## TABLE 1 Exact binomial probabilities $Pr(X = k) = \binom{n}{k} p^k q^{n-k}$

| $n$ | $k$ | .05 | .10 | .15 | .20 | .25 | .30 | .35 | .40 | .45 | .50 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 0 | .9025 | .8100 | .7225 | .6400 | .5625 | .4900 | .4225 | .3600 | .3025 | .2500 |
| | 1 | .0950 | .1800 | .2550 | .3200 | .3750 | .4200 | .4550 | .4800 | .4950 | .5000 |
| | 2 | .0025 | .0100 | .0225 | .0400 | .0625 | .0900 | .1225 | .1600 | .2025 | .2500 |
| 3 | 0 | .8574 | .7290 | .6141 | .5120 | .4219 | .3430 | .2746 | .2160 | .1664 | .1250 |
| | 1 | .1354 | .2430 | .3251 | .3840 | .4219 | .4410 | .4436 | .4320 | .4084 | .3750 |
| | 2 | .0071 | .0270 | .0574 | .0960 | .1406 | .1890 | .2389 | .2880 | .3341 | .3750 |
| | 3 | .0001 | .0010 | .0034 | .0080 | .0156 | .0270 | .0429 | .0640 | .0911 | .1250 |
| 4 | 0 | .8145 | .6561 | .5220 | .4096 | .3164 | .2401 | .1785 | .1296 | .0915 | .0625 |
| | 1 | .1715 | .2916 | .3685 | .4096 | .4219 | .4116 | .3845 | .3456 | .2995 | .2500 |
| | 2 | .0135 | .0486 | .0975 | .1536 | .2109 | .2646 | .3105 | .3456 | .3675 | .3750 |
| | 3 | .0005 | .0036 | .0115 | .0256 | .0469 | .0756 | .1115 | .1536 | .2005 | .2500 |
| | 4 | .0000 | .0001 | .0005 | .0016 | .0039 | .0081 | .0150 | .0256 | .0410 | .0625 |
| 5 | 0 | .7738 | .5905 | .4437 | .3277 | .2373 | .1681 | .1160 | .0778 | .0503 | .0313 |
| | 1 | .2036 | .3280 | .3915 | .4096 | .3955 | .3602 | .3124 | .2592 | .2059 | .1563 |
| | 2 | .0214 | .0729 | .1382 | .2048 | .2637 | .3087 | .3364 | .3456 | .3369 | .3125 |
| | 3 | .0011 | .0081 | .0244 | .0512 | .0879 | .1323 | .1811 | .2304 | .2757 | .3125 |
| | 4 | .0000 | .0004 | .0022 | .0064 | .0146 | .0283 | .0488 | .0768 | .1128 | .1563 |
| | 5 | .0000 | .0000 | .0001 | .0003 | .0010 | .0024 | .0053 | .0102 | .0185 | .0313 |
| 6 | 0 | .7351 | .5314 | .3771 | .2621 | .1780 | .1176 | .0754 | .0467 | .0277 | .0156 |
| | 1 | .2321 | .3543 | .3993 | .3932 | .3560 | .3025 | .2437 | .1866 | .1359 | .0938 |
| | 2 | .0305 | .0984 | .1762 | .2458 | .2966 | .3241 | .3280 | .3110 | .2780 | .2344 |
| | 3 | .0021 | .0146 | .0415 | .0819 | .1318 | .1852 | .2355 | .2765 | .3032 | .3125 |
| | 4 | .0001 | .0012 | .0055 | .0154 | .0330 | .0595 | .0951 | .1382 | .1861 | .2344 |
| | 5 | .0000 | .0001 | .0004 | .0015 | .0044 | .0102 | .0205 | .0369 | .0609 | .0938 |
| | 6 | .0000 | .0000 | .0000 | .0001 | .0002 | .0007 | .0018 | .0041 | .0083 | .0156 |
| 7 | 0 | .6983 | .4783 | .3206 | .2097 | .1335 | .0824 | .0490 | .0280 | .0152 | .0078 |
| | 1 | .2573 | .3720 | .3960 | .3670 | .3115 | .2471 | .1848 | .1306 | .0872 | .0547 |
| | 2 | .0406 | .1240 | .2097 | .2753 | .3115 | .3177 | .2985 | .2613 | .2140 | .1641 |
| | 3 | .0036 | .0230 | .0617 | .1147 | .1730 | .2269 | .2679 | .2903 | .2918 | .2734 |
| | 4 | .0002 | .0026 | .0109 | .0287 | .0577 | .0972 | .1442 | .1935 | .2388 | .2734 |
| | 5 | .0000 | .0002 | .0012 | .0043 | .0115 | .0250 | .0466 | .0774 | .1172 | .1641 |
| | 6 | .0000 | .0000 | .0001 | .0004 | .0013 | .0036 | .0084 | .0172 | .0320 | .0547 |
| | 7 | .0000 | .0000 | .0000 | .0000 | .0001 | .0002 | .0006 | .0016 | .0037 | .0078 |
| 8 | 0 | .6634 | .4305 | .2725 | .1678 | .1001 | .0576 | .0319 | .0168 | .0084 | .0039 |
| | 1 | .2793 | .3826 | .3847 | .3355 | .2670 | .1977 | .1373 | .0896 | .0548 | .0313 |
| | 2 | .0515 | .1488 | .2376 | .2936 | .3115 | .2965 | .2587 | .2090 | .1569 | .1094 |
| | 3 | .0054 | .0331 | .0839 | .1468 | .2076 | .2541 | .2786 | .2787 | .2568 | .2188 |

*(continued on next page)*

## TABLE 1 Exact binomial probabilities $Pr(X = k) = \binom{n}{k} p^k q^{n-k}$ (continued)

| $n$ | $k$ | .05 | .10 | .15 | .20 | .25 | .30 | .35 | .40 | .45 | .50 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 4 | .0004 | .0046 | .0185 | .0459 | .0865 | .1361 | .1875 | .2322 | .2627 | .2734 |
| | 5 | .0000 | .0004 | .0026 | .0092 | .0231 | .0467 | .0808 | .1239 | .1719 | .2188 |
| | 6 | .0000 | .0000 | .0002 | .0011 | .0038 | .0100 | .0217 | .0413 | .0703 | .1094 |
| | 7 | .0000 | .0000 | .0000 | .0001 | .0004 | .0012 | .0033 | .0079 | .0164 | .0313 |
| | 8 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0002 | .0007 | .0017 | .0039 |
| 9 | 0 | .6302 | .3874 | .2316 | .1342 | .0751 | .0404 | .0207 | .0101 | .0046 | .0020 |
| | 1 | .2985 | .3874 | .3679 | .3020 | .2253 | .1556 | .1004 | .0605 | .0339 | .0176 |
| | 2 | .0629 | .1722 | .2597 | .3020 | .3003 | .2668 | .2162 | .1612 | .1110 | .0703 |
| | 3 | .0077 | .0446 | .1069 | .1762 | .2336 | .2668 | .2716 | .2508 | .2119 | .1641 |
| | 4 | .0006 | .0074 | .0283 | .0661 | .1168 | .1715 | .2194 | .2508 | .2600 | .2461 |
| | 5 | .0000 | .0008 | .0050 | .0165 | .0389 | .0735 | .1181 | .1672 | .2128 | .2461 |
| | 6 | .0000 | .0001 | .0006 | .0028 | .0087 | .0210 | .0424 | .0743 | .1160 | .1641 |
| | 7 | .0000 | .0000 | .0000 | .0003 | .0012 | .0039 | .0098 | .0212 | .0407 | .0703 |
| | 8 | .0000 | .0000 | .0000 | .0000 | .0001 | .0004 | .0013 | .0035 | .0083 | .0176 |
| | 9 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0003 | .0008 | .0020 |
| 10 | 0 | .5987 | .3487 | .1969 | .1074 | .0563 | .0282 | .0135 | .0060 | .0025 | .0010 |
| | 1 | .3151 | .3874 | .3474 | .2684 | .1877 | .1211 | .0725 | .0403 | .0207 | .0098 |
| | 2 | .0746 | .1937 | .2759 | .3020 | .2816 | .2335 | .1757 | .1209 | .0763 | .0439 |
| | 3 | .0105 | .0574 | .1298 | .2013 | .2503 | .2668 | .2522 | .2150 | .1665 | .1172 |
| | 4 | .0010 | .0112 | .0401 | .0881 | .1460 | .2001 | .2377 | .2508 | .2384 | .2051 |
| | 5 | .0001 | .0015 | .0085 | .0264 | .0584 | .1029 | .1536 | .2007 | .2340 | .2461 |
| | 6 | .0000 | .0001 | .0012 | .0055 | .0162 | .0368 | .0689 | .1115 | .1596 | .2051 |
| | 7 | .0000 | .0000 | .0001 | .0008 | .0031 | .0090 | .0212 | .0425 | .0746 | .1172 |
| | 8 | .0000 | .0000 | .0000 | .0001 | .0004 | .0014 | .0043 | .0106 | .0229 | .0439 |
| | 9 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0005 | .0016 | .0042 | .0098 |
| | 10 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0003 | .0010 |
| 11 | 0 | .5688 | .3138 | .1673 | .0859 | .0422 | .0198 | .0088 | .0036 | .0014 | .0005 |
| | 1 | .3293 | .3835 | .3248 | .2362 | .1549 | .0932 | .0518 | .0266 | .0125 | .0054 |
| | 2 | .0867 | .2131 | .2866 | .2953 | .2581 | .1998 | .1395 | .0887 | .0513 | .0269 |
| | 3 | .0137 | .0710 | .1517 | .2215 | .2581 | .2568 | .2254 | .1774 | .1259 | .0806 |
| | 4 | .0014 | .0158 | .0536 | .1107 | .1721 | .2201 | .2428 | .2365 | .2060 | .1611 |
| | 5 | .0001 | .0025 | .0132 | .0388 | .0803 | .1321 | .1830 | .2207 | .2360 | .2256 |
| | 6 | .0000 | .0003 | .0023 | .0097 | .0268 | .0566 | .0985 | .1471 | .1931 | .2256 |
| | 7 | .0000 | .0000 | .0003 | .0017 | .0064 | .0173 | .0379 | .0701 | .1128 | .1611 |
| | 8 | .0000 | .0000 | .0000 | .0002 | .0011 | .0037 | .0102 | .0234 | .0462 | .0806 |
| | 9 | .0000 | .0000 | .0000 | .0000 | .0001 | .0005 | .0018 | .0052 | .0126 | .0269 |
| | 10 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0002 | .0007 | .0021 | .0054 |
| | 11 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0002 | .0005 |
| 12 | 0 | .5404 | .2824 | .1422 | .0687 | .0317 | .0138 | .0057 | .0022 | .0008 | .0002 |
| | 1 | .3413 | .3766 | .3012 | .2062 | .1267 | .0712 | .0368 | .0174 | .0075 | .0029 |
| | 2 | .0988 | .2301 | .2924 | .2835 | .2323 | .1678 | .1088 | .0639 | .0339 | .0161 |
| | 3 | .0173 | .0852 | .1720 | .2362 | .2581 | .2397 | .1954 | .1419 | .0923 | .0537 |
| | 4 | .0021 | .0213 | .0683 | .1329 | .1936 | .2311 | .2367 | .2128 | .1700 | .1208 |
| | 5 | .0002 | .0038 | .0193 | .0532 | .1032 | .1585 | .2039 | .2270 | .2225 | .1934 |
| | 6 | .0000 | .0005 | .0040 | .0155 | .0401 | .0792 | .1281 | .1766 | .2124 | .2256 |
| | 7 | .0000 | .0000 | .0006 | .0033 | .0115 | .0291 | .0591 | .1009 | .1489 | .1934 |
| | 8 | .0000 | .0000 | .0001 | .0005 | .0024 | .0078 | .0199 | .0420 | .0762 | .1208 |
| | 9 | .0000 | .0000 | .0000 | .0001 | .0004 | .0015 | .0048 | .0125 | .0277 | .0537 |
| | 10 | .0000 | .0000 | .0000 | .0000 | .0000 | .0002 | .0008 | .0025 | .0068 | .0161 |
| | 11 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0003 | .0010 | .0029 |
| | 12 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0002 |
| 13 | 0 | .5133 | .2542 | .1209 | .0550 | .0238 | .0097 | .0037 | .0013 | .0004 | .0001 |
| | 1 | .3512 | .3672 | .2774 | .1787 | .1029 | .0540 | .0259 | .0113 | .0045 | .0016 |
| | 2 | .1109 | .2448 | .2937 | .2680 | .2059 | .1388 | .0836 | .0453 | .0220 | .0095 |
| | 3 | .0214 | .0997 | .1900 | .2457 | .2517 | .2181 | .1651 | .1107 | .0660 | .0349 |
| | 4 | .0028 | .0277 | .0838 | .1535 | .2097 | .2337 | .2222 | .1845 | .1350 | .0873 |
| | 5 | .0003 | .0055 | .0266 | .0691 | .1258 | .1803 | .2154 | .2214 | .1989 | .1571 |

(continued on next page)

**TABLE 1** Exact binomial probabilities $Pr(X = k) = \binom{n}{k} p^k q^{n-k}$ *(continued)*

| $n$ | $k$ | .05 | .10 | .15 | .20 | .25 | .30 | .35 | .40 | .45 | .50 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 6 | .0000 | .0008 | .0063 | .0230 | .0559 | .1030 | .1546 | .1968 | .2169 | .2095 |
| | 7 | .0000 | .0001 | .0011 | .0058 | .0186 | .0442 | .0833 | .1312 | .1775 | .2095 |
| | 8 | .0000 | .0000 | .0001 | .0011 | .0047 | .0142 | .0336 | .0656 | .1089 | .1571 |
| | 9 | .0000 | .0000 | .0000 | .0001 | .0009 | .0034 | .0101 | .0243 | .0495 | .0873 |
| | 10 | .0000 | .0000 | .0000 | .0000 | .0001 | .0006 | .0022 | .0065 | .0162 | .0349 |
| | 11 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0003 | .0012 | .0036 | .0095 |
| | 12 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0005 | .0016 |
| | 13 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 |
| 14 | 0 | .4877 | .2288 | .1028 | .0440 | .0178 | .0068 | .0024 | .0008 | .0002 | .0001 |
| | 1 | .3593 | .3559 | .2539 | .1539 | .0832 | .0407 | .0181 | .0073 | .0027 | .0009 |
| | 2 | .1229 | .2570 | .2912 | .2501 | .1802 | .1134 | .0634 | .0317 | .0141 | .0056 |
| | 3 | .0259 | .1142 | .2056 | .2501 | .2402 | .1943 | .1366 | .0845 | .0462 | .0222 |
| | 4 | .0037 | .0349 | .0998 | .1720 | .2202 | .2290 | .2022 | .1549 | .1040 | .0611 |
| | 5 | .0004 | .0078 | .0352 | .0860 | .1468 | .1963 | .2178 | .2066 | .1701 | .1222 |
| | 6 | .0000 | .0013 | .0093 | .0322 | .0734 | .1262 | .1759 | .2066 | .2088 | .1833 |
| | 7 | .0000 | .0002 | .0019 | .0092 | .0280 | .0618 | .1082 | .1574 | .1952 | .2095 |
| | 8 | .0000 | .0000 | .0003 | .0020 | .0082 | .0232 | .0510 | .0918 | .1398 | .1833 |
| | 9 | .0000 | .0000 | .0000 | .0003 | .0018 | .0066 | .0183 | .0408 | .0762 | .1222 |
| | 10 | .0000 | .0000 | .0000 | .0000 | .0003 | .0014 | .0049 | .0136 | .0312 | .0611 |
| | 11 | .0000 | .0000 | .0000 | .0000 | .0000 | .0002 | .0010 | .0033 | .0093 | .0222 |
| | 12 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0005 | .0019 | .0056 |
| | 13 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0002 | .0009 |
| | 14 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 |
| 15 | 0 | .4633 | .2059 | .0874 | .0352 | .0134 | .0047 | .0016 | .0005 | .0001 | .0000 |
| | 1 | .3658 | .3432 | .2312 | .1319 | .0668 | .0305 | .0126 | .0047 | .0016 | .0005 |
| | 2 | .1348 | .2669 | .2856 | .2309 | .1559 | .0916 | .0476 | .0219 | .0090 | .0032 |
| | 3 | .0307 | .1285 | .2184 | .2501 | .2252 | .1700 | .1110 | .0634 | .0318 | .0139 |
| | 4 | .0049 | .0428 | .1156 | .1876 | .2252 | .2186 | .1792 | .1268 | .0780 | .0417 |
| | 5 | .0006 | .0105 | .0449 | .1032 | .1651 | .2061 | .2123 | .1859 | .1404 | .0916 |
| | 6 | .0000 | .0019 | .0132 | .0430 | .0917 | .1472 | .1906 | .2066 | .1914 | .1527 |
| | 7 | .0000 | .0003 | .0030 | .0138 | .0393 | .0811 | .1319 | .1771 | .2013 | .1964 |
| | 8 | .0000 | .0000 | .0005 | .0035 | .0131 | .0348 | .0710 | .1181 | .1647 | .1964 |
| | 9 | .0000 | .0000 | .0001 | .0007 | .0034 | .0116 | .0298 | .0612 | .1048 | .1527 |
| | 10 | .0000 | .0000 | .0000 | .0001 | .0007 | .0030 | .0096 | .0245 | .0515 | .0916 |
| | 11 | .0000 | .0000 | .0000 | .0000 | .0001 | .0006 | .0024 | .0074 | .0191 | .0417 |
| | 12 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0004 | .0016 | .0052 | .0139 |
| | 13 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0003 | .0010 | .0032 |
| | 14 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0005 |
| | 15 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 |
| 16 | 0 | .4401 | .1853 | .0743 | .0281 | .0100 | .0033 | .0010 | .0003 | .0001 | .0000 |
| | 1 | .3706 | .3294 | .2097 | .1126 | .0535 | .0228 | .0087 | .0030 | .0009 | .0002 |
| | 2 | .1463 | .2745 | .2775 | .2111 | .1336 | .0732 | .0353 | .0150 | .0056 | .0018 |
| | 3 | .0359 | .1423 | .2285 | .2463 | .2079 | .1465 | .0888 | .0468 | .0215 | .0085 |
| | 4 | .0061 | .0514 | .1311 | .2001 | .2252 | .2040 | .1553 | .1014 | .0572 | .0278 |
| | 5 | .0008 | .0137 | .0555 | .1201 | .1802 | .2099 | .2008 | .1623 | .1123 | .0667 |
| | 6 | .0001 | .0028 | .0180 | .0550 | .1101 | .1649 | .1982 | .1983 | .1684 | .1222 |
| | 7 | .0000 | .0004 | .0045 | .0197 | .0524 | .1010 | .1524 | .1889 | .1969 | .1746 |
| | 8 | .0000 | .0001 | .0009 | .0055 | .0197 | .0487 | .0923 | .1417 | .1812 | .1964 |
| | 9 | .0000 | .0000 | .0001 | .0012 | .0058 | .0185 | .0442 | .0840 | .1318 | .1746 |
| | 10 | .0000 | .0000 | .0000 | .0002 | .0014 | .0056 | .0167 | .0392 | .0755 | .1222 |
| | 11 | .0000 | .0000 | .0000 | .0000 | .0002 | .0013 | .0049 | .0142 | .0337 | .0667 |
| | 12 | .0000 | .0000 | .0000 | .0000 | .0000 | .0002 | .0011 | .0040 | .0115 | .0278 |
| | 13 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0002 | .0008 | .0029 | .0085 |
| | 14 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0005 | .0018 |
| | 15 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0002 |
| | 16 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 |

