2712	0.2826	0.2930	0.3028
40	0.2014	0.2197	0.2365	0.2519	0.2660	0.2789	0.2909	0.3020	0.3124	
60	0.2058	0.2250	0.2425	0.2587	0.2736	0.2873	0.3001	0.3119	0.3230	
120	0.2105	0.2306	0.2491	0.2661	0.2819	0.2965	0.3102	0.3229	0.3348	
∞	0.2156	0.2367	0.2562	0.2742	0.2910	0.3067	0.3214	0.3351	0.3480	

I Critical Values of F (Area = 0.995) (cont.)

		Numerator Degrees of Freedom						
		19	20	24	30	40	60	120
Denominator Degrees of Freedom	1	0.0993	0.1006	0.1047	0.1089	0.1133	0.1177	0.1223
	2	0.1410	0.1431	0.1501	0.1574	0.1648	0.1726	0.1805
	3	0.1690	0.1719	0.1812	0.1909	0.2010	0.2115	0.2224
	4	0.1898	0.1933	0.2045	0.2163	0.2286	0.2416	0.2551
	5	0.2061	0.2100	0.2229	0.2365	0.2509	0.2660	0.2818
	6	0.2192	0.2236	0.2380	0.2532	0.2693	0.2864	0.3044
	7	0.2302	0.2349	0.2506	0.2673	0.2850	0.3038	0.3239
	8	0.2394	0.2445	0.2613	0.2793	0.2985	0.3190	0.3410
	9	0.2474	0.2528	0.2706	0.2898	0.3104	0.3324	0.3561
	10	0.2543	0.2599	0.2788	0.2990	0.3208	0.3443	0.3697
	11	0.2603	0.2663	0.2860	0.3072	0.3302	0.3550	0.3819
	12	0.2657	0.2719	0.2924	0.3146	0.3386	0.3647	0.3931
	13	0.2706	0.2769	0.2982	0.3212	0.3463	0.3735	0.4033
	14	0.2749	0.2815	0.3034	0.3272	0.3532	0.3816	0.4127
	15	0.2788	0.2856	0.3081	0.3327	0.3596	0.3890	0.4215
	16	0.2824	0.2893	0.3124	0.3377	0.3654	0.3959	0.4296
	17	0.2856	0.2927	0.3164	0.3423	0.3708	0.4023	0.4371
	18	0.2886	0.2958	0.3200	0.3466	0.3758	0.4082	0.4442
	19	0.2914	0.2987	0.3234	0.3506	0.3805	0.4137	0.4508
	20	0.2939	0.3014	0.3265	0.3542	0.3848	0.4189	0.4570
	21	0.2963	0.3039	0.3295	0.3577	0.3889	0.4238	0.4629
	22	0.2985	0.3062	0.3322	0.3609	0.3927	0.4283	0.4684
	23	0.3006	0.3083	0.3347	0.3639	0.3963	0.4326	0.4737
	24	0.3025	0.3104	0.3371	0.3667	0.3997	0.4367	0.4787
	25	0.3043	0.3123	0.3393	0.3693	0.4029	0.4406	0.4834
	26	0.3059	0.3140	0.3414	0.3718	0.4059	0.4442	0.4879
	27	0.3075	0.3157	0.3434	0.3742	0.4087	0.4477	0.4922
	28	0.3090	0.3173	0.3452	0.3764	0.4114	0.4510	0.4964
	29	0.3104	0.3188	0.3470	0.3785	0.4140	0.4542	0.5003
	30	0.3118	0.3202	0.3487	0.3805	0.4164	0.4572	0.5040
40	0.3220	0.3310	0.3616	0.3962	0.4356	0.4810	0.5345	
60	0.3333	0.3429	0.3762	0.4141	0.4579	0.5096	0.5725	
120	0.3459	0.3564	0.3927	0.4348	0.4846	0.5452	0.6229	
∞	0.3602	0.3717	0.4119	0.4596	0.5177	0.5922	0.6988	

I Critical Values of F (Area = 0.990)

		Numerator Degrees of Freedom								
		1	2	3	4	5	6	7	8	9
Denominator Degrees of Freedom	1	0.0002	0.0102	0.0293	0.0472	0.0615	0.0728	0.0817	0.0888	0.0947
	2	0.0002	0.0101	0.0325	0.0556	0.0753	0.0915	0.1047	0.1156	0.1247
	3	0.0002	0.0101	0.0339	0.0599	0.0829	0.1023	0.1183	0.1317	0.1430
	4	0.0002	0.0101	0.0348	0.0626	0.0878	0.1093	0.1274	0.1427	0.1557
	5	0.0002	0.0101	0.0354	0.0644	0.0912	0.1143	0.1340	0.1508	0.1651
	6	0.0002	0.0101	0.0358	0.0658	0.0937	0.1181	0.1391	0.1570	0.1724
	7	0.0002	0.0101	0.0361	0.0668	0.0956	0.1211	0.1430	0.1619	0.1782
	8	0.0002	0.0101	0.0364	0.0676	0.0972	0.1234	0.1462	0.1659	0.1829
	9	0.0002	0.0101	0.0366	0.0682	0.0984	0.1254	0.1488	0.1692	0.1869
	10	0.0002	0.0101	0.0367	0.0687	0.0995	0.1270	0.1511	0.1720	0.1902
	11	0.0002	0.0101	0.0369	0.0692	0.1004	0.1284	0.1529	0.1744	0.1931
	12	0.0002	0.0101	0.0370	0.0696	0.1011	0.1296	0.1546	0.1765	0.1956
	13	0.0002	0.0101	0.0371	0.0699	0.1018	0.1306	0.1560	0.1783	0.1978
	14	0.0002	0.0101	0.0371	0.0702	0.1024	0.1315	0.1573	0.1799	0.1998
	15	0.0002	0.0101	0.0372	0.0704	0.1029	0.1323	0.1584	0.1813	0.2015
	16	0.0002	0.0101	0.0373	0.0707	0.1033	0.1330	0.1594	0.1826	0.2031
	17	0.0002	0.0101	0.0373	0.0708	0.1037	0.1336	0.1603	0.1837	0.2045
	18	0.0002	0.0101	0.0374	0.0710	0.1041	0.1342	0.1611	0.1848	0.2058
	19	0.0002	0.0101	0.0374	0.0712	0.1044	0.1347	0.1618	0.1857	0.2069
	20	0.0002	0.0101	0.0375	0.0713	0.1047	0.1352	0.1625	0.1866	0.2080
	21	0.0002	0.0101	0.0375	0.0715	0.1050	0.1356	0.1631	0.1874	0.2090
	22	0.0002	0.0101	0.0375	0.0716	0.1052	0.1360	0.1636	0.1881	0.2099
	23	0.0002	0.0101	0.0376	0.0717	0.1054	0.1364	0.1641	0.1888	0.2107
	24	0.0002	0.0101	0.0376	0.0718	0.1056	0.1367	0.1646	0.1894	0.2115
	25	0.0002	0.0101	0.0376	0.0719	0.1058	0.1371	0.1651	0.1900	0.2122
	26	0.0002	0.0101	0.0376	0.0720	0.1060	0.1374	0.1655	0.1905	0.2128
	27	0.0002	0.0101	0.0377	0.0721	0.1062	0.1376	0.1659	0.1910	0.2135
	28	0.0002	0.0101	0.0377	0.0721	0.1063	0.1379	0.1662	0.1915	0.2141
	29	0.0002	0.0101	0.0377	0.0722	0.1065	0.1381	0.1666	0.1920	0.2146
	30	0.0002	0.0101	0.0377	0.0723	0.1066	0.1383	0.1669	0.1924	0.2151
40	0.0002	0.0101	0.0379	0.0728	0.1076	0.1400	0.1692	0.1955	0.2190	
60	0.0002	0.0101	0.0380	0.0732	0.1087	0.1417	0.1717	0.1987	0.2231	
120	0.0002	0.0101	0.0381	0.0738	0.1097	0.1435	0.1743	0.2022	0.2274	
∞	0.0002	0.0101	0.0383	0.0743	0.1109	0.1453	0.1770	0.2058	0.2320	

I Critical Values of F (Area = 0.990) (cont.)

		Numerator Degrees of Freedom								
		10	11	12	13	14	15	16	17	18
Denominator Degrees of Freedom	1	0.0996	0.1037	0.1072	0.1102	0.1128	0.1152	0.1172	0.1191	0.1207
	2	0.1323	0.1388	0.1444	0.1492	0.1535	0.1573	0.1606	0.1636	0.1663
	3	0.1526	0.1609	0.1680	0.1742	0.1797	0.1846	0.1890	0.1929	0.1964
	4	0.1668	0.1764	0.1848	0.1921	0.1986	0.2044	0.2095	0.2142	0.2184
	5	0.1774	0.1881	0.1975	0.2057	0.2130	0.2195	0.2254	0.2306	0.2354
	6	0.1857	0.1973	0.2074	0.2164	0.2244	0.2316	0.2380	0.2438	0.2491
	7	0.1923	0.2047	0.2155	0.2252	0.2338	0.2415	0.2484	0.2547	0.2604
	8	0.1978	0.2108	0.2223	0.2324	0.2415	0.2497	0.2571	0.2638	0.2699
	9	0.2023	0.2159	0.2279	0.2386	0.2482	0.2568	0.2645	0.2716	0.2780
	10	0.2062	0.2203	0.2328	0.2439	0.2538	0.2628	0.2709	0.2783	0.2850
	11	0.2096	0.2241	0.2370	0.2485	0.2588	0.2681	0.2765	0.2842	0.2912
	12	0.2125	0.2274	0.2407	0.2525	0.2631	0.2728	0.2815	0.2894	0.2967
	13	0.2151	0.2303	0.2439	0.2561	0.2670	0.2769	0.2859	0.2941	0.3015
	14	0.2174	0.2329	0.2468	0.2592	0.2704	0.2806	0.2898	0.2982	0.3059
	15	0.2194	0.2352	0.2494	0.2621	0.2735	0.2839	0.2933	0.3020	0.3099
	16	0.2212	0.2373	0.2517	0.2647	0.2763	0.2869	0.2966	0.3054	0.3134
	17	0.2229	0.2392	0.2539	0.2670	0.2789	0.2897	0.2995	0.3085	0.3167
	18	0.2244	0.2409	0.2558	0.2691	0.2812	0.2922	0.3022	0.3113	0.3197
	19	0.2257	0.2425	0.2576	0.2711	0.2833	0.2945	0.3046	0.3139	0.3224
	20	0.2270	0.2440	0.2592	0.2729	0.2853	0.2966	0.3069	0.3163	0.3250
	21	0.2281	0.2453	0.2607	0.2745	0.2871	0.2985	0.3090	0.3185	0.3273
	22	0.2292	0.2465	0.2620	0.2761	0.2888	0.3003	0.3109	0.3206	0.3295
	23	0.2302	0.2476	0.2633	0.2775	0.2903	0.3020	0.3127	0.3225	0.3315
	24	0.2311	0.2487	0.2645	0.2788	0.2918	0.3036	0.3144	0.3243	0.3334
	25	0.2320	0.2497	0.2656	0.2800	0.2931	0.3050	0.3160	0.3260	0.3352
	26	0.2328	0.2506	0.2667	0.2812	0.2944	0.3064	0.3174	0.3276	0.3369
	27	0.2335	0.2515	0.2676	0.2823	0.2956	0.3077	0.3188	0.3290	0.3385
	28	0.2342	0.2523	0.2685	0.2833	0.2967	0.3089	0.3201	0.3304	0.3399
29	0.2348	0.2530	0.2694	0.2842	0.2977	0.3101	0.3213	0.3317	0.3413	
30	0.2355	0.2537	0.2702	0.2851	0.2987	0.3111	0.3225	0.3330	0.3426	
40	0.2401	0.2591	0.2763	0.2919	0.3062	0.3193	0.3313	0.3424	0.3527	
60	0.2450	0.2648	0.2828	0.2993	0.3143	0.3282	0.3409	0.3528	0.3637	
120	0.2502	0.2710	0.2899	0.3072	0.3232	0.3379	0.3515	0.3642	0.3760	
∞	0.2558	0.2776	0.2975	0.3159	0.3329	0.3486	0.3633	0.3769	0.3897	

I Critical Values of F (Area = 0.990) (cont.)

