UNIVERSIDAD ORT
Uruguay

Facultad de Ingeniería
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PROBABILIDAD Y ESTADÍSTICA APLICADA

TABLAS Y FÓRMULAS DEL CURSO DE LA

Licenciatura en Sistemas

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Cátedra de Matemáticas

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UNIVERSIDAD ORT URUGUAY
LICENCIATURA EN SISTEMAS

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TABLAS Y FÓRMULAS DEL CURSO

FÓRMULAS USUALES

MEDIDAS DE POSICIÓN

Media aritmética

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n} \qquad \bar{X} = \frac{\sum_{i=1}^{m} X_i n_i}{n} = \sum_{i=1}^{m} X_i h_i$$

Propiedades

$$y_i = x_i + q \;\rightarrow\; \bar{y} = \bar{x} + q \qquad y_i = k x_i \;\rightarrow\; \bar{y} = k\bar{x}$$

$$\sum (x_i - \bar{x}) = 0 \qquad \overline{x + y} = \bar{x} + \bar{y}$$

$$\sum (x_i - \bar{x})^2 \le \sum (x_i - O_i)^2 \qquad \bar{\bar{x}} = \frac{\sum \bar{x}_i n_i}{\sum n_i}$$

Media geométrica

$$m_g = \sqrt[n]{x_1 \cdot x_2 \cdot \ldots \cdot x_n} = \sqrt[n]{\prod_{i=1}^{n} x_i}$$

$$M_g = \sqrt[n]{X_1^{n_1} \cdot X_2^{n_2} \cdot \ldots \cdot X_m^{n_m}} = \sqrt[n]{\prod_{i=1}^{m} X_i^{n_i}} \qquad \lg M_g = \frac{\sum_{i=1}^{m} n_i \lg X_i}{n} = \sum_{i=1}^{m} h_i \lg X_i$$

Media armónica

$$m_h = \frac{n}{\frac{1}{x_1} + \frac{1}{x_2} + \ldots + \frac{1}{x_n}} = \frac{n}{\sum \frac{1}{x_i}} \qquad M_h = \frac{n}{\sum_{i=1}^{m} \frac{n_i}{x_i}}$$

Mediana (datos simples)

$$Me = x_{\frac{n+1}{2}} \quad si \quad n = impar \qquad Me = \left(\frac{x_{\frac{n}{2}} + x_{\frac{n}{2}+1}}{2} \right) \quad si \quad n = par$$

Cuantiles

Variable discreta:

$$P_s^r = X_i \quad si \quad N_{i-1} < \frac{r}{s} n < N_i \quad o \quad H_{i-1} < \frac{r}{s} < H_i$$

$$P_s^r = \frac{X_{i-1} + X_i}{2} \quad si \quad N_{i-1} = \frac{r}{s} n \quad o \quad H_{i-1} = \frac{r}{s}$$

Variable continua

$$P_s^r = X'_{i-1} + c_i \frac{\frac{r}{s} n - N_{i-1}}{n_i} = X'_{i-1} + c_i \frac{\frac{r}{s} - H_{i-1}}{h_i}$$

Moda

$$M_d = X_i \quad si \quad n_{i-1} < n_i \quad y \quad n_i > n_{i+1}$$

MEDIDAS DE DISPERSION

Varianza

$$s^2 = \frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n} = \frac{\sum_{i=1}^{n} x_i^2}{n} - \bar{x}^2$$

$$S^2 = \frac{\sum_{i=1}^{m}(X_i - \bar{X})^2 n_i}{n} = \frac{\sum_{i=1}^{m} X_i^2 n_i}{n} - \bar{X}^2$$

$$= \sum_{i=1}^{m}(X_i - \bar{X})^2 h_i = \sum_{i=1}^{m} X_i^2 h_i - \bar{X}^2$$

Propiedades

$$y_i = x_i + q \quad \rightarrow \quad S_y^2 = S_x^2 \qquad\qquad y_i = k x_i \quad \rightarrow \quad S_y^2 = k^2 S_x^2$$

$$S_{x \pm y}^2 = S_x^2 + S_y^2 \pm 2S_{xy}$$

Coeficiente de Variación

$$CV = \frac{s}{\bar{x}}$$

Covarianza

$$s_{xy} = \frac{\sum_{i} x_i y_i}{n} - \bar{x}\bar{y} \qquad\qquad \hat{\sigma}_{xy} = \frac{\sum_{i} x_i y_i - n\bar{x}\bar{y}}{n-1}$$

INDICE DE GINI

$$IG = 1 - \sum_{i=1}^{m}(H'_{i-1} + H'_i)h_i \quad con: \quad H'_i = \frac{\sum_{i=1}^{i} X_i n_i}{\sum_{i=1}^{m} X_i n_i}$$

NÚMEROS ÍNDICE

Índices simples o relativos

$$p_{i\,0}^{\,t} = \frac{p_{it}}{p_{i0}} \qquad q_{i\,0}^{\,t} = \frac{q_{it}}{q_{i0}} \qquad v_{i\,0}^{\,t} = \frac{p_{it} \cdot q_{it}}{p_{i0} \cdot q_{i0}}$$

Cambio porcentual

$$\Delta_r^t = \left(\frac{I_0^t}{I_0^r} - 1 \right)$$

Tasa media de variación

$$i_r^t = \sqrt[t-r]{\frac{I_0^t}{I_0^r}} - 1$$

Índices ponderados

INDICE	PRECIOS	CANTIDADES
LASPEYRES	$_{l}P_0^t = \dfrac{\sum p_t q_0}{\sum p_0 q_0}$	$_{l}Q_0^t = \dfrac{\sum p_0 q_t}{\sum p_0 q_0}$
PAASCHE	$_{P}P_0^t = \dfrac{\sum p_t q_t}{\sum p_0 q_t}$	$_{P}Q_0^t = \dfrac{\sum p_t q_t}{\sum p_t q_0}$

VALOR GLOBAL
$V_0^t = \dfrac{\sum p_t q_t}{\sum p_0 q_0}$

PROBABILIDADES

Probabilidad del suceso unión

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

En general:

$$P\left(\bigcup_{i=1}^{n} A_i\right) = \sum_{i=1}^{n} P(A_i) - \sum_{1 \le i < j \le n} P(A_i \cap A_j) + \sum_{1 \le i < j < k \le n} P(A_i \cap A_j \cap A_k) - \ldots + (-1)^n P\left(\bigcap_{i=1}^{n} A_i\right)$$

Probabilidad condicional e independencia de sucesos

$$\left.\begin{aligned} P(A/B) &= \frac{P(A \cap B)}{P(B)} \\ P(B/A) &= \frac{P(A \cap B)}{P(A)} \end{aligned}\right| \qquad \begin{aligned} P(A \cap B) &= P(B) \cdot P(A/B) \\ &= P(A) \cdot P(B/A) \end{aligned}$$

Si A y B son independientes $\quad P(A/B) = P(A) \quad y \quad P(B/A) = P(B)$

Independencia completa de sucesos

$$P\left(\bigcap_{i=1}^{n} A_{i_j}\right) = \prod_{i_1}^{i_m} P\left(A_{i_j}\right) \quad \text{con } 2 \le m \le n \quad \text{y} \quad 1 \le i_1 < i_2 < \ldots < i_m = n$$

Teorema de la probabilidad total

$$P(A) = \sum_{H_i \subseteq \Omega} P(H_i) \cdot P(A/H_i)$$

Teorema de Bayes

$$P(H_i/A) = \frac{P(H_i) \cdot P(A/H_i)}{\sum_{H_i \subseteq \Omega} P(H_i) \cdot P(A/H_i)}$$

ALGUNAS FUNCIONES DE PROBABILIDAD DE VARIABLE DISCRETA

Bernoulli

$$X \sim b(p) \;\rightarrow\; E[X]=p \;\;;\;\; V(X)=pq=p(1-p)$$

Binomial

$$X \sim B(n\,;\,p) \;\rightarrow\; E[X]=np \;\;;\;\; V(X)=npq=np(1-p)$$

$$\Pr(X=r)=C_r^n\, p^r q^{n-r} \quad \text{con} \quad 0\le r\le n$$

Hipergeométrica

$$X \sim H(N\,;n\,;p) \;\rightarrow\; E[X]=np \;\;;\;\; V(X)=npq\left[\frac{N-n}{N-1}\right]$$

$$\Pr(X=r)=\frac{C_r^a \cdot C_{n-r}^b}{C_n^N} \quad \text{con } 0\le r\le n\le a \quad \text{y} \quad a+b=N$$

Poisson (Caso B con n $\rightarrow\infty$ y p $\rightarrow$ 0)

$$X \sim P(\lambda) \;\rightarrow\; E[X]=V(X)=\lambda$$

$$\Pr(X=r)=\frac{e^{-\lambda}\,\lambda^r}{r!} \quad \text{con} \quad r\in \mathbb{I} \;\wedge\; 0\le r\le\infty$$

ALGUNAS FUNCIONES DE PROBABILIDAD DE VARIABLE CONTINUA

Normal

$$X \sim N\left(E[X]=\mu\,;V(X)=\sigma^2\right) \;\rightarrow\; z=\frac{x-\mu}{\sigma}\sim N(0\,;1)$$

$$f(x)=\frac{1}{\sigma\sqrt{2\pi}}\,e^{-\frac{1}{2}\frac{(x-\mu)^2}{\sigma^2}} \qquad (x\in\mathbb{R}) \qquad\qquad f(z)=\frac{1}{\sqrt{2\pi}}\,e^{-\frac{z^2}{2}} \qquad (z\in\mathbb{R})$$

Ji - cuadrado (χ^2)

$$f(x)=\frac{x^{\left(\frac{\nu}{2}-1\right)}\,e^{-\frac{x}{2}}}{2^{\frac{\nu}{2}}\,\Gamma\left(\frac{\nu}{2}\right)} \qquad \left(x\in\mathbb{R}^+\right) \;\rightarrow\; E[X]=\nu \;\;;\;\; V(X)=2\nu$$

con $\frac{\nu}{2}>0$ $\qquad \Gamma\left(\frac{\nu}{2}\right)=\left(\frac{\nu}{2}-1\right)\left(\frac{\nu}{2}-2\right)\ldots\partial\Gamma(\delta)$ $\qquad$ si $\frac{\nu}{2}=$ entero, $\Gamma\left(\frac{\nu}{2}\right)=\left(\frac{\nu}{2}-1\right)!$

y si $\frac{\nu}{2}=\frac{1}{2}$ $\qquad \Gamma\left(\frac{\nu}{2}\right)=\sqrt{\pi}$

$$\text{Para } \nu>30 \quad \chi^2 \underset{Ap.}{\sim} N(\nu\,;2\nu)$$

't' de Student

Sea $t = \dfrac{X}{\sqrt{\dfrac{Y}{\nu}}}$, con $X \sim N(0;1)$, $Y \sim \chi^2(\nu)$ y X independiente de Y:

$$f(t) = \frac{\Gamma\left(\frac{\nu+1}{2}\right)}{\Gamma\left(\frac{\nu}{2}\right)\sqrt{\pi\nu}}\left(1+\frac{t^2}{\nu}\right)^{-\frac{\nu+1}{2}} \qquad (t \in \mathbb{R}) \qquad\qquad E[X]=0 \;\; ; \;\; V(X)=\frac{\nu}{\nu-2}$$

$$\text{Para } \nu > 30 \quad t \underset{Ap}{\sim} N(0;1)$$

DISTRIBUCIONES EN EL MUESTREO

Muestras grandes o σ conocida

De la media aritmética

$$\bar{x} \sim N\left(\mu ; \frac{\sigma^2}{n}\right) \rightarrow z = \frac{\bar{x}-\mu}{\frac{\sigma}{\sqrt{n}}} \sim N(0;1)$$