*(continued on next page)*

## TABLE 1 Exact binomial probabilities $Pr(X = k) = \binom{n}{k} p^k q^{n-k}$ (continued)

| $n$ | $k$ | .05 | .10 | .15 | .20 | .25 | .30 | .35 | .40 | .45 | .50 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 | 0 | .4181 | .1668 | .0631 | .0225 | .0075 | .0023 | .0007 | .0002 | .0000 | .0000 |
| | 1 | .3741 | .3150 | .1893 | .0957 | .0426 | .0169 | .0060 | .0019 | .0005 | .0001 |
| | 2 | .1575 | .2800 | .2673 | .1914 | .1136 | .0581 | .0260 | .0102 | .0035 | .0010 |
| | 3 | .0415 | .1556 | .2359 | .2393 | .1893 | .1245 | .0701 | .0341 | .0144 | .0052 |
| | 4 | .0076 | .0605 | .1457 | .2093 | .2209 | .1868 | .1320 | .0796 | .0411 | .0182 |
| | 5 | .0010 | .0175 | .0668 | .1361 | .1914 | .2081 | .1849 | .1379 | .0875 | .0472 |
| | 6 | .0001 | .0039 | .0236 | .0680 | .1276 | .1784 | .1991 | .1839 | .1432 | .0944 |
| | 7 | .0000 | .0007 | .0065 | .0267 | .0668 | .1201 | .1685 | .1927 | .1841 | .1484 |
| | 8 | .0000 | .0001 | .0014 | .0084 | .0279 | .0644 | .1134 | .1606 | .1883 | .1855 |
| | 9 | .0000 | .0000 | .0003 | .0021 | .0093 | .0276 | .0611 | .1070 | .1540 | .1855 |
| | 10 | .0000 | .0000 | .0000 | .0004 | .0025 | .0095 | .0263 | .0571 | .1008 | .1484 |
| | 11 | .0000 | .0000 | .0000 | .0001 | .0005 | .0026 | .0090 | .0242 | .0525 | .0944 |
| | 12 | .0000 | .0000 | .0000 | .0000 | .0001 | .0006 | .0024 | .0081 | .0215 | .0472 |
| | 13 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0005 | .0021 | .0068 | .0182 |
| | 14 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0004 | .0016 | .0052 |
| | 15 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0003 | .0010 |
| | 16 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 |
| | 17 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 |
| 18 | 0 | .3972 | .1501 | .0536 | .0180 | .0056 | .0016 | .0004 | .0001 | .0000 | .0000 |
| | 1 | .3763 | .3002 | .1704 | .0811 | .0338 | .0126 | .0042 | .0012 | .0003 | .0001 |
| | 2 | .1683 | .2835 | .2556 | .1723 | .0958 | .0458 | .0190 | .0069 | .0022 | .0006 |
| | 3 | .0473 | .1680 | .2406 | .2297 | .1704 | .1046 | .0547 | .0246 | .0095 | .0031 |
| | 4 | .0093 | .0700 | .1592 | .2153 | .2130 | .1681 | .1104 | .0614 | .0291 | .0117 |
| | 5 | .0014 | .0218 | .0787 | .1507 | .1988 | .2017 | .1664 | .1146 | .0666 | .0327 |
| | 6 | .0002 | .0052 | .0301 | .0816 | .1436 | .1873 | .1941 | .1655 | .1181 | .0708 |
| | 7 | .0000 | .0010 | .0091 | .0350 | .0820 | .1376 | .1792 | .1892 | .1657 | .1214 |
| | 8 | .0000 | .0002 | .0022 | .0120 | .0376 | .0811 | .1327 | .1734 | .1864 | .1669 |
| | 9 | .0000 | .0000 | .0004 | .0033 | .0139 | .0386 | .0794 | .1284 | .1694 | .1855 |
| | 10 | .0000 | .0000 | .0001 | .0008 | .0042 | .0149 | .0385 | .0771 | .1248 | .1669 |
| | 11 | .0000 | .0000 | .0000 | .0001 | .0010 | .0046 | .0151 | .0374 | .0742 | .1214 |
| | 12 | .0000 | .0000 | .0000 | .0000 | .0002 | .0012 | .0047 | .0145 | .0354 | .0708 |
| | 13 | .0000 | .0000 | .0000 | .0000 | .0000 | .0002 | .0012 | .0045 | .0134 | .0327 |
| | 14 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0002 | .0011 | .0039 | .0117 |
| | 15 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0002 | .0009 | .0031 |
| | 16 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0006 |
| | 17 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 |
| | 18 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 |
| 19 | 0 | .3774 | .1351 | .0456 | .0144 | .0042 | .0011 | .0003 | .0001 | .0000 | .0000 |
| | 1 | .3774 | .2852 | .1529 | .0685 | .0268 | .0093 | .0029 | .0008 | .0002 | .0000 |
| | 2 | .1787 | .2852 | .2428 | .1540 | .0803 | .0358 | .0138 | .0046 | .0013 | .0003 |
| | 3 | .0533 | .1796 | .2428 | .2182 | .1517 | .0869 | .0422 | .0175 | .0062 | .0018 |
| | 4 | .0112 | .0798 | .1714 | .2182 | .2023 | .1491 | .0909 | .0467 | .0203 | .0074 |
| | 5 | .0018 | .0266 | .0907 | .1636 | .2023 | .1916 | .1468 | .0933 | .0497 | .0222 |
| | 6 | .0002 | .0069 | .0374 | .0955 | .1574 | .1916 | .1844 | .1451 | .0949 | .0518 |
| | 7 | .0000 | .0014 | .0122 | .0443 | .0974 | .1525 | .1844 | .1797 | .1443 | .0961 |
| | 8 | .0000 | .0002 | .0032 | .0166 | .0487 | .0981 | .1489 | .1797 | .1771 | .1442 |
| | 9 | .0000 | .0000 | .0007 | .0051 | .0198 | .0514 | .0980 | .1464 | .1771 | .1762 |
| | 10 | .0000 | .0000 | .0001 | .0013 | .0066 | .0220 | .0528 | .0976 | .1449 | .1762 |
| | 11 | .0000 | .0000 | .0000 | .0003 | .0018 | .0077 | .0233 | .0532 | .0970 | .1442 |
| | 12 | .0000 | .0000 | .0000 | .0000 | .0004 | .0022 | .0083 | .0237 | .0529 | .0961 |
| | 13 | .0000 | .0000 | .0000 | .0000 | .0001 | .0005 | .0024 | .0085 | .0233 | .0518 |
| | 14 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0006 | .0024 | .0082 | .0222 |
| | 15 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0005 | .0022 | .0074 |
| | 16 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0005 | .0018 |
| | 17 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0003 |

(continued on next page)

## TABLE 1 Exact binomial probabilities $Pr(X = k) = \binom{n}{k} p^k q^{n-k}$ (continued)

| $n$ | $k$ | .05 | .10 | .15 | .20 | .25 | .30 | .35 | .40 | .45 | .50 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 18 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 |
| | 19 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 |
| 20 | 0 | .3585 | .1216 | .0388 | .0115 | .0032 | .0008 | .0002 | .0000 | .0000 | .0000 |
| | 1 | .3774 | .2702 | .1368 | .0576 | .0211 | .0068 | .0020 | .0005 | .0001 | .0000 |
| | 2 | .1887 | .2852 | .2293 | .1369 | .0669 | .0278 | .0100 | .0031 | .0008 | .0002 |
| | 3 | .0596 | .1901 | .2428 | .2054 | .1339 | .0716 | .0323 | .0123 | .0040 | .0011 |
| | 4 | .0133 | .0898 | .1821 | .2182 | .1897 | .1304 | .0738 | .0350 | .0139 | .0046 |
| | 5 | .0022 | .0319 | .1028 | .1746 | .2023 | .1789 | .1272 | .0746 | .0365 | .0148 |
| | 6 | .0003 | .0089 | .0454 | .1091 | .1686 | .1916 | .1712 | .1244 | .0746 | .0370 |
| | 7 | .0000 | .0020 | .0160 | .0546 | .1124 | .1643 | .1844 | .1659 | .1221 | .0739 |
| | 8 | .0000 | .0004 | .0046 | .0222 | .0609 | .1144 | .1614 | .1797 | .1623 | .1201 |
| | 9 | .0000 | .0001 | .0011 | .0074 | .0271 | .0654 | .1158 | .1597 | .1771 | .1602 |
| | 10 | .0000 | .0000 | .0002 | .0020 | .0099 | .0308 | .0686 | .1171 | .1593 | .1762 |
| | 11 | .0000 | .0000 | .0000 | .0005 | .0030 | .0120 | .0336 | .0710 | .1185 | .1602 |
| | 12 | .0000 | .0000 | .0000 | .0001 | .0008 | .0039 | .0136 | .0355 | .0727 | .1201 |
| | 13 | .0000 | .0000 | .0000 | .0000 | .0002 | .0010 | .0045 | .0146 | .0366 | .0739 |
| | 14 | .0000 | .0000 | .0000 | .0000 | .0000 | .0002 | .0012 | .0049 | .0150 | .0370 |
| | 15 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0003 | .0013 | .0049 | .0148 |
| | 16 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0003 | .0013 | .0046 |
| | 17 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0002 | .0011 |
| | 18 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0002 |
| | 19 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 |
| | 20 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 |

## TABLE 2 Exact Poisson probabilities $Pr(X = k) = \frac{e^{-\mu}\mu^k}{k!}$

| | μ | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| $k$ | 0.5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 | 5.0 |
| 0 | .6065 | .3679 | .2231 | .1353 | .0821 | .0498 | .0302 | .0183 | .0111 | .0067 |
| 1 | .3033 | .3679 | .3347 | .2707 | .2052 | .1494 | .1057 | .0733 | .0500 | .0337 |
| 2 | .0758 | .1839 | .2510 | .2707 | .2565 | .2240 | .1850 | .1465 | .1125 | .0842 |
| 3 | .0126 | .0613 | .1255 | .1804 | .2138 | .2240 | .2158 | .1954 | .1687 | .1404 |
| 4 | .0016 | .0153 | .0471 | .0902 | .1336 | .1680 | .1888 | .1954 | .1898 | .1755 |
| 5 | .0002 | .0031 | .0141 | .0361 | .0668 | .1008 | .1322 | .1563 | .1708 | .1755 |
| 6 | .0000 | .0005 | .0035 | .0120 | .0278 | .0504 | .0771 | .1042 | .1281 | .1462 |
| 7 | .0000 | .0001 | .0008 | .0034 | .0099 | .0216 | .0385 | .0595 | .0824 | .1044 |
| 8 | .0000 | .0000 | .0001 | .0009 | .0031 | .0081 | .0169 | .0298 | .0463 | .0653 |
| 9 | .0000 | .0000 | .0000 | .0002 | .0009 | .0027 | .0066 | .0132 | .0232 | .0363 |
| 10 | .0000 | .0000 | .0000 | .0000 | .0002 | .0008 | .0023 | .0053 | .0104 | .0181 |
| 11 | .0000 | .0000 | .0000 | .0000 | .0000 | .0002 | .0007 | .0019 | .0043 | .0082 |
| 12 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0002 | .0006 | .0016 | .0034 |
| 13 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0002 | .0006 | .0013 |
| 14 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0002 | .0005 |
| 15 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0002 |
| 16 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 |

| | μ | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| $k$ | 5.5 | 6.0 | 6.5 | 7.0 | 7.5 | 8.0 | 8.5 | 9.0 | 9.5 | 10.0 |
| 0 | .0041 | .0025 | .0015 | .0009 | .0006 | .0003 | .0002 | .0001 | .0001 | .0000 |
| 1 | .0225 | .0149 | .0098 | .0064 | .0041 | .0027 | .0017 | .0011 | .0007 | .0005 |
| 2 | .0618 | .0446 | .0318 | .0223 | .0156 | .0107 | .0074 | .0050 | .0034 | .0023 |
| 3 | .1133 | .0892 | .0688 | .0521 | .0389 | .0286 | .0208 | .0150 | .0107 | .0076 |

(continued on next page)

## TABLE 2 Exact Poisson probabilities $Pr(X = k) = \frac{e^{-\mu}\mu^k}{k!}$ *(continued)*

| | μ | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *k* | 5.5 | 6.0 | 6.5 | 7.0 | 7.5 | 8.0 | 8.5 | 9.0 | 9.5 | 10.0 |
| 4 | .1558 | .1339 | .1118 | .0912 | .0729 | .0573 | .0443 | .0337 | .0254 | .0189 |
| 5 | .1714 | .1606 | .1454 | .1277 | .1094 | .0916 | .0752 | .0607 | .0483 | .0378 |
| 6 | .1571 | .1606 | .1575 | .1490 | .1367 | .1221 | .1066 | .0911 | .0764 | .0631 |
| 7 | .1234 | .1377 | .1462 | .1490 | .1465 | .1396 | .1294 | .1171 | .1037 | .0901 |
| 8 | .0849 | .1033 | .1188 | .1304 | .1373 | .1396 | .1375 | .1318 | .1232 | .1126 |
| 9 | .0519 | .0688 | .0858 | .1014 | .1144 | .1241 | .1299 | .1318 | .1300 | .1251 |
| 10 | .0285 | .0413 | .0558 | .0710 | .0858 | .0993 | .1104 | .1186 | .1235 | .1251 |
| 11 | .0143 | .0225 | .0330 | .0452 | .0585 | .0722 | .0853 | .0970 | .1067 | .1137 |
| 12 | .0065 | .0113 | .0179 | .0263 | .0366 | .0481 | .0604 | .0728 | .0844 | .0948 |
| 13 | .0028 | .0052 | .0089 | .0142 | .0211 | .0296 | .0395 | .0504 | .0617 | .0729 |
| 14 | .0011 | .0022 | .0041 | .0071 | .0113 | .0169 | .0240 | .0324 | .0419 | .0521 |
| 15 | .0004 | .0009 | .0018 | .0033 | .0057 | .0090 | .0136 | .0194 | .0265 | .0347 |
| 16 | .0001 | .0003 | .0007 | .0014 | .0026 | .0045 | .0072 | .0109 | .0157 | .0217 |
| 17 | .0000 | .0001 | .0003 | .0006 | .0012 | .0021 | .0036 | .0058 | .0088 | .0128 |
| 18 | .0000 | .0000 | .0001 | .0002 | .0005 | .0009 | .0017 | .0029 | .0046 | .0071 |
| 19 | .0000 | .0000 | .0000 | .0001 | .0002 | .0004 | .0008 | .0014 | .0023 | .0037 |
| 20 | .0000 | .0000 | .0000 | .0000 | .0001 | .0002 | .0003 | .0006 | .0011 | .0019 |
| 21 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0001 | .0003 | .0005 | .0009 |
| 22 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0001 | .0002 | .0004 |
| 23 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0002 |
| 24 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 |
| 25 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 |