		Numerator Degrees of Freedom						
		19	20	24	30	40	60	120
Denominator Degrees of Freedom	1	0.1222	0.1235	0.1278	0.1322	0.1367	0.1413	0.1460
	2	0.1688	0.1710	0.1781	0.1855	0.1931	0.2009	0.2089
	3	0.1996	0.2025	0.2120	0.2217	0.2319	0.2424	0.2532
	4	0.2222	0.2257	0.2371	0.2489	0.2612	0.2740	0.2874
	5	0.2398	0.2437	0.2567	0.2703	0.2846	0.2995	0.3151
	6	0.2539	0.2583	0.2727	0.2879	0.3039	0.3206	0.3383
	7	0.2656	0.2704	0.2860	0.3026	0.3201	0.3386	0.3582
	8	0.2754	0.2806	0.2974	0.3152	0.3341	0.3542	0.3755
	9	0.2839	0.2893	0.3071	0.3261	0.3463	0.3679	0.3908
	10	0.2912	0.2969	0.3156	0.3357	0.3571	0.3800	0.4045
	11	0.2977	0.3036	0.3232	0.3442	0.3667	0.3908	0.4168
	12	0.3033	0.3095	0.3299	0.3517	0.3753	0.4006	0.4280
	13	0.3084	0.3148	0.3359	0.3585	0.3830	0.4095	0.4382
	14	0.3130	0.3195	0.3413	0.3647	0.3901	0.4177	0.4476
	15	0.3171	0.3238	0.3462	0.3703	0.3966	0.4251	0.4563
	16	0.3209	0.3277	0.3506	0.3755	0.4025	0.4320	0.4643
	17	0.3243	0.3313	0.3548	0.3802	0.4080	0.4384	0.4718
	18	0.3274	0.3346	0.3585	0.3846	0.4131	0.4443	0.4788
	19	0.3303	0.3376	0.3620	0.3886	0.4178	0.4498	0.4854
	20	0.3330	0.3404	0.3652	0.3924	0.4221	0.4550	0.4915
	21	0.3355	0.3430	0.3682	0.3959	0.4262	0.4598	0.4973
	22	0.3378	0.3454	0.3710	0.3991	0.4301	0.4644	0.5028
	23	0.3399	0.3476	0.3736	0.4022	0.4337	0.4687	0.5079
	24	0.3419	0.3497	0.3761	0.4050	0.4371	0.4727	0.5128
	25	0.3438	0.3517	0.3784	0.4077	0.4403	0.4766	0.5175
	26	0.3455	0.3535	0.3805	0.4103	0.4433	0.4802	0.5219
	27	0.3472	0.3553	0.3826	0.4127	0.4461	0.4836	0.5261
	28	0.3487	0.3569	0.3845	0.4149	0.4488	0.4869	0.5301
	29	0.3502	0.3584	0.3863	0.4171	0.4514	0.4900	0.5340
	30	0.3516	0.3599	0.3880	0.4191	0.4538	0.4930	0.5376
40	0.3622	0.3711	0.4012	0.4349	0.4730	0.5165	0.5673	
60	0.3739	0.3835	0.4161	0.4529	0.4952	0.5446	0.6040	
120	0.3870	0.3973	0.4329	0.4738	0.5216	0.5793	0.6523	
∞	0.4017	0.4130	0.4523	0.4984	0.5541	0.6247	0.7243	

I Critical Values of F (Area = 0.975)

		Numerator Degrees of Freedom								
		1	2	3	4	5	6	7	8	9
Denominator Degrees of Freedom	1	0.0015	0.0260	0.0573	0.0818	0.0999	0.1135	0.1239	0.1321	0.1387
	2	0.0013	0.0256	0.0623	0.0939	0.1186	0.1377	0.1529	0.1650	0.1750
	3	0.0012	0.0255	0.0648	0.1002	0.1288	0.1515	0.1698	0.1846	0.1969
	4	0.0011	0.0255	0.0662	0.1041	0.1354	0.1606	0.1811	0.1979	0.2120
	5	0.0011	0.0254	0.0672	0.1068	0.1399	0.1670	0.1892	0.2076	0.2230
	6	0.0011	0.0254	0.0679	0.1087	0.1433	0.1718	0.1954	0.2150	0.2315
	7	0.0011	0.0254	0.0684	0.1102	0.1459	0.1756	0.2002	0.2208	0.2383
	8	0.0010	0.0254	0.0688	0.1114	0.1480	0.1786	0.2041	0.2256	0.2438
	9	0.0010	0.0254	0.0691	0.1123	0.1497	0.1810	0.2073	0.2295	0.2484
	10	0.0010	0.0254	0.0694	0.1131	0.1511	0.1831	0.2100	0.2328	0.2523
	11	0.0010	0.0254	0.0696	0.1137	0.1523	0.1849	0.2123	0.2357	0.2556
	12	0.0010	0.0254	0.0698	0.1143	0.1533	0.1864	0.2143	0.2381	0.2585
	13	0.0010	0.0254	0.0699	0.1147	0.1541	0.1877	0.2161	0.2403	0.2611
	14	0.0010	0.0254	0.0700	0.1152	0.1549	0.1888	0.2176	0.2422	0.2633
	15	0.0010	0.0254	0.0702	0.1155	0.1556	0.1898	0.2189	0.2438	0.2653
	16	0.0010	0.0254	0.0703	0.1158	0.1562	0.1907	0.2201	0.2453	0.2671
	17	0.0010	0.0254	0.0704	0.1161	0.1567	0.1915	0.2212	0.2467	0.2687
	18	0.0010	0.0254	0.0704	0.1164	0.1572	0.1922	0.2222	0.2479	0.2702
	19	0.0010	0.0254	0.0705	0.1166	0.1576	0.1929	0.2231	0.2490	0.2715
	20	0.0010	0.0253	0.0706	0.1168	0.1580	0.1935	0.2239	0.2500	0.2727
	21	0.0010	0.0253	0.0706	0.1170	0.1584	0.1940	0.2246	0.2510	0.2738
	22	0.0010	0.0253	0.0707	0.1172	0.1587	0.1945	0.2253	0.2518	0.2749
	23	0.0010	0.0253	0.0708	0.1173	0.1590	0.1950	0.2259	0.2526	0.2758
	24	0.0010	0.0253	0.0708	0.1175	0.1593	0.1954	0.2265	0.2533	0.2767
	25	0.0010	0.0253	0.0708	0.1176	0.1595	0.1958	0.2270	0.2540	0.2775
	26	0.0010	0.0253	0.0709	0.1178	0.1598	0.1962	0.2275	0.2547	0.2783
	27	0.0010	0.0253	0.0709	0.1179	0.1600	0.1965	0.2280	0.2552	0.2790
	28	0.0010	0.0253	0.0710	0.1180	0.1602	0.1968	0.2284	0.2558	0.2797
	29	0.0010	0.0253	0.0710	0.1181	0.1604	0.1971	0.2288	0.2563	0.2803
	30	0.0010	0.0253	0.0710	0.1182	0.1606	0.1974	0.2292	0.2568	0.2809
40	0.0010	0.0253	0.0712	0.1189	0.1619	0.1995	0.2321	0.2604	0.2853	
60	0.0010	0.0253	0.0715	0.1196	0.1633	0.2017	0.2351	0.2642	0.2899	
120	0.0010	0.0253	0.0717	0.1203	0.1648	0.2039	0.2382	0.2682	0.2948	
∞	0.0010	0.0253	0.0719	0.1211	0.1662	0.2062	0.2414	0.2725	0.3000	

I Critical Values of F (Area = 0.975) (cont.)

		Numerator Degrees of Freedom								
		10	11	12	13	14	15	16	17	18
Denominator Degrees of Freedom	1	0.1442	0.1487	0.1526	0.1559	0.1588	0.1613	0.1635	0.1655	0.1673
	2	0.1833	0.1903	0.1962	0.2014	0.2059	0.2099	0.2134	0.2165	0.2193
	3	0.2072	0.2160	0.2235	0.2300	0.2358	0.2408	0.2453	0.2493	0.2529
	4	0.2238	0.2339	0.2426	0.2503	0.2569	0.2629	0.2681	0.2729	0.2771
	5	0.2361	0.2473	0.2570	0.2655	0.2730	0.2796	0.2855	0.2909	0.2957
	6	0.2456	0.2577	0.2682	0.2774	0.2856	0.2929	0.2993	0.3052	0.3105
	7	0.2532	0.2661	0.2773	0.2871	0.2959	0.3036	0.3106	0.3169	0.3226
	8	0.2594	0.2729	0.2848	0.2952	0.3044	0.3126	0.3200	0.3267	0.3327
	9	0.2646	0.2787	0.2910	0.3019	0.3116	0.3202	0.3280	0.3350	0.3414
	10	0.2690	0.2836	0.2964	0.3077	0.3178	0.3268	0.3349	0.3422	0.3489
	11	0.2729	0.2879	0.3011	0.3127	0.3231	0.3325	0.3409	0.3485	0.3554
	12	0.2762	0.2916	0.3051	0.3171	0.3279	0.3375	0.3461	0.3540	0.3612
	13	0.2791	0.2948	0.3087	0.3210	0.3320	0.3419	0.3508	0.3589	0.3663
	14	0.2817	0.2977	0.3119	0.3245	0.3357	0.3458	0.3550	0.3633	0.3709
	15	0.2840	0.3003	0.3147	0.3276	0.3391	0.3494	0.3587	0.3672	0.3750
	16	0.2860	0.3026	0.3173	0.3304	0.3421	0.3526	0.3621	0.3708	0.3787
	17	0.2879	0.3047	0.3196	0.3329	0.3448	0.3555	0.3652	0.3741	0.3821
	18	0.2896	0.3066	0.3217	0.3352	0.3473	0.3582	0.3681	0.3770	0.3853
	19	0.2911	0.3084	0.3237	0.3373	0.3496	0.3606	0.3706	0.3798	0.3881
	20	0.2925	0.3100	0.3254	0.3393	0.3517	0.3629	0.3730	0.3823	0.3908
	21	0.2938	0.3114	0.3271	0.3410	0.3536	0.3649	0.3752	0.3846	0.3932
	22	0.2950	0.3128	0.3286	0.3427	0.3554	0.3668	0.3773	0.3868	0.3955
	23	0.2961	0.3140	0.3300	0.3442	0.3570	0.3686	0.3792	0.3888	0.3976
	24	0.2971	0.3152	0.3313	0.3456	0.3586	0.3703	0.3809	0.3907	0.3996
	25	0.2981	0.3163	0.3325	0.3470	0.3600	0.3718	0.3826	0.3924	0.4014
	26	0.2990	0.3173	0.3336	0.3482	0.3614	0.3733	0.3841	0.3940	0.4031
	27	0.2998	0.3183	0.3347	0.3494	0.3626	0.3746	0.3856	0.3956	0.4048
	28	0.3006	0.3191	0.3357	0.3505	0.3638	0.3759	0.3869	0.3970	0.4063
	29	0.3013	0.3200	0.3366	0.3515	0.3649	0.3771	0.3882	0.3984	0.4077
	30	0.3020	0.3208	0.3375	0.3525	0.3660	0.3783	0.3894	0.3997	0.4091
40	0.3072	0.3267	0.3441	0.3598	0.3739	0.3868	0.3986	0.4095	0.4194	
60	0.3127	0.3329	0.3512	0.3676	0.3825	0.3962	0.4087	0.4201	0.4308	
120	0.3185	0.3397	0.3588	0.3761	0.3919	0.4063	0.4196	0.4319	0.4433	
∞	0.3247	0.3469	0.3670	0.3853	0.4021	0.4175	0.4317	0.4450	0.4573	

I Critical Values of F (Area = 0.975) (cont.)

		Numerator Degrees of Freedom						
		19	20	24	30	40	60	120
Denominator Degrees of Freedom	1	0.1689	0.1703	0.1749	0.1796	0.1844	0.1892	0.1941
	2	0.2219	0.2242	0.2315	0.2391	0.2469	0.2548	0.2628
	3	0.2562	0.2592	0.2687	0.2786	0.2887	0.2992	0.3099
	4	0.2810	0.2845	0.2959	0.3077	0.3199	0.3325	0.3455
	5	0.3001	0.3040	0.3170	0.3304	0.3444	0.3589	0.3740
	6	0.3153	0.3197	0.3339	0.3488	0.3644	0.3806	0.3976
	7	0.3278	0.3325	0.3480	0.3642	0.3811	0.3989	0.4176
	8	0.3383	0.3433	0.3598	0.3772	0.3954	0.4147	0.4349
	9	0.3472	0.3525	0.3700	0.3884	0.4078	0.4284	0.4501
	10	0.3550	0.3605	0.3788	0.3982	0.4187	0.4405	0.4636
	11	0.3617	0.3675	0.3866	0.4069	0.4284	0.4513	0.4757
	12	0.3677	0.3737	0.3935	0.4146	0.4370	0.4610	0.4867
	13	0.3730	0.3792	0.3997	0.4215	0.4448	0.4698	0.4966
	14	0.3778	0.3842	0.4052	0.4278	0.4519	0.4778	0.5057
	15	0.3821	0.3886	0.4103	0.4334	0.4583	0.4851	0.5141
	16	0.3860	0.3927	0.4148	0.4386	0.4642	0.4919	0.5219
	17	0.3896	0.3964	0.4190	0.4434	0.4696	0.4981	0.5291
	18	0.3928	0.3998	0.4229	0.4477	0.4747	0.5039	0.5358
	19	0.3958	0.4029	0.4264	0.4518	0.4793	0.5093	0.5421
	20	0.3986	0.4058	0.4297	0.4555	0.4836	0.5143	0.5480
	21	0.4011	0.4084	0.4327	0.4590	0.4877	0.5190	0.5535
	22	0.4035	0.4109	0.4356	0.4623	0.4914	0.5234	0.5587
	23	0.4057	0.4132	0.4382	0.4653	0.4950	0.5275	0.5636
	24	0.4078	0.4154	0.4407	0.4682	0.4983	0.5314	0.5683
	25	0.4097	0.4174	0.4430	0.4709	0.5014	0.5351	0.5727
	26	0.4115	0.4193	0.4452	0.4734	0.5044	0.5386	0.5769
	27	0.4132	0.4210	0.4472	0.4758	0.5072	0.5419	0.5809
	28	0.4148	0.4227	0.4491	0.4780	0.5098	0.5451	0.5847
	29	0.4163	0.4243	0.4510	0.4802	0.5123	0.5481	0.5883
	30	0.4178	0.4258	0.4527	0.4822	0.5147	0.5509	0.5917
	40	0.4286	0.4372	0.4660	0.4978	0.5333	0.5734	0.6195
	60	0.4406	0.4498	0.4808	0.5155	0.5547	0.6000	0.6536
120	0.4539	0.4638	0.4975	0.5358	0.5800	0.6325	0.6980	
∞	0.4688	0.4795	0.5167	0.5597	0.6108	0.6747	0.7631	

I Critical Values of F (Area = 0.950)

