

Formulas and Tables

for *Elementary Statistics, Tenth Edition*, by Mario F. Triola

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Ch. 13: Nonparametric Tests

$$z = \frac{(x + 0.5) - (n/2)}{\sqrt{n}/2} \quad \text{Sign test for } n > 25$$

$$z = \frac{T - n(n+1)/4}{\sqrt{\frac{n(n+1)(2n+1)}{24}}} \quad \text{Wilcoxon signed ranks (matched pairs and } n > 30)$$

$$z = \frac{R - \mu_R}{\sigma_R} = \frac{R - \frac{n_1(n_1 + n_2 + 1)}{2}}{\sqrt{\frac{n_1 n_2 (n_1 + n_2 + 1)}{12}}} \quad \text{Wilcoxon rank-sum (two independent samples)}$$

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

Kruskal-Wallis (chi-square $df = k - 1$)

$$r_s = 1 - \frac{6\sum d^2}{n(n^2 - 1)} \quad \text{Rank correlation}$$

(critical value for $n > 30$: $\frac{\pm z}{\sqrt{n-1}}$)

$$z = \frac{G - \mu_G}{\sigma_G} = \frac{G - \left(\frac{2n_1 n_2}{n_1 + n_2} + 1 \right)}{\sqrt{\frac{(2n_1 n_2)(2n_1 n_2 - n_1 - n_2)}{(n_1 + n_2)^2 (n_1 + n_2 - 1)}}} \quad \text{Runs test for } n > 20$$

Ch. 14: Control Charts

R chart: Plot sample ranges

$$\text{UCL: } D_4 \bar{R}$$

$$\text{Centerline: } \bar{R}$$

$$\text{LCL: } D_3 \bar{R}$$

\bar{x} chart: Plot sample means

$$\text{UCL: } \bar{\bar{x}} + A_2 \bar{R}$$

$$\text{Centerline: } \bar{\bar{x}}$$

$$\text{LCL: } \bar{\bar{x}} - A_2 \bar{R}$$

p chart: Plot sample proportions

$$\text{UCL: } \bar{p} + 3\sqrt{\frac{\bar{p}\bar{q}}{n}}$$

$$\text{Centerline: } \bar{p}$$

$$\text{LCL: } \bar{p} - 3\sqrt{\frac{\bar{p}\bar{q}}{n}}$$

TABLE A-6
Critical Values of the Pearson
Correlation Coefficient r

n	$\alpha = .05$	$\alpha = .01$
4	.950	.999
5	.878	.959
6	.811	.917
7	.754	.875
8	.707	.834
9	.666	.798
10	.632	.765
11	.602	.735
12	.576	.708
13	.553	.684
14	.532	.661
15	.514	.641
16	.497	.623
17	.482	.606
18	.468	.590
19	.456	.575
20	.444	.561
25	.396	.505
30	.361	.463
35	.335	.430
40	.312	.402
45	.294	.378
50	.279	.361
60	.254	.330
70	.236	.305
80	.220	.286
90	.207	.269
100	.196	.256

NOTE: To test $H_0: \rho = 0$ against $H_1: \rho \neq 0$, reject H_0 if the absolute value of r is greater than the critical value in the table.

Control Chart Constants

Subgroup Size	A_2	D_3	D_4
n			
2	1.880	0.000	3.267
3	1.023	0.000	2.574
4	0.729	0.000	2.282
5	0.577	0.000	2.114
6	0.483	0.000	2.004
7	0.419	0.076	1.924