| | μ | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *k* | 10.5 | 11.0 | 11.5 | 12.0 | 12.5 | 13.0 | 13.5 | 14.0 | 14.5 | 15.0 |
| 0 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 |
| 1 | .0003 | .0002 | .0001 | .0001 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 |
| 2 | .0015 | .0010 | .0007 | .0004 | .0003 | .0002 | .0001 | .0001 | .0001 | .0000 |
| 3 | .0053 | .0037 | .0026 | .0018 | .0012 | .0008 | .0006 | .0004 | .0003 | .0002 |
| 4 | .0139 | .0102 | .0074 | .0053 | .0038 | .0027 | .0019 | .0013 | .0009 | .0006 |
| 5 | .0293 | .0224 | .0170 | .0127 | .0095 | .0070 | .0051 | .0037 | .0027 | .0019 |
| 6 | .0513 | .0411 | .0325 | .0255 | .0197 | .0152 | .0115 | .0087 | .0065 | .0048 |
| 7 | .0769 | .0646 | .0535 | .0437 | .0353 | .0281 | .0222 | .0174 | .0135 | .0104 |
| 8 | .1009 | .0888 | .0769 | .0655 | .0551 | .0457 | .0375 | .0304 | .0244 | .0194 |
| 9 | .1177 | .1085 | .0982 | .0874 | .0765 | .0661 | .0563 | .0473 | .0394 | .0324 |
| 10 | .1236 | .1194 | .1129 | .1048 | .0956 | .0859 | .0760 | .0663 | .0571 | .0486 |
| 11 | .1180 | .1194 | .1181 | .1144 | .1087 | .1015 | .0932 | .0844 | .0753 | .0663 |
| 12 | .1032 | .1094 | .1131 | .1144 | .1132 | .1099 | .1049 | .0984 | .0910 | .0829 |
| 13 | .0834 | .0926 | .1001 | .1056 | .1089 | .1099 | .1089 | .1060 | .1014 | .0956 |
| 14 | .0625 | .0728 | .0822 | .0905 | .0972 | .1021 | .1050 | .1060 | .1051 | .1024 |
| 15 | .0438 | .0534 | .0630 | .0724 | .0810 | .0885 | .0945 | .0989 | .1016 | .1024 |
| 16 | .0287 | .0367 | .0453 | .0543 | .0633 | .0719 | .0798 | .0866 | .0920 | .0960 |
| 17 | .0177 | .0237 | .0306 | .0383 | .0465 | .0550 | .0633 | .0713 | .0785 | .0847 |
| 18 | .0104 | .0145 | .0196 | .0255 | .0323 | .0397 | .0475 | .0554 | .0632 | .0706 |
| 19 | .0057 | .0084 | .0119 | .0161 | .0213 | .0272 | .0337 | .0409 | .0483 | .0557 |
| 20 | .0030 | .0046 | .0068 | .0097 | .0133 | .0177 | .0228 | .0286 | .0350 | .0418 |
| 21 | .0015 | .0024 | .0037 | .0055 | .0079 | .0109 | .0146 | .0191 | .0242 | .0299 |
| 22 | .0007 | .0012 | .0020 | .0030 | .0045 | .0065 | .0090 | .0121 | .0159 | .0204 |
| 23 | .0003 | .0006 | .0010 | .0016 | .0024 | .0037 | .0053 | .0074 | .0100 | .0133 |
| 24 | .0001 | .0003 | .0005 | .0008 | .0013 | .0020 | .0030 | .0043 | .0061 | .0083 |
| 25 | .0001 | .0001 | .0002 | .0004 | .0006 | .0010 | .0016 | .0024 | .0035 | .0050 |
| 26 | .0000 | .0000 | .0001 | .0002 | .0003 | .0005 | .0008 | .0013 | .0020 | .0029 |
| 27 | .0000 | .0000 | .0000 | .0001 | .0001 | .0002 | .0004 | .0007 | .0011 | .0016 |
| 28 | .0000 | .0000 | .0000 | .0000 | .0001 | .0001 | .0002 | .0003 | .0005 | .0009 |

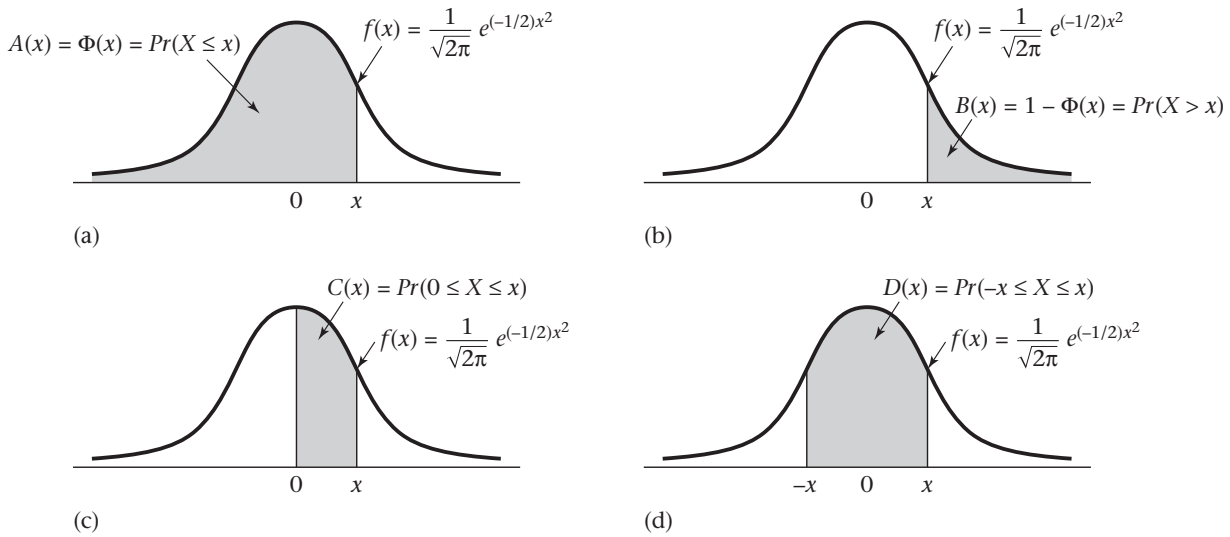
*(continued on next page)*

## TABLE 2 Exact Poisson probabilities $Pr(X = k) = \frac{e^{-\mu}\mu^k}{k!}$ *(continued)*

| | μ | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *k* | 10.5 | 11.0 | 11.5 | 12.0 | 12.5 | 13.0 | 13.5 | 14.0 | 14.5 | 15.0 |
| 29 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0001 | .0002 | .0003 | .0004 |
| 30 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0001 | .0002 |
| 31 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0001 |
| 32 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 |
| 33 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 |

| | μ | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *k* | 15.5 | 16.0 | 16.5 | 17.0 | 17.5 | 18.0 | 18.5 | 19.0 | 19.5 | 20.0 |
| 0 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 |
| 1 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 |
| 2 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 |
| 3 | .0001 | .0001 | .0001 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 |
| 4 | .0004 | .0003 | .0002 | .0001 | .0001 | .0001 | .0000 | .0000 | .0000 | .0000 |
| 5 | .0014 | .0010 | .0007 | .0005 | .0003 | .0002 | .0002 | .0001 | .0001 | .0001 |
| 6 | .0036 | .0026 | .0019 | .0014 | .0010 | .0007 | .0005 | .0004 | .0003 | .0002 |
| 7 | .0079 | .0060 | .0045 | .0034 | .0025 | .0019 | .0014 | .0010 | .0007 | .0005 |
| 8 | .0153 | .0120 | .0093 | .0072 | .0055 | .0042 | .0031 | .0024 | .0018 | .0013 |
| 9 | .0264 | .0213 | .0171 | .0135 | .0107 | .0083 | .0065 | .0050 | .0038 | .0029 |
| 10 | .0409 | .0341 | .0281 | .0230 | .0186 | .0150 | .0120 | .0095 | .0074 | .0058 |
| 11 | .0577 | .0496 | .0422 | .0355 | .0297 | .0245 | .0201 | .0164 | .0132 | .0106 |
| 12 | .0745 | .0661 | .0580 | .0504 | .0432 | .0368 | .0310 | .0259 | .0214 | .0176 |
| 13 | .0888 | .0814 | .0736 | .0658 | .0582 | .0509 | .0441 | .0378 | .0322 | .0271 |
| 14 | .0983 | .0930 | .0868 | .0800 | .0728 | .0655 | .0583 | .0514 | .0448 | .0387 |
| 15 | .1016 | .0992 | .0955 | .0906 | .0849 | .0786 | .0719 | .0650 | .0582 | .0516 |
| 16 | .0984 | .0992 | .0985 | .0963 | .0929 | .0884 | .0831 | .0772 | .0710 | .0646 |
| 17 | .0897 | .0934 | .0956 | .0963 | .0956 | .0936 | .0904 | .0863 | .0814 | .0760 |
| 18 | .0773 | .0830 | .0876 | .0909 | .0929 | .0936 | .0930 | .0911 | .0882 | .0844 |
| 19 | .0630 | .0699 | .0761 | .0814 | .0856 | .0887 | .0905 | .0911 | .0905 | .0888 |
| 20 | .0489 | .0559 | .0628 | .0692 | .0749 | .0798 | .0837 | .0866 | .0883 | .0888 |
| 21 | .0361 | .0426 | .0493 | .0560 | .0624 | .0684 | .0738 | .0783 | .0820 | .0846 |
| 22 | .0254 | .0310 | .0370 | .0433 | .0496 | .0560 | .0620 | .0676 | .0727 | .0769 |
| 23 | .0171 | .0216 | .0265 | .0320 | .0378 | .0438 | .0499 | .0559 | .0616 | .0669 |
| 24 | .0111 | .0144 | .0182 | .0226 | .0275 | .0328 | .0385 | .0442 | .0500 | .0557 |
| 25 | .0069 | .0092 | .0120 | .0154 | .0193 | .0237 | .0285 | .0336 | .0390 | .0446 |
| 26 | .0041 | .0057 | .0076 | .0101 | .0130 | .0164 | .0202 | .0246 | .0293 | .0343 |
| 27 | .0023 | .0034 | .0047 | .0063 | .0084 | .0109 | .0139 | .0173 | .0211 | .0254 |
| 28 | .0013 | .0019 | .0028 | .0038 | .0053 | .0070 | .0092 | .0117 | .0147 | .0181 |
| 29 | .0007 | .0011 | .0016 | .0023 | .0032 | .0044 | .0058 | .0077 | .0099 | .0125 |
| 30 | .0004 | .0006 | .0009 | .0013 | .0019 | .0026 | .0036 | .0049 | .0064 | .0083 |
| 31 | .0002 | .0003 | .0005 | .0007 | .0010 | .0015 | .0022 | .0030 | .0040 | .0054 |
| 32 | .0001 | .0001 | .0002 | .0004 | .0006 | .0009 | .0012 | .0018 | .0025 | .0034 |
| 33 | .0000 | .0001 | .0001 | .0002 | .0003 | .0005 | .0007 | .0010 | .0015 | .0020 |
| 34 | .0000 | .0000 | .0001 | .0001 | .0002 | .0002 | .0004 | .0006 | .0008 | .0012 |
| 35 | .0000 | .0000 | .0000 | .0000 | .0001 | .0001 | .0002 | .0003 | .0005 | .0007 |
| 36 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0001 | .0002 | .0003 | .0004 |
| 37 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0001 | .0001 | .0002 |
| 38 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0001 |
| 39 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 |
| 40 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 |

## TABLE 3 The normal distribution




| x | A[a] | B[b] | C[c] | D[d] | x | A | B | C | D |
|---|---|---|---|---|---|---|---|---|---|
| 0.0 | .5000 | .5000 | .0 | .0 | 0.32 | .6255 | .3745 | .1255 | .2510 |
| 0.01 | .5040 | .4960 | .0040 | .0080 | 0.33 | .6293 | .3707 | .1293 | .2586 |
| 0.02 | .5080 | .4920 | .0080 | .0160 | 0.34 | .6331 | .3669 | .1331 | .2661 |
| 0.03 | .5120 | .4880 | .0120 | .0239 | 0.35 | .6368 | .3632 | .1368 | .2737 |
| 0.04 | .5160 | .4840 | .0160 | .0319 | 0.36 | .6406 | .3594 | .1406 | .2812 |
| 0.05 | .5199 | .4801 | .0199 | .0399 | 0.37 | .6443 | .3557 | .1443 | .2886 |
| 0.06 | .5239 | .4761 | .0239 | .0478 | 0.38 | .6480 | .3520 | .1480 | .2961 |
| 0.07 | .5279 | .4721 | .0279 | .0558 | 0.39 | .6517 | .3483 | .1517 | .3035 |
| 0.08 | .5319 | .4681 | .0319 | .0638 | 0.40 | .6554 | .3446 | .1554 | .3108 |
| 0.09 | .5359 | .4641 | .0359 | .0717 | 0.41 | .6591 | .3409 | .1591 | .3182 |
| 0.10 | .5398 | .4602 | .0398 | .0797 | 0.42 | .6628 | .3372 | .1628 | .3255 |
| 0.11 | .5438 | .4562 | .0438 | .0876 | 0.43 | .6664 | .3336 | .1664 | .3328 |
| 0.12 | .5478 | .4522 | .0478 | .0955 | 0.44 | .6700 | .3300 | .1700 | .3401 |
| 0.13 | .5517 | .4483 | .0517 | .1034 | 0.45 | .6736 | .3264 | .1736 | .3473 |
| 0.14 | .5557 | .4443 | .0557 | .1113 | 0.46 | .6772 | .3228 | .1772 | .3545 |
| 0.15 | .5596 | .4404 | .0596 | .1192 | 0.47 | .6808 | .3192 | .1808 | .3616 |
| 0.16 | .5636 | .4364 | .0636 | .1271 | 0.48 | .6844 | .3156 | .1844 | .3688 |
| 0.17 | .5675 | .4325 | .0675 | .1350 | 0.49 | .6879 | .3121 | .1879 | .3759 |
| 0.18 | .5714 | .4286 | .0714 | .1428 | 0.50 | .6915 | .3085 | .1915 | .3829 |
| 0.19 | .5753 | .4247 | .0753 | .1507 | 0.51 | .6950 | .3050 | .1950 | .3899 |
| 0.20 | .5793 | .4207 | .0793 | .1585 | 0.52 | .6985 | .3015 | .1985 | .3969 |
| 0.21 | .5832 | .4168 | .0832 | .1663 | 0.53 | .7019 | .2981 | .2019 | .4039 |
| 0.22 | .5871 | .4129 | .0871 | .1741 | 0.54 | .7054 | .2946 | .2054 | .4108 |
| 0.23 | .5910 | .4090 | .0910 | .1819 | 0.55 | .7088 | .2912 | .2088 | .4177 |
| 0.24 | .5948 | .4052 | .0948 | .1897 | 0.56 | .7123 | .2877 | .2123 | .4245 |
| 0.25 | .5987 | .4013 | .0987 | .1974 | 0.57 | .7157 | .2843 | .2157 | .4313 |
| 0.26 | .6026 | .3974 | .1026 | .2051 | 0.58 | .7190 | .2810 | .2190 | .4381 |
| 0.27 | .6064 | .3936 | .1064 | .2128 | 0.59 | .7224 | .2776 | .2224 | .4448 |
| 0.28 | .6103 | .3897 | .1103 | .2205 | 0.60 | .7257 | .2743 | .2257 | .4515 |
| 0.29 | .6141 | .3859 | .1141 | .2282 | 0.61 | .7291 | .2709 | .2291 | .4581 |
| 0.30 | .6179 | .3821 | .1179 | .2358 | 0.62 | .7324 | .2676 | .2324 | .4647 |
| 0.31 | .6217 | .3783 | .1217 | .2434 | 0.63 | .7357 | .2643 | .2357 | .4713 |

(continued on next page)