		Numerator Degrees of Freedom								
		1	2	3	4	5	6	7	8	9
Denominator Degrees of Freedom	1	0.0062	0.0540	0.0987	0.1297	0.1513	0.1670	0.1788	0.1881	0.1954
	2	0.0050	0.0526	0.1047	0.1440	0.1728	0.1944	0.2111	0.2243	0.2349
	3	0.0046	0.0522	0.1078	0.1517	0.1849	0.2102	0.2301	0.2459	0.2589
	4	0.0045	0.0520	0.1097	0.1565	0.1926	0.2206	0.2427	0.2606	0.2752
	5	0.0043	0.0518	0.1109	0.1598	0.1980	0.2279	0.2518	0.2712	0.2872
	6	0.0043	0.0517	0.1118	0.1623	0.2020	0.2334	0.2587	0.2793	0.2964
	7	0.0042	0.0517	0.1125	0.1641	0.2051	0.2377	0.2641	0.2857	0.3037
	8	0.0042	0.0516	0.1131	0.1655	0.2075	0.2411	0.2684	0.2909	0.3096
	9	0.0042	0.0516	0.1135	0.1667	0.2095	0.2440	0.2720	0.2951	0.3146
	10	0.0041	0.0516	0.1138	0.1677	0.2112	0.2463	0.2750	0.2988	0.3187
	11	0.0041	0.0515	0.1141	0.1685	0.2126	0.2483	0.2775	0.3018	0.3223
	12	0.0041	0.0515	0.1144	0.1692	0.2138	0.2500	0.2797	0.3045	0.3254
	13	0.0041	0.0515	0.1146	0.1697	0.2148	0.2515	0.2817	0.3068	0.3281
	14	0.0041	0.0515	0.1147	0.1703	0.2157	0.2528	0.2833	0.3089	0.3305
	15	0.0041	0.0515	0.1149	0.1707	0.2165	0.2539	0.2848	0.3107	0.3327
	16	0.0041	0.0515	0.1150	0.1711	0.2172	0.2550	0.2862	0.3123	0.3346
	17	0.0040	0.0514	0.1152	0.1715	0.2178	0.2559	0.2874	0.3138	0.3363
	18	0.0040	0.0514	0.1153	0.1718	0.2184	0.2567	0.2884	0.3151	0.3378
	19	0.0040	0.0514	0.1154	0.1721	0.2189	0.2574	0.2894	0.3163	0.3393
	20	0.0040	0.0514	0.1155	0.1723	0.2194	0.2581	0.2903	0.3174	0.3405
	21	0.0040	0.0514	0.1156	0.1726	0.2198	0.2587	0.2911	0.3184	0.3417
	22	0.0040	0.0514	0.1156	0.1728	0.2202	0.2593	0.2919	0.3194	0.3428
	23	0.0040	0.0514	0.1157	0.1730	0.2206	0.2598	0.2926	0.3202	0.3438
	24	0.0040	0.0514	0.1158	0.1732	0.2209	0.2603	0.2932	0.3210	0.3448
	25	0.0040	0.0514	0.1158	0.1733	0.2212	0.2608	0.2938	0.3217	0.3456
	26	0.0040	0.0514	0.1159	0.1735	0.2215	0.2612	0.2944	0.3224	0.3465
	27	0.0040	0.0514	0.1159	0.1737	0.2217	0.2616	0.2949	0.3231	0.3472
	28	0.0040	0.0514	0.1160	0.1738	0.2220	0.2619	0.2954	0.3237	0.3479
	29	0.0040	0.0514	0.1160	0.1739	0.2222	0.2623	0.2958	0.3242	0.3486
	30	0.0040	0.0514	0.1161	0.1740	0.2224	0.2626	0.2962	0.3247	0.3492
40	0.0040	0.0514	0.1164	0.1749	0.2240	0.2650	0.2994	0.3286	0.3539	
60	0.0040	0.0513	0.1167	0.1758	0.2257	0.2674	0.3026	0.3327	0.3588	
120	0.0039	0.0513	0.1170	0.1767	0.2274	0.2699	0.3060	0.3370	0.3640	
∞	0.0039	0.0513	0.1173	0.1777	0.2291	0.2726	0.3096	0.3416	0.3695	

I Critical Values of F (Area = 0.950) (cont.)

		Numerator Degrees of Freedom								
		10	11	12	13	14	15	16	17	18
Denominator Degrees of Freedom	1	0.2014	0.2064	0.2106	0.2143	0.2174	0.2201	0.2225	0.2247	0.2266
	2	0.2437	0.2511	0.2574	0.2628	0.2675	0.2716	0.2752	0.2784	0.2813
	3	0.2697	0.2788	0.2865	0.2932	0.2991	0.3042	0.3087	0.3128	0.3165
	4	0.2875	0.2979	0.3068	0.3146	0.3213	0.3273	0.3326	0.3373	0.3416
	5	0.3007	0.3121	0.3220	0.3305	0.3380	0.3447	0.3506	0.3559	0.3606
	6	0.3108	0.3231	0.3338	0.3430	0.3512	0.3584	0.3648	0.3706	0.3758
	7	0.3189	0.3320	0.3432	0.3531	0.3618	0.3695	0.3763	0.3825	0.3881
	8	0.3256	0.3392	0.3511	0.3614	0.3706	0.3787	0.3859	0.3925	0.3984
	9	0.3311	0.3453	0.3576	0.3684	0.3780	0.3865	0.3941	0.4009	0.4071
	10	0.3358	0.3504	0.3632	0.3744	0.3843	0.3931	0.4010	0.4082	0.4146
	11	0.3398	0.3549	0.3680	0.3796	0.3898	0.3989	0.4071	0.4145	0.4212
	12	0.3433	0.3587	0.3722	0.3841	0.3946	0.4040	0.4124	0.4201	0.4270
	13	0.3464	0.3621	0.3759	0.3881	0.3988	0.4085	0.4171	0.4250	0.4321
	14	0.3491	0.3651	0.3792	0.3916	0.4026	0.4125	0.4214	0.4294	0.4367
	15	0.3515	0.3678	0.3821	0.3948	0.4060	0.4161	0.4251	0.4333	0.4408
	16	0.3537	0.3702	0.3848	0.3976	0.4091	0.4193	0.4285	0.4369	0.4445
	17	0.3556	0.3724	0.3872	0.4002	0.4118	0.4222	0.4316	0.4402	0.4479
	18	0.3574	0.3744	0.3893	0.4026	0.4144	0.4249	0.4345	0.4431	0.4510
	19	0.3590	0.3762	0.3913	0.4047	0.4167	0.4274	0.4371	0.4459	0.4539
	20	0.3605	0.3779	0.3931	0.4067	0.4188	0.4296	0.4395	0.4484	0.4565
	21	0.3618	0.3794	0.3948	0.4085	0.4207	0.4317	0.4417	0.4507	0.4589
	22	0.3631	0.3808	0.3964	0.4102	0.4225	0.4336	0.4437	0.4528	0.4612
	23	0.3643	0.3821	0.3978	0.4117	0.4242	0.4354	0.4456	0.4548	0.4632
	24	0.3653	0.3833	0.3991	0.4132	0.4258	0.4371	0.4473	0.4567	0.4652
	25	0.3663	0.3844	0.4004	0.4145	0.4272	0.4386	0.4490	0.4584	0.4670
	26	0.3673	0.3855	0.4015	0.4158	0.4286	0.4401	0.4505	0.4600	0.4687
	27	0.3681	0.3864	0.4026	0.4170	0.4299	0.4415	0.4520	0.4616	0.4703
	28	0.3689	0.3874	0.4036	0.4181	0.4311	0.4427	0.4533	0.4630	0.4718
	29	0.3697	0.3882	0.4046	0.4191	0.4322	0.4439	0.4546	0.4643	0.4732
	30	0.3704	0.3890	0.4055	0.4201	0.4332	0.4451	0.4558	0.4656	0.4746
40	0.3758	0.3951	0.4122	0.4275	0.4412	0.4537	0.4650	0.4753	0.4848	
60	0.3815	0.4016	0.4194	0.4354	0.4499	0.4629	0.4749	0.4858	0.4959	
120	0.3876	0.4085	0.4272	0.4440	0.4592	0.4730	0.4857	0.4973	0.5081	
∞	0.3940	0.4159	0.4355	0.4532	0.4693	0.4841	0.4976	0.5101	0.5217	

I Critical Values of F (Area = 0.950) (cont.)

		Numerator Degrees of Freedom						
		19	20	24	30	40	60	120
Denominator Degrees of Freedom	1	0.2283	0.2298	0.2348	0.2398	0.2448	0.2499	0.2551
	2	0.2839	0.2863	0.2939	0.3016	0.3094	0.3174	0.3255
	3	0.3198	0.3227	0.3324	0.3422	0.3523	0.3626	0.3731
	4	0.3454	0.3489	0.3602	0.3718	0.3837	0.3960	0.4086
	5	0.3650	0.3689	0.3816	0.3947	0.4083	0.4222	0.4367
	6	0.3805	0.3848	0.3987	0.4131	0.4281	0.4436	0.4598
	7	0.3932	0.3978	0.4128	0.4284	0.4446	0.4616	0.4792
	8	0.4038	0.4087	0.4246	0.4413	0.4587	0.4769	0.4959
	9	0.4128	0.4179	0.4347	0.4523	0.4708	0.4902	0.5105
	10	0.4205	0.4259	0.4435	0.4620	0.4814	0.5019	0.5234
	11	0.4273	0.4329	0.4512	0.4705	0.4908	0.5122	0.5350
	12	0.4333	0.4391	0.4580	0.4780	0.4991	0.5215	0.5453
	13	0.4386	0.4445	0.4641	0.4847	0.5066	0.5299	0.5548
	14	0.4433	0.4494	0.4695	0.4908	0.5134	0.5376	0.5634
	15	0.4476	0.4539	0.4745	0.4963	0.5196	0.5445	0.5713
	16	0.4515	0.4579	0.4789	0.5013	0.5253	0.5509	0.5785
	17	0.4550	0.4615	0.4830	0.5059	0.5305	0.5568	0.5853
	18	0.4582	0.4649	0.4868	0.5102	0.5353	0.5623	0.5916
	19	0.4612	0.4679	0.4902	0.5141	0.5397	0.5674	0.5974
	20	0.4639	0.4708	0.4934	0.5177	0.5438	0.5721	0.6029
	21	0.4665	0.4734	0.4964	0.5210	0.5477	0.5765	0.6080
	22	0.4688	0.4758	0.4991	0.5242	0.5512	0.5806	0.6129
	23	0.4710	0.4781	0.5017	0.5271	0.5546	0.5845	0.6174
	24	0.4730	0.4802	0.5041	0.5298	0.5577	0.5882	0.6217
	25	0.4749	0.4822	0.5063	0.5324	0.5607	0.5916	0.6258
	26	0.4767	0.4840	0.5084	0.5348	0.5635	0.5949	0.6297
	27	0.4784	0.4858	0.5104	0.5371	0.5661	0.5980	0.6333
	28	0.4799	0.4874	0.5123	0.5393	0.5686	0.6009	0.6368
	29	0.4814	0.4890	0.5141	0.5413	0.5710	0.6037	0.6402
	30	0.4828	0.4904	0.5157	0.5432	0.5733	0.6064	0.6434
40	0.4935	0.5016	0.5286	0.5581	0.5907	0.6272	0.6688	
60	0.5052	0.5138	0.5428	0.5749	0.6108	0.6518	0.6998	
120	0.5181	0.5273	0.5588	0.5940	0.6343	0.6815	0.7397	
∞	0.5325	0.5425	0.5770	0.6164	0.6627	0.7198	0.7975	

I Critical Values of F (Area = 0.900)

		Numerator Degrees of Freedom								
		1	2	3	4	5	6	7	8	9
Denominator Degrees of Freedom	1	0.0251	0.1173	0.1806	0.2200	0.2463	0.2648	0.2786	0.2892	0.2976
	2	0.0202	0.1111	0.1831	0.2312	0.2646	0.2887	0.3070	0.3212	0.3326
	3	0.0187	0.1091	0.1855	0.2386	0.2763	0.3041	0.3253	0.3420	0.3555
	4	0.0179	0.1082	0.1872	0.2435	0.2841	0.3144	0.3378	0.3563	0.3714
	5	0.0175	0.1076	0.1884	0.2469	0.2896	0.3218	0.3468	0.3668	0.3831
	6	0.0172	0.1072	0.1892	0.2494	0.2937	0.3274	0.3537	0.3748	0.3920
	7	0.0170	0.1070	0.1899	0.2513	0.2969	0.3317	0.3591	0.3811	0.3992
	8	0.0168	0.1068	0.1904	0.2528	0.2995	0.3352	0.3634	0.3862	0.4050
	9	0.0167	0.1066	0.1908	0.2541	0.3015	0.3381	0.3670	0.3904	0.4098
	10	0.0166	0.1065	0.1912	0.2551	0.3033	0.3405	0.3700	0.3940	0.4139
	11	0.0165	0.1064	0.1915	0.2560	0.3047	0.3425	0.3726	0.3971	0.4173
	12	0.0165	0.1063	0.1917	0.2567	0.3060	0.3443	0.3748	0.3997	0.4204
	13	0.0164	0.1062	0.1919	0.2573	0.3071	0.3458	0.3767	0.4020	0.4230
	14	0.0164	0.1062	0.1921	0.2579	0.3080	0.3471	0.3784	0.4040	0.4253
	15	0.0163	0.1061	0.1923	0.2584	0.3088	0.3483	0.3799	0.4058	0.4274
	16	0.0163	0.1061	0.1924	0.2588	0.3096	0.3493	0.3812	0.4074	0.4293
	17	0.0163	0.1060	0.1926	0.2592	0.3102	0.3503	0.3824	0.4089	0.4309
	18	0.0162	0.1060	0.1927	0.2595	0.3108	0.3511	0.3835	0.4102	0.4325
	19	0.0162	0.1059	0.1928	0.2598	0.3114	0.3519	0.3845	0.4114	0.4338
	20	0.0162	0.1059	0.1929	0.2601	0.3119	0.3526	0.3854	0.4124	0.4351
	21	0.0162	0.1059	0.1930	0.2604	0.3123	0.3532	0.3862	0.4134	0.4363
	22	0.0162	0.1059	0.1930	0.2606	0.3127	0.3538	0.3870	0.4143	0.4373
	23	0.0161	0.1058	0.1931	0.2608	0.3131	0.3543	0.3877	0.4152	0.4383
	24	0.0161	0.1058	0.1932	0.2610	0.3134	0.3548	0.3883	0.4160	0.4392
	25	0.0161	0.1058	0.1932	0.2612	0.3137	0.3553	0.3889	0.4167	0.4401
	26	0.0161	0.1058	0.1933	0.2614	0.3140	0.3557	0.3894	0.4174	0.4408
	27	0.0161	0.1058	0.1934	0.2615	0.3143	0.3561	0.3900	0.4180	0.4416
	28	0.0161	0.1058	0.1934	0.2617	0.3146	0.3565	0.3904	0.4186	0.4423
	29	0.0161	0.1057	0.1935	0.2618	0.3148	0.3568	0.3909	0.4191	0.4429
	30	0.0161	0.1057	0.1935	0.2620	0.3151	0.3571	0.3913	0.4196	0.4435
40	0.0160	0.1056	0.1938	0.2629	0.3167	0.3596	0.3945	0.4235	0.4480	
60	0.0159	0.1055	0.1941	0.2639	0.3184	0.3621	0.3977	0.4275	0.4528	
120	0.0159	0.1055	0.1945	0.2649	0.3202	0.3647	0.4012	0.4317	0.4578	
∞	0.0158	0.1054	0.1948	0.2659	0.3221	0.3674	0.4047	0.4362	0.4631	

I Critical Values of F (Area = 0.900) (cont.)