Del contraste de dos medias (muestras de poblaciones independientes)

$$\bar{x}-\bar{y} \sim N\left(\mu_X-\mu_Y ; \frac{\sigma_X^2}{n_X}+\frac{\sigma_Y^2}{n_Y}\right) \rightarrow z = \frac{(\bar{x}-\bar{y})-(\mu_X-\mu_Y)}{\sqrt{\frac{\sigma_X^2}{n_X}+\frac{\sigma_Y^2}{n_Y}}} \sim N(0;1)$$

De las proporciones

$$p \underset{Ap}{\sim} N\left(P ; \frac{PQ}{n}\right) \rightarrow z = \frac{p-P}{\sqrt{\frac{PQ}{n}}} \underset{Ap}{\sim} N(0;1)$$

Intervalo de confianza para P

$$L_i^s = \frac{p+\frac{z^2}{2n} \pm z\sqrt{\frac{pq}{n}+\frac{z^2}{4n^2}}}{1+\frac{z^2}{n}}$$

Del contraste de proporciones

$$p_1-p_2 \underset{Ap}{\sim} N\left(P_1-P_2 ; \frac{P_1Q_1}{n_1}+\frac{P_2Q_2}{n_2}\right) \rightarrow z = \frac{(p_1-p_2)-(P_1-P_2)}{\sqrt{\frac{P_1Q_1}{n_1}+\frac{P_2Q_2}{n_2}}} \underset{Ap}{\sim} N(0;1)$$

Si $P_1 = P_2$ pero desconocidos:

$$\hat{P} = \frac{p_1n_1+p_2n_2}{n_1+n_2} \rightarrow z = \frac{p_1-p_2}{\sqrt{\hat{P}\hat{Q}\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}} \underset{Ap}{\sim} N(0;1)$$

Muestras chicas y σ estimada (Poblaciones con distribución Nomal)

De la media aritmética:

$$\bar{x} \sim N\left(\mu ; \frac{\sigma^2}{n}\right) \rightarrow t = \frac{\bar{x} - \mu}{\frac{\hat{\sigma}}{\sqrt{n}}} \sim t_{n-1} \quad ; \quad \hat{\sigma}^2 = s^2 \frac{n}{n-1} = \frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n-1}$$

Del contraste de dos medias (muestras de poblaciones independientes y σ_i^2 homogéneas)

$$t = \frac{(\bar{x} - \bar{y}) - (\mu_x - \mu_y)}{\sqrt{\frac{\sum (x_i - \bar{x})^2 + \sum (y_i - \bar{y})^2}{n_x + n_y - 2} \left(\frac{1}{n_x} + \frac{1}{n_y}\right)}} \sim t_{n_x + n_y - 2}$$

según los datos disponibles se puede sustituir $\sum (x_i - \bar{x})^2 + \sum (y_i - \bar{y})^2$ por $n_x s_x^2 + n_y s_y^2$ o bien por $\nu_x \sigma_x^2 + \nu_y \sigma_y^2$ con $\nu_x = n_x - 1$ y $\nu_y = n_y - 1$.

Del contraste de dos medias (observaciones apareadas)

$$\bar{d} \sim N\left(\mu_d ; \frac{\sigma_d^2}{n}\right) \rightarrow t = \frac{\bar{d} - \mu_d}{\frac{\hat{\sigma}_d}{\sqrt{n}}} \sim t_{n-1}$$

Ajuste a modelos y cuadros de contingencia r x k -criterio χ^2 de Pearson-

$$U = \sum_{i=1}^{m} \frac{(n_i - n_i^*)^2}{n_i^*} = \sum_{i=1}^{m} \frac{n_i^2}{n_i^*} - n \underset{Ap.}{\sim} \chi^2_{(m-1-n^{\circ}\ parámetros\ estimados)}$$

$$U = \sum_{i=1}^{r} \sum_{j=1}^{k} \frac{(n_{ij} - n_{ij}^*)^2}{n_{ij}^*} = \sum_{i=1}^{r} \sum_{j=1}^{k} \frac{n_{ij}^2}{n_{ij}^*} - n \underset{Ap.}{\sim} \chi^2_{[(r-1)(k-1)]}$$

$$n_{ij}^* = \frac{n_{i.}\, n_{.j}}{n} \quad ; \quad n_{i.} = \sum_{j=1}^{k} n_{ij} \quad ; \quad n_{.j} = \sum_{i=1}^{r} n_{ij}$$

Si χ^2 resulta con 1 GL, se aplica la corrección por continuidad de Yates:

$$\left.\begin{aligned} U_0 &= \sum_{i=1}^{m} \frac{\left(|n_i - n_i^*| - \frac{1}{2}\right)^2}{n_i^*} \\ U_0 &= \sum_{i=1}^{2} \sum_{j=1}^{2} \frac{\left(|n_{ij} - n_{ij}^*| - \frac{1}{2}\right)^2}{n_{ij}^*} \end{aligned}\right\} \quad U_0 \underset{Ap.}{\sim} \chi^2_{(1)}$$

CORRELACIÓN Y MODELOS LINEALES

Coeficiente de correlación rectilínea

Datos simples:

$$r = \frac{s_{xy}}{s_x s_y} = \frac{\hat{\sigma}_{xy}}{\hat{\sigma}_x \hat{\sigma}_y} = \frac{\sum x_i y_i - n\bar{x}\bar{y}}{\sqrt{\left(\sum x_i^2 - n\bar{x}^2\right)\left(\sum y_i^2 - n\bar{y}^2\right)}}$$

$$r = \frac{\sum x_i y_i - \dfrac{\left(\sum x_i\right)\left(\sum y_i\right)}{n}}{\sqrt{\left[\sum x_i^2 - \dfrac{\left(\sum x_i\right)^2}{n}\right]\left[\sum y_i^2 - \dfrac{\left(\sum y_i\right)^2}{n}\right]}}$$

Datos agrupados:

$$R = \frac{\sum_{i}\sum_{j} X_i Y_j n_{ij} - n\bar{X}\bar{Y}}{\sqrt{\left(\sum_{i} X_i^2 n_{i\cdot} - n\bar{X}^2\right)\left(\sum_{j} Y_j^2 n_{\cdot j} - n\bar{Y}^2\right)}}$$

$$= \frac{\sum_{i}\sum_{j} X_i Y_j n_{ij} - \dfrac{\left(\sum_{i} X_i n_{i\cdot}\right)\left(\sum_{j} Y_j n_{\cdot j}\right)}{n}}{\sqrt{\left[\sum_{i} X_i^2 n_{i\cdot} - \dfrac{\left(\sum_{i} X_i n_{i\cdot}\right)^2}{n}\right]\left[\sum_{j} Y_j^2 n_{\cdot j} - \dfrac{\left(\sum_{j} Y_j n_{\cdot j}\right)^2}{n}\right]}}$$

Transformaciones de r y distribución

Si $\rho = 0$: $\quad t = r\sqrt{\dfrac{n-2}{1-r^2}} \sim t_{n-2}$

Cualquier $-1 < \rho < 1$:

$$Z_r = \frac{1}{2}\ln\left(\frac{1+r}{1-r}\right) \rightarrow \left\{\mu_{Z_r} = \frac{1}{2}\ln\left(\frac{1+\rho}{1-\rho}\right); \sigma_{Z_r}^2 = \frac{1}{n-3}\right\} \rightarrow Z \sim N\left(\mu_{Z_r}; \sigma_{Z_r}^2\right)$$

Regresión rectilínea sobre una variable, ecuaciones normales

$$\hat{y}_i = a + bx_i \rightarrow \begin{matrix} an + b\sum x_i = \sum y_i \\ a\sum x_i + b\sum x_i^2 = \sum x_i y_i \end{matrix} \rightarrow \begin{cases} b = \dfrac{\sum x_i y_i - n\bar{x}\bar{y}}{\sum x_i^2 - n\bar{x}^2} \\ a = \bar{y} - b\bar{x} \end{cases}$$

Parábola de segundo grado, ecuaciones normales

$$\hat{y}_i = a + b x_i + c x_i^2 \rightarrow \begin{cases} \sum y_i = c\sum x_i^2 + b\sum x_i + na \\ \sum x_i y_i = c\sum x_i^3 + b\sum x_i^2 + a\sum x_i \\ \sum x_i^2 y_i = c\sum x_i^4 + b\sum x_i^3 + a\sum x_i^2 \end{cases}$$

Exponencial, transformación, ecuaciones normales

$$\hat{y}_i = ab^{x_i} \rightarrow \log \hat{y}_i = x_i \log b + \log a \rightarrow \begin{matrix} n\log a + \log b \sum x_i = \sum \log y_i \\ \log a \sum x_i + \log b \sum x_i^2 = \sum x_i \log y_i \end{matrix}$$

Aplicación a series cronológicas. Sistemas reducidos para aislar la tendencia

Sea $x_i = x_i - \bar{x}$ de modo que $\sum x_i = 0$.

Ajuste rectilíneo

$$\hat{y}_i = a + b x_i \rightarrow \begin{cases} b = \dfrac{\sum x_i y_i}{\sum x_i^2} \\ a = \bar{y} \end{cases}$$

Coeficiente de correlación rectilínea

$$r = \frac{\sum x_i y_i}{\sqrt{\left(\sum x_i^2\right)\left(\sum y_i^2 - n\bar{y}^2\right)}}$$

Ajuste parabólico de segundo grado, ecuaciones normales

$$\hat{y}_i = a + b x_i + c x_i^2 \rightarrow \begin{vmatrix} \sum y_i = c\sum x_i^2 + na \\ \sum x_i y_i = b\sum x_i^2 \\ \sum x_i^2 y_i = c\sum x_i^4 + a\sum x_i^2 \end{vmatrix}$$

Coeficiente de determinación

$$r^2 = 1 - \frac{\sum\left(y_i - \hat{y}_i\right)^2}{\sum\left(y_i - \bar{y}\right)^2}$$

Ajuste exponencial

$$\hat{y}_i = a b^{x_i} \rightarrow \log \hat{y}_i = \log a + x_i \log b \rightarrow \begin{cases} \log b = \dfrac{\sum x_i \log y_i}{\sum x_i^2} \\ \log a = \dfrac{\sum \log x_i}{n} \end{cases}$$

Coeficiente de correlación

$$r = \frac{\sum x_i \log y_i}{\sqrt{\left(\sum x_i^2\right)\left[\sum\left(\log y_i\right)^2 - n\left(\dfrac{\sum \log y_i}{n}\right)^2\right]}}$$

ANÁLISIS DE LA VARIANZA

En muestreo, o diseño de experimentos.