## TABLE 3 The normal distribution *(continued)*

| *x* | *A*[a] | *B*[b] | *C*[c] | *D*[d] | *x* | *A* | *B* | *C* | *D* |
|---|---|---|---|---|---|---|---|---|---|
| 0.64 | .7389 | .2611 | .2389 | .4778 | 1.23 | .8907 | .1093 | .3907 | .7813 |
| 0.65 | .7422 | .2578 | .2422 | .4843 | 1.24 | .8925 | .1075 | .3925 | .7850 |
| 0.66 | .7454 | .2546 | .2454 | .4907 | 1.25 | .8944 | .1056 | .3944 | .7887 |
| 0.67 | .7486 | .2514 | .2486 | .4971 | 1.26 | .8962 | .1038 | .3962 | .7923 |
| 0.68 | .7517 | .2483 | .2517 | .5035 | 1.27 | .8980 | .1020 | .3980 | .7959 |
| 0.69 | .7549 | .2451 | .2549 | .5098 | 1.28 | .8997 | .1003 | .3997 | .7995 |
| 0.70 | .7580 | .2420 | .2580 | .5161 | 1.29 | .9015 | .0985 | .4015 | .8029 |
| 0.71 | .7611 | .2389 | .2611 | .5223 | 1.30 | .9032 | .0968 | .4032 | .8064 |
| 0.72 | .7642 | .2358 | .2642 | .5285 | 1.31 | .9049 | .0951 | .4049 | .8098 |
| 0.73 | .7673 | .2327 | .2673 | .5346 | 1.32 | .9066 | .0934 | .4066 | .8132 |
| 0.74 | .7703 | .2297 | .2703 | .5407 | 1.33 | .9082 | .0918 | .4082 | .8165 |
| 0.75 | .7734 | .2266 | .2734 | .5467 | 1.34 | .9099 | .0901 | .4099 | .8198 |
| 0.76 | .7764 | .2236 | .2764 | .5527 | 1.35 | .9115 | .0885 | .4115 | .8230 |
| 0.77 | .7793 | .2207 | .2793 | .5587 | 1.36 | .9131 | .0869 | .4131 | .8262 |
| 0.78 | .7823 | .2177 | .2823 | .5646 | 1.37 | .9147 | .0853 | .4147 | .8293 |
| 0.79 | .7852 | .2148 | .2852 | .5705 | 1.38 | .9162 | .0838 | .4162 | .8324 |
| 0.80 | .7881 | .2119 | .2881 | .5763 | 1.39 | .9177 | .0823 | .4177 | .8355 |
| 0.81 | .7910 | .2090 | .2910 | .5821 | 1.40 | .9192 | .0808 | .4192 | .8385 |
| 0.82 | .7939 | .2061 | .2939 | .5878 | 1.41 | .9207 | .0793 | .4207 | .8415 |
| 0.83 | .7967 | .2033 | .2967 | .5935 | 1.42 | .9222 | .0778 | .4222 | .8444 |
| 0.84 | .7995 | .2005 | .2995 | .5991 | 1.43 | .9236 | .0764 | .4236 | .8473 |
| 0.85 | .8023 | .1977 | .3023 | .6047 | 1.44 | .9251 | .0749 | .4251 | .8501 |
| 0.86 | .8051 | .1949 | .3051 | .6102 | 1.45 | .9265 | .0735 | .4265 | .8529 |
| 0.87 | .8078 | .1922 | .3078 | .6157 | 1.46 | .9279 | .0721 | .4279 | .8557 |
| 0.88 | .8106 | .1894 | .3106 | .6211 | 1.47 | .9292 | .0708 | .4292 | .8584 |
| 0.89 | .8133 | .1867 | .3133 | .6265 | 1.48 | .9306 | .0694 | .4306 | .8611 |
| 0.90 | .8159 | .1841 | .3159 | .6319 | 1.49 | .9319 | .0681 | .4319 | .8638 |
| 0.91 | .8186 | .1814 | .3186 | .6372 | 1.50 | .9332 | .0668 | .4332 | .8664 |
| 0.92 | .8212 | .1788 | .3212 | .6424 | 1.51 | .9345 | .0655 | .4345 | .8690 |
| 0.93 | .8238 | .1762 | .3238 | .6476 | 1.52 | .9357 | .0643 | .4357 | .8715 |
| 0.94 | .8264 | .1736 | .3264 | .6528 | 1.53 | .9370 | .0630 | .4370 | .8740 |
| 0.95 | .8289 | .1711 | .3289 | .6579 | 1.54 | .9382 | .0618 | .4382 | .8764 |
| 0.96 | .8315 | .1685 | .3315 | .6629 | 1.55 | .9394 | .0606 | .4394 | .8789 |
| 0.97 | .8340 | .1660 | .3340 | .6680 | 1.56 | .9406 | .0594 | .4406 | .8812 |
| 0.98 | .8365 | .1635 | .3365 | .6729 | 1.57 | .9418 | .0582 | .4418 | .8836 |
| 0.99 | .8389 | .1611 | .3389 | .6778 | 1.58 | .9429 | .0571 | .4429 | .8859 |
| 1.00 | .8413 | .1587 | .3413 | .6827 | 1.59 | .9441 | .0559 | .4441 | .8882 |
| 1.01 | .8438 | .1562 | .3438 | .6875 | 1.60 | .9452 | .0548 | .4452 | .8904 |
| 1.02 | .8461 | .1539 | .3461 | .6923 | 1.61 | .9463 | .0537 | .4463 | .8926 |
| 1.03 | .8485 | .1515 | .3485 | .6970 | 1.62 | .9474 | .0526 | .4474 | .8948 |
| 1.04 | .8508 | .1492 | .3508 | .7017 | 1.63 | .9484 | .0516 | .4484 | .8969 |
| 1.05 | .8531 | .1469 | .3531 | .7063 | 1.64 | .9495 | .0505 | .4495 | .8990 |
| 1.06 | .8554 | .1446 | .3554 | .7109 | 1.65 | .9505 | .0495 | .4505 | .9011 |
| 1.07 | .8577 | .1423 | .3577 | .7154 | 1.66 | .9515 | .0485 | .4515 | .9031 |
| 1.08 | .8599 | .1401 | .3599 | .7199 | 1.67 | .9525 | .0475 | .4525 | .9051 |
| 1.09 | .8621 | .1379 | .3621 | .7243 | 1.68 | .9535 | .0465 | .4535 | .9070 |
| 1.10 | .8643 | .1357 | .3643 | .7287 | 1.69 | .9545 | .0455 | .4545 | .9090 |
| 1.11 | .8665 | .1335 | .3665 | .7330 | 1.70 | .9554 | .0446 | .4554 | .9109 |
| 1.12 | .8686 | .1314 | .3686 | .7373 | 1.71 | .9564 | .0436 | .4564 | .9127 |
| 1.13 | .8708 | .1292 | .3708 | .7415 | 1.72 | .9573 | .0427 | .4573 | .9146 |
| 1.14 | .8729 | .1271 | .3729 | .7457 | 1.73 | .9582 | .0418 | .4582 | .9164 |
| 1.15 | .8749 | .1251 | .3749 | .7499 | 1.74 | .9591 | .0409 | .4591 | .9181 |
| 1.16 | .8770 | .1230 | .3770 | .7540 | 1.75 | .9599 | .0401 | .4599 | .9199 |
| 1.17 | .8790 | .1210 | .3790 | .7580 | 1.76 | .9608 | .0392 | .4608 | .9216 |
| 1.18 | .8810 | .1190 | .3810 | .7620 | 1.77 | .9616 | .0384 | .4616 | .9233 |
| 1.19 | .8830 | .1170 | .3830 | .7660 | 1.78 | .9625 | .0375 | .4625 | .9249 |
| 1.20 | .8849 | .1151 | .3849 | .7699 | 1.79 | .9633 | .0367 | .4633 | .9265 |
| 1.21 | .8869 | .1131 | .3869 | .7737 | 1.80 | .9641 | .0359 | .4641 | .9281 |
| 1.22 | .8888 | .1112 | .3888 | .7775 | 1.81 | .9649 | .0351 | .4649 | .9297 |

*(continued on next page)*

## TABLE 3 The normal distribution *(continued)*

| $x$ | $A^a$ | $B^b$ | $C^c$ | $D^d$ | $x$ | $A$ | $B$ | $C$ | $D$ |
|---|---|---|---|---|---|---|---|---|---|
| 1.82 | .9656 | .0344 | .4656 | .9312 | 2.39 | .9916 | .0084 | .4916 | .9832 |
| 1.83 | .9664 | .0336 | .4664 | .9327 | 2.40 | .9918 | .0082 | .4918 | .9836 |
| 1.84 | .9671 | .0329 | .4671 | .9342 | 2.41 | .9920 | .0080 | .4920 | .9840 |
| 1.85 | .9678 | .0322 | .4678 | .9357 | 2.42 | .9922 | .0078 | .4922 | .9845 |
| 1.86 | .9686 | .0314 | .4686 | .9371 | 2.43 | .9925 | .0075 | .4925 | .9849 |
| 1.87 | .9693 | .0307 | .4693 | .9385 | 2.44 | .9927 | .0073 | .4927 | .9853 |
| 1.88 | .9699 | .0301 | .4699 | .9399 | 2.45 | .9929 | .0071 | .4929 | .9857 |
| 1.89 | .9706 | .0294 | .4706 | .9412 | 2.46 | .9931 | .0069 | .4931 | .9861 |
| 1.90 | .9713 | .0287 | .4713 | .9426 | 2.47 | .9932 | .0068 | .4932 | .9865 |
| 1.91 | .9719 | .0281 | .4719 | .9439 | 2.48 | .9934 | .0066 | .4934 | .9869 |
| 1.92 | .9726 | .0274 | .4726 | .9451 | 2.49 | .9936 | .0064 | .4936 | .9872 |
| 1.93 | .9732 | .0268 | .4732 | .9464 | 2.50 | .9938 | .0062 | .4938 | .9876 |
| 1.94 | .9738 | .0262 | .4738 | .9476 | 2.51 | .9940 | .0060 | .4940 | .9879 |
| 1.95 | .9744 | .0256 | .4744 | .9488 | 2.52 | .9941 | .0059 | .4941 | .9883 |
| 1.96 | .9750 | .0250 | .4750 | .9500 | 2.53 | .9943 | .0057 | .4943 | .9886 |
| 1.97 | .9756 | .0244 | .4756 | .9512 | 2.54 | .9945 | .0055 | .4945 | .9889 |
| 1.98 | .9761 | .0239 | .4761 | .9523 | 2.55 | .9946 | .0054 | .4946 | .9892 |
| 1.99 | .9767 | .0233 | .4767 | .9534 | 2.56 | .9948 | .0052 | .4948 | .9895 |
| 2.00 | .9772 | .0228 | .4772 | .9545 | 2.57 | .9949 | .0051 | .4949 | .9898 |
| 2.01 | .9778 | .0222 | .4778 | .9556 | 2.58 | .9951 | .0049 | .4951 | .9901 |
| 2.02 | .9783 | .0217 | .4783 | .9566 | 2.59 | .9952 | .0048 | .4952 | .9904 |
| 2.03 | .9788 | .0212 | .4788 | .9576 | 2.60 | .9953 | .0047 | .4953 | .9907 |
| 2.04 | .9793 | .0207 | .4793 | .9586 | 2.61 | .9955 | .0045 | .4955 | .9909 |
| 2.05 | .9798 | .0202 | .4798 | .9596 | 2.62 | .9956 | .0044 | .4956 | .9912 |
| 2.06 | .9803 | .0197 | .4803 | .9606 | 2.63 | .9957 | .0043 | .4957 | .9915 |
| 2.07 | .9808 | .0192 | .4808 | .9615 | 2.64 | .9959 | .0041 | .4959 | .9917 |
| 2.08 | .9812 | .0188 | .4812 | .9625 | 2.65 | .9960 | .0040 | .4960 | .9920 |
| 2.09 | .9817 | .0183 | .4817 | .9634 | 2.66 | .9961 | .0039 | .4961 | .9922 |
| 2.10 | .9821 | .0179 | .4821 | .9643 | 2.67 | .9962 | .0038 | .4962 | .9924 |
| 2.11 | .9826 | .0174 | .4826 | .9651 | 2.68 | .9963 | .0037 | .4963 | .9926 |
| 2.12 | .9830 | .0170 | .4830 | .9660 | 2.69 | .9964 | .0036 | .4964 | .9929 |
| 2.13 | .9834 | .0166 | .4834 | .9668 | 2.70 | .9965 | .0035 | .4965 | .9931 |
| 2.14 | .9838 | .0162 | .4838 | .9676 | 2.71 | .9966 | .0034 | .4966 | .9933 |
| 2.15 | .9842 | .0158 | .4842 | .9684 | 2.72 | .9967 | .0033 | .4967 | .9935 |
| 2.16 | .9846 | .0154 | .4846 | .9692 | 2.73 | .9968 | .0032 | .4968 | .9937 |
| 2.17 | .9850 | .0150 | .4850 | .9700 | 2.74 | .9969 | .0031 | .4969 | .9939 |
| 2.18 | .9854 | .0146 | .4854 | .9707 | 2.75 | .9970 | .0030 | .4970 | .9940 |
| 2.19 | .9857 | .0143 | .4857 | .9715 | 2.76 | .9971 | .0029 | .4971 | .9942 |
| 2.20 | .9861 | .0139 | .4861 | .9722 | 2.77 | .9972 | .0028 | .4972 | .9944 |
| 2.21 | .9864 | .0136 | .4864 | .9729 | 2.78 | .9973 | .0027 | .4973 | .9946 |
| 2.22 | .9868 | .0132 | .4868 | .9736 | 2.79 | .9974 | .0026 | .4974 | .9947 |
| 2.23 | .9871 | .0129 | .4871 | .9743 | 2.80 | .9974 | .0026 | .4974 | .9949 |
| 2.24 | .9875 | .0125 | .4875 | .9749 | 2.81 | .9975 | .0025 | .4975 | .9950 |
| 2.25 | .9878 | .0122 | .4878 | .9756 | 2.82 | .9976 | .0024 | .4976 | .9952 |
| 2.26 | .9881 | .0119 | .4881 | .9762 | 2.83 | .9977 | .0023 | .4977 | .9953 |
| 2.27 | .9884 | .0116 | .4884 | .9768 | 2.84 | .9977 | .0023 | .4977 | .9955 |
| 2.28 | .9887 | .0113 | .4887 | .9774 | 2.85 | .9978 | .0022 | .4978 | .9956 |
| 2.29 | .9890 | .0110 | .4890 | .9780 | 2.86 | .9979 | .0021 | .4979 | .9958 |
| 2.30 | .9893 | .0107 | .4893 | .9786 | 2.87 | .9979 | .0021 | .4979 | .9959 |
| 2.31 | .9896 | .0104 | .4896 | .9791 | 2.88 | .9980 | .0020 | .4980 | .9960 |
| 2.32 | .9898 | .0102 | .4898 | .9797 | 2.89 | .9981 | .0019 | .4981 | .9961 |
| 2.33 | .9901 | .0099 | .4901 | .9802 | 2.90 | .9981 | .0019 | .4981 | .9963 |
| 2.34 | .9904 | .0096 | .4904 | .9807 | 2.91 | .9982 | .0018 | .4982 | .9964 |
| 2.35 | .9906 | .0094 | .4906 | .9812 | 2.92 | .9982 | .0018 | .4982 | .9965 |
| 2.36 | .9909 | .0091 | .4909 | .9817 | 2.93 | .9983 | .0017 | .4983 | .9966 |
| 2.37 | .9911 | .0089 | .4911 | .9822 | 2.94 | .9984 | .0016 | .4984 | .9967 |
| 2.38 | .9913 | .0087 | .4913 | .9827 | 2.95 | .9984 | .0016 | .4984 | .9968 |

*(continued on next page)*

## TABLE 3 The normal distribution *(continued)*

| $x$ | $A^a$ | $B^b$ | $C^c$ | $D^d$ | $x$ | $A$ | $B$ | $C$ | $D$ |
|---|---|---|---|---|---|---|---|---|---|
| 2.96 | .9985 | .0015 | .4985 | .9969 | 3.49 | .9998 | .0002 | .4998 | .9995 |
| 2.97 | .9985 | .0015 | .4985 | .9970 | 3.50 | .9998 | .0002 | .4998 | .9995 |
| 2.98 | .9986 | .0014 | .4986 | .9971 | 3.51 | .9998 | .0002 | .4998 | .9996 |
| 2.99 | .9986 | .0014 | .4986 | .9972 | 3.52 | .9998 | .0002 | .4998 | .9996 |
| 3.00 | .9987 | .0013 | .4987 | .9973 | 3.53 | .9998 | .0002 | .4998 | .9996 |
| 3.01 | .9987 | .0013 | .4987 | .9974 | 3.54 | .9998 | .0002 | .4998 | .9996 |
| 3.02 | .9987 | .0013 | .4987 | .9975 | 3.55 | .9998 | .0002 | .4998 | .9996 |
| 3.03 | .9988 | .0012 | .4988 | .9976 | 3.56 | .9998 | .0002 | .4998 | .9996 |
| 3.04 | .9988 | .0012 | .4988 | .9976 | 3.57 | .9998 | .0002 | .4998 | .9996 |
| 3.05 | .9989 | .0011 | .4989 | .9977 | 3.58 | .9998 | .0002 | .4998 | .9997 |
| 3.06 | .9989 | .0011 | .4989 | .9978 | 3.59 | .9998 | .0002 | .4998 | .9997 |
| 3.07 | .9989 | .0011 | .4989 | .9979 | 3.60 | .9998 | .0002 | .4998 | .9997 |
| 3.08 | .9990 | .0010 | .4990 | .9979 | 3.61 | .9998 | .0002 | .4998 | .9997 |
| 3.09 | .9990 | .0010 | .4990 | .9980 | 3.62 | .9999 | .0001 | .4999 | .9997 |
| 3.10 | .9990 | .0010 | .4990 | .9981 | 3.63 | .9999 | .0001 | .4999 | .9997 |
| 3.11 | .9991 | .0009 | .4991 | .9981 | 3.64 | .9999 | .0001 | .4999 | .9997 |
| 3.12 | .9991 | .0009 | .4991 | .9982 | 3.65 | .9999 | .0001 | .4999 | .9997 |
| 3.13 | .9991 | .0009 | .4991 | .9983 | 3.66 | .9999 | .0001 | .4999 | .9997 |
| 3.14 | .9992 | .0008 | .4992 | .9983 | 3.67 | .9999 | .0001 | .4999 | .9998 |
| 3.15 | .9992 | .0008 | .4992 | .9984 | 3.68 | .9999 | .0001 | .4999 | .9998 |
| 3.16 | .9992 | .0008 | .4992 | .9984 | 3.69 | .9999 | .0001 | .4999 | .9998 |
| 3.17 | .9992 | .0008 | .4992 | .9985 | 3.70 | .9999 | .0001 | .4999 | .9998 |
| 3.18 | .9993 | .0007 | .4993 | .9985 | 3.71 | .9999 | .0001 | .4999 | .9998 |
| 3.19 | .9993 | .0007 | .4993 | .9986 | 3.72 | .9999 | .0001 | .4999 | .9998 |
| 3.20 | .9993 | .0007 | .4993 | .9986 | 3.73 | .9999 | .0001 | .4999 | .9998 |
| 3.21 | .9993 | .0007 | .4993 | .9987 | 3.74 | .9999 | .0001 | .4999 | .9998 |
| 3.22 | .9994 | .0006 | .4994 | .9987 | 3.75 | .9999 | .0001 | .4999 | .9998 |
| 3.23 | .9994 | .0006 | .4994 | .9988 | 3.76 | .9999 | .0001 | .4999 | .9998 |
| 3.24 | .9994 | .0006 | .4994 | .9988 | 3.77 | .9999 | .0001 | .4999 | .9998 |
| 3.25 | .9994 | .0006 | .4994 | .9988 | 3.78 | .9999 | .0001 | .4999 | .9998 |
| 3.26 | .9994 | .0006 | .4994 | .9989 | 3.79 | .9999 | .0001 | .4999 | .9998 |
| 3.27 | .9995 | .0005 | .4995 | .9989 | 3.80 | .9999 | .0001 | .4999 | .9999 |
| 3.28 | .9995 | .0005 | .4995 | .9990 | 3.81 | .9999 | .0001 | .4999 | .9999 |
| 3.29 | .9995 | .0005 | .4995 | .9990 | 3.82 | .9999 | .0001 | .4999 | .9999 |
| 3.30 | .9995 | .0005 | .4995 | .9990 | 3.83 | .9999 | .0001 | .4999 | .9999 |
| 3.31 | .9995 | .0005 | .4995 | .9991 | 3.84 | .9999 | .0001 | .4999 | .9999 |
| 3.32 | .9995 | .0005 | .4995 | .9991 | 3.85 | .9999 | .0001 | .4999 | .9999 |
| 3.33 | .9996 | .0004 | .4996 | .9991 | 3.86 | .9999 | .0001 | .4999 | .9999 |
| 3.34 | .9996 | .0004 | .4996 | .9992 | 3.87 | .9999 | .0001 | .4999 | .9999 |
| 3.35 | .9996 | .0004 | .4996 | .9992 | 3.88 | .9999 | .0001 | .4999 | .9999 |
| 3.36 | .9996 | .0004 | .4996 | .9992 | 3.89 | .9999 | .0001 | .4999 | .9999 |
| 3.37 | .9996 | .0004 | .4996 | .9992 | 3.90 | 1.0000 | .0000 | .5000 | .9999 |
| 3.38 | .9996 | .0004 | .4996 | .9993 | 3.91 | 1.0000 | .0000 | .5000 | .9999 |
| 3.39 | .9997 | .0003 | .4997 | .9993 | 3.92 | 1.0000 | .0000 | .5000 | .9999 |
| 3.40 | .9997 | .0003 | .4997 | .9993 | 3.93 | 1.0000 | .0000 | .5000 | .9999 |
| 3.42 | .9997 | .0003 | .4997 | .9994 | 3.94 | 1.0000 | .0000 | .5000 | .9999 |
| 3.43 | .9997 | .0003 | .4997 | .9994 | 3.95 | 1.0000 | .0000 | .5000 | .9999 |
| 3.45 | .9997 | .0003 | .4997 | .9994 | 3.96 | 1.0000 | .0000 | .5000 | .9999 |
| 3.46 | .9997 | .0003 | .4997 | .9995 | 3.97 | 1.0000 | .0000 | .5000 | .9999 |
| 3.47 | .9997 | .0003 | .4997 | .9995 | 3.98 | 1.0000 | .0000 | .5000 | .9999 |
| 3.48 | .9997 | .0003 | .4997 | .9995 | 3.99 | 1.0000 | .0000 | .5000 | .9999 |

