C.8 Critical Values for the Wilcoxon Rank-Sum Test

Table C.8 provides critical values for the Wilcoxon rank-sum test for independent samples with sizes from 3 to 25. Column m is the sample size for the smaller sample and column n is the sample size for the larger sample. If the sample sizes are equal, either sample can be designated m. For each pair of sample sizes (m, n) there are two sets of critical values, one set for one-tail $\alpha = 0.025$ and two-tail $\alpha = 0.05$ and a second set for one-tail $\alpha = 0.05$ and two-tail $\alpha = 0.10$. Suppose for a two-tailed test at $\alpha = 0.05$ we have $m = 8$ and $n = 9$. In the appropriate row and column we find the following numbers 51, 93 0.0232. The 51 and 93 are the lower and upper critical values for W_X, the statistic testing H_0: $M_X = M_Y$. If $W_X \leq 51$ or $W_X \geq 93$, H_0 would be rejected. The value 0.0232 is the exact P value for the critical values of 51 or 93. For more examples see Chapter 7.

1-tail / 2-tail		$\alpha = 0.025$ / $\alpha = 0.05$		$\alpha = 0.05$ / $\alpha = 0.10$		1-tail / 2-tail		$\alpha = 0.025$ / $\alpha = 0.05$		$\alpha = 0.05$ / $\alpha = 0.10$	
m	n	W	P	W	P	m	n	W	P	W	P
3	3			6, 15	0.0500	5	10	23, 57	0.0200	26, 54	0.0496
3	4			6, 18	0.0286	5	11	24, 61	0.0190	27, 58	0.0449
3	5	6, 21	0.0179	7, 20	0.0357	5	12	26, 64	0.0242	28, 62	0.0409
3	6	7, 23	0.0238	8, 22	0.0476	5	13	27, 68	0.0230	30, 65	0.0473
3	7	7, 26	0.0167	8, 25	0.0333	5	14	28, 72	0.0218	31, 69	0.0435
3	8	8, 28	0.0242	9, 27	0.0424	5	15	29, 76	0.0209	33, 72	0.0491
3	9	8, 31	0.0182	10, 29	0.0500	5	16	30, 80	0.0201	34, 76	0.0455
3	10	9, 33	0.0245	10, 32	0.0385	5	17	32, 83	0.0238	35, 80	0.0425
3	11	9, 36	0.0192	11, 34	0.0440	5	18	33, 87	0.0229	37, 83	0.0472
3	12	10, 38	0.0242	11, 37	0.0352	5	19	34, 91	0.0220	38, 87	0.0442
3	13	10, 41	0.0196	12, 39	0.0411	5	20	35, 95	0.0212	40, 90	0.0485
3	14	11, 43	0.0235	13, 41	0.0456	5	21	37, 98	0.0243	41, 94	0.0457
3	15	11, 46	0.0196	13, 44	0.0380	5	22	38, 102	0.0234	43, 97	0.0496
3	16	12, 48	0.0237	14, 46	0.0423	5	23	39, 106	0.0226	44, 101	0.0469
3	17	12, 51	0.0202	15, 48	0.0465	5	24	40, 110	0.0219	45, 105	0.0445
3	18	13, 53	0.0233	15, 51	0.0398	5	25	42, 113	0.0246	47, 108	0.0480
3	19	13, 56	0.0201	16, 53	0.0435	6	6	26, 52	0.0206	28, 50	0.0465
3	20	14, 58	0.0232	17, 55	0.0469	6	7	27, 57	0.0175	29, 55	0.0367
3	21	14, 61	0.0203	17, 58	0.0410	6	8	29, 61	0.0213	31, 59	0.0406
3	22	15, 63	0.0230	18, 60	0.0443	6	9	31, 65	0.0248	33, 63	0.0440
3	23	15, 66	0.0204	19, 62	0.0473	6	10	32, 70	0.0210	35, 67	0.0467
3	24	16, 68	0.0229	19, 65	0.0421	6	11	34, 74	0.0238	37, 71	0.0491
3	25	16, 71	0.0205	20, 67	0.0449	6	12	35, 79	0.0207	38, 76	0.0415
4	4	10, 26	0.0143	11, 25	0.0286	6	13	37, 83	0.0231	40, 80	0.0437
4	5	11, 29	0.0159	12, 28	0.0317	6	14	38, 88	0.0204	42, 84	0.0457
4	6	12, 32	0.0190	13, 31	0.0333	6	15	40, 92	0.0224	44, 88	0.0474