		Numerator Degrees of Freedom								
		10	11	12	13	14	15	16	17	18
Denominator Degrees of Freedom	1	0.3044	0.3101	0.3148	0.3189	0.3224	0.3254	0.3281	0.3304	0.3326
	2	0.3419	0.3497	0.3563	0.3619	0.3668	0.3710	0.3748	0.3781	0.3811
	3	0.3666	0.3759	0.3838	0.3906	0.3965	0.4016	0.4062	0.4103	0.4139
	4	0.3838	0.3943	0.4032	0.4109	0.4176	0.4235	0.4287	0.4333	0.4375
	5	0.3966	0.4080	0.4177	0.4261	0.4335	0.4399	0.4457	0.4508	0.4554
	6	0.4064	0.4186	0.4290	0.4380	0.4459	0.4529	0.4591	0.4646	0.4696
	7	0.4143	0.4271	0.4381	0.4476	0.4560	0.4634	0.4699	0.4758	0.4811
	8	0.4207	0.4340	0.4455	0.4555	0.4643	0.4720	0.4789	0.4851	0.4907
	9	0.4260	0.4399	0.4518	0.4621	0.4713	0.4793	0.4865	0.4930	0.4988
	10	0.4306	0.4448	0.4571	0.4678	0.4772	0.4856	0.4931	0.4998	0.5058
	11	0.4344	0.4490	0.4617	0.4727	0.4824	0.4910	0.4987	0.5056	0.5119
	12	0.4378	0.4527	0.4657	0.4770	0.4869	0.4958	0.5037	0.5108	0.5172
	13	0.4408	0.4560	0.4692	0.4807	0.4909	0.5000	0.5081	0.5154	0.5220
	14	0.4434	0.4589	0.4723	0.4841	0.4945	0.5037	0.5120	0.5194	0.5262
	15	0.4457	0.4614	0.4751	0.4871	0.4976	0.5070	0.5155	0.5231	0.5300
	16	0.4478	0.4638	0.4776	0.4897	0.5005	0.5101	0.5187	0.5264	0.5334
	17	0.4497	0.4658	0.4799	0.4922	0.5031	0.5128	0.5215	0.5294	0.5365
	18	0.4514	0.4677	0.4819	0.4944	0.5054	0.5153	0.5241	0.5321	0.5394
	19	0.4530	0.4694	0.4838	0.4964	0.5076	0.5176	0.5265	0.5346	0.5420
	20	0.4544	0.4710	0.4855	0.4983	0.5096	0.5197	0.5287	0.5370	0.5444
	21	0.4557	0.4725	0.4871	0.5000	0.5114	0.5216	0.5308	0.5391	0.5466
	22	0.4569	0.4738	0.4886	0.5015	0.5131	0.5234	0.5327	0.5411	0.5487
	23	0.4580	0.4750	0.4899	0.5030	0.5146	0.5250	0.5344	0.5429	0.5506
	24	0.4590	0.4762	0.4912	0.5044	0.5161	0.5266	0.5360	0.5446	0.5524
	25	0.4600	0.4773	0.4923	0.5056	0.5174	0.5280	0.5375	0.5462	0.5540
	26	0.4609	0.4783	0.4934	0.5068	0.5187	0.5294	0.5390	0.5477	0.5556
	27	0.4617	0.4792	0.4944	0.5079	0.5199	0.5306	0.5403	0.5491	0.5571
	28	0.4625	0.4801	0.4954	0.5089	0.5210	0.5318	0.5415	0.5504	0.5584
	29	0.4633	0.4809	0.4963	0.5099	0.5220	0.5329	0.5427	0.5516	0.5597
	30	0.4639	0.4816	0.4971	0.5108	0.5230	0.5340	0.5438	0.5528	0.5610
40	0.4691	0.4874	0.5035	0.5177	0.5305	0.5419	0.5522	0.5616	0.5702	
60	0.4746	0.4936	0.5103	0.5251	0.5384	0.5504	0.5613	0.5712	0.5803	
120	0.4804	0.5001	0.5175	0.5331	0.5470	0.5597	0.5712	0.5817	0.5914	
∞	0.4865	0.5071	0.5253	0.5417	0.5564	0.5698	0.5820	0.5932	0.6036	

I Critical Values of F (Area = 0.900) (cont.)

		Numerator Degrees of Freedom						
		19	20	24	30	40	60	120
Denominator Degrees of Freedom	1	0.3345	0.3362	0.3416	0.3471	0.3527	0.3583	0.3639
	2	0.3838	0.3862	0.3940	0.4018	0.4098	0.4178	0.4260
	3	0.4172	0.4202	0.4297	0.4394	0.4492	0.4593	0.4695
	4	0.4412	0.4447	0.4556	0.4668	0.4783	0.4900	0.5019
	5	0.4596	0.4633	0.4755	0.4880	0.5008	0.5140	0.5275
	6	0.4741	0.4782	0.4914	0.5050	0.5190	0.5334	0.5483
	7	0.4859	0.4903	0.5044	0.5190	0.5340	0.5496	0.5658
	8	0.4958	0.5004	0.5153	0.5308	0.5468	0.5634	0.5807
	9	0.5041	0.5089	0.5246	0.5408	0.5578	0.5754	0.5937
	10	0.5113	0.5163	0.5326	0.5496	0.5673	0.5858	0.6052
	11	0.5176	0.5228	0.5397	0.5573	0.5757	0.5951	0.6154
	12	0.5231	0.5284	0.5459	0.5641	0.5832	0.6033	0.6245
	13	0.5280	0.5335	0.5514	0.5702	0.5900	0.6108	0.6328
	14	0.5323	0.5380	0.5564	0.5757	0.5960	0.6175	0.6403
	15	0.5363	0.5420	0.5608	0.5806	0.6015	0.6237	0.6472
	16	0.5398	0.5457	0.5649	0.5851	0.6066	0.6293	0.6536
	17	0.5431	0.5490	0.5686	0.5893	0.6112	0.6345	0.6595
	18	0.5460	0.5521	0.5720	0.5930	0.6154	0.6393	0.6649
	19	0.5487	0.5549	0.5751	0.5965	0.6194	0.6437	0.6700
	20	0.5512	0.5575	0.5780	0.5998	0.6230	0.6479	0.6747
	21	0.5535	0.5598	0.5807	0.6028	0.6264	0.6517	0.6792
	22	0.5557	0.5621	0.5831	0.6056	0.6295	0.6554	0.6833
	23	0.5576	0.5641	0.5854	0.6082	0.6325	0.6587	0.6873
	24	0.5595	0.5660	0.5876	0.6106	0.6353	0.6619	0.6910
	25	0.5612	0.5678	0.5896	0.6129	0.6379	0.6649	0.6945
	26	0.5629	0.5695	0.5915	0.6150	0.6403	0.6678	0.6978
	27	0.5644	0.5711	0.5933	0.6171	0.6427	0.6705	0.7010
	28	0.5658	0.5726	0.5950	0.6190	0.6449	0.6730	0.7040
	29	0.5672	0.5740	0.5966	0.6208	0.6469	0.6754	0.7068
	30	0.5684	0.5753	0.5980	0.6225	0.6489	0.6777	0.7095
40	0.5781	0.5854	0.6095	0.6356	0.6642	0.6957	0.7312	
60	0.5887	0.5964	0.6222	0.6504	0.6816	0.7167	0.7574	
120	0.6003	0.6085	0.6364	0.6672	0.7019	0.7421	0.7908	
∞	0.6132	0.6221	0.6524	0.6866	0.7263	0.7743	0.8385	

I Critical Values of F (Area = 0.100)

		Numerator Degrees of Freedom								
		1	2	3	4	5	6	7	8	9
Denominator Degrees of Freedom	1	39.8635	49.5000	53.5932	55.8330	57.2401	58.2044	58.9060	59.4390	59.8576
	2	8.5263	9.0000	9.1618	9.2434	9.2926	9.3255	9.3491	9.3668	9.3805
	3	5.5383	5.4624	5.3908	5.3426	5.3092	5.2847	5.2662	5.2517	5.2400
	4	4.5448	4.3246	4.1909	4.1072	4.0506	4.0097	3.9790	3.9549	3.9357
	5	4.0604	3.7797	3.6195	3.5202	3.4530	3.4045	3.3679	3.3393	3.3163
	6	3.7759	3.4633	3.2888	3.1808	3.1075	3.0546	3.0145	2.9830	2.9577
	7	3.5894	3.2574	3.0741	2.9605	2.8833	2.8274	2.7849	2.7516	2.7247
	8	3.4579	3.1131	2.9238	2.8064	2.7264	2.6683	2.6241	2.5893	2.5612
	9	3.3603	3.0065	2.8129	2.6927	2.6106	2.5509	2.5053	2.4694	2.4403
	10	3.2850	2.9245	2.7277	2.6053	2.5216	2.4606	2.4140	2.3772	2.3473
	11	3.2252	2.8595	2.6602	2.5362	2.4512	2.3891	2.3416	2.3040	2.2735
	12	3.1765	2.8068	2.6055	2.4801	2.3940	2.3310	2.2828	2.2446	2.2135
	13	3.1362	2.7632	2.5603	2.4337	2.3467	2.2830	2.2341	2.1953	2.1638
	14	3.1022	2.7265	2.5222	2.3947	2.3069	2.2426	2.1931	2.1539	2.1220
	15	3.0732	2.6952	2.4898	2.3614	2.2730	2.2081	2.1582	2.1185	2.0862
	16	3.0481	2.6682	2.4618	2.3327	2.2438	2.1783	2.1280	2.0880	2.0553
	17	3.0262	2.6446	2.4374	2.3077	2.2183	2.1524	2.1017	2.0613	2.0284
	18	3.0070	2.6239	2.4160	2.2858	2.1958	2.1296	2.0785	2.0379	2.0047
	19	2.9899	2.6056	2.3970	2.2663	2.1760	2.1094	2.0580	2.0171	1.9836
	20	2.9747	2.5893	2.3801	2.2489	2.1582	2.0913	2.0397	1.9985	1.9649
	21	2.9610	2.5746	2.3649	2.2333	2.1423	2.0751	2.0233	1.9819	1.9480
	22	2.9486	2.5613	2.3512	2.2193	2.1279	2.0605	2.0084	1.9668	1.9327
	23	2.9374	2.5493	2.3387	2.2065	2.1149	2.0472	1.9949	1.9531	1.9189
	24	2.9271	2.5383	2.3274	2.1949	2.1030	2.0351	1.9826	1.9407	1.9063
	25	2.9177	2.5283	2.3170	2.1842	2.0922	2.0241	1.9714	1.9292	1.8947
	26	2.9091	2.5191	2.3075	2.1745	2.0822	2.0139	1.9610	1.9188	1.8841
	27	2.9012	2.5106	2.2987	2.1655	2.0730	2.0045	1.9515	1.9091	1.8743
	28	2.8938	2.5028	2.2906	2.1571	2.0645	1.9959	1.9427	1.9001	1.8652
29	2.8870	2.4955	2.2831	2.1494	2.0566	1.9878	1.9345	1.8918	1.8568	
30	2.8807	2.4887	2.2761	2.1422	2.0492	1.9803	1.9269	1.8841	1.8490	
40	2.8354	2.4404	2.2261	2.0909	1.9968	1.9269	1.8725	1.8289	1.7929	
60	2.7911	2.3933	2.1774	2.0410	1.9457	1.8747	1.8194	1.7748	1.7380	
120	2.7478	2.3473	2.1300	1.9923	1.8959	1.8238	1.7675	1.7220	1.6842	
∞	2.7055	2.3026	2.0838	1.9449	1.8473	1.7741	1.7167	1.6702	1.6315	

I Critical Values of F (Area = 0.100) (cont.)