[a] $A(x) = \Phi(x) = Pr(X \le x)$, where $X$ is a standard normal distribution.
[b] $B(x) = 1 - \Phi(x) = Pr(X > x)$, where $X$ is a standard normal distribution.
[c] $C(x) = Pr(0 \le X \le x)$, where $X$ is a standard normal distribution.
[d] $D(x) = Pr(-x \le X \le x)$, where $X$ is a standard normal distribution.

## TABLE 4 Table of 1000 random digits

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 01 | 32924 | 22324 | 18125 | 09077 | 26 | 96772 | 16443 | 39877 | 04653 |
| 02 | 54632 | 90374 | 94143 | 49295 | 27 | 52167 | 21038 | 14338 | 01395 |
| 03 | 88720 | 43035 | 97081 | 83373 | 28 | 69644 | 37198 | 00028 | 98195 |
| 04 | 21727 | 11904 | 41513 | 31653 | 29 | 71011 | 62004 | 81712 | 87536 |
| 05 | 80985 | 70799 | 57975 | 69282 | 30 | 31217 | 75877 | 85366 | 55500 |
| 06 | 40412 | 58826 | 94868 | 52632 | 31 | 64990 | 98735 | 02999 | 35521 |
| 07 | 43918 | 56807 | 75218 | 46077 | 32 | 48417 | 23569 | 59307 | 46550 |
| 08 | 26513 | 47480 | 77410 | 47741 | 33 | 07900 | 65059 | 48592 | 44087 |
| 09 | 18164 | 35784 | 44255 | 30124 | 34 | 74526 | 32601 | 24482 | 16981 |
| 10 | 39446 | 01375 | 75264 | 51173 | 35 | 51056 | 04402 | 58353 | 37332 |
| 11 | 16638 | 04680 | 98617 | 90298 | 36 | 39005 | 93458 | 63143 | 21817 |
| 12 | 16872 | 94749 | 44012 | 48884 | 37 | 67883 | 76343 | 78155 | 67733 |
| 13 | 65419 | 87092 | 78596 | 91512 | 38 | 06014 | 60999 | 87226 | 36071 |
| 14 | 05207 | 36702 | 56804 | 10498 | 39 | 93147 | 88766 | 04148 | 42471 |
| 15 | 78807 | 79243 | 13729 | 81222 | 40 | 01099 | 95731 | 47622 | 13294 |
| 16 | 69341 | 79028 | 64253 | 80447 | 41 | 89252 | 01201 | 58138 | 13809 |
| 17 | 41871 | 17566 | 61200 | 15994 | 42 | 41766 | 57239 | 50251 | 64675 |
| 18 | 25758 | 04625 | 43226 | 32986 | 43 | 92736 | 77800 | 81996 | 45646 |
| 19 | 06604 | 94486 | 40174 | 10742 | 44 | 45118 | 36600 | 68977 | 68831 |
| 20 | 82259 | 56512 | 48945 | 18183 | 45 | 73457 | 01579 | 00378 | 70197 |
| 21 | 07895 | 37090 | 50627 | 71320 | 46 | 49465 | 85251 | 42914 | 17277 |
| 22 | 59836 | 71148 | 42320 | 67816 | 47 | 15745 | 37285 | 23768 | 39302 |
| 23 | 57133 | 76610 | 89104 | 30481 | 48 | 28760 | 81331 | 78265 | 60690 |
| 24 | 76964 | 57126 | 87174 | 61025 | 49 | 82193 | 32787 | 70451 | 91141 |
| 25 | 27694 | 17145 | 32439 | 68245 | 50 | 89664 | 50242 | 12382 | 39379 |

## TABLE 5 Percentage points of the *t* distribution ($t_{d,u}$)[a]

| Degrees of freedom, *d* | *u* | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | .75 | .80 | .85 | .90 | .95 | .975 | .99 | .995 | .9995 |
| 1 | 1.000 | 1.376 | 1.963 | 3.078 | 6.314 | 12.706 | 31.821 | 63.657 | 636.619 |
| 2 | 0.816 | 1.061 | 1.386 | 1.886 | 2.920 | 4.303 | 6.965 | 9.925 | 31.598 |
| 3 | 0.765 | 0.978 | 1.250 | 1.638 | 2.353 | 3.182 | 4.541 | 5.841 | 12.924 |
| 4 | 0.741 | 0.941 | 1.190 | 1.533 | 2.132 | 2.776 | 3.747 | 4.604 | 8.610 |
| 5 | 0.727 | 0.920 | 1.156 | 1.476 | 2.015 | 2.571 | 3.365 | 4.032 | 6.869 |
| 6 | 0.718 | 0.906 | 1.134 | 1.440 | 1.943 | 2.447 | 3.143 | 3.707 | 5.959 |
| 7 | 0.711 | 0.896 | 1.119 | 1.415 | 1.895 | 2.365 | 2.998 | 3.499 | 5.408 |
| 8 | 0.706 | 0.889 | 1.108 | 1.397 | 1.860 | 2.306 | 2.896 | 3.355 | 5.041 |
| 9 | 0.703 | 0.883 | 1.100 | 1.383 | 1.833 | 2.262 | 2.821 | 3.250 | 4.781 |
| 10 | 0.700 | 0.879 | 1.093 | 1.372 | 1.812 | 2.228 | 2.764 | 3.169 | 4.587 |
| 11 | 0.697 | 0.876 | 1.088 | 1.363 | 1.796 | 2.201 | 2.718 | 3.106 | 4.437 |
| 12 | 0.695 | 0.873 | 1.083 | 1.356 | 1.782 | 2.179 | 2.681 | 3.055 | 4.318 |
| 13 | 0.694 | 0.870 | 1.079 | 1.350 | 1.771 | 2.160 | 2.650 | 3.012 | 4.221 |
| 14 | 0.692 | 0.868 | 1.076 | 1.345 | 1.761 | 2.145 | 2.624 | 2.977 | 4.140 |
| 15 | 0.691 | 0.866 | 1.074 | 1.341 | 1.753 | 2.131 | 2.602 | 2.947 | 4.073 |
| 16 | 0.690 | 0.865 | 1.071 | 1.337 | 1.746 | 2.120 | 2.583 | 2.921 | 4.015 |
| 17 | 0.689 | 0.863 | 1.069 | 1.333 | 1.740 | 2.110 | 2.567 | 2.898 | 3.965 |
| 18 | 0.688 | 0.862 | 1.067 | 1.330 | 1.734 | 2.101 | 2.552 | 2.878 | 3.922 |
| 19 | 0.688 | 0.861 | 1.066 | 1.328 | 1.729 | 2.093 | 2.539 | 2.861 | 3.883 |
| 20 | 0.687 | 0.860 | 1.064 | 1.325 | 1.725 | 2.086 | 2.528 | 2.845 | 3.850 |
| 21 | 0.686 | 0.859 | 1.063 | 1.323 | 1.721 | 2.080 | 2.518 | 2.831 | 3.819 |
| 22 | 0.686 | 0.858 | 1.061 | 1.321 | 1.717 | 2.074 | 2.508 | 2.819 | 3.792 |
| 23 | 0.685 | 0.858 | 1.060 | 1.319 | 1.714 | 2.069 | 2.500 | 2.807 | 3.767 |
| 24 | 0.685 | 0.857 | 1.059 | 1.318 | 1.711 | 2.064 | 2.492 | 2.797 | 3.745 |
| 25 | 0.684 | 0.856 | 1.058 | 1.316 | 1.708 | 2.060 | 2.485 | 2.787 | 3.725 |
| 26 | 0.684 | 0.856 | 1.058 | 1.315 | 1.706 | 2.056 | 2.479 | 2.779 | 3.707 |
| 27 | 0.684 | 0.855 | 1.057 | 1.314 | 1.703 | 2.052 | 2.473 | 2.771 | 3.690 |
| 28 | 0.683 | 0.855 | 1.056 | 1.313 | 1.701 | 2.048 | 2.467 | 2.763 | 3.674 |
| 29 | 0.683 | 0.854 | 1.055 | 1.311 | 1.699 | 2.045 | 2.462 | 2.756 | 3.659 |
| 30 | 0.683 | 0.854 | 1.055 | 1.310 | 1.697 | 2.042 | 2.457 | 2.750 | 3.646 |
| 40 | 0.681 | 0.851 | 1.050 | 1.303 | 1.684 | 2.021 | 2.423 | 2.704 | 3.551 |
| 60 | 0.679 | 0.848 | 1.046 | 1.296 | 1.671 | 2.000 | 2.390 | 2.660 | 3.460 |
| 120 | 0.677 | 0.845 | 1.041 | 1.289 | 1.658 | 1.980 | 2.358 | 2.617 | 3.373 |
| ∞ | 0.674 | 0.842 | 1.036 | 1.282 | 1.645 | 1.960 | 2.326 | 2.576 | 3.291 |

[a]The *u*th percentile of a *t* distribution with *d* degrees of freedom.

*Source:* Table 5 is taken from Table III of Fisher and Yates: "Statistical Tables for Biological, Agricultural and Medical Research," published by Longman Group Ltd., London (previously published by Oliver and Boyd Ltd., Edinburgh).

## TABLE 6 Percentage points of the chi-square distribution ($\chi^2_{d,u}$)[a]

| | $u$ | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d$ | .005 | .01 | .025 | .05 | .10 | .25 | .50 | .75 | .90 | .95 | .975 | .99 | .995 | .999 |
| 1 | $0.0^4393$[b] | $0.0^3157$[c] | $0.0^3982$[d] | 0.00393 | 0.02 | 0.10 | 0.45 | 1.32 | 2.71 | 3.84 | 5.02 | 6.63 | 7.88 | 10.83 |
| 2 | 0.0100 | 0.0201 | 0.0506 | 0.103 | 0.21 | 0.58 | 1.39 | 2.77 | 4.61 | 5.99 | 7.38 | 9.21 | 10.60 | 13.81 |
| 3 | 0.0717 | 0.115 | 0.216 | 0.352 | 0.58 | 1.21 | 2.37 | 4.11 | 6.25 | 7.81 | 9.35 | 11.34 | 12.84 | 16.27 |
| 4 | 0.207 | 0.297 | 0.484 | 0.711 | 1.06 | 1.92 | 3.36 | 5.39 | 7.78 | 9.49 | 11.14 | 13.28 | 14.86 | 18.47 |
| 5 | 0.412 | 0.554 | 0.831 | 1.15 | 1.61 | 2.67 | 4.35 | 6.63 | 9.24 | 11.07 | 12.83 | 15.09 | 16.75 | 20.52 |
| 6 | 0.676 | 0.872 | 1.24 | 1.64 | 2.20 | 3.45 | 5.35 | 7.84 | 10.64 | 12.59 | 14.45 | 16.81 | 18.55 | 22.46 |
| 7 | 0.989 | 1.24 | 1.69 | 2.17 | 2.83 | 4.25 | 6.35 | 9.04 | 12.02 | 14.07 | 16.01 | 18.48 | 20.28 | 24.32 |
| 8 | 1.34 | 1.65 | 2.18 | 2.73 | 3.49 | 5.07 | 7.34 | 10.22 | 13.36 | 15.51 | 17.53 | 20.09 | 21.95 | 26.12 |
| 9 | 1.73 | 2.09 | 2.70 | 3.33 | 4.17 | 5.90 | 8.34 | 11.39 | 14.68 | 16.92 | 19.02 | 21.67 | 23.59 | 27.88 |
| 10 | 2.16 | 2.56 | 3.25 | 3.94 | 4.87 | 6.74 | 9.34 | 12.55 | 15.99 | 18.31 | 20.48 | 23.21 | 25.19 | 29.59 |
| 11 | 2.60 | 3.05 | 3.82 | 4.57 | 5.58 | 7.58 | 10.34 | 13.70 | 17.28 | 19.68 | 21.92 | 24.72 | 26.76 | 31.26 |
| 12 | 3.07 | 3.57 | 4.40 | 5.23 | 6.30 | 8.44 | 11.34 | 14.85 | 18.55 | 21.03 | 23.34 | 26.22 | 28.30 | 32.91 |
| 13 | 3.57 | 4.11 | 5.01 | 5.89 | 7.04 | 9.30 | 12.34 | 15.98 | 19.81 | 22.36 | 24.74 | 27.69 | 29.82 | 34.53 |
| 14 | 4.07 | 4.66 | 5.63 | 6.57 | 7.79 | 10.17 | 13.34 | 17.12 | 21.06 | 23.68 | 26.12 | 29.14 | 31.32 | 36.12 |
| 15 | 4.60 | 5.23 | 6.27 | 7.26 | 8.55 | 11.04 | 14.34 | 18.25 | 22.31 | 25.00 | 27.49 | 30.58 | 32.80 | 37.70 |
| 16 | 5.14 | 5.81 | 6.91 | 7.96 | 9.31 | 11.91 | 15.34 | 19.37 | 23.54 | 26.30 | 28.85 | 32.00 | 34.27 | 39.25 |
| 17 | 5.70 | 6.41 | 7.56 | 8.67 | 10.09 | 12.79 | 16.34 | 20.49 | 24.77 | 27.59 | 30.19 | 33.41 | 35.72 | 40.79 |
| 18 | 6.26 | 7.01 | 8.23 | 9.39 | 10.86 | 13.68 | 17.34 | 21.60 | 25.99 | 28.87 | 31.53 | 34.81 | 37.16 | 42.31 |
| 19 | 6.84 | 7.63 | 8.91 | 10.12 | 11.65 | 14.56 | 18.34 | 22.72 | 27.20 | 30.14 | 32.85 | 36.19 | 38.58 | 43.82 |
| 20 | 7.43 | 8.26 | 9.59 | 10.85 | 12.44 | 15.45 | 19.34 | 23.83 | 28.41 | 31.41 | 34.17 | 37.57 | 40.00 | 45.32 |
| 21 | 8.03 | 8.90 | 10.28 | 11.59 | 13.24 | 16.34 | 20.34 | 24.93 | 29.62 | 32.67 | 35.48 | 38.93 | 41.40 | 46.80 |
| 22 | 8.64 | 9.54 | 10.98 | 12.34 | 14.04 | 17.24 | 21.34 | 26.04 | 30.81 | 33.92 | 36.78 | 40.29 | 42.80 | 48.27 |
| 23 | 9.26 | 10.20 | 11.69 | 13.09 | 14.85 | 18.14 | 22.34 | 27.14 | 32.01 | 35.17 | 38.08 | 41.64 | 44.18 | 49.73 |
| 24 | 9.89 | 10.86 | 12.40 | 13.85 | 15.66 | 19.04 | 23.34 | 28.24 | 33.20 | 36.42 | 39.36 | 42.98 | 45.56 | 51.18 |
| 25 | 10.52 | 11.52 | 13.12 | 14.61 | 16.47 | 19.94 | 24.34 | 29.34 | 34.38 | 37.65 | 40.65 | 44.31 | 46.93 | 52.62 |
| 26 | 11.16 | 12.20 | 13.84 | 15.38 | 17.29 | 20.84 | 25.34 | 30.43 | 35.56 | 38.89 | 41.92 | 45.64 | 48.29 | 54.05 |
| 27 | 11.81 | 12.88 | 14.57 | 16.15 | 18.11 | 21.75 | 26.34 | 31.53 | 36.74 | 40.11 | 43.19 | 46.96 | 49.64 | 55.48 |
| 28 | 12.46 | 13.56 | 15.31 | 16.93 | 18.94 | 22.66 | 27.34 | 32.62 | 37.92 | 41.34 | 44.46 | 48.28 | 50.99 | 56.89 |
| 29 | 13.12 | 14.26 | 16.05 | 17.71 | 19.77 | 23.57 | 28.34 | 33.71 | 39.09 | 42.56 | 45.72 | 49.59 | 52.34 | 58.30 |
| 30 | 13.79 | 14.95 | 16.79 | 18.49 | 20.60 | 24.48 | 29.34 | 34.80 | 40.26 | 43.77 | 46.98 | 50.89 | 53.67 | 59.70 |
| 40 | 20.71 | 22.16 | 24.43 | 26.51 | 29.05 | 33.66 | 39.34 | 45.62 | 51.81 | 55.76 | 59.34 | 63.69 | 66.77 | 73.40 |
| 50 | 27.99 | 29.71 | 32.36 | 34.76 | 37.69 | 42.94 | 49.33 | 56.33 | 63.17 | 67.50 | 71.42 | 76.15 | 79.49 | 86.66 |
| 60 | 35.53 | 37.48 | 40.48 | 43.19 | 46.46 | 52.29 | 59.33 | 66.98 | 74.40 | 79.08 | 83.30 | 88.38 | 91.95 | 99.61 |
| 70 | 43.28 | 45.44 | 48.76 | 51.74 | 55.33 | 61.70 | 69.33 | 77.58 | 85.53 | 90.53 | 95.02 | 100.42 | 104.22 | 112.32 |
| 80 | 51.17 | 53.54 | 57.15 | 60.39 | 64.28 | 71.14 | 79.33 | 88.13 | 96.58 | 101.88 | 106.63 | 112.33 | 116.32 | 124.84 |
| 90 | 59.20 | 61.75 | 65.65 | 69.13 | 73.29 | 80.62 | 89.33 | 98.64 | 107.56 | 113.14 | 118.14 | 124.12 | 128.30 | 137.21 |
| 100 | 67.33 | 70.06 | 74.22 | 77.93 | 82.36 | 90.13 | 99.33 | 109.14 | 118.50 | 124.34 | 129.56 | 135.81 | 140.17 | 149.45 |