Modelo de clasificación en un sentido (m. a. s.; d. c. a.)

Modelo matemático:

$$Y_{ij} = \mu_i + e_{ij} = \mu + \tau_i + e_{ij} \quad \text{con} \quad e_{ij} \sim N.I.D.\left(0;\sigma^2\right) \quad 1 \le i \le t \quad ; \quad 1 \le j \le n_i$$

Fuente de variación	ν (GL)	S.C.	C.M.	F_0
T O T A L	t n - 1	$SC = \sum_{i=1}^{t}\sum_{j=1}^{n} y_{ij}^2 - \not{C}$		
Entre grupos (tratamientos)	$\nu_T = t - 1$	$SCT = \frac{1}{n}\sum_{i=1}^{t} Y_{i\cdot}^2 - \not{C}$	$CMT = SCT/\nu_T$	CMT/CMe
Dentro de grupos (error experimental)	$\nu_e = t(n-1)$	$SCe = SC - SCT$	$CMe = SCe/\nu_e$	

$$\not{C} = \frac{Y_{\cdot\cdot}^2}{tn} \quad \text{y} \quad Y_{\cdot\cdot} = \sum_i \sum_j y_{ij}$$

Si el número de repeticiones -observaciones en cada grupo o tratamiento- es diferente:

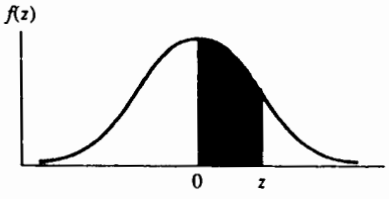
$$SCT = \sum_{i=1}^{t} \frac{Y_{i\cdot}^2}{n_i} - \not{C} \quad ; \quad \nu_e = \sum_i (n_i - 1) \quad ; \quad \nu_{total} = \sum_i n_i - 1$$

ESTADISTICAS PARA CONTRASTES MÚLTIPLES

Simples

<u>*Tukey*</u> $\left[q_{(t;\nu_e)}\right]$ $\qquad \Delta = q_{(t;\nu_e)}\sqrt{\frac{CMe}{n}}$

1. Áreas bajo la curva normal

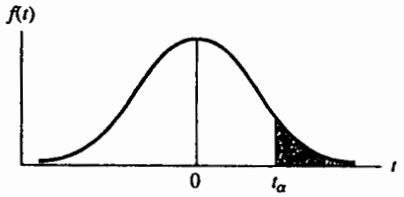


z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990

2. Exponencial $e^{-\lambda}$

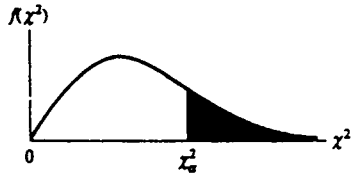
λ	$e^{-\lambda}$	λ	$e^{-\lambda}$	λ	$e^{-\lambda}$	λ	$e^{-\lambda}$	λ	$e^{-\lambda}$
.00	1.000000	2.05	.128735	4.05	.017422	6.05	.002358	8.05	.000319
.05	.951229	2.10	.122456	4.10	.016573	6.10	.002243	8.10	.000304
.10	.904837	2.15	.116484	4.15	.015764	6.15	.002133	8.15	.000289
.15	.860708	2.20	.110803	4.20	.014996	6.20	.002029	8.20	.000275
.20	.818731	2.25	.105399	4.25	.014264	6.25	.001930	8.25	.000261
.25	.778801	2.30	.100259	4.30	.013569	6.30	.001836	8.30	.000249
.30	.740818	2.35	.095369	4.35	.012907	6.35	.001747	8.35	.000236
.35	.704688	2.40	.090718	4.40	.012277	6.40	.001661	8.40	.000225
.40	.670320	2.45	.086294	4.45	.011679	6.45	.001581	8.45	.000214
.45	.637628	2.50	.082085	4.50	.011109	6.50	.001503	8.50	.000204
.50	.606531	2.55	.078082	4.55	.010567	6.55	.001430	8.55	.000194
.55	.576950	2.60	.074274	4.60	.010052	6.60	.001360	8.60	.000184
.60	.548812	2.65	.070651	4.65	.009562	6.65	.001294	8.65	.000175
.65	.522046	2.70	.067206	4.70	.009095	6.70	.001231	8.70	.000167
.70	.496585	2.75	.063928	4.75	.008652	6.75	.001171	8.75	.000158
.75	.472367	2.80	.060810	4.80	.008230	6.80	.001114	8.80	.000151
.80	.449329	2.85	.057844	4.85	.007828	6.85	.001059	8.85	.000143
.85	.427415	2.90	.055023	4.90	.007447	6.90	.001008	8.90	.000136
.90	.406570	2.95	.052340	4.95	.007083	6.95	.000959	8.95	.000130
.95	.386741	3.00	.049787	5.00	.006738	7.00	.000912	9.00	.000123
1.00	.367879	3.05	.047359	5.05	.006409	7.05	.000867	9.05	.000117
1.05	.349938	3.10	.045049	5.10	.006097	7.10	.000825	9.10	.000112
1.10	.332871	3.15	.042852	5.15	.005799	7.15	.000785	9.15	.000106
1.15	.316637	3.20	.040762	5.20	.005517	7.20	.000747	9.20	.000101
1.20	.301194	3.25	.038774	5.25	.005248	7.25	.000710	9.25	.000096
1.25	.286505	3.30	.036883	5.30	.004992	7.30	.000676	9.30	.000091
1.30	.272532	3.35	.035084	5.35	.004748	7.35	.000643	9.35	.000087
1.35	.259240	3.40	.033373	5.40	.004517	7.40	.000611	9.40	.000083
1.40	.246597	3.45	.031746	5.45	.004296	7.45	.000581	9.45	.000079
1.45	.234570	3.50	.030197	5.50	.004087	7.50	.000553	9.50	.000075
1.50	.223130	3.55	.028725	5.55	.003887	7.55	.000526	9.55	.000071
1.55	.212248	3.60	.027324	5.60	.003698	7.60	.000501	9.60	.000068
1.60	.201897	3.65	.025991	5.65	.003518	7.65	.000476	9.65	.000064
1.65	.192050	3.70	.024724	5.70	.003346	7.70	.000453	9.70	.000061
1.70	.182684	3.75	.023518	5.75	.003183	7.75	.000431	9.75	.000058
1.75	.173774	3.80	.022371	5.80	.003028	7.80	.000410	9.80	.000056
1.80	.165299	3.85	.021280	5.85	.002880	7.85	.000390	9.85	.000053
1.85	.157237	3.90	.020242	5.90	.002739	7.90	.000371	9.90	.000050
1.90	.149569	3.95	.019255	5.95	.002606	7.95	.000353	9.95	.000048
1.95	.142274	4.00	.018316	6.00	.002479	8.00	.000336	10.00	.000045
2.00	.135335								

3. Valores críticos de t de Student



ν	$t_{.100}$	$t_{.050}$	$t_{.025}$	$t_{.010}$	$t_{.005}$	$t_{.001}$	$t_{.0005}$
1	3.078	6.314	12.706	31.821	63.657	318.31	636.62
2	1.886	2.920	4.303	6.965	9.925	22.326	31.598
3	1.638	2.353	3.182	4.541	5.841	10.213	12.924
4	1.533	2.132	2.776	3.747	4.604	7.173	8.610
5	1.476	2.015	2.571	3.365	4.032	5.893	6.869
6	1.440	1.943	2.447	3.143	3.707	5.208	5.959
7	1.415	1.895	2.365	2.998	3.499	4.785	5.408
8	1.397	1.860	2.306	2.896	3.355	4.501	5.041
9	1.383	1.833	2.262	2.821	3.250	4.297	4.781
10	1.372	1.812	2.228	2.764	3.169	4.144	4.587
11	1.363	1.796	2.201	2.718	3.106	4.025	4.437
12	1.356	1.782	2.179	2.681	3.055	3.930	4.318
13	1.350	1.771	2.160	2.650	3.012	3.852	4.221
14	1.345	1.761	2.145	2.624	2.977	3.787	4.140
15	1.341	1.753	2.131	2.602	2.947	3.733	4.073
16	1.337	1.746	2.120	2.583	2.921	3.686	4.015
17	1.333	1.740	2.110	2.567	2.898	3.646	3.965
18	1.330	1.734	2.101	2.552	2.878	3.610	3.922
19	1.328	1.729	2.093	2.539	2.861	3.579	3.883
20	1.325	1.725	2.086	2.528	2.845	3.552	3.850
21	1.323	1.721	2.080	2.518	2.831	3.527	3.819
22	1.321	1.717	2.074	2.508	2.819	3.505	3.792
23	1.319	1.714	2.069	2.500	2.807	3.485	3.767
24	1.318	1.711	2.064	2.492	2.797	3.467	3.745
25	1.316	1.708	2.060	2.485	2.787	3.450	3.725
26	1.315	1.706	2.056	2.479	2.779	3.435	3.707
27	1.314	1.703	2.052	2.473	2.771	3.421	3.690
28	1.313	1.701	2.048	2.467	2.763	3.408	3.674
29	1.311	1.699	2.045	2.462	2.756	3.396	3.659
30	1.310	1.697	2.042	2.457	2.750	3.385	3.646
40	1.303	1.684	2.021	2.423	2.704	3.307	3.551
60	1.296	1.671	2.000	2.390	2.660	3.232	3.460
120	1.289	1.658	1.980	2.358	2.617	3.160	3.373
∞	1.282	1.645	1.960	2.326	2.576	3.090	3.291