		Numerator Degrees of Freedom								
		10	11	12	13	14	15	16	17	18
Denominator Degrees of Freedom	1	60.1950	60.4727	60.7052	60.9028	61.0727	61.2203	61.3499	61.4644	61.5664
	2	9.3916	9.4006	9.4081	9.4145	9.4200	9.4247	9.4289	9.4325	9.4358
	3	5.2304	5.2224	5.2156	5.2098	5.2047	5.2003	5.1964	5.1929	5.1898
	4	3.9199	3.9067	3.8955	3.8859	3.8776	3.8704	3.8639	3.8582	3.8531
	5	3.2974	3.2816	3.2682	3.2567	3.2468	3.2380	3.2303	3.2234	3.2172
	6	2.9369	2.9195	2.9047	2.8920	2.8809	2.8712	2.8626	2.8550	2.8481
	7	2.7025	2.6839	2.6681	2.6545	2.6426	2.6322	2.6230	2.6148	2.6074
	8	2.5380	2.5186	2.5020	2.4876	2.4752	2.4642	2.4545	2.4458	2.4380
	9	2.4163	2.3961	2.3789	2.3640	2.3510	2.3396	2.3295	2.3205	2.3123
	10	2.3226	2.3018	2.2841	2.2687	2.2553	2.2435	2.2330	2.2237	2.2153
	11	2.2482	2.2269	2.2087	2.1930	2.1792	2.1671	2.1563	2.1467	2.1380
	12	2.1878	2.1660	2.1474	2.1313	2.1173	2.1049	2.0938	2.0839	2.0750
	13	2.1376	2.1155	2.0966	2.0802	2.0658	2.0532	2.0419	2.0318	2.0227
	14	2.0954	2.0729	2.0537	2.0370	2.0224	2.0095	1.9981	1.9878	1.9785
	15	2.0593	2.0366	2.0171	2.0001	1.9853	1.9722	1.9605	1.9501	1.9407
	16	2.0281	2.0051	1.9854	1.9682	1.9532	1.9399	1.9281	1.9175	1.9079
	17	2.0009	1.9777	1.9577	1.9404	1.9252	1.9117	1.8997	1.8889	1.8792
	18	1.9770	1.9535	1.9333	1.9158	1.9004	1.8868	1.8747	1.8638	1.8539
	19	1.9557	1.9321	1.9117	1.8940	1.8785	1.8647	1.8524	1.8414	1.8314
	20	1.9367	1.9129	1.8924	1.8745	1.8588	1.8449	1.8325	1.8214	1.8113
	21	1.9197	1.8956	1.8750	1.8570	1.8412	1.8271	1.8146	1.8034	1.7932
	22	1.9043	1.8801	1.8593	1.8411	1.8252	1.8111	1.7984	1.7871	1.7768
	23	1.8903	1.8659	1.8450	1.8267	1.8107	1.7964	1.7837	1.7723	1.7619
	24	1.8775	1.8530	1.8319	1.8136	1.7974	1.7831	1.7703	1.7587	1.7483
	25	1.8658	1.8412	1.8200	1.8015	1.7853	1.7708	1.7579	1.7463	1.7358
	26	1.8550	1.8303	1.8090	1.7904	1.7741	1.7596	1.7466	1.7349	1.7243
	27	1.8451	1.8203	1.7989	1.7802	1.7638	1.7492	1.7361	1.7243	1.7137
	28	1.8359	1.8110	1.7895	1.7708	1.7542	1.7395	1.7264	1.7146	1.7039
	29	1.8274	1.8024	1.7808	1.7620	1.7454	1.7306	1.7174	1.7055	1.6947
	30	1.8195	1.7944	1.7727	1.7538	1.7371	1.7223	1.7090	1.6970	1.6862
40	1.7627	1.7369	1.7146	1.6950	1.6778	1.6624	1.6486	1.6362	1.6249	
60	1.7070	1.6805	1.6574	1.6372	1.6193	1.6034	1.5890	1.5760	1.5642	
120	1.6524	1.6250	1.6012	1.5803	1.5617	1.5450	1.5300	1.5164	1.5039	
∞	1.5987	1.5705	1.5458	1.5240	1.5046	1.4871	1.4714	1.4570	1.4439	

I Critical Values of F (Area = 0.100) (cont.)

		Numerator Degrees of Freedom						
		19	20	24	30	40	60	120
Denominator Degrees of Freedom	1	61.6579	61.7403	62.0020	62.2650	62.5291	62.7943	63.0606
	2	9.4387	9.4413	9.4496	9.4579	9.4662	9.4746	9.4829
	3	5.1870	5.1845	5.1764	5.1681	5.1597	5.1512	5.1425
	4	3.8485	3.8443	3.8310	3.8174	3.8036	3.7896	3.7753
	5	3.2117	3.2067	3.1905	3.1741	3.1573	3.1402	3.1228
	6	2.8419	2.8363	2.8183	2.8000	2.7812	2.7620	2.7423
	7	2.6008	2.5947	2.5753	2.5555	2.5351	2.5142	2.4928
	8	2.4310	2.4246	2.4041	2.3830	2.3614	2.3391	2.3162
	9	2.3050	2.2983	2.2768	2.2547	2.2320	2.2085	2.1843
	10	2.2077	2.2007	2.1784	2.1554	2.1317	2.1072	2.0818
	11	2.1302	2.1230	2.1000	2.0762	2.0516	2.0261	1.9997
	12	2.0670	2.0597	2.0360	2.0115	1.9861	1.9597	1.9323
	13	2.0145	2.0070	1.9827	1.9576	1.9315	1.9043	1.8759
	14	1.9701	1.9625	1.9377	1.9119	1.8852	1.8572	1.8280
	15	1.9321	1.9243	1.8990	1.8728	1.8454	1.8168	1.7867
	16	1.8992	1.8913	1.8656	1.8388	1.8108	1.7816	1.7507
	17	1.8704	1.8624	1.8362	1.8090	1.7805	1.7506	1.7191
	18	1.8450	1.8368	1.8103	1.7827	1.7537	1.7232	1.6910
	19	1.8224	1.8142	1.7873	1.7592	1.7298	1.6988	1.6659
	20	1.8022	1.7938	1.7667	1.7382	1.7083	1.6768	1.6433
	21	1.7840	1.7756	1.7481	1.7193	1.6890	1.6569	1.6228
	22	1.7675	1.7590	1.7312	1.7021	1.6714	1.6389	1.6041
	23	1.7525	1.7439	1.7159	1.6864	1.6554	1.6224	1.5871
	24	1.7388	1.7302	1.7019	1.6721	1.6407	1.6073	1.5715
	25	1.7263	1.7175	1.6890	1.6589	1.6272	1.5934	1.5570
	26	1.7147	1.7059	1.6771	1.6468	1.6147	1.5805	1.5437
	27	1.7040	1.6951	1.6662	1.6356	1.6032	1.5686	1.5313
	28	1.6941	1.6852	1.6560	1.6252	1.5925	1.5575	1.5198
	29	1.6849	1.6759	1.6465	1.6155	1.5825	1.5472	1.5090
	30	1.6763	1.6673	1.6377	1.6065	1.5732	1.5376	1.4989
40	1.6146	1.6052	1.5741	1.5411	1.5056	1.4672	1.4248	
60	1.5534	1.5435	1.5107	1.4755	1.4373	1.3952	1.3476	
120	1.4926	1.4821	1.4472	1.4094	1.3676	1.3203	1.2646	
∞	1.4318	1.4206	1.3832	1.3419	1.2951	1.2400	1.1686	

I Critical Values of F (Area = 0.050)

		Numerator Degrees of Freedom								
		1	2	3	4	5	6	7	8	9
Denominator Degrees of Freedom	1	161.4476	199.5000	215.7073	224.5832	230.1619	233.9860	236.7684	238.8827	240.5433
	2	18.5128	19.0000	19.1643	19.2468	19.2964	19.3295	19.3532	19.3710	19.3848
	3	10.1280	9.5521	9.2766	9.1172	9.0135	8.9406	8.8867	8.8452	8.8123
	4	7.7086	6.9443	6.5914	6.3882	6.2561	6.1631	6.0942	6.0410	5.9988
	5	6.6079	5.7861	5.4095	5.1922	5.0503	4.9503	4.8759	4.8183	4.7725
	6	5.9874	5.1433	4.7571	4.5337	4.3874	4.2839	4.2067	4.1468	4.0990
	7	5.5914	4.7374	4.3468	4.1203	3.9715	3.8660	3.7870	3.7257	3.6767
	8	5.3177	4.4590	4.0662	3.8379	3.6875	3.5806	3.5005	3.4381	3.3881
	9	5.1174	4.2565	3.8625	3.6331	3.4817	3.3738	3.2927	3.2296	3.1789
	10	4.9646	4.1028	3.7083	3.4780	3.3258	3.2172	3.1355	3.0717	3.0204
	11	4.8443	3.9823	3.5874	3.3567	3.2039	3.0946	3.0123	2.9480	2.8962
	12	4.7472	3.8853	3.4903	3.2592	3.1059	2.9961	2.9134	2.8486	2.7964
	13	4.6672	3.8056	3.4105	3.1791	3.0254	2.9153	2.8321	2.7669	2.7144
	14	4.6001	3.7389	3.3439	3.1122	2.9582	2.8477	2.7642	2.6987	2.6458
	15	4.5431	3.6823	3.2874	3.0556	2.9013	2.7905	2.7066	2.6408	2.5876
	16	4.4940	3.6337	3.2389	3.0069	2.8524	2.7413	2.6572	2.5911	2.5377
	17	4.4513	3.5915	3.1968	2.9647	2.8100	2.6987	2.6143	2.5480	2.4943
	18	4.4139	3.5546	3.1599	2.9277	2.7729	2.6613	2.5767	2.5102	2.4563
	19	4.3807	3.5219	3.1274	2.8951	2.7401	2.6283	2.5435	2.4768	2.4227
	20	4.3512	3.4928	3.0984	2.8661	2.7109	2.5990	2.5140	2.4471	2.3928
	21	4.3248	3.4668	3.0725	2.8401	2.6848	2.5727	2.4876	2.4205	2.3660
	22	4.3009	3.4434	3.0491	2.8167	2.6613	2.5491	2.4638	2.3965	2.3419
	23	4.2793	3.4221	3.0280	2.7955	2.6400	2.5277	2.4422	2.3748	2.3201
	24	4.2597	3.4028	3.0088	2.7763	2.6207	2.5082	2.4226	2.3551	2.3002
	25	4.2417	3.3852	2.9912	2.7587	2.6030	2.4904	2.4047	2.3371	2.2821
	26	4.2252	3.3690	2.9752	2.7426	2.5868	2.4741	2.3883	2.3205	2.2655
	27	4.2100	3.3541	2.9604	2.7278	2.5719	2.4591	2.3732	2.3053	2.2501
	28	4.1960	3.3404	2.9467	2.7141	2.5581	2.4453	2.3593	2.2913	2.2360
29	4.1830	3.3277	2.9340	2.7014	2.5454	2.4324	2.3463	2.2783	2.2229	
30	4.1709	3.3158	2.9223	2.6896	2.5336	2.4205	2.3343	2.2662	2.2107	
40	4.0847	3.2317	2.8387	2.6060	2.4495	2.3359	2.2490	2.1802	2.1240	
60	4.0012	3.1504	2.7581	2.5252	2.3683	2.2541	2.1665	2.0970	2.0401	
120	3.9201	3.0718	2.6802	2.4472	2.2899	2.1750	2.0868	2.0164	1.9588	
∞	3.8415	2.9957	2.6049	2.3719	2.2141	2.0986	2.0096	1.9384	1.8799	

I Critical Values of F (Area = 0.050) (cont.)

		Numerator Degrees of Freedom								
		10	11	12	13	14	15	16	17	18
Denominator Degrees of Freedom	1	241.8817	242.9835	243.9060	244.6898	245.3640	245.9499	246.4639	246.9184	247.3232
	2	19.3959	19.4050	19.4125	19.4189	19.4244	19.4291	19.4333	19.4370	19.4402
	3	8.7855	8.7633	8.7446	8.7287	8.7149	8.7029	8.6923	8.6829	8.6745
	4	5.9644	5.9358	5.9117	5.8911	5.8733	5.8578	5.8441	5.8320	5.8211
	5	4.7351	4.7040	4.6777	4.6552	4.6358	4.6188	4.6038	4.5904	4.5785
	6	4.0600	4.0274	3.9999	3.9764	3.9559	3.9381	3.9223	3.9083	3.8957
	7	3.6365	3.6030	3.5747	3.5503	3.5292	3.5107	3.4944	3.4799	3.4669
	8	3.3472	3.3130	3.2839	3.2590	3.2374	3.2184	3.2016	3.1867	3.1733
	9	3.1373	3.1025	3.0729	3.0475	3.0255	3.0061	2.9890	2.9737	2.9600
	10	2.9782	2.9430	2.9130	2.8872	2.8647	2.8450	2.8276	2.8120	2.7980
	11	2.8536	2.8179	2.7876	2.7614	2.7386	2.7186	2.7009	2.6851	2.6709
	12	2.7534	2.7173	2.6866	2.6602	2.6371	2.6169	2.5989	2.5828	2.5684
	13	2.6710	2.6347	2.6037	2.5769	2.5536	2.5331	2.5149	2.4987	2.4841
	14	2.6022	2.5655	2.5342	2.5073	2.4837	2.4630	2.4446	2.4282	2.4134
	15	2.5437	2.5068	2.4753	2.4481	2.4244	2.4034	2.3849	2.3683	2.3533
	16	2.4935	2.4564	2.4247	2.3973	2.3733	2.3522	2.3335	2.3167	2.3016
	17	2.4499	2.4126	2.3807	2.3531	2.3290	2.3077	2.2888	2.2719	2.2567
	18	2.4117	2.3742	2.3421	2.3143	2.2900	2.2686	2.2496	2.2325	2.2172
	19	2.3779	2.3402	2.3080	2.2800	2.2556	2.2341	2.2149	2.1977	2.1823
	20	2.3479	2.3100	2.2776	2.2495	2.2250	2.2033	2.1840	2.1667	2.1511
	21	2.3210	2.2829	2.2504	2.2222	2.1975	2.1757	2.1563	2.1389	2.1232
	22	2.2967	2.2585	2.2258	2.1975	2.1727	2.1508	2.1313	2.1138	2.0980
	23	2.2747	2.2364	2.2036	2.1752	2.1502	2.1282	2.1086	2.0910	2.0751
	24	2.2547	2.2163	2.1834	2.1548	2.1298	2.1077	2.0880	2.0703	2.0543
	25	2.2365	2.1979	2.1649	2.1362	2.1111	2.0889	2.0691	2.0513	2.0353
	26	2.2197	2.1811	2.1479	2.1192	2.0939	2.0716	2.0518	2.0339	2.0178
	27	2.2043	2.1655	2.1323	2.1035	2.0781	2.0558	2.0358	2.0179	2.0017
	28	2.1900	2.1512	2.1179	2.0889	2.0635	2.0411	2.0210	2.0030	1.9868
	29	2.1768	2.1379	2.1045	2.0755	2.0500	2.0275	2.0073	1.9893	1.9730
	30	2.1646	2.1256	2.0921	2.0630	2.0374	2.0148	1.9946	1.9765	1.9601
40	2.0772	2.0376	2.0035	1.9738	1.9476	1.9245	1.9037	1.8851	1.8682	
60	1.9926	1.9522	1.9174	1.8870	1.8602	1.8364	1.8151	1.7959	1.7784	
120	1.9105	1.8693	1.8337	1.8026	1.7750	1.7505	1.7285	1.7085	1.6904	
∞	1.8307	1.7887	1.7522	1.7202	1.6918	1.6664	1.6435	1.6228	1.6039	

I Critical Values of F (Area = 0.050) (cont.)