[a] $\chi^2_{d,u}$ = $u$th percentile of a $\chi^2$ distribution with $d$ degrees of freedom.
[b] = 0.0000393
[c] = 0.000157
[d] = 0.000982
*Source:* Based on the Biometrika Trustees, from Table 3 of *Biometrika Tables for Statisticians,* Volume 2, edited by E. S. Pearson and H. O. Hartley.

## TABLE 7 Confidence limits for the expectation of a Poisson variable ($\mu$)

| | Confidence level $(1-\alpha)$ | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.998 | | 0.99 | | 0.98 | | 0.95 | | 0.90 | | |
| x | Lower | Upper | Lower | Upper | Lower | Upper | Lower | Upper | Lower | Upper | x |
| **0** | 0.00000 | 6.91 | 0.00000 | 5.30 | 0.0000 | 4.61 | 0.0000 | 3.69 | 0.0000 | 3.00 | **0** |
| **1** | .00100 | 9.23 | .00501 | 7.43 | .0101 | 6.64 | .0253 | 5.57 | .0513 | 4.74 | **1** |
| **2** | .0454 | 11.23 | .103 | 9.27 | .149 | 8.41 | .242 | 7.22 | .355 | 6.30 | **2** |
| **3** | .191 | 13.06 | .338 | 10.98 | .436 | 10.05 | .619 | 8.77 | .818 | 7.75 | **3** |
| **4** | .429 | 14.79 | .672 | 12.59 | .823 | 11.60 | 1.09 | 10.24 | 1.37 | 9.15 | **4** |
| **5** | 0.739 | 16.45 | 1.08 | 14.15 | 1.28 | 13.11 | 1.62 | 11.67 | 1.97 | 10.51 | **5** |
| **6** | 1.11 | 18.06 | 1.54 | 15.66 | 1.79 | 14.57 | 2.20 | 13.06 | 2.61 | 11.84 | **6** |
| **7** | 1.52 | 19.63 | 2.04 | 17.13 | 2.33 | 16.00 | 2.81 | 14.42 | 3.29 | 13.15 | **7** |
| **8** | 1.97 | 21.16 | 2.57 | 18.58 | 2.91 | 17.40 | 3.45 | 15.76 | 3.98 | 14.43 | **8** |
| **9** | 2.45 | 22.66 | 3.13 | 20.00 | 3.51 | 18.78 | 4.12 | 17.08 | 4.70 | 15.71 | **9** |
| **10** | 2.96 | 24.13 | 3.72 | 21.40 | 4.13 | 20.14 | 4.80 | 18.39 | 5.43 | 16.96 | **10** |
| **11** | 3.49 | 25.59 | 4.32 | 22.78 | 4.77 | 21.49 | 5.49 | 19.68 | 6.17 | 18.21 | **11** |
| **12** | 4.04 | 27.03 | 4.94 | 24.14 | 5.43 | 22.82 | 6.20 | 20.96 | 6.92 | 19.44 | **12** |
| **13** | 4.61 | 28.45 | 5.58 | 25.50 | 6.10 | 24.14 | 6.92 | 22.23 | 7.69 | 20.67 | **13** |
| **14** | 5.20 | 29.85 | 6.23 | 26.84 | 6.78 | 25.45 | 7.65 | 23.49 | 8.46 | 21.89 | **14** |
| **15** | 5.79 | 31.24 | 6.89 | 28.16 | 7.48 | 26.74 | 8.40 | 24.74 | 9.25 | 23.10 | **15** |
| **16** | 6.41 | 32.62 | 7.57 | 29.48 | 8.18 | 28.03 | 9.15 | 25.98 | 10.04 | 24.30 | **16** |
| **17** | 7.03 | 33.99 | 8.25 | 30.79 | 8.89 | 29.31 | 9.90 | 27.22 | 10.83 | 25.50 | **17** |
| **18** | 7.66 | 35.35 | 8.94 | 32.09 | 9.62 | 30.58 | 10.67 | 28.45 | 11.63 | 26.69 | **18** |
| **19** | 8.31 | 36.70 | 9.64 | 33.38 | 10.35 | 31.85 | 11.44 | 29.67 | 12.44 | 27.88 | **19** |
| **20** | 8.96 | 38.04 | 10.35 | 34.67 | 11.08 | 33.10 | 12.22 | 30.89 | 13.25 | 29.06 | **20** |
| **21** | 9.62 | 39.38 | 11.07 | 35.95 | 11.82 | 34.36 | 13.00 | 32.10 | 14.07 | 30.24 | **21** |
| **22** | 10.29 | 40.70 | 11.79 | 37.22 | 12.57 | 35.60 | 13.79 | 33.31 | 14.89 | 31.42 | **22** |
| **23** | 10.96 | 42.02 | 12.52 | 38.48 | 13.33 | 36.84 | 14.58 | 34.51 | 15.72 | 32.59 | **23** |
| **24** | 11.65 | 43.33 | 13.25 | 39.74 | 14.09 | 38.08 | 15.38 | 35.71 | 16.55 | 33.75 | **24** |
| **25** | 12.34 | 44.64 | 14.00 | 41.00 | 14.85 | 39.31 | 16.18 | 36.90 | 17.38 | 34.92 | **25** |
| **26** | 13.03 | 45.94 | 14.74 | 42.25 | 15.62 | 40.53 | 16.98 | 38.10 | 18.22 | 36.08 | **26** |
| **27** | 13.73 | 47.23 | 15.49 | 43.50 | 16.40 | 41.76 | 17.79 | 39.28 | 19.06 | 37.23 | **27** |
| **28** | 14.44 | 48.52 | 16.24 | 44.74 | 17.17 | 42.98 | 18.61 | 40.47 | 19.90 | 38.39 | **28** |
| **29** | 15.15 | 49.80 | 17.00 | 45.98 | 17.96 | 44.19 | 19.42 | 41.65 | 20.75 | 39.54 | **29** |
| **30** | 15.87 | 51.08 | 17.77 | 47.21 | 18.74 | 45.40 | 20.24 | 42.83 | 21.59 | 40.69 | **30** |
| **35** | 19.52 | 57.42 | 21.64 | 53.32 | 22.72 | 51.41 | 24.38 | 48.68 | 25.87 | 46.40 | **35** |
| **40** | 23.26 | 63.66 | 25.59 | 59.36 | 26.77 | 57.35 | 28.58 | 54.47 | 30.20 | 52.07 | **40** |
| **45** | 27.08 | 69.83 | 29.60 | 65.34 | 30.88 | 63.23 | 32.82 | 60.21 | 34.56 | 57.69 | **45** |
| **50** | 30.96 | 75.94 | 33.66 | 71.27 | 35.03 | 69.07 | 37.11 | 65.92 | 38.96 | 63.29 | **50** |

*Note:* If $X$ is the random variable denoting the observed number of events and $\mu_1$, $\mu_2$ are the lower and upper confidence limits for its expectation, $\mu$, then $Pr(\mu_1 \le \mu \le \mu_2) = 1 - \alpha$.

*Source: Biometrika Tables for Statisticians,* 3rd edition, Volume 1, edited by E. S. Pearson and H. O. Hartley. Published for the Biometrika Trustees, Cambridge University Press, Cambridge, England, 1966.

## TABLE 8 Percentage points of the *F* distribution ($F_{d_1,d_2,p}$)

| *df* for denominator, $d_2$ | $p$ | *df* for numerator, $d_1$ | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 12 | 24 | ∞ |
| 1 | .90 | 39.86 | 49.50 | 53.59 | 55.83 | 57.24 | 58.20 | 58.91 | 59.44 | 60.71 | 62.00 | 63.33 |
| | .95 | 161.4 | 199.5 | 215.7 | 224.6 | 230.2 | 234.0 | 236.8 | 238.9 | 243.9 | 249.1 | 254.3 |
| | .975 | 647.8 | 799.5 | 864.2 | 899.6 | 921.8 | 937.1 | 948.2 | 956.7 | 976.7 | 997.2 | 1018. |
| | .99 | 4052. | 5000. | 5403. | 5625. | 5764. | 5859. | 5928. | 5981. | 6106. | 6235. | 6366. |
| | .995 | 16211. | 20000. | 21615. | 22500. | 23056. | 23437. | 23715. | 23925. | 24426. | 24940. | 25464. |
| | .999 | 405280. | 500000. | 540380. | 562500. | 576400. | 585940. | 592870. | 598140. | 610670. | 623500. | 636620. |
| 2 | .90 | 8.53 | 9.00 | 9.16 | 9.24 | 9.29 | 9.33 | 9.35 | 9.37 | 9.41 | 9.45 | 9.49 |
| | .95 | 18.51 | 19.00 | 19.16 | 19.25 | 19.30 | 19.33 | 19.35 | 19.37 | 19.41 | 19.45 | 19.50 |
| | .975 | 38.51 | 39.00 | 39.17 | 39.25 | 39.30 | 39.33 | 39.36 | 39.37 | 39.42 | 39.46 | 39.50 |
| | .99 | 98.50 | 99.00 | 99.17 | 99.25 | 99.30 | 99.33 | 99.36 | 99.37 | 99.42 | 99.46 | 99.50 |
| | .995 | 198.5 | 199.0 | 199.2 | 199.2 | 199.3 | 199.3 | 199.4 | 199.4 | 199.4 | 199.5 | 199.5 |
| | .999 | 998.5 | 999.0 | 999.2 | 999.2 | 999.3 | 999.3 | 999.4 | 999.4 | 999.4 | 999.5 | 999.5 |
| 3 | .90 | 5.54 | 5.46 | 5.39 | 5.34 | 5.31 | 5.28 | 5.27 | 5.25 | 5.22 | 5.18 | 5.13 |
| | .95 | 10.13 | 9.55 | 9.28 | 9.12 | 9.01 | 8.94 | 8.89 | 8.85 | 8.74 | 8.64 | 8.53 |
| | .975 | 17.44 | 16.04 | 15.44 | 15.10 | 14.88 | 14.74 | 14.62 | 14.54 | 14.34 | 14.12 | 13.90 |
| | .99 | 34.12 | 30.82 | 29.46 | 28.71 | 28.24 | 27.91 | 27.67 | 27.49 | 27.05 | 26.60 | 26.13 |
| | .995 | 55.55 | 49.80 | 47.47 | 46.20 | 45.39 | 44.84 | 44.43 | 44.13 | 43.39 | 42.62 | 41.83 |
| | .999 | 167.00 | 148.5 | 141.1 | 137.1 | 134.6 | 132.8 | 131.6 | 130.6 | 128.3 | 125.9 | 123.5 |
| 4 | .90 | 4.54 | 4.32 | 4.19 | 4.11 | 4.05 | 4.01 | 3.98 | 3.95 | 3.90 | 3.83 | 3.76 |
| | .95 | 7.71 | 6.94 | 6.59 | 6.39 | 6.26 | 6.16 | 6.09 | 6.04 | 5.91 | 5.77 | 5.63 |
| | .975 | 12.22 | 10.65 | 9.98 | 9.60 | 9.36 | 9.20 | 9.07 | 8.98 | 8.75 | 8.51 | 8.26 |
| | .99 | 21.20 | 18.00 | 16.69 | 15.98 | 15.52 | 15.21 | 14.98 | 14.80 | 14.37 | 13.93 | 13.46 |
| | .995 | 31.33 | 26.28 | 24.26 | 23.16 | 22.46 | 21.98 | 21.62 | 21.35 | 20.70 | 20.03 | 19.32 |
| | .999 | 74.14 | 61.25 | 56.18 | 53.44 | 51.71 | 50.53 | 49.66 | 49.00 | 47.41 | 45.77 | 44.05 |
| 5 | .90 | 4.06 | 3.78 | 3.62 | 3.52 | 3.45 | 3.40 | 3.37 | 3.34 | 3.27 | 3.19 | 3.10 |
| | .95 | 6.61 | 5.79 | 5.41 | 5.19 | 5.05 | 4.95 | 4.88 | 4.82 | 4.68 | 4.53 | 4.36 |
| | .975 | 10.01 | 8.43 | 7.76 | 7.39 | 7.15 | 6.98 | 6.85 | 6.76 | 6.52 | 6.28 | 6.02 |
| | .99 | 16.26 | 13.27 | 12.06 | 11.39 | 10.97 | 10.67 | 10.46 | 10.29 | 9.89 | 9.47 | 9.02 |
| | .995 | 22.78 | 18.31 | 16.53 | 15.56 | 14.94 | 14.51 | 14.20 | 13.96 | 13.38 | 12.78 | 12.14 |
| | .999 | 47.18 | 37.12 | 33.20 | 31.09 | 29.75 | 28.83 | 28.16 | 27.65 | 26.42 | 25.13 | 23.79 |
| 6 | .90 | 3.78 | 3.46 | 3.29 | 3.18 | 3.11 | 3.05 | 3.01 | 2.98 | 2.90 | 2.82 | 2.72 |
| | .95 | 5.99 | 5.14 | 4.76 | 4.53 | 4.39 | 4.28 | 4.21 | 4.15 | 4.00 | 3.84 | 3.67 |
| | .975 | 8.81 | 7.26 | 6.60 | 6.23 | 5.99 | 5.82 | 5.70 | 5.60 | 5.37 | 5.12 | 4.85 |
| | .99 | 13.75 | 10.92 | 9.78 | 9.15 | 8.75 | 8.47 | 8.26 | 8.10 | 7.72 | 7.31 | 6.88 |
| | .995 | 18.64 | 14.54 | 12.92 | 12.03 | 11.46 | 11.07 | 10.79 | 10.57 | 10.03 | 9.47 | 8.88 |
| | .999 | 35.51 | 27.00 | 23.70 | 21.92 | 20.80 | 20.03 | 19.46 | 19.03 | 17.99 | 16.90 | 15.75 |
| 7 | .90 | 3.59 | 3.26 | 3.07 | 2.96 | 2.88 | 2.83 | 2.78 | 2.75 | 2.67 | 2.58 | 2.47 |
| | .95 | 5.59 | 4.74 | 4.35 | 4.12 | 3.97 | 3.87 | 3.79 | 3.73 | 3.57 | 3.41 | 3.23 |
| | .975 | 8.07 | 6.54 | 5.89 | 5.52 | 5.29 | 5.12 | 4.99 | 4.90 | 4.67 | 4.42 | 4.14 |
| | .99 | 12.25 | 9.55 | 8.45 | 7.85 | 7.46 | 7.19 | 6.99 | 6.84 | 6.47 | 6.07 | 5.65 |
| | .995 | 16.24 | 12.40 | 10.88 | 10.05 | 9.52 | 9.16 | 8.89 | 8.68 | 8.18 | 7.65 | 7.08 |
| | .999 | 29.25 | 21.69 | 18.77 | 17.20 | 16.21 | 15.52 | 15.02 | 14.63 | 13.71 | 12.73 | 11.70 |
| 8 | .90 | 3.46 | 3.11 | 2.92 | 2.81 | 2.73 | 2.67 | 2.62 | 2.59 | 2.50 | 2.40 | 2.29 |
| | .95 | 5.32 | 4.46 | 4.07 | 3.84 | 3.69 | 3.58 | 3.50 | 3.44 | 3.28 | 3.12 | 2.93 |
| | .975 | 7.57 | 6.06 | 5.42 | 5.05 | 4.82 | 4.65 | 4.53 | 4.43 | 4.20 | 3.95 | 3.67 |
| | .99 | 11.26 | 8.65 | 7.59 | 7.01 | 6.63 | 6.37 | 6.18 | 6.03 | 5.67 | 5.28 | 4.86 |
| | .995 | 14.69 | 11.04 | 9.60 | 8.81 | 8.30 | 7.95 | 7.69 | 7.50 | 7.01 | 6.50 | 5.95 |
| | .999 | 25.42 | 18.49 | 15.83 | 14.39 | 13.49 | 12.86 | 12.40 | 12.04 | 11.19 | 10.30 | 9.33 |
| 9 | .90 | 3.36 | 3.01 | 2.81 | 2.69 | 2.61 | 2.55 | 2.51 | 2.47 | 2.38 | 2.28 | 2.16 |
| | .95 | 5.12 | 4.26 | 3.86 | 3.63 | 3.48 | 3.37 | 3.29 | 3.23 | 3.07 | 2.90 | 2.71 |
| | .975 | 7.21 | 5.71 | 5.08 | 4.72 | 4.48 | 4.32 | 4.20 | 4.10 | 3.87 | 3.61 | 3.33 |
| | .99 | 10.56 | 8.02 | 6.99 | 6.42 | 6.06 | 5.80 | 5.61 | 5.47 | 5.11 | 4.73 | 4.31 |
| | .995 | 13.61 | 10.11 | 8.72 | 7.96 | 7.47 | 7.13 | 6.88 | 6.69 | 6.23 | 5.73 | 5.19 |
| | .999 | 22.86 | 16.39 | 13.90 | 12.56 | 11.71 | 11.13 | 10.70 | 10.37 | 9.57 | 8.72 | 7.81 |
| 10 | .90 | 3.29 | 2.92 | 2.73 | 2.61 | 2.52 | 2.46 | 2.41 | 2.38 | 2.28 | 2.18 | 2.06 |
| | .95 | 4.96 | 4.10 | 3.71 | 3.48 | 3.33 | 3.22 | 3.14 | 3.07 | 2.91 | 2.74 | 2.54 |
| | .975 | 6.94 | 5.46 | 4.83 | 4.47 | 4.24 | 4.07 | 3.95 | 3.85 | 3.62 | 3.37 | 3.08 |
| | .99 | 10.04 | 7.56 | 6.55 | 5.99 | 5.64 | 5.39 | 5.20 | 5.06 | 4.71 | 4.33 | 3.91 |
| | .995 | 12.83 | 9.43 | 8.08 | 7.34 | 6.87 | 6.54 | 6.30 | 6.12 | 5.66 | 5.17 | 4.64 |
| | .999 | 21.04 | 14.91 | 12.55 | 11.28 | 10.48 | 9.93 | 9.52 | 9.20 | 8.45 | 7.64 | 6.76 |
| 12 | .90 | 3.18 | 2.81 | 2.61 | 2.48 | 2.39 | 2.33 | 2.28 | 2.24 | 2.15 | 2.04 | 1.90 |
| | .95 | 4.75 | 3.89 | 3.49 | 3.26 | 3.11 | 3.00 | 2.91 | 2.85 | 2.69 | 2.51 | 2.30 |
| | .975 | 6.55 | 5.10 | 4.47 | 4.12 | 3.89 | 3.73 | 3.61 | 3.51 | 3.28 | 3.02 | 2.72 |

