Tukey's Q Table — Studentized Range Critical Values

Significance Level: α = 0.05 | 95% Confidence | k = 2–10 Groups | Within-Group df = 1–∞

Source: StatisticsFundamentals.com | statisticsfundamentals.com/tables/tukeys-q-table/ | **Derived from:** Tukey, J. W. (1949). Biometrics, 5(2), 99–114. doi:10.2307/3001913 | NIST/SEMATECH e-Handbook of Statistical Methods, itl.nist.gov | Penn State STAT 503, online.stat.psu.edu

HSD = q(α, k, df) × √(MSE / n) ■ df = N − k ■ Reject H■ for pair (i,j) if |■_i − ■_j| > HSD

df \ k	k = 2	k = 3	k = 4	k = 5	k = 6	k = 7	k = 8	k = 9	k = 10
1	17.97	26.98	32.82	37.08	40.41	43.12	45.40	47.36	49.07
2	6.08	8.33	9.80	10.88	11.74	12.44	13.03	13.54	13.99
3	4.50	5.91	6.82	7.50	8.04	8.48	8.85	9.18	9.46
4	3.93	5.04	5.76	6.29	6.71	7.05	7.35	7.60	7.83
5	3.64	4.60	5.22	5.67	6.03	6.33	6.58	6.80	6.99
6	3.46	4.34	4.90	5.30	5.63	5.90	6.12	6.32	6.49
7	3.34	4.16	4.68	5.06	5.36	5.61	5.82	6.00	6.16
8	3.26	4.04	4.53	4.89	5.17	5.40	5.60	5.77	5.92
9	3.20	3.95	4.41	4.76	5.02	5.24	5.43	5.59	5.74
10	3.15	3.88	4.33	4.65	4.91	5.12	5.30	5.46	5.60
11	3.11	3.82	4.26	4.57	4.82	5.03	5.20	5.35	5.49
12	3.08	3.77	4.20	4.51	4.75	4.95	5.12	5.27	5.39
13	3.06	3.73	4.15	4.45	4.69	4.88	5.05	5.19	5.32
14	3.03	3.70	4.11	4.41	4.64	4.83	4.99	5.13	5.25
15	3.01	3.67	4.08	4.37	4.60	4.78	4.94	5.08	5.20
16	3.00	3.65	4.05	4.33	4.56	4.74	4.90	5.03	5.15
17	2.98	3.63	4.02	4.30	4.52	4.70	4.86	4.99	5.11
18	2.97	3.61	4.00	4.28	4.49	4.67	4.82	4.96	5.07
19	2.96	3.59	3.98	4.25	4.47	4.65	4.79	4.92	5.04
20	2.95	3.58	3.96	4.23	4.45	4.62	4.77	4.90	5.01
24	2.92	3.53	3.90	4.17	4.37	4.54	4.68	4.81	4.92

df \ k	k = 2	k = 3	k = 4	k = 5	k = 6	k = 7	k = 8	k = 9	k = 10
30	2.89	3.49	3.85	4.10	4.30	4.46	4.60	4.72	4.82
40	2.86	3.44	3.79	4.04	4.23	4.39	4.52	4.63	4.73
60	2.83	3.40	3.74	3.98	4.16	4.31	4.44	4.55	4.65
120	2.80	3.36	3.68	3.92	4.10	4.24	4.36	4.47	4.56
∞	2.77	3.31	3.63	3.86	4.03	4.17	4.29	4.39	4.47

■ ***How to read:*** *Find the column for k (total number of groups) and the row for the within-group degrees of freedom df = N – k from your ANOVA table. The intersecting cell is q(α, k, df). Multiply by √(MSE/n) to obtain the minimum significant difference (HSD). For unequal sample sizes use the Tukey-Kramer SE = √(MSE/2 × (1/n■ + 1/n■)).*

Most Commonly Used Values (α = 0.05)

Parameters	q (α=0.05)
k=3, df=10	3.88
k=4, df=20	3.96
k=5, df=20	4.23
k=4, df=30	3.85
k=3, df=20	3.58
k=5, df=30	4.10

Keywords: Tukey Q table | Studentized range distribution table | Tukey HSD | post-hoc ANOVA | pairwise comparisons | family-wise error rate | FWER | k groups | within-group degrees of freedom | MSE | mean square error | multiple comparisons | Bonferroni | Scheffe | Dunnett | statistics | statisticsfundamentals.com | α = 0.05 | 95% confidence