		Numerator Degrees of Freedom						
		19	20	24	30	40	60	120
Denominator Degrees of Freedom	1	247.6861	248.0131	249.0518	250.0951	251.1432	252.1957	253.2529
	2	19.4431	19.4458	19.4541	19.4624	19.4707	19.4791	19.4874
	3	8.6670	8.6602	8.6385	8.6166	8.5944	8.5720	8.5494
	4	5.8114	5.8025	5.7744	5.7459	5.7170	5.6877	5.6581
	5	4.5678	4.5581	4.5272	4.4957	4.4638	4.4314	4.3985
	6	3.8844	3.8742	3.8415	3.8082	3.7743	3.7398	3.7047
	7	3.4551	3.4445	3.4105	3.3758	3.3404	3.3043	3.2674
	8	3.1613	3.1503	3.1152	3.0794	3.0428	3.0053	2.9669
	9	2.9477	2.9365	2.9005	2.8637	2.8259	2.7872	2.7475
	10	2.7854	2.7740	2.7372	2.6996	2.6609	2.6211	2.5801
	11	2.6581	2.6464	2.6090	2.5705	2.5309	2.4901	2.4480
	12	2.5554	2.5436	2.5055	2.4663	2.4259	2.3842	2.3410
	13	2.4709	2.4589	2.4202	2.3803	2.3392	2.2966	2.2524
	14	2.4000	2.3879	2.3487	2.3082	2.2664	2.2229	2.1778
	15	2.3398	2.3275	2.2878	2.2468	2.2043	2.1601	2.1141
	16	2.2880	2.2756	2.2354	2.1938	2.1507	2.1058	2.0589
	17	2.2429	2.2304	2.1898	2.1477	2.1040	2.0584	2.0107
	18	2.2033	2.1906	2.1497	2.1071	2.0629	2.0166	1.9681
	19	2.1683	2.1555	2.1141	2.0712	2.0264	1.9795	1.9302
	20	2.1370	2.1242	2.0825	2.0391	1.9938	1.9464	1.8963
	21	2.1090	2.0960	2.0540	2.0102	1.9645	1.9165	1.8657
	22	2.0837	2.0707	2.0283	1.9842	1.9380	1.8894	1.8380
	23	2.0608	2.0476	2.0050	1.9605	1.9139	1.8648	1.8128
	24	2.0399	2.0267	1.9838	1.9390	1.8920	1.8424	1.7896
	25	2.0207	2.0075	1.9643	1.9192	1.8718	1.8217	1.7684
	26	2.0032	1.9898	1.9464	1.9010	1.8533	1.8027	1.7488
	27	1.9870	1.9736	1.9299	1.8842	1.8361	1.7851	1.7306
	28	1.9720	1.9586	1.9147	1.8687	1.8203	1.7689	1.7138
	29	1.9581	1.9446	1.9005	1.8543	1.8055	1.7537	1.6981
	30	1.9452	1.9317	1.8874	1.8409	1.7918	1.7396	1.6835
40	1.8529	1.8389	1.7929	1.7444	1.6928	1.6373	1.5766	
60	1.7625	1.7480	1.7001	1.6491	1.5943	1.5343	1.4673	
120	1.6739	1.6587	1.6084	1.5543	1.4952	1.4290	1.3519	
∞	1.5865	1.5705	1.5173	1.4591	1.3940	1.3180	1.2214	

I Critical Values of F (Area = 0.025)

		Numerator Degrees of Freedom								
		1	2	3	4	5	6	7	8	9
Denominator Degrees of Freedom	1	647.7890	799.5000	864.1630	899.5833	921.8479	937.1111	948.2169	956.6562	963.2846
	2	38.5063	39.0000	39.1655	39.2484	39.2982	39.3315	39.3552	39.3730	39.3869
	3	17.4434	16.0441	15.4392	15.1010	14.8848	14.7347	14.6244	14.5399	14.4731
	4	12.2179	10.6491	9.9792	9.6045	9.3645	9.1973	9.0741	8.9796	8.9047
	5	10.0070	8.4336	7.7636	7.3879	7.1464	6.9777	6.8531	6.7572	6.6811
	6	8.8131	7.2599	6.5988	6.2272	5.9876	5.8198	5.6955	5.5996	5.5234
	7	8.0727	6.5415	5.8898	5.5226	5.2852	5.1186	4.9949	4.8993	4.8232
	8	7.5709	6.0595	5.4160	5.0526	4.8173	4.6517	4.5286	4.4333	4.3572
	9	7.2093	5.7147	5.0781	4.7181	4.4844	4.3197	4.1970	4.1020	4.0260
	10	6.9367	5.4564	4.8256	4.4683	4.2361	4.0721	3.9498	3.8549	3.7790
	11	6.7241	5.2559	4.6300	4.2751	4.0440	3.8807	3.7586	3.6638	3.5879
	12	6.5538	5.0959	4.4742	4.1212	3.8911	3.7283	3.6065	3.5118	3.4358
	13	6.4143	4.9653	4.3472	3.9959	3.7667	3.6043	3.4827	3.3880	3.3120
	14	6.2979	4.8567	4.2417	3.8919	3.6634	3.5014	3.3799	3.2853	3.2093
	15	6.1995	4.7650	4.1528	3.8043	3.5764	3.4147	3.2934	3.1987	3.1227
	16	6.1151	4.6867	4.0768	3.7294	3.5021	3.3406	3.2194	3.1248	3.0488
	17	6.0420	4.6189	4.0112	3.6648	3.4379	3.2767	3.1556	3.0610	2.9849
	18	5.9781	4.5597	3.9539	3.6083	3.3820	3.2209	3.0999	3.0053	2.9291
	19	5.9216	4.5075	3.9034	3.5587	3.3327	3.1718	3.0509	2.9563	2.8801
	20	5.8715	4.4613	3.8587	3.5147	3.2891	3.1283	3.0074	2.9128	2.8365
	21	5.8266	4.4199	3.8188	3.4754	3.2501	3.0895	2.9686	2.8740	2.7977
	22	5.7863	4.3828	3.7829	3.4401	3.2151	3.0546	2.9338	2.8392	2.7628
	23	5.7498	4.3492	3.7505	3.4083	3.1835	3.0232	2.9023	2.8077	2.7313
	24	5.7166	4.3187	3.7211	3.3794	3.1548	2.9946	2.8738	2.7791	2.7027
	25	5.6864	4.2909	3.6943	3.3530	3.1287	2.9685	2.8478	2.7531	2.6766
	26	5.6586	4.2655	3.6697	3.3289	3.1048	2.9447	2.8240	2.7293	2.6528
	27	5.6331	4.2421	3.6472	3.3067	3.0828	2.9228	2.8021	2.7074	2.6309
	28	5.6096	4.2205	3.6264	3.2863	3.0626	2.9027	2.7820	2.6872	2.6106
	29	5.5878	4.2006	3.6072	3.2674	3.0438	2.8840	2.7633	2.6686	2.5919
	30	5.5675	4.1821	3.5894	3.2499	3.0265	2.8667	2.7460	2.6513	2.5746
40	5.4239	4.0510	3.4633	3.1261	2.9037	2.7444	2.6238	2.5289	2.4519	
60	5.2856	3.9253	3.3425	3.0077	2.7863	2.6274	2.5068	2.4117	2.3344	
120	5.1523	3.8046	3.2269	2.8943	2.6740	2.5154	2.3948	2.2994	2.2217	
∞	5.0239	3.6889	3.1161	2.7858	2.5665	2.4082	2.2876	2.1918	2.1137	

I Critical Values of F (Area = 0.025) (cont.)

		Numerator Degrees of Freedom								
		10	11	12	13	14	15	16	17	18
Denominator Degrees of Freedom	1	968.6274	973.0252	976.7079	979.8368	982.5278	984.8668	986.9187	988.7331	990.3490
	2	39.3980	39.4071	39.4146	39.4210	39.4265	39.4313	39.4354	39.4391	39.4424
	3	14.4189	14.3742	14.3366	14.3045	14.2768	14.2527	14.2315	14.2127	14.1960
	4	8.8439	8.7935	8.7512	8.7150	8.6838	8.6565	8.6326	8.6113	8.5924
	5	6.6192	6.5678	6.5245	6.4876	6.4556	6.4277	6.4032	6.3814	6.3619
	6	5.4613	5.4098	5.3662	5.3290	5.2968	5.2687	5.2439	5.2218	5.2021
	7	4.7611	4.7095	4.6658	4.6285	4.5961	4.5678	4.5428	4.5206	4.5008
	8	4.2951	4.2434	4.1997	4.1622	4.1297	4.1012	4.0761	4.0538	4.0338
	9	3.9639	3.9121	3.8682	3.8306	3.7980	3.7694	3.7441	3.7216	3.7015
	10	3.7168	3.6649	3.6209	3.5832	3.5504	3.5217	3.4963	3.4737	3.4534
	11	3.5257	3.4737	3.4296	3.3917	3.3588	3.3299	3.3044	3.2816	3.2612
	12	3.3736	3.3215	3.2773	3.2393	3.2062	3.1772	3.1515	3.1286	3.1081
	13	3.2497	3.1975	3.1532	3.1150	3.0819	3.0527	3.0269	3.0039	2.9832
	14	3.1469	3.0946	3.0502	3.0119	2.9786	2.9493	2.9234	2.9003	2.8795
	15	3.0602	3.0078	2.9633	2.9249	2.8915	2.8621	2.8360	2.8128	2.7919
	16	2.9862	2.9337	2.8890	2.8506	2.8170	2.7875	2.7614	2.7380	2.7170
	17	2.9222	2.8696	2.8249	2.7863	2.7526	2.7230	2.6968	2.6733	2.6522
	18	2.8664	2.8137	2.7689	2.7302	2.6964	2.6667	2.6404	2.6168	2.5956
	19	2.8172	2.7645	2.7196	2.6808	2.6469	2.6171	2.5907	2.5670	2.5457
	20	2.7737	2.7209	2.6758	2.6369	2.6030	2.5731	2.5465	2.5228	2.5014
	21	2.7348	2.6819	2.6368	2.5978	2.5638	2.5338	2.5071	2.4833	2.4618
	22	2.6998	2.6469	2.6017	2.5626	2.5285	2.4984	2.4717	2.4478	2.4262
	23	2.6682	2.6152	2.5699	2.5308	2.4966	2.4665	2.4396	2.4157	2.3940
	24	2.6396	2.5865	2.5411	2.5019	2.4677	2.4374	2.4105	2.3865	2.3648
	25	2.6135	2.5603	2.5149	2.4756	2.4413	2.4110	2.3840	2.3599	2.3381
	26	2.5896	2.5363	2.4908	2.4515	2.4171	2.3867	2.3597	2.3355	2.3137
	27	2.5676	2.5143	2.4688	2.4293	2.3949	2.3644	2.3373	2.3131	2.2912
	28	2.5473	2.4940	2.4484	2.4089	2.3743	2.3438	2.3167	2.2924	2.2704
	29	2.5286	2.4752	2.4295	2.3900	2.3554	2.3248	2.2976	2.2732	2.2512
	30	2.5112	2.4577	2.4120	2.3724	2.3378	2.3072	2.2799	2.2554	2.2334
40	2.3882	2.3343	2.2882	2.2481	2.2130	2.1819	2.1542	2.1293	2.1068	
60	2.2702	2.2159	2.1692	2.1286	2.0929	2.0613	2.0330	2.0076	1.9846	
120	2.1570	2.1021	2.0548	2.0136	1.9773	1.9450	1.9161	1.8900	1.8663	
∞	2.0483	1.9927	1.9447	1.9028	1.8657	1.8326	1.8028	1.7760	1.7515	

I Critical Values of F (Area = 0.025) (cont.)