*(continued on next page)*

## TABLE 8 Percentage points of the *F* distribution ($F_{d_1,d_2,p}$) *(continued)*

| *df* for denominator, $d_2$ | $p$ | *df* for numerator, $d_1$ 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 12 | 24 | ∞ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | .99 | 9.33 | 6.93 | 5.95 | 5.41 | 5.06 | 4.82 | 4.64 | 4.50 | 4.16 | 3.78 | 3.36 |
| | .995 | 11.75 | 8.51 | 7.23 | 6.52 | 6.07 | 5.76 | 5.52 | 5.35 | 4.91 | 4.43 | 3.90 |
| | .999 | 18.64 | 12.97 | 10.80 | 9.63 | 8.89 | 8.38 | 8.00 | 7.71 | 7.00 | 6.25 | 5.42 |
| 14 | .90 | 3.10 | 2.73 | 2.52 | 2.39 | 2.31 | 2.24 | 2.19 | 2.15 | 2.05 | 1.94 | 1.80 |
| | .95 | 4.60 | 3.74 | 3.34 | 3.11 | 2.96 | 2.85 | 2.76 | 2.70 | 2.53 | 2.35 | 2.13 |
| | .975 | 6.30 | 4.86 | 4.24 | 3.89 | 3.66 | 3.50 | 3.38 | 3.29 | 3.05 | 2.79 | 2.49 |
| | .99 | 8.86 | 6.51 | 5.56 | 5.04 | 4.69 | 4.46 | 4.28 | 4.14 | 3.80 | 3.43 | 3.00 |
| | .995 | 11.06 | 7.92 | 6.68 | 6.00 | 5.56 | 5.26 | 5.03 | 4.86 | 4.43 | 3.96 | 3.44 |
| | .999 | 17.14 | 11.78 | 9.73 | 8.62 | 7.92 | 7.44 | 7.08 | 6.80 | 6.13 | 5.41 | 4.60 |
| 16 | .90 | 3.05 | 2.67 | 2.46 | 2.33 | 2.24 | 2.18 | 2.13 | 2.09 | 1.99 | 1.87 | 1.72 |
| | .95 | 4.49 | 3.63 | 3.24 | 3.01 | 2.85 | 2.74 | 2.66 | 2.59 | 2.42 | 2.24 | 2.01 |
| | .975 | 6.12 | 4.69 | 4.08 | 3.73 | 3.50 | 3.34 | 3.22 | 3.12 | 2.89 | 2.63 | 2.32 |
| | .99 | 8.53 | 6.23 | 5.29 | 4.77 | 4.44 | 4.20 | 4.03 | 3.89 | 3.55 | 3.18 | 2.75 |
| | .995 | 10.58 | 7.51 | 6.30 | 5.64 | 5.21 | 4.91 | 4.69 | 4.52 | 4.10 | 3.64 | 3.11 |
| | .999 | 16.12 | 10.97 | 9.01 | 7.94 | 7.27 | 6.80 | 6.46 | 6.19 | 5.55 | 4.85 | 4.06 |
| 18 | .90 | 3.01 | 2.62 | 2.42 | 2.29 | 2.20 | 2.13 | 2.08 | 2.04 | 1.93 | 1.81 | 1.66 |
| | .95 | 4.41 | 3.55 | 3.16 | 2.93 | 2.77 | 2.66 | 2.58 | 2.51 | 2.34 | 2.15 | 1.92 |
| | .975 | 5.98 | 4.56 | 3.95 | 3.61 | 3.38 | 3.22 | 3.10 | 3.01 | 2.77 | 2.50 | 2.19 |
| | .99 | 8.29 | 6.01 | 5.09 | 4.58 | 4.25 | 4.01 | 3.84 | 3.71 | 3.37 | 3.00 | 2.57 |
| | .995 | 10.22 | 7.21 | 6.03 | 5.37 | 4.96 | 4.66 | 4.44 | 4.28 | 3.86 | 3.40 | 2.87 |
| | .999 | 15.38 | 10.39 | 8.49 | 7.46 | 6.81 | 6.35 | 6.02 | 5.76 | 5.13 | 4.45 | 3.67 |
| 20 | .90 | 2.97 | 2.59 | 2.38 | 2.25 | 2.16 | 2.09 | 2.04 | 2.00 | 1.89 | 1.77 | 1.61 |
| | .95 | 4.35 | 3.49 | 3.10 | 2.87 | 2.71 | 2.60 | 2.51 | 2.45 | 2.28 | 2.08 | 1.84 |
| | .975 | 5.87 | 4.46 | 3.86 | 3.51 | 3.29 | 3.13 | 3.01 | 2.91 | 2.68 | 2.41 | 2.09 |
| | .99 | 8.10 | 5.85 | 4.94 | 4.43 | 4.10 | 3.87 | 3.70 | 3.56 | 3.23 | 2.86 | 2.42 |
| | .995 | 9.94 | 6.99 | 5.82 | 5.17 | 4.76 | 4.47 | 4.26 | 4.09 | 3.68 | 3.22 | 2.69 |
| | .999 | 14.82 | 9.95 | 8.10 | 7.10 | 6.46 | 6.02 | 5.69 | 5.44 | 4.82 | 4.15 | 3.38 |
| 30 | .90 | 2.88 | 2.49 | 2.28 | 2.14 | 2.05 | 1.98 | 1.93 | 1.88 | 1.77 | 1.64 | 1.46 |
| | .95 | 4.17 | 3.32 | 2.92 | 2.69 | 2.53 | 2.42 | 2.33 | 2.27 | 2.09 | 1.89 | 1.62 |
| | .975 | 5.57 | 4.18 | 3.59 | 3.25 | 3.03 | 2.87 | 2.75 | 2.65 | 2.41 | 2.14 | 1.79 |
| | .99 | 7.56 | 5.39 | 4.51 | 4.02 | 3.70 | 3.47 | 3.30 | 3.17 | 2.84 | 2.47 | 2.01 |
| | .995 | 9.18 | 6.35 | 5.24 | 4.62 | 4.23 | 3.95 | 3.74 | 3.58 | 3.18 | 2.73 | 2.18 |
| | .999 | 13.29 | 8.77 | 7.05 | 6.12 | 5.53 | 5.12 | 4.82 | 4.58 | 4.00 | 3.36 | 2.59 |
| 40 | .90 | 2.84 | 2.44 | 2.23 | 2.09 | 2.00 | 1.93 | 1.87 | 1.83 | 1.71 | 1.57 | 1.38 |
| | .95 | 4.08 | 3.23 | 2.84 | 2.61 | 2.45 | 2.34 | 2.25 | 2.18 | 2.00 | 1.79 | 1.51 |
| | .975 | 5.42 | 4.05 | 3.46 | 3.13 | 2.90 | 2.74 | 2.62 | 2.53 | 2.29 | 2.01 | 1.64 |
| | .99 | 7.31 | 5.18 | 4.31 | 3.83 | 3.51 | 3.29 | 3.12 | 2.99 | 2.66 | 2.29 | 1.80 |
| | .995 | 8.83 | 6.07 | 4.98 | 4.37 | 3.99 | 3.71 | 3.51 | 3.35 | 2.95 | 2.50 | 1.93 |
| | .999 | 12.61 | 8.25 | 6.59 | 5.70 | 5.13 | 4.73 | 4.44 | 4.21 | 3.64 | 3.01 | 2.23 |
| 60 | .90 | 2.79 | 2.39 | 2.18 | 2.04 | 1.95 | 1.87 | 1.82 | 1.77 | 1.66 | 1.51 | 1.29 |
| | .95 | 4.00 | 3.15 | 2.76 | 2.53 | 2.37 | 2.25 | 2.17 | 2.10 | 1.92 | 1.70 | 1.39 |
| | .975 | 5.29 | 3.93 | 3.34 | 3.01 | 2.79 | 2.63 | 2.51 | 2.41 | 2.17 | 1.88 | 1.48 |
| | .99 | 7.08 | 4.98 | 4.13 | 3.65 | 3.34 | 3.12 | 2.95 | 2.82 | 2.50 | 2.12 | 1.60 |
| | .995 | 8.49 | 5.80 | 4.73 | 4.14 | 3.76 | 3.49 | 3.29 | 3.13 | 2.74 | 2.29 | 1.69 |
| | .999 | 11.97 | 7.77 | 6.17 | 5.31 | 4.76 | 4.37 | 4.09 | 3.86 | 3.32 | 2.69 | 1.89 |
| 120 | .90 | 2.75 | 2.35 | 2.13 | 1.99 | 1.90 | 1.82 | 1.77 | 1.72 | 1.60 | 1.45 | 1.19 |
| | .95 | 3.92 | 3.07 | 2.68 | 2.45 | 2.29 | 2.17 | 2.09 | 2.02 | 1.83 | 1.61 | 1.25 |
| | .975 | 5.15 | 3.80 | 3.23 | 2.89 | 2.67 | 2.52 | 2.39 | 2.30 | 2.05 | 1.76 | 1.31 |
| | .99 | 6.85 | 4.79 | 3.95 | 3.48 | 3.17 | 2.96 | 2.79 | 2.66 | 2.34 | 1.95 | 1.38 |
| | .995 | 8.18 | 5.54 | 4.50 | 3.92 | 3.55 | 3.28 | 3.09 | 2.93 | 2.54 | 2.09 | 1.43 |
| | .999 | 11.38 | 7.32 | 5.78 | 4.95 | 4.42 | 4.04 | 3.77 | 3.55 | 3.02 | 2.40 | 1.54 |
| ∞ | .90 | 2.71 | 2.30 | 2.08 | 1.94 | 1.85 | 1.77 | 1.72 | 1.67 | 1.55 | 1.38 | 1.00 |
| | .95 | 3.84 | 3.00 | 2.60 | 2.37 | 2.21 | 2.10 | 2.01 | 1.94 | 1.75 | 1.52 | 1.00 |
| | .975 | 5.02 | 3.69 | 3.12 | 2.79 | 2.57 | 2.41 | 2.29 | 2.19 | 1.94 | 1.64 | 1.00 |
| | .99 | 6.63 | 4.61 | 3.78 | 3.32 | 3.02 | 2.80 | 2.64 | 2.51 | 2.18 | 1.79 | 1.00 |
| | .995 | 7.88 | 5.30 | 4.28 | 3.72 | 3.35 | 3.09 | 2.90 | 2.74 | 2.36 | 1.90 | 1.00 |
| | .999 | 10.83 | 6.91 | 5.42 | 4.62 | 4.10 | 3.74 | 3.47 | 3.27 | 2.74 | 2.13 | 1.00 |

*Note:* $F_{d_1,d_2,p}$ = $p$th percentile of an *F* distribution with $d_1$ and $d_2$ degrees of freedom.

*Source:* Based on the Biometrika Trustees, from *Biometrika Tables for Statisticians,* Volume 2, edited by E. S. Pearson and H. O. Hartley.

## TABLE 9 Critical values for the ESD (Extreme Studentized Deviate) outlier statistic ($ESD_{n,1-\alpha}$, $\alpha$ = .05, .01)

| | 1 − α | | | 1 − α | |
|---|---|---|---|---|---|
| *n* | .95 | .99 | *n* | .95 | .99 |
| **5** | 1.72 | 1.76 | **25** | 2.82 | 3.14 |
| **6** | 1.89 | 1.97 | **26** | 2.84 | 3.16 |
| **7** | 2.02 | 2.14 | **27** | 2.86 | 3.18 |
| **8** | 2.13 | 2.28 | **28** | 2.88 | 3.20 |
| **9** | 2.21 | 2.39 | **29** | 2.89 | 3.22 |
| **10** | 2.29 | 2.48 | **30** | 2.91 | 3.24 |
| **11** | 2.36 | 2.56 | **35** | 2.98 | 3.32 |
| **12** | 2.41 | 2.64 | **40** | 3.04 | 3.38 |
| **13** | 2.46 | 2.70 | **45** | 3.09 | 3.44 |
| **14** | 2.51 | 2.75 | **50** | 3.13 | 3.48 |
| **15** | 2.55 | 2.81 | **60** | 3.20 | 3.56 |
| **16** | 2.59 | 2.85 | **70** | 3.26 | 3.62 |
| **17** | 2.62 | 2.90 | **80** | 3.31 | 3.67 |
| **18** | 2.65 | 2.93 | **90** | 3.35 | 3.72 |
| **19** | 2.68 | 2.97 | **100** | 3.38 | 3.75 |
| **20** | 2.71 | 3.00 | **150** | 3.52 | 3.89 |
| **21** | 2.73 | 3.03 | **200** | 3.61 | 3.98 |
| **22** | 2.76 | 3.06 | **300** | 3.72 | 4.09 |
| **23** | 2.78 | 3.08 | **400** | 3.80 | 4.17 |
| **24** | 2.80 | 3.11 | **500** | 3.86 | 4.23 |

*Note:* For values of *n* not found in the table, the percentiles can be evaluated using the formula $ESD_{n,1-\alpha} = \frac{t_{n-2,p}(n-1)}{\sqrt{n(n-2+t^2_{n-2,p})}}$, where $p = 1 - [\alpha/(2n)]$.

