How to Use the Mann-Whitney U Critical Values Table

Decision: U ≤ U_critical → Reject H■

$U_1 = n_1 n_2 + n_1(n_1+1)/2 - R_1$ | $U_2 = n_1 n_2 + n_2(n_2+1)/2 - R_2$ | $U = \min(U_1, U_2)$ | Verify: $U_1 + U_2 = n_1 \times n_2$

1. **Rank all observations jointly** (lowest = rank 1). Ties get the average of their rank positions.
2. **Compute R_1 and R_2** — sum of ranks for each sample. Verify $R_1 + R_2 = (n_1+n_2)(n_1+n_2+1)/2$.
3. **Calculate U_1 and U_2** using the formulas above. Verify $U_1 + U_2 = n_1 \times n_2$.
4. **Set $U = \min(U_1, U_2)$.** Always use the smaller value — using U_max is the most common student error.
5. **Look up U_critical** in the table for your n_1, n_2, and α. A dash (—) means no significance is achievable.
6. **If U ≤ U_critical** → **Reject H_0** (groups differ significantly). If U > U_critical → Fail to reject H_0.
7. **For n > 20:** use $z = (U - n_1 n_2/2) / \sqrt{n_1 n_2(n_1+n_2+1)/12}$. Compare to ±1.96 (α=0.05) or ±2.576 (α=0.01).

Symbols & Notation Glossary

Symbol	Meaning
n■, n■	Number of observations in samples 1 and 2
R■, R■	Sum of ranks assigned to each sample after joint ranking
U■, U■	U statistics computed from rank sums (both must be calculated)
U	Test statistic = min(U■, U■) — always use the smaller value
U_critical	Maximum U for rejection of H■ at the chosen α and sample sizes
— (dash)	No critical value exists — sample size too small for this α level
α (alpha)	Significance level: probability of Type I error (false positive)
Two-tailed α	H■: groups differ in either direction (A ≠ B)
One-tailed α	H■: directional (A > B or A < B) — must be pre-specified
One-tailed 0.05	Same critical values as Two-Tailed α = 0.10 table
One-tailed 0.025	Same critical values as Two-Tailed α = 0.05 table

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Decision: U ≤ U_critical → Reject H■

Which Table to Use: One-Tailed vs Two-Tailed

Test Type	Alternative H■	Use This Table	Typical Use Case
Two-tailed, α=0.05	Groups differ (A ≠ B)	Table 1 (most common)	Standard research default
Two-tailed, α=0.01	Groups differ (A ≠ B)	Table 2 (strict)	Clinical/medical research
Two-tailed, α=0.10	Groups differ (A ≠ B)	Table 3 (lenient)	Exploratory / pilot studies
One-tailed, α=0.05	A > B or A < B	Same as Table 3 (α=0.10)	Pre-specified direction only
One-tailed, α=0.025	A > B or A < B	Same as Table 1 (α=0.05)	Pre-specified direction only
One-tailed, α=0.005	A > B or A < B	Same as Table 2 (α=0.01)	Strict + directional

Worked Example — Psychology Research (Ordinal Likert Data)

Ordinal data (Likert scales, pain ratings, ranked preferences) violates the interval-scale assumption of the t-test. The Mann-Whitney U test is the recommended nonparametric alternative, consistent with APA guidelines for psychological measurement data.

Decision: U ≤ U_critical → Reject H■

Step	Calculation / Detail	Result
`Scenario`	Two anxiety groups: CBT (n■=8) vs Standard care (n■=9), ordinal Likert scores, α=0.05	Two-tailed
`Joint ranking`	Rank all 17 scores lowest→highest; assign tied ranks the average of positions	17 ranks total
`R■ (CBT)`	Sum of ranks for all 8 CBT observations	R■ = 47.0
`R■ (Std)`	Sum of ranks for all 9 standard-care observations	R■ = 106.0
`Verify`	R■ + R■ = (17×18)/2 = 153	47 + 106 = 153 ✓
`U■`	8×9 + 8(9)/2 – 47 = 72+36–47	U■ = 61
`U■`	8×9 + 9(10)/2 – 106 = 72+45–106	U■ = 11
`Verify`	U■ + U■ should equal 8×9 = 72	61 + 11 = 72 ✓
`U = min`	min(61, 11)	U = 11
`U_critical`	n■=8, n■=9, α=0.05, two-tailed (Table 1 above)	**U_critical = 18**
`Decision`	11 ≤ 18 → Reject H■	**Significant at α = 0.05**
`Conclusion`	CBT group scored significantly lower on anxiety than standard care	**p < 0.05**

Common Student Mistakes to Avoid

Common Student Mistake	Correct Approach
Using U_max instead of U_min	Always U = min(U■, U■). The larger U is never compared to the table.
Confusing one-tailed and two-tailed α	One-tailed α=0.05 ≠ Two-tailed α=0.05. One-tailed 0.05 = two-tailed 0.10 table.
Assigning consecutive ranks to ties	Tied observations get the average of the positions they collectively hold.
Skipping the U■+U■ verification	Always verify: U■+U■ must exactly equal n■×n■.
Extrapolating the table beyond n=20	Use the z-approximation formula for n■ or n■ > 20.
Choosing one-tailed after seeing data	One-tailed tests must be pre-specified before data collection.