		Numerator Degrees of Freedom						
		19	20	24	30	40	60	120
Denominator Degrees of Freedom	1	991.7973	993.1028	997.2492	1001.4144	1005.5981	1009.8001	1014.0202
	2	39.4453	39.4479	39.4562	39.4646	39.4729	39.4812	39.4896
	3	14.1810	14.1674	14.1241	14.0805	14.0365	13.9921	13.9473
	4	8.5753	8.5599	8.5109	8.4613	8.4111	8.3604	8.3092
	5	6.3444	6.3286	6.2780	6.2269	6.1750	6.1225	6.0693
	6	5.1844	5.1684	5.1172	5.0652	5.0125	4.9589	4.9044
	7	4.4829	4.4667	4.4150	4.3624	4.3089	4.2544	4.1989
	8	4.0158	3.9995	3.9472	3.8940	3.8398	3.7844	3.7279
	9	3.6833	3.6669	3.6142	3.5604	3.5055	3.4493	3.3918
	10	3.4351	3.4185	3.3654	3.3110	3.2554	3.1984	3.1399
	11	3.2428	3.2261	3.1725	3.1176	3.0613	3.0035	2.9441
	12	3.0896	3.0728	3.0187	2.9633	2.9063	2.8478	2.7874
	13	2.9646	2.9477	2.8932	2.8372	2.7797	2.7204	2.6590
	14	2.8607	2.8437	2.7888	2.7324	2.6742	2.6142	2.5519
	15	2.7730	2.7559	2.7006	2.6437	2.5850	2.5242	2.4611
	16	2.6980	2.6808	2.6252	2.5678	2.5085	2.4471	2.3831
	17	2.6331	2.6158	2.5598	2.5020	2.4422	2.3801	2.3153
	18	2.5764	2.5590	2.5027	2.4445	2.3842	2.3214	2.2558
	19	2.5265	2.5089	2.4523	2.3937	2.3329	2.2696	2.2032
	20	2.4821	2.4645	2.4076	2.3486	2.2873	2.2234	2.1562
	21	2.4424	2.4247	2.3675	2.3082	2.2465	2.1819	2.1141
	22	2.4067	2.3890	2.3315	2.2718	2.2097	2.1446	2.0760
	23	2.3745	2.3567	2.2989	2.2389	2.1763	2.1107	2.0415
	24	2.3452	2.3273	2.2693	2.2090	2.1460	2.0799	2.0099
	25	2.3184	2.3005	2.2422	2.1816	2.1183	2.0516	1.9811
	26	2.2939	2.2759	2.2174	2.1565	2.0928	2.0257	1.9545
	27	2.2713	2.2533	2.1946	2.1334	2.0693	2.0018	1.9299
	28	2.2505	2.2324	2.1735	2.1121	2.0477	1.9797	1.9072
	29	2.2313	2.2131	2.1540	2.0923	2.0276	1.9591	1.8861
	30	2.2134	2.1952	2.1359	2.0739	2.0089	1.9400	1.8664
40	2.0864	2.0677	2.0069	1.9429	1.8752	1.8028	1.7242	
60	1.9636	1.9445	1.8817	1.8152	1.7440	1.6668	1.5810	
120	1.8447	1.8249	1.7597	1.6899	1.6141	1.5299	1.4327	
∞	1.7291	1.7085	1.6402	1.5660	1.4836	1.3883	1.2685	

I Critical Values of F (Area = 0.010)

		Numerator Degrees of Freedom								
		1	2	3	4	5	6	7	8	9
Denominator Degrees of Freedom	1	4052.1807	4999.5000	5403.3520	5624.5833	5763.6496	5858.9861	5928.3557	5981.0703	6022.4732
	2	98.5025	99.0000	99.1662	99.2494	99.2993	99.3326	99.3564	99.3742	99.3881
	3	34.1162	30.8165	29.4567	28.7099	28.2371	27.9107	27.6717	27.4892	27.3452
	4	21.1977	18.0000	16.6944	15.9770	15.5219	15.2069	14.9758	14.7989	14.6591
	5	16.2582	13.2739	12.0600	11.3919	10.9670	10.6723	10.4555	10.2893	10.1578
	6	13.7450	10.9248	9.7795	9.1483	8.7459	8.4661	8.2600	8.1017	7.9761
	7	12.2464	9.5466	8.4513	7.8466	7.4604	7.1914	6.9928	6.8400	6.7188
	8	11.2586	8.6491	7.5910	7.0061	6.6318	6.3707	6.1776	6.0289	5.9106
	9	10.5614	8.0215	6.9919	6.4221	6.0569	5.8018	5.6129	5.4671	5.3511
	10	10.0443	7.5594	6.5523	5.9943	5.6363	5.3858	5.2001	5.0567	4.9424
	11	9.6460	7.2057	6.2167	5.6683	5.3160	5.0692	4.8861	4.7445	4.6315
	12	9.3302	6.9266	5.9525	5.4120	5.0643	4.8206	4.6395	4.4994	4.3875
	13	9.0738	6.7010	5.7394	5.2053	4.8616	4.6204	4.4410	4.3021	4.1911
	14	8.8616	6.5149	5.5639	5.0354	4.6950	4.4558	4.2779	4.1399	4.0297
	15	8.6831	6.3589	5.4170	4.8932	4.5556	4.3183	4.1415	4.0045	3.8948
	16	8.5310	6.2262	5.2922	4.7726	4.4374	4.2016	4.0259	3.8896	3.7804
	17	8.3997	6.1121	5.1850	4.6690	4.3359	4.1015	3.9267	3.7910	3.6822
	18	8.2854	6.0129	5.0919	4.5790	4.2479	4.0146	3.8406	3.7054	3.5971
	19	8.1849	5.9259	5.0103	4.5003	4.1708	3.9386	3.7653	3.6305	3.5225
	20	8.0960	5.8489	4.9382	4.4307	4.1027	3.8714	3.6987	3.5644	3.4567
	21	8.0166	5.7804	4.8740	4.3688	4.0421	3.8117	3.6396	3.5056	3.3981
	22	7.9454	5.7190	4.8166	4.3134	3.9880	3.7583	3.5867	3.4530	3.3458
	23	7.8811	5.6637	4.7649	4.2636	3.9392	3.7102	3.5390	3.4057	3.2986
	24	7.8229	5.6136	4.7181	4.2184	3.8951	3.6667	3.4959	3.3629	3.2560
	25	7.7698	5.5680	4.6755	4.1774	3.8550	3.6272	3.4568	3.3239	3.2172
	26	7.7213	5.5263	4.6366	4.1400	3.8183	3.5911	3.4210	3.2884	3.1818
	27	7.6767	5.4881	4.6009	4.1056	3.7848	3.5580	3.3882	3.2558	3.1494
	28	7.6356	5.4529	4.5681	4.0740	3.7539	3.5276	3.3581	3.2259	3.1195
	29	7.5977	5.4204	4.5378	4.0449	3.7254	3.4995	3.3303	3.1982	3.0920
	30	7.5625	5.3903	4.5097	4.0179	3.6990	3.4735	3.3045	3.1726	3.0665
40	7.3141	5.1785	4.3126	3.8283	3.5138	3.2910	3.1238	2.9930	2.8876	
60	7.0771	4.9774	4.1259	3.6490	3.3389	3.1187	2.9530	2.8233	2.7185	
120	6.8509	4.7865	3.9491	3.4795	3.1735	2.9559	2.7918	2.6629	2.5586	
∞	6.6349	4.6052	3.7816	3.3192	3.0173	2.8020	2.6393	2.5113	2.4074	

I Critical Values of F (Area = 0.010) (cont.)

		Numerator Degrees of Freedom								
		10	11	12	13	14	15	16	17	18
Denominator Degrees of Freedom	1	6055.8467	6083.3168	6106.3207	6125.8647	6142.6740	6157.2846	6170.1012	6181.4348	6191.5287
	2	99.3992	99.4083	99.4159	99.4223	99.4278	99.4325	99.4367	99.4404	99.4436
	3	27.2287	27.1326	27.0518	26.9831	26.9238	26.8722	26.8269	26.7867	26.7509
	4	14.5459	14.4523	14.3736	14.3065	14.2486	14.1982	14.1539	14.1146	14.0795
	5	10.0510	9.9626	9.8883	9.8248	9.7700	9.7222	9.6802	9.6429	9.6096
	6	7.8741	7.7896	7.7183	7.6575	7.6049	7.5590	7.5186	7.4827	7.4507
	7	6.6201	6.5382	6.4691	6.4100	6.3590	6.3143	6.2750	6.2401	6.2089
	8	5.8143	5.7343	5.6667	5.6089	5.5589	5.5151	5.4766	5.4423	5.4116
	9	5.2565	5.1779	5.1114	5.0545	5.0052	4.9621	4.9240	4.8902	4.8599
	10	4.8491	4.7715	4.7059	4.6496	4.6008	4.5581	4.5204	4.4869	4.4569
	11	4.5393	4.4624	4.3974	4.3416	4.2932	4.2509	4.2134	4.1801	4.1503
	12	4.2961	4.2198	4.1553	4.0999	4.0518	4.0096	3.9724	3.9392	3.9095
	13	4.1003	4.0245	3.9603	3.9052	3.8573	3.8154	3.7783	3.7452	3.7156
	14	3.9394	3.8640	3.8001	3.7452	3.6975	3.6557	3.6187	3.5857	3.5561
	15	3.8049	3.7299	3.6662	3.6115	3.5639	3.5222	3.4852	3.4523	3.4228
	16	3.6909	3.6162	3.5527	3.4981	3.4506	3.4089	3.3720	3.3391	3.3096
	17	3.5931	3.5185	3.4552	3.4007	3.3533	3.3117	3.2748	3.2419	3.2124
	18	3.5082	3.4338	3.3706	3.3162	3.2689	3.2273	3.1904	3.1575	3.1280
	19	3.4338	3.3596	3.2965	3.2422	3.1949	3.1533	3.1165	3.0836	3.0541
	20	3.3682	3.2941	3.2311	3.1769	3.1296	3.0880	3.0512	3.0183	2.9887
	21	3.3098	3.2359	3.1730	3.1187	3.0715	3.0300	2.9931	2.9602	2.9306
	22	3.2576	3.1837	3.1209	3.0667	3.0195	2.9779	2.9411	2.9082	2.8786
	23	3.2106	3.1368	3.0740	3.0199	2.9727	2.9311	2.8943	2.8613	2.8317
	24	3.1681	3.0944	3.0316	2.9775	2.9303	2.8887	2.8519	2.8189	2.7892
	25	3.1294	3.0558	2.9931	2.9389	2.8917	2.8502	2.8133	2.7803	2.7506
	26	3.0941	3.0205	2.9578	2.9038	2.8566	2.8150	2.7781	2.7451	2.7153
	27	3.0618	2.9882	2.9256	2.8715	2.8243	2.7827	2.7458	2.7127	2.6830
	28	3.0320	2.9585	2.8959	2.8418	2.7946	2.7530	2.7160	2.6830	2.6532
	29	3.0045	2.9311	2.8685	2.8144	2.7672	2.7256	2.6886	2.6555	2.6257
	30	2.9791	2.9057	2.8431	2.7890	2.7418	2.7002	2.6632	2.6301	2.6003
40	2.8005	2.7274	2.6648	2.6107	2.5634	2.5216	2.4844	2.4511	2.4210	
60	2.6318	2.5587	2.4961	2.4419	2.3943	2.3523	2.3148	2.2811	2.2507	
120	2.4721	2.3990	2.3363	2.2818	2.2339	2.1915	2.1536	2.1194	2.0885	
∞	2.3209	2.2477	2.1848	2.1299	2.0815	2.0385	2.0000	1.9652	1.9336	

I Critical Values of F (Area = 0.010) (cont.)

		Numerator Degrees of Freedom						
		19	20	24	30	40	60	120
Denominator Degrees of Freedom	1	6200.5756	6208.7302	6234.6309	6260.6486	6286.7821	6313.0301	6339.3913
	2	99.4465	99.4492	99.4575	99.4658	99.4742	99.4825	99.4908
	3	26.7188	26.6898	26.5975	26.5045	26.4108	26.3164	26.2211
	4	14.0480	14.0196	13.9291	13.8377	13.7454	13.6522	13.5581
	5	9.5797	9.5526	9.4665	9.3793	9.2912	9.2020	9.1118
	6	7.4219	7.3958	7.3127	7.2285	7.1432	7.0567	6.9690
	7	6.1808	6.1554	6.0743	5.9920	5.9084	5.8236	5.7373
	8	5.3840	5.3591	5.2793	5.1981	5.1156	5.0316	4.9461
	9	4.8327	4.8080	4.7290	4.6486	4.5666	4.4831	4.3978
	10	4.4299	4.4054	4.3269	4.2469	4.1653	4.0819	3.9965
	11	4.1234	4.0990	4.0209	3.9411	3.8596	3.7761	3.6904
	12	3.8827	3.8584	3.7805	3.7008	3.6192	3.5355	3.4494
	13	3.6888	3.6646	3.5868	3.5070	3.4253	3.3413	3.2548
	14	3.5294	3.5052	3.4274	3.3476	3.2656	3.1813	3.0942
	15	3.3961	3.3719	3.2940	3.2141	3.1319	3.0471	2.9595
	16	3.2829	3.2587	3.1808	3.1007	3.0182	2.9330	2.8447
	17	3.1857	3.1615	3.0835	3.0032	2.9205	2.8348	2.7459
	18	3.1013	3.0771	2.9990	2.9185	2.8354	2.7493	2.6597
	19	3.0274	3.0031	2.9249	2.8442	2.7608	2.6742	2.5839
	20	2.9620	2.9377	2.8594	2.7785	2.6947	2.6077	2.5168
	21	2.9039	2.8796	2.8010	2.7200	2.6359	2.5484	2.4568
	22	2.8518	2.8274	2.7488	2.6675	2.5831	2.4951	2.4029
	23	2.8049	2.7805	2.7017	2.6202	2.5355	2.4471	2.3542
	24	2.7624	2.7380	2.6591	2.5773	2.4923	2.4035	2.3100
	25	2.7238	2.6993	2.6203	2.5383	2.4530	2.3637	2.2696
	26	2.6885	2.6640	2.5848	2.5026	2.4170	2.3273	2.2325
	27	2.6561	2.6316	2.5522	2.4699	2.3840	2.2938	2.1985
	28	2.6263	2.6017	2.5223	2.4397	2.3535	2.2629	2.1670
	29	2.5987	2.5742	2.4946	2.4118	2.3253	2.2344	2.1379
	30	2.5732	2.5487	2.4689	2.3860	2.2992	2.2079	2.1108
40	2.3937	2.3689	2.2880	2.2034	2.1142	2.0194	1.9172	
60	2.2230	2.1978	2.1154	2.0285	1.9360	1.8363	1.7263	
120	2.0604	2.0346	1.9500	1.8600	1.7628	1.6557	1.5330	
∞	1.9048	1.8783	1.7908	1.6964	1.5923	1.4730	1.3246	

