# Critical values for the Wilcoxon rank sum test

This table gives critical values for the Wilcoxon rank sum test for two samples both of size 10 or less for the hypothesis that the two populations have the same underlying distributions. The tabulated values are the values of the test statistic $R$ equal to the sum of the ranks in the smaller sample (with sample size $n_S$) beyond which the $p$-value is less than the column heading (the larger sample is of size $n_B$). The tabulated $p$-values are for the two-sided alternative.

For larger samples, $R$ is approximately normally distributed with mean $\mu_R = n_S(n_S + n_B + 1)/2$ and variance $\sigma_R^2 = (n_S n_B)(n_S + n_B + 1)/12$, and so the $p$-value can be determined by comparing

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

to the standard normal tables.

| $n_B$ | $n_S$ | 5% | | 1% | |
|---|---|---|---|---|---|
| 4 | 4 | 10 | 26 | — | — |
| 5 | 4 | 11 | 29 | — | — |
| 5 | 5 | 17 | 38 | 15 | 40 |
| 6 | 4 | 12 | 32 | 10 | 34 |
| 6 | 5 | 18 | 42 | 16 | 44 |
| 6 | 6 | 26 | 52 | 23 | 55 |
| 7 | 4 | 13 | 35 | 10 | 38 |
| 7 | 5 | 20 | 45 | 16 | 49 |
| 7 | 6 | 27 | 57 | 24 | 60 |
| 7 | 7 | 36 | 69 | 32 | 73 |
| 8 | 4 | 14 | 38 | 11 | 41 |
| 8 | 5 | 21 | 49 | 17 | 53 |
| 8 | 6 | 29 | 61 | 25 | 65 |
| 8 | 7 | 38 | 74 | 34 | 78 |
| 8 | 8 | 49 | 87 | 43 | 93 |
| 9 | 4 | 14 | 42 | 11 | 45 |
| 9 | 5 | 22 | 53 | 18 | 57 |
| 9 | 6 | 31 | 65 | 26 | 70 |
| 9 | 7 | 40 | 79 | 35 | 84 |
| 9 | 8 | 51 | 93 | 45 | 99 |
| 9 | 9 | 62 | 109 | 56 | 115 |
| 10 | 4 | 15 | 45 | 12 | 48 |
| 10 | 5 | 23 | 57 | 19 | 61 |
| 10 | 6 | 32 | 70 | 27 | 75 |
| 10 | 7 | 42 | 84 | 37 | 89 |
| 10 | 8 | 53 | 99 | 47 | 105 |
| 10 | 9 | 65 | 115 | 58 | 122 |
| 10 | 10 | 78 | 132 | 71 | 139 |