Table 1: Two-Tailed α = 0.05 | One-Tailed α = 0.025

Most commonly used table. Standard choice for social, behavioural, and educational research. Reject H_0 when $U \leq$ tabled value.

Decision: $U \leq U\_critical$ → Reject H■

n■ \ n■	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	—	0	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8
3	—	—	—	0	1	2	3	4	4	5	6	7	8	9	10	11	11	12	13	14
4	—	—	0	1	2	3	5	6	7	8	9	11	12	13	14	15	17	18	19	20
5	—	0	1	2	4	5	6	8	9	11	12	13	15	16	18	19	20	22	23	25
6	—	1	2	3	5	7	8	10	12	14	16	17	19	21	23	25	26	28	30	32
7	—	1	3	5	6	8	11	13	15	17	19	21	24	26	28	30	33	35	37	39
8	—	2	4	6	8	10	13	15	18	20	23	26	28	31	33	36	39	41	44	47
9	—	2	4	7	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54
10	—	3	5	8	11	14	17	20	24	27	31	34	37	41	44	48	51	55	58	62
11	—	3	6	9	12	16	19	23	27	31	34	38	42	46	50	54	57	61	65	69
12	—	4	7	11	13	17	21	26	30	34	38	42	47	51	55	60	64	68	72	77
13	—	4	8	12	15	19	24	28	33	37	42	47	51	56	61	65	70	75	80	84
14	—	5	9	13	16	21	26	31	36	41	46	51	56	61	66	71	77	82	87	92
15	—	5	10	14	18	23	28	33	39	44	50	55	61	66	72	77	83	88	94	100
16	—	6	11	15	19	25	30	36	42	48	54	60	65	71	77	83	89	95	101	107
17	—	6	11	17	20	26	33	39	45	51	57	64	70	77	83	89	96	102	109	115
18	—	7	12	18	22	28	35	41	48	55	61	68	75	82	88	95	102	109	116	123
19	—	7	13	19	23	30	37	44	51	58	65	72	80	87	94	101	109	116	123	130
20	—	8	14	20	25	32	39	47	54	62	69	77	84	92	100	107	115	123	130	138

Table 2: Two-Tailed α = 0.01 | One-Tailed α = 0.005

Strict significance level. Use for clinical trials, medical research, and situations where the cost of a false positive is high. More dashes appear at this level.

Decision: U ≤ U_critical → Reject H■

n■ \ n■	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	0	0	1	1	2	2	2	3	3	4	4	5	5
4	—	—	—	—	0	1	1	2	3	4	5	6	7	7	8	9	10	11	12	13
5	—	—	—	0	1	2	3	4	5	7	8	9	10	11	13	14	15	16	17	18
6	—	—	—	1	2	3	5	6	8	10	11	13	14	16	18	19	21	22	24	26
7	—	—	—	1	3	5	7	9	11	13	15	17	20	22	24	26	28	30	32	35
8	—	—	0	2	4	6	9	11	14	16	19	22	24	27	30	32	35	38	40	43
9	—	—	0	3	5	8	11	14	17	20	23	26	29	32	35	38	42	45	48	51
10	—	—	1	4	7	10	13	16	20	23	27	30	34	37	41	45	48	52	56	59
11	—	—	1	5	8	11	15	19	23	27	31	35	39	43	47	51	55	59	63	67
12	—	—	2	6	9	13	17	22	26	30	35	39	44	48	53	57	62	67	71	76
13	—	—	2	7	10	14	20	24	29	34	39	44	49	54	59	64	69	74	79	84
14	—	—	2	7	11	16	22	27	32	37	43	48	54	59	65	70	76	82	87	93
15	—	—	3	8	13	18	24	30	35	41	47	53	59	65	70	76	82	89	95	101
16	—	—	3	9	14	19	26	32	38	45	51	57	64	70	76	83	89	96	102	109
17	—	—	4	10	15	21	28	35	42	48	55	62	69	76	82	89	96	103	110	118
18	—	—	4	11	16	22	30	38	45	52	59	67	74	82	89	96	103	111	118	126
19	—	—	5	12	17	24	32	40	48	56	63	71	79	87	95	102	110	118	126	134
20	—	—	5	13	18	26	35	43	51	59	67	76	84	93	101	109	118	126	134	143

Table 3: Two-Tailed α = 0.10 | One-Tailed α = 0.05

Exploratory / pilot research level. One-tailed tests at α = 0.05 use these exact values. Only appropriate when missing a real effect (Type II error) is the greater concern.