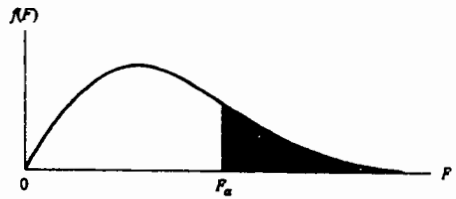
4. Valores críticos de χ^2



Grados de libertad	$\chi^2_{.995}$	$\chi^2_{.990}$	$\chi^2_{.975}$	$\chi^2_{.950}$	$\chi^2_{.900}$
1	.0000393	.0001571	.0009821	.0039321	.0157908
2	.0100251	.0201007	.0506356	.102587	.210720
3	.0717212	.114832	.215795	.351846	.584375
4	.206990	.297110	.484419	.710721	1.063623
5	.411740	.554300	.831211	1.145476	1.61031
6	.675727	0.872085	1.237347	1.63539	2.20413
7	.989265	1.239043	1.68987	2.16735	2.83311
8	1.344419	1.646482	2.17973	2.73264	3.48954
9	1.734926	2.087912	2.70039	3.32511	4.16816
10	2.15585	2.55821	3.24697	3.94030	4.86518
11	2.60321	3.05347	3.81575	4.57481	5.57779
12	3.07382	3.57056	4.40379	5.22603	6.30380
13	3.56503	4.10691	5.00874	5.89186	7.04150
14	4.07468	4.66043	5.62872	6.57063	7.78953
15	4.60094	5.22935	6.26214	7.26094	8.54675
16	5.14224	5.81221	6.90766	7.96164	9.31223
17	5.69724	6.40776	7.56418	8.67176	10.0852
18	6.26481	7.01491	8.23075	9.39046	10.8649
19	6.84398	7.63273	8.90655	10.1170	11.6509
20	7.43386	8.26040	9.59083	10.8508	12.4426
21	8.03366	8.89720	10.28293	11.5913	13.2396
22	8.64272	9.54249	10.9823	12.3380	14.0415
23	9.26042	10.19567	11.6885	13.0905	14.8479
24	9.88623	10.8564	12.4011	13.8484	15.6587
25	10.5197	11.5240	13.1197	14.6114	16.4734
26	11.1603	12.1981	13.8439	15.3791	17.2919
27	11.8076	12.8786	14.5733	16.1513	18.1138
28	12.4613	13.5648	15.3079	16.9279	18.9392
29	13.1211	14.2565	16.0471	17.7083	19.7677
30	13.7867	14.9535	16.7908	18.4926	20.5992
40	20.7065	22.1643	24.4331	26.5093	29.0505
50	27.9907	29.7067	32.3574	34.7642	37.6886
60	35.5346	37.4848	40.4817	43.1879	46.4589
70	43.2752	45.4418	48.7576	51.7393	55.3290
80	51.1720	53.5400	57.1532	60.3915	64.2778
90	59.1963	61.7541	65.6466	69.1260	73.2912
100	67.3276	70.0648	74.2219	77.9295	82.3581

Grados de libertad	$\chi^2_{.100}$	$\chi^2_{.050}$	$\chi^2_{.025}$	$\chi^2_{.010}$	$\chi^2_{.005}$
1	2.70554	3.84146	5.02389	6.63490	7.87944
2	4.60517	5.99147	7.37776	9.21034	10.5966
3	6.25139	7.81473	9.34840	11.3449	12.8381
4	7.77944	9.48773	11.1433	13.2767	14.8602
5	9.23635	11.0705	12.8325	15.0863	16.7496
6	10.6446	12.5916	14.4494	16.8119	18.5476
7	12.0170	14.0671	16.0128	18.4753	20.2777
8	13.3616	15.5073	17.5346	20.0902	21.9550
9	14.6837	16.9190	19.0228	21.6660	23.5893
10	15.9871	18.3070	20.4831	23.2093	25.1882
11	17.2750	19.6751	21.9200	24.7250	26.7569
12	18.5494	21.0261	23.3367	26.2170	28.2995
13	19.8119	22.3621	24.7356	27.6883	29.8194
14	21.0642	23.6848	26.1190	29.1413	31.3193
15	22.3072	24.9958	27.4884	30.5779	32.8013
16	23.5418	26.2962	28.8454	31.9999	34.2672
17	24.7690	27.5871	30.1910	33.4087	35.7185
18	25.9894	28.8693	31.5264	34.8053	37.1564
19	27.2036	30.1435	32.8523	36.1908	38.5822
20	28.4120	31.4104	34.1696	37.5662	39.9968
21	29.6151	32.6705	35.4789	38.9321	41.4010
22	30.8133	33.9244	36.7807	40.2894	42.7956
23	32.0069	35.1725	38.0757	41.6384	44.1813
24	33.1963	36.4151	39.3641	42.9798	45.5585
25	34.3816	37.6525	40.6465	44.3141	46.9278
26	35.5631	38.8852	41.9232	45.6417	48.2899
27	36.7412	40.1133	43.1944	46.9630	49.6449
28	37.9159	41.3372	44.4607	48.2782	50.9933
29	39.0875	42.5569	45.7222	49.5879	52.3356
30	40.2560	43.7729	46.9792	50.8922	53.6720
40	51.8050	55.7585	59.3417	63.6907	66.7659
50	63.1671	67.5048	71.4202	76.1539	79.4900
60	74.3970	79.0819	83.2976	88.3794	91.9517
70	85.5271	90.5312	95.0231	100.425	104.215
80	96.5782	101.879	106.629	112.329	116.321
90	107.565	113.145	118.136	124.116	128.299
100	118.498	124.342	129.561	135.807	140.169

5. Valores críticos de F $\alpha = 0.10$



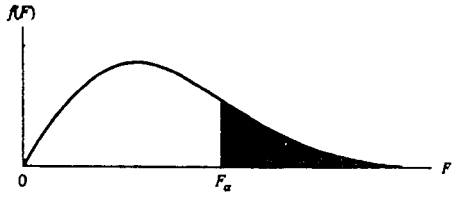
ν_2 \ ν_1	1	2	3	4	5	6	7	8	9
1	39.86	49.50	53.59	55.83	57.24	58.20	58.91	59.44	59.86
2	8.53	9.00	9.16	9.24	9.29	9.33	9.35	9.37	9.38
3	5.54	5.46	5.39	5.34	5.31	5.28	5.27	5.25	5.24
4	4.54	4.32	4.19	4.11	4.05	4.01	3.98	3.95	3.94
5	4.06	3.78	3.62	3.52	3.45	3.40	3.37	3.34	3.32
6	3.78	3.46	3.29	3.18	3.11	3.05	3.01	2.98	2.96
7	3.59	3.26	3.07	2.96	2.88	2.83	2.78	2.75	2.72
8	3.46	3.11	2.92	2.81	2.73	2.67	2.62	2.59	2.56
9	3.36	3.01	2.81	2.69	2.61	2.55	2.51	2.47	2.44
10	3.29	2.92	2.73	2.61	2.52	2.46	2.41	2.38	2.35
11	3.23	2.86	2.66	2.54	2.45	2.39	2.34	2.30	2.27
12	3.18	2.81	2.61	2.48	2.39	2.33	2.28	2.24	2.21
13	3.14	2.76	2.56	2.43	2.35	2.28	2.23	2.20	2.16
14	3.10	2.73	2.52	2.39	2.31	2.24	2.19	2.15	2.12
15	3.07	2.70	2.49	2.36	2.27	2.21	2.16	2.12	2.09
16	3.05	2.67	2.46	2.33	2.24	2.18	2.13	2.09	2.06
17	3.03	2.64	2.44	2.31	2.22	2.15	2.10	2.06	2.03
18	3.01	2.62	2.42	2.29	2.20	2.13	2.08	2.04	2.00
19	2.99	2.61	2.40	2.27	2.18	2.11	2.06	2.02	1.98
20	2.97	2.59	2.38	2.25	2.16	2.09	2.04	2.00	1.96
21	2.96	2.57	2.36	2.23	2.14	2.08	2.02	1.98	1.95
22	2.95	2.56	2.35	2.22	2.13	2.06	2.01	1.97	1.93
23	2.94	2.55	2.34	2.21	2.11	2.05	1.99	1.95	1.92
24	2.93	2.54	2.33	2.19	2.10	2.04	1.98	1.94	1.91
25	2.92	2.53	2.32	2.18	2.09	2.02	1.97	1.93	1.89
26	2.91	2.52	2.31	2.17	2.08	2.01	1.96	1.92	1.88
27	2.90	2.51	2.30	2.17	2.07	2.00	1.95	1.91	1.87
28	2.89	2.50	2.29	2.16	2.06	2.00	1.94	1.90	1.87
29	2.89	2.50	2.28	2.15	2.06	1.99	1.93	1.89	1.86
30	2.88	2.49	2.28	2.14	2.05	1.98	1.93	1.88	1.85
40	2.84	2.44	2.23	2.09	2.00	1.93	1.87	1.83	1.79
60	2.79	2.39	2.18	2.04	1.95	1.87	1.82	1.77	1.74
120	2.75	2.35	2.13	1.99	1.90	1.82	1.77	1.72	1.68
∞	2.71	2.30	2.08	1.94	1.85	1.77	1.72	1.67	1.63

Grados de libertad de numerador (ν_1) — Grados de libertad de denominador (ν_2)

ν_2 \ ν_1	10	12	15	20	24	30	40	60	120	∞
1	60.19	60.71	61.22	61.74	62.00	62.26	62.53	62.79	63.06	63.33
2	9.39	9.41	9.42	9.44	9.45	9.46	9.47	9.47	9.48	9.49
3	5.23	5.22	5.20	5.18	5.18	5.17	5.16	5.15	5.14	5.13
4	3.92	3.90	3.87	3.84	3.83	3.82	3.80	3.79	3.78	3.76
5	3.30	3.27	3.24	3.21	3.19	3.17	3.16	3.14	3.12	3.10
6	2.94	2.90	2.87	2.84	2.82	2.80	2.78	2.76	2.74	2.72
7	2.70	2.67	2.63	2.59	2.58	2.56	2.54	2.51	2.49	2.47
8	2.54	2.50	2.46	2.42	2.40	2.38	2.36	2.34	2.32	2.29
9	2.42	2.38	2.34	2.30	2.28	2.25	2.23	2.21	2.18	2.16
10	2.32	2.28	2.24	2.20	2.18	2.16	2.13	2.11	2.08	2.06
11	2.25	2.21	2.17	2.12	2.10	2.08	2.05	2.03	2.00	1.97
12	2.19	2.15	2.10	2.06	2.04	2.01	1.99	1.96	1.93	1.90
13	2.14	2.10	2.05	2.01	1.98	1.96	1.93	1.90	1.88	1.85
14	2.10	2.05	2.01	1.96	1.94	1.91	1.89	1.86	1.83	1.80
15	2.06	2.02	1.97	1.92	1.90	1.87	1.85	1.82	1.79	1.76
16	2.03	1.99	1.94	1.89	1.87	1.84	1.81	1.78	1.75	1.72
17	2.00	1.96	1.91	1.86	1.84	1.81	1.78	1.75	1.72	1.69
18	1.98	1.93	1.89	1.84	1.81	1.78	1.75	1.72	1.69	1.66
19	1.96	1.91	1.86	1.81	1.79	1.76	1.73	1.70	1.67	1.63
20	1.94	1.89	1.84	1.79	1.77	1.74	1.71	1.68	1.64	1.61
21	1.92	1.87	1.83	1.78	1.75	1.72	1.69	1.66	1.62	1.59
22	1.90	1.86	1.81	1.76	1.73	1.70	1.67	1.64	1.60	1.57
23	1.89	1.84	1.80	1.74	1.72	1.69	1.66	1.62	1.59	1.55
24	1.88	1.83	1.78	1.73	1.70	1.67	1.64	1.61	1.57	1.53
25	1.87	1.82	1.77	1.72	1.69	1.66	1.63	1.59	1.56	1.52
26	1.86	1.81	1.76	1.71	1.68	1.65	1.61	1.58	1.54	1.50
27	1.85	.180	1.75	1.70	1.67	1.64	1.60	1.57	1.53	1.49
28	1.84	1.79	1.74	1.69	1.66	1.63	1.59	1.56	1.52	1.48
29	1.83	1.78	1.73	1.68	1.65	1.62	1.58	1.55	1.51	1.47
30	1.82	1.77	1.72	1.67	1.64	1.61	1.57	1.54	1.50	1.46
40	1.76	1.71	1.66	1.61	1.57	1.54	1.51	1.47	1.42	1.38
60	1.71	1.66	1.60	1.54	1.51	1.48	1.44	1.40	1.35	1.29
120	1.65	1.60	1.55	1.48	1.45	1.41	1.37	1.32	1.26	1.19
∞	1.60	1.55	1.49	1.42	1.38	1.34	1.30	1.24	1.17	1.00