4	7	13, 35	0.0212	14, 34	0.0364	6	16	42, 96	0.0244	46, 92	0.0490
4	8	14, 38	0.0242	15, 37	0.0364	6	17	43, 101	0.0219	47, 97	0.0433
4	9	14, 42	0.0168	16, 40	0.0378	6	18	45, 105	0.0236	49, 101	0.0448
4	10	15, 45	0.0180	17, 43	0.0380	6	19	46, 110	0.0214	51, 105	0.0462
4	11	16, 48	0.0198	18, 46	0.0388	6	20	48, 114	0.0229	53, 109	0.0475
4	12	17, 51	0.0209	19, 49	0.0390	6	21	50, 118	0.0244	55, 113	0.0487
4	13	18, 54	0.0223	20, 52	0.0395	6	22	51, 123	0.0224	57, 117	0.0498
4	14	19, 57	0.0232	21, 55	0.0395	6	23	53, 127	0.0237	58, 122	0.0452
4	15	20, 60	0.0243	22, 58	0.0400	6	24	54, 132	0.0219	60, 126	0.0463
4	16	21, 63	0.0250	24, 60	0.0497	6	25	56, 136	0.0231	62, 130	0.0473
4	17	21, 67	0.0202	25, 63	0.0493	7	7	36, 69	0.0189	39, 66	0.0487
4	18	22, 70	0.0212	26, 66	0.0491	7	8	38, 74	0.0200	41, 71	0.0469
4	19	23, 73	0.0219	27, 69	0.0487	7	9	40, 79	0.0209	43, 76	0.0454
4	20	24, 76	0.0227	28, 72	0.0485	7	10	42, 84	0.0215	45, 81	0.0439
4	21	25, 79	0.0233	29, 75	0.0481	7	11	44, 89	0.0221	47, 86	0.0427
4	22	26, 82	0.0240	30, 78	0.0480	7	12	46, 94	0.0225	49, 91	0.0416
4	23	27, 85	0.0246	31, 81	0.0477	7	13	48, 99	0.0228	52, 95	0.0484
4	24	27, 89	0.0211	32, 84	0.0475	7	14	50, 104	0.0230	54, 100	0.0469
4	25	28, 92	0.0217	33, 87	0.0473	7	15	52, 109	0.0233	56, 105	0.0455
5	5	17, 38	0.0159	19, 36	0.0476	7	16	54, 114	0.0234	58, 110	0.0443
5	6	18, 42	0.0152	20, 40	0.0411	7	17	56, 119	0.0236	61, 114	0.0497
5	7	20, 45	0.0240	21, 44	0.0366	7	18	58, 124	0.0237	63, 119	0.0484
5	8	21, 49	0.0225	23, 47	0.0466	7	19	60, 129	0.0238	65, 124	0.0471
5	9	22, 53	0.0210	24, 51	0.0415	7	20	62, 134	0.0239	67, 129	0.0460

1-tail / 2-tail		$\alpha = 0.025$ / $\alpha = 0.05$		$\alpha = 0.05$ / $\alpha = 0.10$		1-tail / 2-tail		$\alpha = 0.025$ / $\alpha = 0.05$		$\alpha = 0.05$ / $\alpha = 0.10$	
m	n	W	P	W	P	m	n	W	P	W	P
7	21	64, 139	0.0240	69, 134	0.0449	10	20	110, 200	0.0245	117, 193	0.0498
7	22	66, 144	0.0240	72, 138	0.0492	10	21	113, 207	0.0241	120, 200	0.0478
7	23	68, 149	0.0241	74, 143	0.0481	10	22	116, 214	0.0237	123, 207	0.0459
7	24	70, 154	0.0241	76, 148	0.0470	10	23	119, 221	0.0233	127, 213	0.0482
7	25	72, 159	0.0242	78, 153	0.0461	10	24	122, 228	0.0230	130, 220	0.0465
8	8	49, 87	0.0249	51, 85	0.0415	10	25	126, 234	0.0248	134, 226	0.0486
8	9	51, 93	0.0232	54, 90	0.0464	11	11	96, 157	0.0237	100, 153	0.0440
8	10	53, 99	0.0217	56, 96	0.0416	11	12	99, 165	0.0219	104, 160	0.0454
8	11	55, 105	0.0204	59, 101	0.0454	11	13	103, 172	0.0237	108, 167	0.0467
8	12	58, 110	0.0237	62, 106	0.0489	11	14	106, 180	0.0221	112, 174	0.0477
8	13	60, 116	0.0223	64, 112	0.0445	11	15	110, 187	0.0236	116, 181	0.0486
8	14	62, 122	0.0211	67, 117	0.0475	11	16	113, 195	0.0221	120, 188	0.0494
8	15	65, 127	0.0237	69, 123	0.0437	11	17	117, 202	0.0235	123, 196	0.0453
8	16	67, 133	0.0224	72, 128	0.0463	11	18	121, 209	0.0247	127, 203	0.0461
8	17	70, 138	0.0247	75, 133	0.0487	11	19	124, 217	0.0233	131, 210	0.0468