I Critical Values of F (Area = 0.005)

		Numerator Degrees of Freedom								
		1	2	3	4	5	6	7	8	9
Denominator Degrees of Freedom	1	16210.7227	19999.5000	21614.7414	22499.5833	23055.7982	23437.1111	23714.5658	23925.4062	24091.0041
	2	198.5013	199.0000	199.1664	199.2497	199.2996	199.3330	199.3568	199.3746	199.3885
	3	55.5520	49.7993	47.4672	46.1946	45.3916	44.8385	44.4341	44.1256	43.8824
	4	31.3328	26.2843	24.2591	23.1545	22.4564	21.9746	21.6217	21.3520	21.1391
	5	22.7848	18.3138	16.5298	15.5561	14.9396	14.5133	14.2004	13.9610	13.7716
	6	18.6350	14.5441	12.9166	12.0275	11.4637	11.0730	10.7859	10.5658	10.3915
	7	16.2356	12.4040	10.8824	10.0505	9.5221	9.1553	8.8854	8.6781	8.5138
	8	14.6882	11.0424	9.5965	8.8051	8.3018	7.9520	7.6941	7.4959	7.3386
	9	13.6136	10.1067	8.7171	7.9559	7.4712	7.1339	6.8849	6.6933	6.5411
	10	12.8265	9.4270	8.0807	7.3428	6.8724	6.5446	6.3025	6.1159	5.9676
	11	12.2263	8.9122	7.6004	6.8809	6.4217	6.1016	5.8648	5.6821	5.5368
	12	11.7542	8.5096	7.2258	6.5211	6.0711	5.7570	5.5245	5.3451	5.2021
	13	11.3735	8.1865	6.9258	6.2335	5.7910	5.4819	5.2529	5.0761	4.9351
	14	11.0603	7.9216	6.6804	5.9984	5.5623	5.2574	5.0313	4.8566	4.7173
	15	10.7980	7.7008	6.4760	5.8029	5.3721	5.0708	4.8473	4.6744	4.5364
	16	10.5755	7.5138	6.3034	5.6378	5.2117	4.9134	4.6920	4.5207	4.3838
	17	10.3842	7.3536	6.1556	5.4967	5.0746	4.7789	4.5594	4.3894	4.2535
	18	10.2181	7.2148	6.0278	5.3746	4.9560	4.6627	4.4448	4.2759	4.1410
	19	10.0725	7.0935	5.9161	5.2681	4.8526	4.5614	4.3448	4.1770	4.0428
	20	9.9439	6.9865	5.8177	5.1743	4.7616	4.4721	4.2569	4.0900	3.9564
	21	9.8295	6.8914	5.7304	5.0911	4.6809	4.3931	4.1789	4.0128	3.8799
	22	9.7271	6.8064	5.6524	5.0168	4.6088	4.3225	4.1094	3.9440	3.8116
	23	9.6348	6.7300	5.5823	4.9500	4.5441	4.2591	4.0469	3.8822	3.7502
	24	9.5513	6.6609	5.5190	4.8898	4.4857	4.2019	3.9905	3.8264	3.6949
	25	9.4753	6.5982	5.4615	4.8351	4.4327	4.1500	3.9394	3.7758	3.6447
	26	9.4059	6.5409	5.4091	4.7852	4.3844	4.1027	3.8928	3.7297	3.5989
	27	9.3423	6.4885	5.3611	4.7396	4.3402	4.0594	3.8501	3.6875	3.5571
	28	9.2838	6.4403	5.3170	4.6977	4.2996	4.0197	3.8110	3.6487	3.5186
	29	9.2297	6.3958	5.2764	4.6591	4.2622	3.9831	3.7749	3.6131	3.4832
30	9.1797	6.3547	5.2388	4.6234	4.2276	3.9492	3.7416	3.5801	3.4505	
40	8.8279	6.0664	4.9758	4.3738	3.9860	3.7129	3.5088	3.3498	3.2220	
60	8.4946	5.7950	4.7290	4.1399	3.7599	3.4918	3.2911	3.1344	3.0083	
120	8.1788	5.5393	4.4972	3.9207	3.5482	3.2849	3.0874	2.9330	2.8083	
∞	7.8795	5.2983	4.2794	3.7151	3.3499	3.0913	2.8968	2.7444	2.6211	

I Critical Values of F (Area = 0.005) (cont.)

		Numerator Degrees of Freedom								
		10	11	12	13	14	15	16	17	18
Denominator Degrees of Freedom	1	24224.4868	24334.3581	24426.3662	24504.5356	24571.7673	24630.2051	24681.4673	24726.7982	24767.1704
	2	199.3996	199.4087	199.4163	199.4227	199.4282	199.4329	199.4371	199.4408	199.4440
	3	43.6858	43.5236	43.3874	43.2715	43.1716	43.0847	43.0083	42.9407	42.8804
	4	20.9667	20.8243	20.7047	20.6027	20.5148	20.4383	20.3710	20.3113	20.2581
	5	13.6182	13.4912	13.3845	13.2934	13.2148	13.1463	13.0861	13.0327	12.9850
	6	10.2500	10.1329	10.0343	9.9501	9.8774	9.8140	9.7582	9.7086	9.6644
	7	8.3803	8.2697	8.1764	8.0967	8.0279	7.9678	7.9148	7.8678	7.8258
	8	7.2106	7.1045	7.0149	6.9384	6.8721	6.8143	6.7633	6.7180	6.6775
	9	6.4172	6.3142	6.2274	6.1530	6.0887	6.0325	5.9829	5.9388	5.8994
	10	5.8467	5.7462	5.6613	5.5887	5.5257	5.4707	5.4221	5.3789	5.3403
	11	5.4183	5.3197	5.2363	5.1649	5.1031	5.0489	5.0011	4.9586	4.9205
	12	5.0855	4.9884	4.9062	4.8358	4.7748	4.7213	4.6741	4.6321	4.5945
	13	4.8199	4.7240	4.6429	4.5733	4.5129	4.4600	4.4132	4.3716	4.3344
	14	4.6034	4.5085	4.4281	4.3591	4.2993	4.2468	4.2005	4.1592	4.1221
	15	4.4235	4.3295	4.2497	4.1813	4.1219	4.0698	4.0237	3.9827	3.9459
	16	4.2719	4.1785	4.0994	4.0314	3.9723	3.9205	3.8747	3.8338	3.7972
	17	4.1424	4.0496	3.9709	3.9033	3.8445	3.7929	3.7473	3.7066	3.6701
	18	4.0305	3.9382	3.8599	3.7926	3.7341	3.6827	3.6373	3.5967	3.5603
	19	3.9329	3.8410	3.7631	3.6961	3.6378	3.5866	3.5412	3.5008	3.4645
	20	3.8470	3.7555	3.6779	3.6111	3.5530	3.5020	3.4568	3.4164	3.3802
	21	3.7709	3.6798	3.6024	3.5358	3.4779	3.4270	3.3818	3.3416	3.3054
	22	3.7030	3.6122	3.5350	3.4686	3.4108	3.3600	3.3150	3.2748	3.2387
	23	3.6420	3.5515	3.4745	3.4083	3.3506	3.2999	3.2549	3.2148	3.1787
	24	3.5870	3.4967	3.4199	3.3538	3.2962	3.2456	3.2007	3.1606	3.1246
	25	3.5370	3.4470	3.3704	3.3044	3.2469	3.1963	3.1515	3.1114	3.0754
	26	3.4916	3.4017	3.3252	3.2594	3.2020	3.1515	3.1067	3.0666	3.0306
	27	3.4499	3.3602	3.2839	3.2182	3.1608	3.1104	3.0656	3.0256	2.9896
	28	3.4117	3.3222	3.2460	3.1803	3.1231	3.0727	3.0279	2.9879	2.9520
	29	3.3765	3.2871	3.2110	3.1454	3.0882	3.0379	2.9932	2.9532	2.9173
	30	3.3440	3.2547	3.1787	3.1132	3.0560	3.0057	2.9611	2.9211	2.8852
40	3.1167	3.0284	2.9531	2.8880	2.8312	2.7811	2.7365	2.6966	2.6607	
60	2.9042	2.8166	2.7419	2.6771	2.6205	2.5705	2.5259	2.4859	2.4498	
120	2.7052	2.6183	2.5439	2.4794	2.4228	2.3727	2.3280	2.2878	2.2514	
∞	2.5188	2.4325	2.3583	2.2938	2.2371	2.1868	2.1417	2.1011	2.0643	

I Critical Values of F (Area = 0.005) (cont.)

		Numerator Degrees of Freedom						
		19	20	24	30	40	60	120
Denominator Degrees of Freedom	1	24803.3549	24835.9709	24939.5653	25043.6277	25148.1532	25253.1369	25358.5735
	2	199.4470	199.4496	199.4579	199.4663	199.4746	199.4829	199.4912
	3	42.8263	42.7775	42.6222	42.4658	42.3082	42.1494	41.9895
	4	20.2104	20.1673	20.0300	19.8915	19.7518	19.6107	19.4684
	5	12.9422	12.9035	12.7802	12.6556	12.5297	12.4024	12.2737
	6	9.6247	9.5888	9.4742	9.3582	9.2408	9.1219	9.0015
	7	7.7881	7.7540	7.6450	7.5345	7.4224	7.3088	7.1933
	8	6.6411	6.6082	6.5029	6.3961	6.2875	6.1772	6.0649
	9	5.8639	5.8318	5.7292	5.6248	5.5186	5.4104	5.3001
	10	5.3055	5.2740	5.1732	5.0706	4.9659	4.8592	4.7501
	11	4.8863	4.8552	4.7557	4.6543	4.5508	4.4450	4.3367
	12	4.5606	4.5299	4.4314	4.3309	4.2282	4.1229	4.0149
	13	4.3008	4.2703	4.1726	4.0727	3.9704	3.8655	3.7577
	14	4.0888	4.0585	3.9614	3.8619	3.7600	3.6552	3.5473
	15	3.9127	3.8826	3.7859	3.6867	3.5850	3.4803	3.3722
	16	3.7641	3.7342	3.6378	3.5389	3.4372	3.3324	3.2240
	17	3.6372	3.6073	3.5112	3.4124	3.3108	3.2058	3.0971
	18	3.5275	3.4977	3.4017	3.3030	3.2014	3.0962	2.9871
	19	3.4318	3.4020	3.3062	3.2075	3.1058	3.0004	2.8908
	20	3.3475	3.3178	3.2220	3.1234	3.0215	2.9159	2.8058
	21	3.2728	3.2431	3.1474	3.0488	2.9467	2.8408	2.7302
	22	3.2060	3.1764	3.0807	2.9821	2.8799	2.7736	2.6625
	23	3.1461	3.1165	3.0208	2.9221	2.8197	2.7132	2.6015
	24	3.0920	3.0624	2.9667	2.8679	2.7654	2.6585	2.5463
	25	3.0429	3.0133	2.9176	2.8187	2.7160	2.6088	2.4961
	26	2.9981	2.9685	2.8728	2.7738	2.6709	2.5633	2.4501
	27	2.9571	2.9275	2.8318	2.7327	2.6296	2.5217	2.4079
	28	2.9194	2.8899	2.7941	2.6949	2.5916	2.4834	2.3690
	29	2.8847	2.8551	2.7594	2.6600	2.5565	2.4479	2.3331
	30	2.8526	2.8230	2.7272	2.6278	2.5241	2.4151	2.2998
40	2.6281	2.5984	2.5020	2.4015	2.2958	2.1838	2.0636	
60	2.4171	2.3872	2.2898	2.1874	2.0789	1.9622	1.8341	
120	2.2183	2.1881	2.0890	1.9840	1.8709	1.7469	1.6055	
∞	2.0307	1.9999	1.8983	1.7891	1.6692	1.5326	1.3638	

J Critical Values of the Pearson Correlation Coefficient

n	$\alpha = 0.05$	$\alpha = 0.01$
4	0.950	0.990
5	0.878	0.959
6	0.811	0.917
7	0.754	0.875
8	0.707	0.834
9	0.666	0.798
10	0.632	0.765
11	0.602	0.735
12	0.576	0.708
13	0.553	0.684
14	0.532	0.661
15	0.514	0.641
16	0.497	0.623
17	0.482	0.606
18	0.468	0.590
19	0.456	0.575
20	0.444	0.561
21	0.433	0.549
22	0.423	0.537
23	0.413	0.526
24	0.404	0.515
25	0.396	0.505
26	0.388	0.496
27	0.381	0.487
28	0.374	0.479
29	0.367	0.471
30	0.361	0.463
35	0.334	0.430
40	0.312	0.403
45	0.294	0.380
50	0.279	0.361
55	0.266	0.345
60	0.254	0.330
65	0.244	0.317
70	0.235	0.306
75	0.227	0.296
80	0.220	0.286
85	0.213	0.278
90	0.207	0.270
95	0.202	0.268
100	0.197	0.256

Note: r is statistically significant if $|r|$ is greater than or equal to the value given in the table.