Grados de libertad de numerador (ν_1) — Grados de libertad de denominador (ν_2)

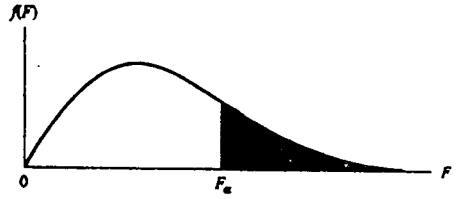
6. Valores críticos de F $\alpha = 0.05$



Grados de libertad de denominador ν_2 \ Grados de libertad de numerador ν_1	1	2	3	4	5	6	7	8	9
1	161.4	199.5	215.7	224.6	230.2	234.0	236.8	238.9	240.5
2	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38
3	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77
6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10
7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68
8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39
9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18
10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02
11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90
12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80
13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71
14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65
15	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59
16	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54
17	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49
18	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46
19	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42
20	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39
21	4.32	3.47	3.07	2.84	2.68	2.57	2.49	2.42	2.37
22	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34
23	4.28	3.42	3.03	2.80	2.64	2.53	2.44	2.37	2.32
24	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30
25	4.24	3.39	2.99	2.76	2.60	2.49	2.40	2.34	2.28
26	4.23	3.37	2.98	2.74	2.59	2.47	2.39	2.32	2.27
27	4.21	3.35	2.96	2.73	2.57	2.46	2.37	2.31	2.25
28	4.20	3.34	2.95	2.71	2.56	2.45	2.36	2.29	2.24
29	4.18	3.33	2.93	2.70	2.55	2.43	2.35	2.28	2.22
30	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21
40	4.08	3.23	2.84	2.61	2.45	2.34	2.25	2.18	2.12
60	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10	2.04
120	3.92	3.07	2.68	2.45	2.29	2.17	2.09	2.02	1.96
∞	3.84	3.00	2.60	2.37	2.21	2.10	2.01	1.94	1.88

Grados de libertad de denominador ν_2 \ Grados de libertad de numerador ν_1	10	12	15	20	24	30	40	60	120	∞
1	241.9	243.9	245.9	248.0	249.1	250.1	251.1	252.2	253.3	254.3
2	19.40	19.41	19.43	19.45	19.45	19.46	19.47	19.48	19.49	19.50
3	8.79	8.74	8.70	8.66	8.64	8.62	8.59	8.57	8.55	8.53
4	5.96	5.91	5.86	5.80	5.77	5.75	5.72	5.69	5.66	5.63
5	4.74	4.68	4.62	4.56	4.53	4.50	4.46	4.43	4.40	4.36
6	4.06	4.00	3.94	3.87	3.84	3.81	3.77	3.74	3.70	3.67
7	3.64	3.57	3.51	3.44	3.41	3.38	3.34	3.30	3.27	3.23
8	3.35	3.28	3.22	3.15	3.12	3.08	3.04	3.01	2.97	2.93
9	3.14	3.07	3.01	2.94	2.90	2.86	2.83	2.79	2.75	2.71
10	2.98	2.91	2.85	2.77	2.74	2.70	2.66	2.62	2.58	2.54
11	2.85	2.79	2.72	2.65	2.61	2.57	2.53	2.49	2.45	2.40
12	2.75	2.69	2.62	2.54	2.51	2.47	2.43	2.38	2.34	2.30
13	2.67	2.60	2.53	2.46	2.42	2.38	2.34	2.30	2.25	2.21
14	2.60	2.53	2.46	2.39	2.35	2.31	2.27	2.22	2.18	2.13
15	2.54	2.48	2.40	2.33	2.29	2.25	2.20	2.16	2.11	2.07
16	2.49	2.42	2.35	2.28	2.24	2.19	2.15	2.11	2.06	2.01
17	2.45	2.38	2.31	2.23	2.19	2.15	2.10	2.06	2.01	1.96
18	2.41	2.34	2.27	2.19	2.15	2.11	2.06	2.02	1.97	1.92
19	2.38	2.31	2.23	2.16	2.11	2.07	2.03	1.98	1.93	1.88
20	2.35	2.28	2.20	2.12	2.08	2.04	1.99	1.95	1.90	1.84
21	2.32	2.25	2.18	2.10	2.05	2.01	1.96	1.92	1.87	1.81
22	2.30	2.23	2.15	2.07	2.03	1.98	1.94	1.89	1.84	1.78
23	2.27	2.20	2.13	2.05	2.01	1.96	1.91	1.86	1.81	1.76
24	2.25	2.18	2.11	2.03	1.98	1.94	1.89	1.84	1.79	1.73
25	2.24	2.16	2.09	2.01	1.96	1.92	1.87	1.82	1.77	1.71
26	2.22	2.15	2.07	1.99	1.95	1.90	1.85	1.80	1.75	1.69
27	2.20	2.13	2.06	1.97	1.93	1.88	1.84	1.79	1.73	1.67
28	2.19	2.12	2.04	1.96	1.91	1.87	1.82	1.77	1.71	1.65
29	2.18	2.10	2.03	1.94	1.90	1.85	1.81	1.75	1.70	1.64
30	2.16	2.09	2.01	1.93	1.89	1.84	1.79	1.74	1.68	1.62
40	2.08	2.00	1.92	1.84	1.79	1.74	1.69	1.64	1.58	1.51
60	1.99	1.92	1.84	1.75	1.70	1.65	1.59	1.53	1.47	1.39
120	1.91	1.83	1.75	1.66	1.61	1.55	1.50	1.43	1.35	1.25
∞	1.83	1.75	1.67	1.57	1.52	1.46	1.39	1.32	1.22	1.00

7. Valores críticos de F $\alpha = 0.025$



ν_2 \ ν_1	1	2	3	4	5	6	7	8	9
1	647.8	799.5	864.2	899.6	921.8	937.1	948.2	956.7	963.3
2	38.51	39.00	39.17	39.25	39.30	39.33	39.36	39.37	39.39
3	17.44	16.04	15.44	15.10	14.88	14.73	14.62	14.54	14.47
4	12.22	10.65	9.98	9.60	9.36	9.20	9.07	8.98	8.90
5	10.01	8.43	7.76	7.39	7.15	6.98	6.85	6.76	6.68
6	8.81	7.26	6.60	6.23	5.99	5.82	5.70	5.60	5.52
7	8.07	6.54	5.89	5.52	5.29	5.12	4.99	4.90	4.82
8	7.57	6.06	5.42	5.05	4.82	4.65	4.53	4.43	4.36
9	7.21	5.71	5.08	4.72	4.48	4.32	4.20	4.10	4.03
10	6.94	5.46	4.83	4.47	4.24	4.07	3.95	3.85	3.78
11	6.72	5.26	4.63	4.28	4.04	3.88	3.76	3.66	3.59
12	6.55	5.10	4.47	4.12	3.89	3.73	3.61	3.51	3.44
13	6.41	4.97	4.35	4.00	3.77	3.60	3.48	3.39	3.31
14	6.30	4.86	4.24	3.89	3.66	3.50	3.38	3.29	3.21
15	6.20	4.77	4.15	3.80	3.58	3.41	3.29	3.20	3.12
16	6.12	4.69	4.08	3.73	3.50	3.34	3.22	3.12	3.05
17	6.04	4.62	4.01	3.66	3.44	3.28	3.16	3.06	2.98
18	5.98	4.56	3.95	3.61	3.38	3.22	3.10	3.01	2.93
19	5.92	4.51	3.90	3.56	3.33	3.17	3.05	2.96	2.88
20	5.87	4.46	3.86	3.51	3.29	3.13	3.01	2.91	2.84
21	5.83	4.42	3.82	3.48	3.25	3.09	2.97	2.87	2.80
22	5.79	4.38	3.78	3.44	3.22	3.05	2.93	2.84	2.76
23	5.75	4.35	3.75	3.41	3.18	3.02	2.90	2.81	2.73
24	5.72	4.32	3.72	3.38	3.15	2.99	2.87	2.78	2.70
25	5.69	4.29	3.69	3.35	3.13	2.97	2.85	2.75	2.68
26	5.66	4.27	3.67	3.33	3.10	2.94	2.82	2.73	2.65
27	5.63	4.24	3.65	3.31	3.08	2.92	2.80	2.71	2.63
28	5.61	4.22	3.63	3.29	3.06	2.90	2.78	2.69	2.61
29	5.59	4.20	3.61	3.27	3.04	2.88	2.76	2.67	2.59
30	5.57	4.18	3.59	3.25	3.03	2.87	2.75	2.65	2.57
40	5.42	4.05	3.46	3.13	2.90	2.74	2.62	2.53	2.45
60	5.29	3.93	3.34	3.01	2.79	2.63	2.51	2.41	2.33
120	5.15	3.80	3.23	2.89	2.67	2.52	2.39	2.30	2.22
∞	5.02	3.69	3.12	2.79	2.57	2.41	2.29	2.19	2.11