Decision: U ≤ U_critical → Reject H■

n■ \ n■	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	0	0	1	2	3	3	4	5	5	6	7	7	8	9	9	10	11
3	—	—	0	1	2	3	4	5	6	7	8	9	10	11	12	14	15	16	17	18
4	—	0	1	2	4	5	7	8	10	11	13	14	16	17	19	21	22	24	25	27
5	—	0	2	4	5	7	9	11	13	14	16	18	20	22	24	26	28	30	32	34
6	—	1	3	5	7	9	11	13	16	18	20	22	25	27	29	32	34	36	39	41
7	—	2	4	7	9	11	14	16	19	21	24	27	29	32	34	37	40	42	45	48
8	—	3	5	8	11	13	16	19	22	25	28	31	34	37	40	43	46	49	52	56
9	—	3	6	10	13	16	19	22	25	29	32	35	39	42	45	49	52	56	59	62
10	—	4	7	11	14	18	21	25	29	32	36	40	44	47	51	55	59	62	66	70
11	—	5	8	13	16	20	24	28	32	36	40	44	49	53	57	61	65	70	74	78
12	—	5	9	14	18	22	27	31	35	40	44	49	53	58	63	67	72	77	81	86
13	—	6	10	16	20	25	29	34	39	44	49	53	58	63	68	73	78	83	88	93
14	—	7	11	17	22	27	32	37	42	47	53	58	63	68	73	79	84	89	95	100
15	—	7	12	19	24	29	34	40	45	51	57	63	68	73	79	84	90	96	101	107
16	—	8	14	21	26	32	37	43	49	55	61	67	73	79	84	90	96	102	108	114
17	—	9	15	22	28	34	40	46	52	59	65	72	78	84	90	96	103	109	115	122
18	—	9	16	24	30	36	42	49	56	62	70	77	83	89	96	102	109	115	122	129
19	—	10	17	25	32	39	45	52	59	66	74	81	88	95	101	108	115	122	129	136
20	—	11	18	27	34	41	48	56	62	70	78	86	93	100	107	114	122	129	136	144

Quick Reference: Most Common Exam & Research Values

Decision: U ≤ U_critical → Reject H■

n■ = n■	U_critical (α=0.05, Two-Tailed)
5	4
6	7
7	11
8	15
9	21
10	27
12	42
15	72
20	138

n■ = n■	U_critical (α=0.01, Two-Tailed)
5	1
6	3
7	7
8	11
9	17
10	23
12	39
15	70
20	143

n■ = n■	U_critical (α=0.10, Two-Tailed)
5	5
6	9
7	14
8	19
9	25
10	32
12	49
15	79
20	144

Large-Sample z-Approximation (n_1 or n_2 > 20)

$$z = (U - n_1 n_2/2) / \sqrt{(n_1 n_2 (n_1 + n_2 + 1) / 12)}$$

Test	z_critical	Reject H■ when	Equivalent table
Two-tailed α=0.05	±1.960	|z| ≥ 1.960	Table 1
Two-tailed α=0.01	±2.576	|z| ≥ 2.576	Table 2
Two-tailed α=0.10	±1.645	|z| ≥ 1.645	Table 3
One-tailed α=0.05	+1.645 or −1.645	correct-tail |z| ≥ 1.645	Table 3
One-tailed α=0.025	+1.960 or −1.960	correct-tail |z| ≥ 1.960	Table 1

References & Citation

1. Mann, H. B., & Whitney, D. R. (1947). On a test of whether one of two random variables is stochastically larger than the other. *The Annals of Mathematical Statistics, 18*(1), 50–60. doi:10.1214/aoms/1177730491

2. Siegel, S., & Castellan, N. J. (1988). *Nonparametric Statistics for the Behavioral Sciences* (2nd ed.). McGraw-Hill. [Primary table source]

3. Wilcoxon, F. (1945). Individual comparisons by ranking methods. *Biometrics Bulletin, 1*(6), 80–83.

4. NIST/SEMATECH (2012). *e-Handbook of Statistical Methods*. itl.nist.gov/div898/handbook/eda/section3/eda35f.htm

5. Penn State STAT 415. Nonparametric Tests. online.stat.psu.edu/stat415/lesson/18

6. UCLA OARC Statistical Consulting Group. stats.oarc.ucla.edu

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