8	18	72, 144	0.0235	77, 139	0.0452	11	20	128, 224	0.0244	135, 217	0.0474
8	19	74, 150	0.0224	80, 144	0.0475	11	21	131, 232	0.0230	139, 224	0.0480
8	20	77, 155	0.0244	83, 149	0.0495	11	22	135, 239	0.0240	143, 231	0.0486
8	21	79, 161	0.0233	85, 155	0.0464	11	23	139, 246	0.0250	147, 238	0.0490
8	22	81, 167	0.0223	88, 160	0.0483	11	24	142, 254	0.0237	151, 245	0.0495
8	23	84, 172	0.0240	90, 166	0.0454	11	25	146, 261	0.0246	155, 252	0.0499
8	24	86, 178	0.0231	93, 171	0.0472	12	12	115, 185	0.0225	120, 180	0.0444
8	25	89, 183	0.0247	96, 176	0.0488	12	13	119, 193	0.0229	125, 187	0.0488
9	9	62, 109	0.0200	66, 105	0.0470	12	14	123, 201	0.0232	129, 195	0.0475
9	10	65, 115	0.0217	69, 111	0.0474	12	15	127, 209	0.0234	133, 203	0.0463
9	11	68, 121	0.0232	72, 117	0.0476	12	16	131, 217	0.0236	138, 210	0.0500
9	12	71, 127	0.0245	75, 123	0.0477	12	17	135, 225	0.0238	142, 218	0.0486
9	13	73, 134	0.0217	78, 129	0.0478	12	18	139, 233	0.0239	146, 226	0.0474
9	14	76, 140	0.0228	81, 135	0.0478	12	19	143, 241	0.0240	150, 234	0.0463
9	15	79, 146	0.0238	84, 141	0.0478	12	20	147, 249	0.0241	155, 241	0.0493
9	16	82, 152	0.0247	87, 147	0.0477	12	21	151, 257	0.0242	159, 249	0.0481
9	17	84, 159	0.0223	90, 153	0.0476	12	22	155, 265	0.0242	163, 257	0.0471
9	18	87, 165	0.0231	93, 159	0.0475	12	23	159, 273	0.0243	168, 264	0.0496
9	19	90, 171	0.0239	96, 165	0.0474	12	24	163, 281	0.0243	172, 272	0.0486
9	20	93, 177	0.0245	99, 171	0.0473	12	25	167, 289	0.0243	176, 280	0.0475
9	21	95, 184	0.0225	102, 177	0.0472	13	13	136, 215	0.0221	142, 209	0.0454
9	22	98, 190	0.0231	105, 183	0.0471	13	14	141, 223	0.0241	147, 217	0.0472
9	23	101, 196	0.0237	108, 189	0.0470	13	15	145, 232	0.0232	152, 225	0.0489
9	24	104, 202	0.0243	111, 195	0.0469	13	16	150, 240	0.0250	156, 234	0.0458
9	25	107, 208	0.0249	114, 201	0.0468	13	17	154, 249	0.0240	161, 242	0.0472
10	10	78, 132	0.0216	82, 128	0.0446	13	18	158, 258	0.0232	166, 250	0.0485
10	11	81, 139	0.0215	86, 134	0.0493	13	19	163, 266	0.0247	171, 258	0.0497
10	12	84, 146	0.0213	89, 141	0.0465	13	20	167, 275	0.0238	175, 267	0.0470
10	13	88, 152	0.0247	92, 148	0.0441	13	21	171, 284	0.0231	180, 275	0.0481
10	14	91, 159	0.0242	96, 154	0.0478	13	22	176, 292	0.0243	185, 283	0.0491
10	15	94, 166	0.0238	99, 161	0.0455	13	23	180, 301	0.0236	189, 292	0.0467
10	16	97, 173	0.0234	103, 167	0.0487	13	24	185, 309	0.0247	194, 300	0.0476
10	17	100, 180	0.0230	106, 174	0.0465	13	25	189, 318	0.0240	199, 308	0.0485
10	18	103, 187	0.0226	110, 180	0.0493	14	14	160, 246	0.0249	166, 240	0.0469
10	19	107, 193	0.0250	113, 187	0.0472	14	15	164, 256	0.0229	171, 249	0.0466

1-tail **2-tail**		**$\alpha = 0.025$** **$\alpha = 0.05$**		**$\alpha = 0.05$** **$\alpha = 0.10$**		**1-tail** **2-tail**		**$\alpha = 0.025$** **$\alpha = 0.05$**		**$\alpha = 0.05$** **$\alpha = 0.10$**	
m	n	W	P	W	P	m	n	W	P	W	P