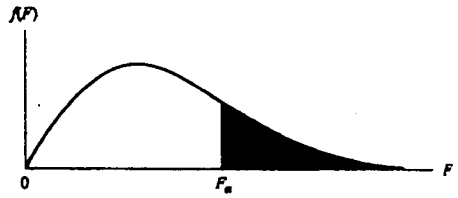
Grados de libertad de denominador

Grados de libertad de numerador

ν_2 \ ν_1	10	12	15	20	24	30	40	60	120	∞
1	968.6	976.7	984.9	993.1	997.2	1,001	1,006	1,010	1,014	1,108
2	39.40	39.41	39.43	39.45	39.46	39.46	39.47	39.48	39.49	39.50
3	14.42	14.34	14.25	14.17	14.12	14.08	14.04	13.99	13.95	13.90
4	8.84	8.75	8.66	8.56	8.51	8.46	8.41	8.36	8.31	8.26
5	6.62	6.52	6.43	6.33	6.28	6.23	6.18	6.12	6.07	6.02
6	5.46	5.37	5.27	5.17	5.12	5.07	5.01	4.96	4.90	4.85
7	4.76	4.67	4.57	4.47	4.42	4.36	4.31	4.25	4.20	4.14
8	4.30	4.20	4.10	4.00	3.95	3.89	3.84	3.78	3.73	3.67
9	3.96	3.87	3.77	3.67	3.61	3.56	3.51	3.45	3.39	3.33
10	3.72	3.62	3.52	3.42	3.37	3.31	3.26	3.20	3.14	3.08
11	3.53	3.43	3.33	3.23	3.17	3.12	3.06	3.00	2.94	2.88
12	3.37	3.28	3.18	3.07	3.02	2.96	2.91	2.85	2.79	2.72
13	3.25	3.15	3.05	2.95	2.89	2.84	2.78	2.72	2.66	2.60
14	3.15	3.05	2.95	2.84	2.79	2.73	2.67	2.61	2.55	2.49
15	3.06	2.96	2.86	2.76	2.70	2.64	2.59	2.52	2.46	2.40
16	2.99	2.89	2.79	2.68	2.63	2.57	2.51	2.45	2.38	2.32
17	2.92	2.82	2.72	2.62	2.56	2.50	2.44	2.38	2.32	2.25
18	2.87	2.77	2.67	2.56	2.50	2.44	2.38	2.32	2.26	2.19
19	2.82	2.72	2.62	2.51	2.45	2.39	2.33	2.27	2.20	2.13
20	2.77	2.68	2.57	2.46	2.41	2.35	2.29	2.22	2.16	2.09
21	2.73	2.64	2.53	2.42	2.37	2.31	2.25	2.18	2.11	2.04
22	2.70	2.60	2.50	2.39	2.33	2.27	2.21	2.14	2.08	2.00
23	2.67	2.57	2.47	2.36	2.30	2.24	2.18	2.11	2.04	1.97
24	2.64	2.54	2.44	2.33	2.27	2.21	2.15	2.08	2.01	1.94
25	2.61	2.51	2.41	2.30	2.24	2.18	2.12	2.05	1.98	1.91
26	2.59	2.49	2.39	2.28	2.22	2.16	2.09	2.03	1.95	1.88
27	2.57	2.47	2.36	2.25	2.19	2.13	2.07	2.00	1.93	1.85
28	2.55	2.45	2.34	2.23	2.17	2.11	2.05	1.98	1.91	1.83
29	2.53	2.43	2.32	2.21	2.15	2.09	2.03	1.96	1.89	1.81
30	2.51	2.41	2.31	2.20	2.14	2.07	2.01	1.94	1.87	1.79
40	2.39	2.29	2.18	2.07	2.01	1.94	1.88	1.80	1.72	1.64
60	2.27	2.17	2.06	1.94	1.88	1.82	1.74	1.67	1.58	1.48
120	2.16	2.05	1.94	1.82	1.76	1.69	1.61	1.53	1.43	1.31
∞	2.05	1.94	1.83	1.71	1.64	1.57	1.48	1.39	1.27	1.00

Grados de libertad de denominador

8. Valores críticos de F $\alpha = 0.01$



Grados de libertad de denominador (ν_2) — Grados de libertad de numerador (ν_1)

ν_2 \ ν_1	1	2	3	4	5	6	7	8	9
1	4,052	4,999.5	5,403	5,625	5,764	5,859	5,928	5,982	6,022
2	98.50	99.00	99.17	99.25	99.30	99.33	99.36	99.37	99.39
3	34.12	30.82	29.46	28.71	28.24	27.91	27.67	27.49	27.35
4	21.20	18.00	16.69	15.98	15.52	15.21	14.98	14.80	14.66
5	16.26	13.27	12.06	11.39	10.97	10.67	10.46	10.29	10.16
6	13.75	10.92	9.78	9.15	8.75	8.47	8.26	8.10	7.98
7	12.25	9.55	8.45	7.85	7.46	7.19	6.99	6.84	6.72
8	11.26	8.65	7.59	7.01	6.63	6.37	6.18	6.03	5.91
9	10.56	8.02	6.99	6.42	6.06	5.80	5.61	5.47	5.35
10	10.04	7.56	6.55	5.99	5.64	5.39	5.20	5.06	4.94
11	9.65	7.21	6.22	5.67	5.32	5.07	4.89	4.74	4.63
12	9.33	6.93	5.95	5.41	5.06	4.82	4.64	4.50	4.39
13	9.07	6.70	5.74	5.21	4.86	4.62	4.44	4.30	4.19
14	8.86	6.51	5.56	5.04	4.69	4.46	4.28	4.14	4.03
15	8.68	6.36	5.42	4.89	4.56	4.32	4.14	4.00	3.89
16	8.53	6.23	5.29	4.77	4.44	4.20	4.03	3.89	3.78
17	8.40	6.11	5.18	4.67	4.34	4.10	3.93	3.79	3.68
18	8.29	6.01	5.09	4.58	4.25	4.01	3.84	3.71	3.60
19	8.18	5.93	5.01	4.50	4.17	3.94	3.77	3.63	3.52
20	8.10	5.85	4.94	4.43	4.10	3.87	3.70	3.56	3.46
21	8.02	5.78	4.87	4.37	4.04	3.81	3.64	3.51	3.40
22	7.95	5.72	4.82	4.31	3.99	3.76	3.59	3.45	3.35
23	7.88	5.66	4.76	4.26	3.94	3.71	3.54	3.41	3.30
24	7.82	5.61	4.72	4.22	3.90	3.67	3.50	3.36	3.26
25	7.77	5.57	4.68	4.18	3.85	3.63	3.46	3.32	3.22
26	7.72	5.53	4.64	4.14	3.82	3.59	3.42	3.29	3.18
27	7.68	5.49	4.60	4.11	3.78	3.56	3.39	3.26	3.15
28	7.64	5.45	4.57	4.07	3.75	3.53	3.36	3.23	3.12
29	7.60	5.42	4.54	4.04	3.73	3.50	3.33	3.20	3.09
30	7.56	5.39	4.51	4.02	3.70	3.47	3.30	3.17	3.07
40	7.31	5.18	4.31	3.83	3.51	3.29	3.12	2.99	2.89
60	7.08	4.98	4.13	3.65	3.34	3.12	2.95	2.82	2.72
120	6.85	4.79	3.95	3.48	3.17	2.96	2.79	2.66	2.56
∞	6.63	4.61	3.78	3.32	3.02	2.80	2.64	2.51	2.41

Grados de libertad de denominador (ν_2) — Grados de libertad de numerador (ν_1)

ν_2 \ ν_1	10	12	15	20	24	30	40	60	120	∞
1	6,056	6,106	6,157	6,209	6,235	6,261	6,287	6,313	6,339	6,366
2	99.40	99.42	99.43	99.45	99.46	99.47	99.47	99.48	99.49	99.50
3	27.23	27.05	26.87	26.69	26.60	26.50	26.41	26.32	26.22	26.13
4	14.55	14.37	14.20	14.02	13.93	13.84	13.75	13.65	13.56	13.46
5	10.05	9.89	9.72	9.55	9.47	9.38	9.29	9.20	9.11	9.02
6	7.87	7.72	7.56	7.40	7.31	7.23	7.14	7.06	6.97	6.88
7	6.62	6.47	6.31	6.16	6.07	5.99	5.91	5.82	5.74	5.65
8	5.81	5.67	5.52	5.36	5.28	5.20	5.12	5.03	4.95	4.86
9	5.26	5.11	4.96	4.81	4.73	4.65	4.57	4.48	4.40	4.31
10	4.85	4.71	4.56	4.41	4.33	4.25	4.17	4.08	4.00	3.91
11	4.54	4.40	4.25	4.10	4.02	3.94	3.86	3.78	3.69	3.60
12	4.30	4.16	4.01	3.86	3.78	3.70	3.62	3.54	3.45	3.36
13	4.10	3.96	3.82	3.66	3.59	3.51	3.43	3.34	3.25	3.17
14	3.94	3.80	3.66	3.51	3.43	3.35	3.27	3.18	3.09	3.00
15	3.80	3.67	3.52	3.37	3.29	3.21	3.13	3.05	2.96	2.87
16	3.69	3.55	3.41	3.26	3.18	3.10	3.02	2.93	2.84	2.75
17	3.59	3.46	3.31	3.16	3.08	3.00	2.92	2.83	2.75	2.65
18	3.51	3.37	3.23	3.08	3.00	2.92	2.84	2.75	2.66	2.57
19	3.43	3.30	3.15	3.00	2.92	2.84	2.76	2.67	2.58	2.49
20	3.37	3.23	3.09	2.94	2.86	2.78	2.69	2.61	2.52	2.42
21	3.31	3.17	3.03	2.88	2.80	2.72	2.64	2.55	2.46	2.36
22	3.26	3.12	2.98	2.83	2.75	2.67	2.58	2.50	2.40	2.31
23	3.21	3.07	2.93	2.78	2.70	2.62	2.54	2.45	2.35	2.26
24	3.17	3.03	2.89	2.74	2.66	2.58	2.49	2.40	2.31	2.21
25	3.13	2.99	2.85	2.70	2.62	2.54	2.45	2.36	2.27	2.17
26	3.09	2.96	2.81	2.66	2.58	2.50	2.42	2.33	2.23	2.13
27	3.06	2.93	2.78	2.63	2.55	2.47	2.38	2.29	2.20	2.10
28	3.03	2.90	2.75	2.60	2.52	2.44	2.35	2.26	2.17	2.06
29	3.00	2.87	2.73	2.57	2.49	2.41	2.33	2.23	2.14	2.03
30	2.98	2.84	2.70	2.55	2.47	2.39	2.30	2.21	2.11	2.01
40	2.80	2.66	2.52	2.37	2.29	2.20	2.11	2.02	1.92	1.80
60	2.63	2.50	2.35	2.20	2.12	2.03	1.94	1.84	1.73	1.60
120	2.47	2.34	2.19	2.03	1.95	1.86	1.76	1.66	1.53	1.38
∞	2.32	2.18	2.04	1.88	1.79	1.70	1.59	1.47	1.32	1.00

