

# Spearman's Rank Correlation

## Complete Critical Values Reference Card

All Significance Levels · One-Tailed & Two-Tailed · n = 5 to 50 · [StatisticsFundamentals.com](https://www.StatisticsFundamentals.com)

<b>Author:</b> Statistics Fundamentals Team	<b>Reviewed by:</b> Minsa A, Senior Statistics Editor	<b>Website:</b> <a href="https://www.StatisticsFundamentals.com">StatisticsFundamentals.com</a>	<b>Date:</b> May 2026
---	---	---	-----------------------

### Complete Spearman Critical Values — All Significance Levels

n	Two-Tail $\alpha=0.10$	Two-Tail $\alpha=0.05$	Two-Tail $\alpha=0.01$	One-Tail $\alpha=0.05$	One-Tail $\alpha=0.01$
5	0.900	1.000	—	0.900	1.000
6	0.829	0.886	1.000	0.829	0.943
7	0.714	0.786	0.929	0.714	0.893
8	0.643	0.738	0.881	0.643	0.833
9	0.600	0.700	0.833	0.600	0.783
10	0.549	0.648	0.794	0.549	0.745
11	0.523	0.618	0.755	0.518	0.709
12	0.497	0.587	0.727	0.497	0.678
13	0.475	0.560	0.703	0.475	0.648
14	0.457	0.538	0.679	0.457	0.626
15	0.441	0.521	0.654	0.441	0.604
16	0.425	0.503	0.635	0.425	0.582
17	0.412	0.485	0.615	0.412	0.566
18	0.399	0.472	0.600	0.399	0.550
19	0.388	0.460	0.584	0.388	0.535
20	0.377	0.447	0.570	0.377	0.520
21	0.368	0.435	0.556	0.368	0.508
22	0.359	0.425	0.544	0.359	0.496
23	0.351	0.415	0.532	0.351	0.486
24	0.343	0.406	0.521	0.343	0.476
25	0.336	0.398	0.511	0.336	0.466
26	0.329	0.390	0.501	0.329	0.457
27	0.323	0.382	0.491	0.323	0.448
28	0.317	0.375	0.483	0.317	0.440
29	0.311	0.368	0.475	0.311	0.433
30	0.305	0.362	0.467	0.305	0.425
35	0.283	0.335	0.433	0.283	0.394
40	0.264	0.313	0.405	0.264	0.368
45	0.248	0.294	0.382	0.248	0.347
50	0.235	0.279	0.363	0.235	0.329

■ Most commonly used (Two-Tailed  $\alpha=0.05$ )    
■ Most commonly used (One-Tailed  $\alpha=0.05$ )    
— Not achievable for this n at this  $\alpha$  level    
▲ Vertical line separates two-tailed | one-tailed

■ Values  $n \leq 30$  are exact permutation-based critical values (Zar, 2010; Conover, 1999). Values  $n = 35-50$  are t-approximations:  $t = r_s \times \sqrt{[(n-2)/(1-r_s^2)]}$ ,  $df = n-2$ .

■ For  $n > 50$  use the t-approximation formula with the t-distribution table ( $df = n-2$ ).

■ Tied ranks: assign midpoint average ranks; use Pearson formula on those ranks.

# How to Use Spearman's Table

Step-by-step guide · Worked example · Formulas · FAQ

## 6-Step Procedure for Spearman's Rank Correlation Test

1	<b>Rank both variables independently.</b> Assign ranks 1, 2, ... n to each variable from lowest to highest. For tied values, assign the average of the ranks they would occupy (midpoint ranks).	2	<b>Compute rank differences d.</b> For each pair i, calculate $d_i = \text{Rank}(X_i) - \text{Rank}(Y_i)$ . Square each: $d_i^2$ . Sum all: $\Sigma d^2$ .
3	<b>Calculate <math>r_s</math>.</b> No ties: $r_s = 1 - (6\Sigma d^2) / [n(n^2-1)]$ . With ties: apply Pearson formula to midpoint ranks.	4	<b>State <math>H_0</math> and <math>H_1</math>.</b> $H_0: \rho = 0$ (no monotonic association). $H_1: \rho \neq 0$ (two-tailed) or $\rho > 0 / \rho < 0$ (one-tailed, direction pre-specified).
5	<b>Look up the critical value.</b> Find row for your n. Move to the column matching your $\alpha$ and test direction. That cell is $r_{\text{critical}}$ .	6	<b>Make the decision.</b> Two-tailed: reject $H_0$ if $ r_s  \geq r_{\text{critical}}$ . One-tailed (positive): reject if $r_s \geq r_{\text{critical}}$ .

## Key Formulas

<b>Standard (no ties)</b> $r_s = 1 - 6\Sigma d^2 / [n(n^2-1)]$ $d = \text{Rank}(X) - \text{Rank}(Y)$ per pair	<b>Tied ranks</b> $r_s =$ Pearson formula on midpoint ranks Assign average rank to each tied group	<b>Large n (&gt;50)</b> $t = r_s \sqrt{[(n-2)/(1-r_s^2)]}$ Use t-table at $df = n - 2$
---	--	--

## Quick Worked Example

Scenario:  $n = 10$ , two-tailed test,  $\alpha = 0.05$ . Calculated  $r_s = 0.697$ .

Step	Action	Result
1-3	Rank data, compute $\Sigma d^2$ , calculate $r_s$	$r_s = 0.697$
4	$H_0: \rho = 0$ $H_1: \rho \neq 0$ (two-tailed, $\alpha = 0.05$ )	Stated
5	Table lookup: $n=10$ , two-tailed $\alpha=0.05$	$r_{\text{critical}} = 0.648$
6	$ 0.697  \geq 0.648 \checkmark$	<b>Reject <math>H_0</math> — Significant</b>

## Quick Reference FAQ

<b>Does Spearman's table use degrees of freedom?</b>	No. Look up n directly — not $df = n-2$ . This is different from Pearson's and t-distribution tables.
<b>What is the minimum n?</b>	$n = 5$ . For $n < 5$ , the permutation space is too small to achieve significance at standard $\alpha$ levels.
<b>What if my calculated value equals <math>r_{\text{critical}}</math> exactly?</b>	Reject $H_0$ . The decision rule is $ r_s  \geq r_{\text{critical}}$ — equality qualifies.
<b>Can I use this table for Kendall's <math>\tau</math>?</b>	No. Kendall's tau uses its own critical value table with different distributional properties.

<p><b>When do I need software instead of a table?</b></p>	<p>Use software when <math>n &gt; 50</math>, when exact p-values are needed, or when ties are extensive.</p>
<p><b>What does <math>r_s = 1</math> mean?</b></p>	<p>A perfect positive monotonic relationship — every increase in X corresponds to an increase in Y with no exceptions.</p>

**References**

Spearman, C. (1904). The proof and measurement of association between two things. *American Journal of Psychology*, 15(1), 72–101. doi:10.2307/1412159

Zar, J. H. (2010). *Biostatistical Analysis* (5th ed.). Prentice Hall. Table B.19.

NIST/SEMATECH (2013). *e-Handbook of Statistical Methods*. National Institute of Standards and Technology. itl.nist.gov

Penn State STAT 415: Non-parametric Methods. online.stat.psu.edu/stat415/lesson/18/18.3

Conover, W. J. (1999). *Practical Nonparametric Statistics* (3rd ed.). Wiley.

UCLA Statistical Consulting Group. stats.oarc.ucla.edu — Spearman Correlation in SPSS and R.