14	16	169, 265	0.0236	176, 258	0.0463	17	24	282, 432	0.0239	294, 420	0.0492
14	17	174, 274	0.0242	182, 266	0.0500	17	25	288, 443	0.0238	300, 431	0.0480
14	18	179, 283	0.0247	187, 275	0.0495	18	18	270, 396	0.0235	280, 386	0.0485
14	19	183, 293	0.0230	192, 284	0.0489	18	19	277, 407	0.0246	287, 397	0.0490
14	20	188, 302	0.0235	197, 293	0.0484	18	20	283, 419	0.0238	294, 408	0.0495
14	21	193, 311	0.0239	202, 302	0.0480	18	21	290, 430	0.0247	301, 419	0.0499
14	22	198, 320	0.0243	207, 311	0.0475	18	22	296, 442	0.0240	307, 431	0.0474
14	23	203, 329	0.0247	212, 320	0.0471	18	23	303, 453	0.0248	314, 442	0.0478
14	24	207, 339	0.0233	218, 328	0.0498	18	24	309, 465	0.0240	321, 453	0.0481
14	25	212, 348	0.0236	223, 337	0.0492	18	25	316, 476	0.0248	328, 464	0.0484
15	15	184, 281	0.0227	192, 273	0.0488	19	19	303, 438	0.0248	313, 428	0.0482
15	16	190, 290	0.0247	197, 283	0.0466	19	20	309, 451	0.0234	320, 440	0.0474
15	17	195, 300	0.0243	203, 292	0.0485	19	21	316, 463	0.0236	328, 451	0.0494
15	18	200, 310	0.0239	208, 302	0.0465	19	22	323, 475	0.0238	335, 463	0.0486
15	19	205, 320	0.0235	214, 311	0.0482	19	23	330, 487	0.0240	342, 475	0.0478
15	20	210, 330	0.0232	220, 320	0.0497	19	24	337, 499	0.0241	350, 486	0.0496
15	21	216, 339	0.0247	225, 330	0.0478	19	25	344, 511	0.0243	357, 498	0.0488
15	22	221, 349	0.0243	231, 339	0.0492	20	20	337, 483	0.0245	348, 472	0.0482
15	23	226, 359	0.0239	236, 349	0.0474	20	21	344, 496	0.0241	356, 484	0.0490
15	24	231, 369	0.0235	242, 358	0.0486	20	22	351, 509	0.0236	364, 496	0.0497
15	25	237, 378	0.0248	248, 367	0.0499	20	23	359, 521	0.0246	371, 509	0.0478
16	16	211, 317	0.0234	219, 309	0.0469	20	24	366, 534	0.0242	379, 521	0.0484
16	17	217, 327	0.0243	225, 319	0.0471	20	25	373, 547	0.0237	387, 533	0.0490
16	18	222, 338	0.0231	231, 329	0.0473	21	21	373, 530	0.0245	385, 518	0.0486
16	19	228, 348	0.0239	237, 339	0.0474	21	22	381, 543	0.0249	393, 531	0.0482
16	20	234, 358	0.0247	243, 349	0.0475	21	23	388, 557	0.0238	401, 544	0.0478
16	21	239, 369	0.0235	249, 359	0.0475	21	24	396, 570	0.0242	410, 556	0.0497
16	22	245, 379	0.0242	255, 369	0.0476	21	25	404, 583	0.0245	418, 569	0.0492
16	23	251, 389	0.0248	261, 379	0.0476	22	22	411, 579	0.0247	424, 566	0.0491
16	24	256, 400	0.0238	267, 389	0.0476	22	23	419, 593	0.0244	432, 580	0.0477
16	25	262, 410	0.0243	273, 399	0.0476	22	24	427, 607	0.0242	441, 593	0.0486
17	17	240, 355	0.0243	249, 346	0.0493	22	25	435, 621	0.0240	450, 606	0.0494
17	18	246, 366	0.0243	255, 357	0.0479	23	23	451, 630	0.0249	465, 616	0.0499
17	19	252, 377	0.0243	262, 367	0.0499	23	24	459, 645	0.0242	474, 630	0.0497
17	20	258, 388	0.0242	268, 378	0.0485	23	25	468, 659	0.0246	483, 644	0.0495
17	21	264, 399	0.0242	274, 389	0.0473	24	24	492, 684	0.0241	507, 669	0.0486
17	22	270, 410	0.0241	281, 399	0.0490	24	25	501, 699	0.0241	517, 683	0.0496
17	23	276, 421	0.0240	287, 410	0.0477	25	25	536, 739	0.0247	552, 723	0.0497