9. Valores críticos del recorrido studentizado $\alpha = 0.01$

ν \ t	2	3	4	5	6	7	8	9	10	11
1	17.97	26.98	32.82	37.08	40.41	43.12	45.40	47.36	49.07	50.59
2	6.08	8.33	9.80	10.88	11.74	12.44	13.03	13.54	13.99	14.39
3	4.50	5.91	6.82	7.50	8.04	8.48	8.85	9.18	9.46	9.72
4	3.93	5.04	5.76	6.29	6.71	7.05	7.35	7.60	7.83	8.03
5	3.64	4.60	5.22	5.67	6.03	6.33	6.58	6.80	6.99	7.17
6	3.46	4.34	4.90	5.30	5.63	5.90	6.12	6.32	6.49	6.65
7	3.34	4.16	4.68	5.06	5.36	5.61	5.82	6.00	6.16	6.30
8	3.26	4.04	4.53	4.89	5.17	5.40	5.60	5.77	5.92	6.05
9	3.20	3.95	4.41	4.76	5.02	5.24	5.43	5.59	5.74	5.87
10	3.15	3.88	4.33	4.65	4.91	5.12	5.30	5.46	5.60	5.72
11	3.11	3.82	4.26	4.57	4.82	5.03	5.20	5.35	5.49	5.61
12	3.08	3.77	4.20	4.51	4.75	4.95	5.12	5.27	5.39	5.51
13	3.06	3.73	4.15	4.45	4.69	4.88	5.05	5.19	5.32	5.43
14	3.03	3.70	4.11	4.41	4.64	4.83	4.99	5.13	5.25	5.36
15	3.01	3.67	4.08	4.37	4.60	4.78	4.94	5.08	5.20	5.31
16	3.00	3.65	4.05	4.33	4.56	4.74	4.90	5.03	5.15	5.26
17	2.98	3.63	4.02	4.30	4.52	4.70	4.86	4.99	5.11	5.21
18	2.97	3.61	4.00	4.28	4.49	4.67	4.82	4.96	5.07	5.17
19	2.96	3.59	3.98	4.25	4.47	4.65	4.79	4.92	5.04	5.14
20	2.95	3.58	3.96	4.23	4.45	4.62	4.77	4.90	5.01	5.11
24	2.92	3.53	3.90	4.17	4.37	4.54	4.68	4.81	4.92	5.01
30	2.89	3.49	3.85	4.10	4.30	4.46	4.60	4.72	4.82	4.92
40	2.86	3.44	3.79	4.04	4.23	4.39	4.52	4.63	4.73	4.82
60	2.83	3.40	3.74	3.98	4.16	4.31	4.44	4.55	4.65	4.73
120	2.80	3.36	3.68	3.92	4.10	4.24	4.36	4.47	4.56	4.64
∞	2.77	3.31	3.63	3.86	4.03	4.17	4.29	4.39	4.47	4.55

ν \ t	12	13	14	15	16	17	18	19	20
1	51.96	53.20	54.33	55.36	56.32	57.22	58.04	58.83	59.56
2	14.75	15.08	15.38	15.65	15.91	16.14	16.37	16.57	16.77
3	9.95	10.15	10.35	10.52	10.69	10.84	10.98	11.11	11.24
4	8.21	8.37	8.52	8.66	8.79	8.91	9.03	9.13	9.23
5	7.32	7.47	7.60	7.72	7.83	7.93	8.03	8.12	8.21
6	6.79	6.92	7.03	7.14	7.24	7.34	7.43	7.51	7.59
7	6.43	6.55	6.66	6.76	6.85	6.94	7.02	7.10	7.17
8	6.18	6.29	6.39	6.48	6.57	6.65	6.73	6.80	6.87
9	5.98	6.09	6.19	6.28	6.36	6.44	6.51	6.58	6.64
10	5.83	5.93	6.03	6.11	6.19	6.27	6.34	6.40	6.47
11	5.71	5.81	5.90	5.98	6.06	6.13	6.20	6.27	6.33
12	5.61	5.71	5.80	5.88	5.95	6.02	6.09	6.15	6.21
13	5.53	5.63	5.71	5.79	5.86	5.93	5.99	6.05	6.11
14	5.46	5.55	5.64	5.71	5.79	5.85	5.91	5.97	6.03
15	5.40	5.49	5.57	5.65	5.72	5.78	5.85	5.90	5.96
16	5.35	5.44	5.52	5.59	5.66	5.73	5.79	5.84	5.90
17	5.31	5.39	5.47	5.54	5.61	5.67	5.73	5.79	5.84
18	5.27	5.35	5.43	5.50	5.57	5.63	5.69	5.74	5.79
19	5.23	5.31	5.39	5.46	5.53	5.59	5.65	5.70	5.75
20	5.20	5.28	5.36	5.43	5.49	5.55	5.61	5.66	5.71
24	5.10	5.18	5.25	5.32	5.38	5.44	5.49	5.55	5.59
30	5.00	5.08	5.15	5.21	5.27	5.33	5.38	5.43	5.47
40	4.90	4.98	5.04	5.11	5.16	5.22	5.27	5.31	5.36
60	4.81	4.88	4.94	5.00	5.06	5.11	5.15	5.20	5.24
120	4.71	4.78	4.84	4.90	4.95	5.00	5.04	5.09	5.13
∞	4.62	4.68	4.74	4.80	4.85	4.89	4.93	4.97	5.01

10. Valores críticos del recorrido studentizado $\alpha = 0.05$

ν \ t	2	3	4	5	6	7	8	9	10	11
1	90.03	135.0	164.3	185.6	202.2	215.8	227.2	237.0	245.6	253.2
2	14.04	19.02	22.29	24.72	26.63	28.20	29.53	30.68	31.69	32.59
3	8.26	10.62	12.17	13.33	14.24	15.00	15.64	16.20	16.69	17.13
4	6.51	8.12	9.17	9.96	10.58	11.10	11.55	11.93	12.27	12.57
5	5.70	6.98	7.80	8.42	8.91	9.32	9.67	9.97	10.24	10.48
6	5.24	6.33	7.03	7.56	7.97	8.32	8.61	8.87	9.10	9.30
7	4.95	5.92	6.54	7.01	7.37	7.68	7.94	8.17	8.37	8.55
8	4.75	5.64	6.20	6.62	6.96	7.24	7.47	7.68	7.86	8.03
9	4.60	5.43	5.96	6.35	6.66	6.91	7.13	7.33	7.49	7.65
10	4.48	5.27	5.77	6.14	6.43	6.67	6.87	7.05	7.21	7.36
11	4.39	5.15	5.62	5.97	6.25	6.48	6.67	6.84	6.99	7.13
12	4.32	5.05	5.50	5.84	6.10	6.32	6.51	6.67	6.81	6.94
13	4.26	4.96	5.40	5.73	5.98	6.19	6.37	6.53	6.67	6.79
14	4.21	4.89	5.32	5.63	5.88	6.08	6.26	6.41	6.54	6.66
15	4.17	4.84	5.25	5.56	5.80	5.99	6.16	6.31	6.44	6.55
16	4.13	4.79	5.19	5.49	5.72	5.92	6.08	6.22	6.35	6.46
17	4.10	4.74	5.14	5.43	5.66	5.85	6.01	6.15	6.27	6.38
18	4.07	4.70	5.09	5.38	5.60	5.79	5.94	6.08	6.20	6.31
19	4.05	4.67	5.05	5.33	5.55	5.73	5.89	6.02	6.14	6.25
20	4.02	4.64	5.02	5.29	5.51	5.69	5.84	5.97	6.09	6.19
24	3.96	4.55	4.91	5.17	5.37	5.54	5.69	5.81	5.92	6.02
30	3.89	4.45	4.80	5.05	5.24	5.40	5.54	5.65	5.76	5.85
40	3.82	4.37	4.70	4.93	5.11	5.26	5.39	5.50	5.60	5.69
60	3.76	4.28	4.59	4.82	4.99	5.13	5.25	5.36	5.45	5.53
120	3.70	4.20	4.50	4.71	4.87	5.01	5.12	5.21	5.30	5.37
∞	3.64	4.12	4.40	4.60	4.76	4.88	4.99	5.08	5.16	5.23

ν \ t	12	13	14	15	16	17	18	19	20
1	260.0	266.2	271.8	277.0	281.8	286.3	290.0	294.3	298.0
2	33.40	34.13	34.81	35.43	36.00	36.53	37.03	37.50	37.95
3	17.53	17.89	18.22	18.52	18.81	19.07	19.32	19.55	19.77
4	12.84	13.09	13.32	13.53	13.73	13.91	14.08	14.24	14.40
5	10.70	10.89	11.08	11.24	11.40	11.55	11.68	11.81	11.93
6	9.48	9.65	9.81	9.95	10.08	10.21	10.32	10.43	10.54
7	8.71	8.86	9.00	9.12	9.24	9.35	9.46	9.55	9.65
8	8.18	8.31	8.44	8.55	8.66	8.76	8.85	8.94	9.03
9	7.78	7.91	8.03	8.13	8.23	8.33	8.41	8.49	8.57
10	7.49	7.60	7.71	7.81	7.91	7.99	8.08	8.15	8.23
11	7.25	7.36	7.46	7.56	7.65	7.73	7.81	7.88	7.95
12	7.06	7.17	7.26	7.36	7.44	7.52	7.59	7.66	7.73
13	6.90	7.01	7.10	7.19	7.27	7.35	7.42	7.48	7.55
14	6.77	6.87	6.96	7.05	7.13	7.20	7.27	7.33	7.39
15	6.66	6.76	6.84	6.93	7.00	7.07	7.14	7.20	7.26
16	6.56	6.66	6.74	6.82	6.90	6.97	7.03	7.09	7.15
17	6.48	6.57	6.66	6.73	6.81	6.87	6.94	7.00	7.05
18	6.41	6.50	6.58	6.65	6.72	6.79	6.85	6.91	6.97
19	6.34	6.43	6.51	6.58	6.65	6.72	6.78	6.84	6.89
20	6.28	6.37	6.45	6.52	6.59	6.65	6.71	6.77	6.82
24	6.11	6.19	6.26	6.33	6.39	6.45	6.51	6.56	6.61
30	5.93	6.01	6.08	6.14	6.20	6.26	6.31	6.36	6.41
40	5.76	5.83	5.90	5.96	6.02	6.07	6.12	6.16	6.21
60	5.60	5.67	5.73	5.78	5.84	5.89	5.93	5.97	6.01
120	5.44	5.50	5.56	5.61	5.66	5.71	5.75	5.79	5.83
∞	5.29	5.35	5.40	5.45	5.49	5.54	5.57	5.61	5.65

9. Números Aleatorios

Fila \ Columna	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	10480	15011	01536	02011	81647	91646	69179	14194	62590	36207	20969	99570	91291	90700
2	22368	46573	25595	85393	30995	89198	27982	53402	93965	34095	52666	19174	39615	99505
3	24130	48360	22527	97265	76393	64809	15179	24830	49340	32081	30680	19655	63348	58629
4	42167	93093	06243	61680	07856	16376	39440	53537	71341	57004	00849	74917	97758	16379
5	37570	39975	81837	16656	06121	91782	60468	81305	49684	60672	14110	06927	01263	54613
6	77921	06907	11008	42751	27756	53498	18602	70659	90655	15053	21916	81825	44394	42880
7	99562	72905	56420	69994	98872	31016	71194	18738	44013	48840	63213	21069	10634	12952
8	96301	91977	05463	07972	18876	20922	94595	56869	69014	60045	18425	84903	42508	32307
9	89579	14342	63661	10281	17453	18103	57740	84378	25331	12566	58678	44947	05585	56941
10	85475	36857	53342	53988	53060	59533	38867	62300	08158	17983	16439	11458	18593	64952
11	28918	69578	88231	33276	70997	79936	56865	05859	90106	31595	01547	85590	91610	78188
12	63553	40961	48235	03427	49626	69445	18663	72695	52180	20847	12234	90511	33703	90322
13	09429	93969	52636	92737	88974	33488	36320	17617	30015	08272	84115	27156	30613	74952
14	10365	61129	87529	85689	48237	52267	67689	93394	01511	26358	85104	20285	29975	89868
15	07119	97336	71048	08178	77233	13916	47564	81056	97735	85977	29372	74461	28551	90707
16	51085	12765	51821	51259	77452	16308	60756	92144	49442	53900	70960	63990	75601	40719
17	02368	21382	52404	60268	89368	19885	55322	44819	01188	65255	64835	44919	05944	55157
18	01011	54092	33362	94904	31273	04146	18594	29852	71585	85030	51132	01915	92747	64951
19	52162	53916	46369	58586	23216	14513	83149	98736	23495	64350	94738	17752	35156	35749
20	07056	97628	33787	09998	42698	06691	76988	13602	51851	46104	88916	19509	25625	58104
21	48663	91245	85828	14346	09172	30168	90229	04734	59193	22178	30421	61666	99904	32812
22	54164	58492	22421	74103	47070	25306	76468	26384	58151	06646	21524	15227	96909	44592
23	32639	32363	05597	24200	13363	38005	94342	28728	35806	06912	17012	64161	18296	22851
24	29334	27001	87637	87308	58731	00256	45834	15398	46557	41135	10367	07684	36188	18510
25	02488	33062	28834	07351	19731	92420	60952	61280	50001	67658	32586	86679	50720	94953
26	81525	72295	04839	96423	24878	82651	66566	14778	76797	14780	13300	87074	79666	95725
27	29676	20591	68086	26432	46901	20849	89768	81536	86645	12659	92259	57102	80428	25280
28	00742	57392	39064	66432	84673	40027	32832	61362	98947	96067	64760	64584	96096	98253
29	05366	04213	25669	26422	44407	44048	37937	63904	45766	66134	75470	66520	34693	90449
30	91921	26418	64117	94305	26766	25940	39972	22209	71500	64568	91402	42416	07844	69618
31	00582	04711	87917	77341	42206	35126	74087	99547	81817	42607	43808	76655	62028	76630
32	00725	69884	62797	56170	86324	88072	76222	36086	84637	93161	76038	65855	77919	88006
33	69011	65795	95876	55293	18988	27354	26575	08625	40801	59920	29841	80150	12777	48501
34	25976	57948	29888	88604	67917	48708	18912	82271	65424	69774	33611	54262	85963	03547
35	09763	83473	73577	12908	30883	18317	28290	35797	05998	41688	34952	37888	38917	88050
36	91576	42595	27958	30134	04024	86385	29880	99730	55536	84855	29080	09250	79656	73211
37	17955	56349	90999	49127	20044	59931	06115	20542	18059	02008	73708	83517	36103	42791
38	46503	18584	18845	49618	02304	51038	20655	58727	28168	15475	56942	53389	20562	87338
39	92157	89634	94824	78171	84610	82834	09922	25417	44137	48413	25555	21246	35509	20468
40	14577	62765	35605	81263	39667	47358	56873	56307	61607	49518	89656	20103	77490	18062
41	98427	07523	33362	64270	01638	92477	66969	98420	04880	45585	46565	04102	46880	45709
42	34914	63976	88720	82765	34476	17032	87589	40836	32427	70002	70663	88863	77775	69348
43	70060	28277	39475	46473	23219	53416	94970	25832	69975	94884	19661	72828	00102	66794
44	53976	54914	06990	67245	68350	82948	11398	42878	80287	88267	47363	46634	06541	97809
45	76072	29515	40980	07391	58745	25774	22987	80059	39911	96189	41151	14222	60697	59583
46	90725	52210	83974	29992	65831	38857	50490	83765	55657	14361	31720	57375	56228	41546
47	64364	67412	33339	31926	14883	24413	59744	92351	97473	89286	35931	04110	23726	51900
48	08962	00358	31662	25388	61642	34072	81249	35648	56891	69352	48373	45578	78547	81788
49	95012	68379	93526	70765	10592	04542	76463	54328	02349	17247	28865	14777	62730	92277
50	15664	10493	20492	38391	91132	21999	59516	81652	27195	48223	46751	22923	32261	85653
51	16408	81899	04153	53381	79401	21438	83035	92350	36693	31238	59649	91754	72772	02338
52	18629	81953	05520	91962	04739	13092	97662	24822	94730	06496	35090	04822	86774	98289
53	73115	35101	47498	87637	99016	71060	88824	71013	18735	20286	23153	72924	35165	43040
54	57491	16703	23167	49323	45021	33132	12544	41035	80780	45393	44812	12515	98931	91202
55	30405	83946	23792	14422	15059	45799	22716	19792	09983	74353	68668	30429	70735	25499
56	16631	35006	85900	98275	32388	52390	16815	69298	82732	38480	73817	32523	41961	44437
57	96773	20206	42559	78985	05300	22164	24369	54224	35083	19687	11052	91491	60383	19746
58	38935	64202	14349	82674	66523	44133	00697	35552	35970	19124	63318	29686	03387	59846
59	31624	76384	17403	53363	44167	64486	64758	75366	76554	31601	12614	33072	60332	92325
60	78919	19474	23632	27889	47914	02584	37680	20801	72152	39339	34806	08930	85001	87820
61	03931	33309	57047	74211	63445	17361	62825	39908	05607	91284	68833	25570	38818	46920
62	74426	33278	43972	10119	89917	15665	52872	73823	73144	88662	88970	74492	51805	99378

(continúa)

Números Aleatorios (continuación)

Fila \ Columna	1	2	3	4	5	6	7	8	9	10	11	12	13	14
63	09066	00903	20795	95452	92648	45454	09552	88815	16553	51125	79375	97596	16296	66092
64	42238	12426	87025	14267	20979	04508	64535	31355	86064	29472	47689	05974	52468	16834
65	16153	08002	26504	41744	81959	65642	74240	56302	00033	67107	77510	70625	28725	34191
66	21457	40742	29820	96783	29400	21840	15035	34537	33310	06116	95240	15957	16572	06004
67	21581	57802	02050	89728	17937	37621	47075	42080	97403	48626	68995	43805	33386	21597
68	55612	78095	83197	33732	05810	24813	86902	60397	16489	03264	88525	42786	05269	92532
69	44657	66999	99324	51281	84463	60563	79312	93454	68876	25471	93911	25650	12682	73572
70	91340	84979	46949	81973	37949	61023	43997	15263	80644	43942	89203	71795	99533	50501
71	91227	21199	31935	27022	84067	05462	35216	14486	29891	68607	41867	14951	91696	85065
72	50001	38140	66321	19924	72163	09538	12151	06878	91903	18749	34405	56087	82790	70925
73	65390	05224	72958	28609	81406	39147	25549	48542	42627	45233	57202	94617	23772	07896
74	27504	96131	83944	41575	10573	08619	64482	73923	36152	05184	94142	25299	84387	34925
75	37169	94851	39117	89632	00959	16487	65536	49071	39782	17095	02330	74301	00275	48280
76	11508	70225	51111	38351	19444	66499	71945	05422	13442	78675	84081	66938	93654	59894
77	37449	30362	06694	54690	04052	53115	62757	95348	78662	11163	81651	50245	34971	52924
78	46515	70331	85922	38329	57015	15765	97161	17869	45349	61796	66345	81073	49106	79860
79	30986	81223	42416	58353	21532	30502	32305	86482	05174	07901	54339	58861	74818	46942
80	63798	64995	46583	09785	44160	78128	83991	42865	92520	83531	80377	35909	81250	54238
81	82486	84846	99254	67632	43218	50076	21361	64816	51202	88124	41870	52689	51275	83556
82	21885	32906	92431	09060	64297	51674	64126	62570	26123	05155	59194	52799	28225	85762
83	60336	98782	07408	53458	13564	59089	26445	29789	85205	41001	12535	12133	14645	23541
84	43937	46891	24010	25560	86355	33941	25786	54990	71899	15475	95434	98227	21824	19585
85	97656	63175	89303	16275	07100	92063	21942	18611	47348	20203	18534	03862	78095	50136
86	03299	01221	05418	38982	55758	92237	26759	86367	21216	98442	08303	56613	91511	75928
87	79626	06486	03574	17668	07785	76020	79924	25651	83325	88428	85076	72811	22717	50585
88	85636	68335	47539	03129	65651	11977	02510	26113	99447	68645	34327	15152	55230	93448
89	18039	14367	61337	06177	12143	46609	32989	74014	64708	00533	35398	58408	13261	47908
90	08362	15656	60627	36478	65648	16764	53412	09013	07832	41574	17639	82163	60859	75567
91	79556	29068	04142	16268	15387	12856	66227	38358	22478	73373	88732	09443	82558	05250
92	92608	82674	27072	32534	17075	27698	98204	63863	11951	34648	88022	56148	34925	57031
93	23982	25835	40055	67006	12293	02753	14827	23235	35071	99704	37543	11601	35503	85171
94	09915	96306	05908	97901	28395	14186	00821	80703	70426	75647	76310	88717	37890	40129
95	59037	33300	26695	62247	69927	76123	50842	43834	86654	70959	79725	93872	28117	19233
96	42488	78077	69882	61657	34136	79180	97526	43092	04098	73571	80799	76536	71255	64239
97	46764	86273	63003	93017	31204	36692	40202	35275	57306	55543	53203	18098	47625	88684
98	03237	45430	55417	63282	90816	17349	88298	90183	36600	78406	06216	95787	42579	90730
99	86591	81482	52667	61582	14972	90053	89534	76036	49199	43716	97548	04379	46370	28672
100	38534	01715	94964	87288	65680	43772	39560	12918	86537	62738	19636	51132	25739	56947

Educando para la vida

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