## TABLE 10 Two-tailed critical values for the Wilcoxon signed-rank test

| | .10 | | .05 | | .02 | | .01 | |
|---|---|---|---|---|---|---|---|---|
| *n*[a] | Lower | Upper | Lower | Upper | Lower | Upper | Lower | Upper |
| 1 | | — | | — | | — | | — |
| 2 | | — | | — | | — | | — |
| 3 | | — | | — | | — | | — |
| 4 | | — | | — | | — | | — |
| 5 | 0 | 15 | | — | | — | | — |
| 6 | 2 | 19 | 0 | 21 | | — | | — |
| 7 | 3 | 25 | 2 | 26 | 0 | 28 | | — |
| 8 | 5 | 31 | 3 | 33 | 1 | 35 | 0 | 36 |
| 9 | 8 | 37 | 5 | 40 | 3 | 42 | 1 | 44 |
| 10 | 10 | 45 | 8 | 47 | 5 | 50 | 3 | 52 |
| 11 | 13 | 53 | 10 | 56 | 7 | 59 | 5 | 61 |
| 12 | 17 | 61 | 13 | 65 | 9 | 69 | 7 | 71 |
| 13 | 21 | 70 | 17 | 74 | 12 | 79 | 9 | 82 |
| 14 | 25 | 80 | 21 | 84 | 15 | 90 | 12 | 93 |
| 15 | 30 | 90 | 25 | 95 | 19 | 101 | 15 | 105 |

[a]*n* = number of untied pairs.
*Source:* Figures from "Documenta Geigy Scientific Tables," 6th edition.

## TABLE 11 Two-tailed critical values for the Wilcoxon rank-sum test

| | α = .10, $n_1$[a] | | | | | | α = .05, $n_1$ | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $n_2$[b] | 4 | 5 | 6 | 7 | 8 | 9 | 4 | 5 | 6 | 7 | 8 | 9 |
| | $T_l$[c] $T_r$[d] | $T_l$ $T_r$ | $T_l$ $T_r$ | $T_l$ $T_r$ | $T_l$ $T_r$ | $T_l$ $T_r$ | $T_l$ $T_r$ | $T_l$ $T_r$ | $T_l$ $T_r$ | $T_l$ $T_r$ | $T_l$ $T_r$ | $T_l$ $T_r$ |
| 4 | 11–25 | 17–33 | 24–42 | 32–52 | 41–63 | 51–75 | 10–26 | 16–34 | 23–43 | 31–53 | 40–64 | 49–77 |
| **5** | 12–28 | 19–36 | 26–46 | 34–57 | 44–68 | 54–81 | 11–29 | 17–38 | 24–48 | 33–58 | 42–70 | 52–83 |
| 6 | 13–31 | 20–40 | 28–50 | 36–62 | 46–74 | 57–87 | 12–32 | 18–42 | 26–52 | 34–64 | 44–76 | 55–89 |
| 7 | 14–34 | 21–44 | 29–55 | 39–66 | 49–79 | 60–93 | 13–35 | 20–45 | 27–57 | 36–69 | 46–82 | 57–96 |
| 8 | 15–37 | 23–47 | 31–59 | 41–71 | 51–85 | 63–99 | 14–38 | 21–49 | 29–61 | 38–74 | 49–87 | 60–102 |
| 9 | 16–40 | 24–51 | 33–63 | 43–76 | 54–90 | 66–105 | 14–42 | 22–53 | 31–65 | 40–79 | 51–93 | 62–109 |
| **10** | 17–43 | 26–54 | 35–67 | 45–81 | 56–96 | 69–111 | 15–45 | 23–57 | 32–70 | 42–84 | 53–99 | 65–115 |
| 11 | 18–46 | 27–58 | 37–71 | 47–86 | 59–101 | 72–117 | 16–48 | 24–61 | 34–74 | 44–89 | 55–105 | 68–121 |
| 12 | 19–49 | 28–62 | 38–76 | 49–91 | 62–106 | 75–123 | 17–51 | 26–64 | 35–79 | 46–94 | 58–110 | 71–127 |
| 13 | 20–52 | 30–65 | 40–80 | 52–95 | 64–112 | 78–129 | 18–54 | 27–68 | 37–83 | 48–99 | 60–116 | 73–134 |
| 14 | 21–55 | 31–69 | 42–84 | 54–100 | 67–117 | 81–135 | 19–57 | 28–72 | 38–88 | 50–104 | 62–122 | 76–140 |
| **15** | 22–58 | 33–72 | 44–88 | 56–105 | 69–123 | 84–141 | 20–60 | 29–76 | 40–92 | 52–109 | 65–127 | 79–146 |
| 16 | 24–60 | 34–76 | 46–92 | 58–110 | 72–128 | 87–147 | 21–63 | 30–80 | 42–96 | 54–114 | 67–133 | 82–152 |
| 17 | 25–63 | 35–80 | 47–97 | 61–114 | 75–133 | 90–153 | 21–67 | 32–83 | 43–101 | 56–119 | 70–138 | 84–159 |
| 18 | 26–66 | 37–83 | 49–101 | 63–119 | 77–139 | 93–159 | 22–70 | 33–87 | 45–105 | 58–124 | 72–144 | 87–165 |
| 19 | 27–69 | 38–87 | 51–105 | 65–124 | 80–144 | 96–165 | 23–73 | 34–91 | 46–110 | 60–129 | 74–150 | 90–171 |
| **20** | 28–72 | 40–90 | 53–109 | 67–129 | 83–149 | 99–171 | 24–76 | 35–95 | 48–114 | 62–134 | 77–155 | 93–177 |
| 21 | 29–75 | 41–94 | 55–113 | 69–134 | 85–155 | 102–177 | 25–79 | 37–98 | 50–118 | 64–139 | 79–161 | 95–184 |
| 22 | 30–78 | 43–97 | 57–117 | 72–138 | 88–160 | 105–183 | 26–82 | 38–102 | 51–123 | 66–144 | 81–167 | 98–190 |
| 23 | 31–81 | 44–101 | 58–122 | 74–143 | 90–166 | 108–189 | 27–85 | 39–106 | 53–127 | 68–149 | 84–172 | 101–196 |
| 24 | 32–84 | 45–105 | 60–126 | 76–148 | 93–171 | 111–195 | 27–89 | 40–110 | 54–132 | 70–154 | 86–178 | 104–202 |
| **25** | 33–87 | 47–108 | 62–130 | 78–153 | 96–176 | 114–201 | 28–92 | 42–113 | 56–136 | 72–159 | 89–183 | 107–208 |
| 26 | 34–90 | 48–112 | 64–134 | 81–157 | 98–182 | 117–207 | 29–95 | 43–117 | 58–140 | 74–164 | 91–189 | 109–215 |
| 27 | 35–93 | 50–115 | 66–138 | 83–162 | 101–187 | 120–213 | 30–98 | 44–121 | 59–145 | 76–169 | 93–195 | 112–221 |
| 28 | 36–96 | 51–119 | 67–143 | 85–167 | 103–193 | 123–219 | 31–101 | 45–125 | 61–149 | 78–174 | 96–200 | 115–227 |
| 29 | 37–99 | 53–122 | 69–147 | 87–172 | 106–198 | 126–225 | 32–104 | 47–128 | 63–153 | 80–179 | 98–206 | 118–233 |
| **30** | 38–102 | 54–126 | 71–151 | 89–177 | 109–203 | 129–231 | 33–107 | 48–132 | 64–158 | 82–184 | 101–211 | 121–239 |
| 31 | 39–105 | 55–130 | 73–155 | 92–181 | 111–209 | 132–237 | 34–110 | 49–136 | 66–162 | 84–189 | 103–217 | 123–246 |
| 32 | 40–108 | 57–133 | 75–159 | 94–186 | 114–214 | 135–243 | 34–114 | 50–140 | 67–167 | 86–194 | 106–222 | 126–252 |
| 33 | 41–111 | 58–137 | 77–163 | 96–191 | 117–219 | 138–249 | 35–117 | 52–143 | 69–171 | 88–199 | 108–228 | 129–258 |
| 34 | 42–114 | 60–140 | 78–168 | 98–196 | 119–225 | 141–255 | 36–120 | 53–147 | 71–175 | 90–204 | 110–234 | 132–264 |
| **35** | 43–117 | 61–144 | 80–172 | 100–201 | 122–230 | 144–261 | 37–123 | 54–151 | 72–180 | 92–209 | 113–239 | 135–270 |
| 36 | 44–120 | 62–148 | 82–176 | 102–206 | 124–236 | 148–266 | 38–126 | 55–155 | 74–184 | 94–214 | 115–245 | 137–277 |
| 37 | 45–123 | 64–151 | 84–180 | 105–210 | 127–241 | 151–272 | 39–129 | 57–158 | 76–188 | 96–219 | 117–251 | 140–283 |
| 38 | 46–126 | 65–155 | 85–185 | 107–215 | 130–246 | 154–278 | 40–132 | 58–162 | 77–193 | 98–224 | 120–256 | 143–289 |
| 39 | 47–129 | 67–158 | 87–189 | 109–220 | 132–252 | 157–284 | 41–135 | 59–166 | 79–197 | 100–229 | 122–262 | 146–295 |
| **40** | 48–132 | 68–162 | 89–193 | 111–225 | 135–257 | 160–290 | 41–139 | 60–170 | 80–202 | 102–234 | 125–267 | 149–301 |
| 41 | 49–135 | 69–166 | 91–197 | 114–229 | 138–262 | 163–296 | 42–142 | 61–174 | 82–206 | 104–239 | 127–273 | 151–308 |
| 42 | 50–138 | 71–169 | 93–201 | 116–234 | 140–268 | 166–302 | 43–145 | 63–177 | 84–210 | 106–244 | 129–279 | 154–314 |
| 43 | 51–141 | 72–173 | 95–205 | 118–239 | 143–273 | 169–308 | 44–148 | 64–181 | 85–215 | 108–249 | 132–284 | 157–320 |
| 44 | 52–144 | 74–176 | 96–210 | 120–244 | 146–278 | 172–314 | 45–151 | 65–185 | 87–219 | 110–254 | 134–290 | 160–326 |
| **45** | 53–147 | 75–180 | 98–214 | 123–248 | 148–284 | 175–320 | 46–154 | 66–189 | 88–224 | 112–259 | 137–295 | 163–332 |
| 46 | 55–149 | 77–183 | 100–218 | 125–253 | 151–289 | 178–326 | 47–157 | 68–192 | 90–228 | 114–264 | 139–301 | 165–339 |
| 47 | 56–152 | 78–187 | 102–222 | 127–258 | 154–294 | 181–332 | 48–160 | 69–196 | 92–232 | 116–269 | 141–307 | 168–345 |
| 48 | 57–155 | 79–191 | 104–226 | 129–263 | 156–300 | 184–338 | 48–164 | 70–200 | 93–237 | 118–274 | 144–312 | 171–351 |
| 49 | 58–158 | 81–194 | 106–230 | 132–267 | 159–305 | 187–344 | 49–167 | 71–204 | 95–241 | 120–279 | 146–318 | 174–357 |
| **50** | 59–161 | 82–198 | 107–235 | 134–272 | 162–310 | 190–350 | 50–170 | 73–207 | 97–245 | 122–284 | 149–323 | 177–363 |

[a] $n_1$ = minimum of the two sample sizes.
[b] $n_2$ = maximum of the two sample sizes.
[c] $T_l$ = lower critical value for the rank sum in the first sample.
[d] $T_r$ = upper critical value for the rank sum in the first sample.

## TABLE 11 Two-tailed critical values for the Wilcoxon rank-sum test *(continued)*

| | α = .02, $n_1$[a] | | | | | | α = .01, $n_1$ | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $n_2$[b] | 4 | 5 | 6 | 7 | 8 | 9 | 4 | 5 | 6 | 7 | 8 | 9 |
| | $T_l$[c] $T_r$[d] | $T_l$ $T_r$ | $T_l$ $T_r$ | $T_l$ $T_r$ | $T_l$ $T_r$ | $T_l$ $T_r$ | $T_l$ $T_r$ | $T_l$ $T_r$ | $T_l$ $T_r$ | $T_l$ $T_r$ | $T_l$ $T_r$ | $T_l$ $T_r$ |
| 4 | — — | 15–35 | 22–44 | 29–55 | 38–66 | 48–78 | — — | — — | 21–45 | 28–56 | 37–67 | 46–80 |
| **5** | 10–30 | 16–39 | 23–49 | 31–60 | 40–72 | 50–85 | — — | 15–40 | 22–50 | 29–62 | 38–74 | 48–87 |
| 6 | 11–33 | 17–43 | 24–54 | 32–66 | 42–78 | 52–92 | 10–34 | 16–44 | 23–55 | 31–67 | 40–80 | 50–94 |
| 7 | 11–37 | 18–47 | 25–59 | 34–71 | 43–85 | 54–99 | 10–38 | 16–49 | 24–60 | 32–73 | 42–86 | 52–101 |
| 8 | 12–40 | 19–51 | 27–63 | 35–77 | 45–91 | 56–106 | 11–41 | 17–53 | 25–65 | 34–78 | 43–93 | 54–108 |
| 9 | 13–43 | 20–55 | 28–68 | 37–82 | 47–97 | 59–112 | 11–45 | 18–57 | 26–70 | 35–84 | 45–99 | 56–115 |
| **10** | 13–47 | 21–59 | 29–73 | 39–87 | 49–103 | 61–119 | 12–48 | 19–61 | 27–75 | 37–89 | 47–105 | 58–122 |
| 11 | 14–50 | 22–63 | 30–78 | 40–93 | 51–109 | 63–126 | 12–52 | 20–65 | 28–80 | 38–95 | 49–111 | 61–128 |
| 12 | 15–53 | 23–67 | 32–82 | 42–98 | 53–115 | 66–132 | 13–55 | 21–69 | 30–84 | 40–100 | 51–117 | 63–135 |
| 13 | 15–57 | 24–71 | 33–87 | 44–103 | 56–120 | 68–139 | 13–59 | 22–73 | 31–89 | 41–106 | 53–123 | 65–142 |
| 14 | 16–60 | 25–75 | 34–92 | 45–109 | 58–126 | 71–145 | 14–62 | 22–78 | 32–94 | 43–111 | 54–130 | 67–149 |
| **15** | 17–63 | 26–79 | 36–96 | 47–114 | 60–132 | 73–152 | 15–65 | 23–82 | 33–99 | 44–117 | 56–136 | 69–156 |
| 16 | 17–67 | 27–83 | 37–101 | 49–119 | 62–138 | 76–158 | 15–69 | 24–86 | 34–104 | 46–122 | 58–142 | 72–162 |
| 17 | 18–70 | 28–87 | 39–105 | 51–124 | 64–144 | 78–165 | 16–72 | 25–90 | 36–108 | 47–128 | 60–148 | 74–169 |
| 18 | 19–73 | 29–91 | 40–110 | 52–130 | 66–150 | 81–171 | 16–76 | 26–94 | 37–113 | 49–133 | 62–154 | 76–176 |
| 19 | 19–77 | 30–95 | 41–115 | 54–135 | 68–156 | 83–178 | 17–79 | 27–98 | 38–118 | 50–139 | 64–160 | 78–183 |
| **20** | 20–80 | 31–99 | 43–119 | 56–140 | 70–162 | 85–185 | 18–82 | 28–102 | 39–123 | 52–144 | 66–166 | 81–189 |
| 21 | 21–83 | 32–103 | 44–124 | 58–145 | 72–168 | 88–191 | 18–86 | 29–106 | 40–128 | 53–150 | 68–172 | 83 196 |
| 22 | 21–87 | 33–107 | 45–129 | 59–151 | 74–174 | 90–198 | 19–89 | 29–111 | 42–132 | 55–155 | 70–178 | 85–203 |
| 23 | 22–90 | 34 111 | 47–133 | 61–156 | 76–180 | 93–204 | 19–93 | 30–115 | 43–137 | 57–160 | 71–185 | 88–209 |
| 24 | 23–93 | 35 115 | 48 138 | 63–161 | 78–186 | 95–211 | 20–96 | 31–119 | 44–142 | 58–166 | 73–191 | 90–216 |
| **25** | 23–97 | 36 119 | 50 142 | 64–167 | 81–191 | 98–217 | 20–100 | 32–123 | 45–147 | 60–171 | 75–197 | 92–223 |
| 26 | 24–100 | 37–123 | 51–147 | 66–172 | 83–197 | 100–224 | 21–103 | 33–127 | 46–152 | 61–177 | 77–203 | 94–230 |
| 27 | 25–103 | 38–127 | 52–152 | 68–177 | 85–203 | 103–230 | 22–106 | 34–131 | 48–156 | 63–182 | 79–209 | 97–236 |
| 28 | 26–106 | 39–131 | 54–156 | 70–182 | 87–209 | 105–237 | 22–110 | 35–135 | 49–161 | 64–188 | 81–215 | 99–243 |
| 29 | 26–110 | 40–135 | 55–161 | 71–188 | 89–215 | 108–243 | 23–113 | 36–139 | 50–166 | 66–193 | 83–221 | 101–250 |
| **30** | 27–113 | 41–139 | 56–166 | 73–193 | 91–221 | 110–250 | 23–117 | 37–143 | 51–171 | 68–198 | 85–227 | 103–257 |
| 31 | 28–116 | 42–143 | 58–170 | 75–198 | 93–227 | 112–257 | 24–120 | 37–148 | 53–175 | 68–204 | 87–233 | 106–263 |
| 32 | 28–120 | 43–147 | 59–175 | 77–203 | 95–233 | 115–263 | 24–124 | 38–152 | 54–180 | 71–209 | 89–239 | 108–270 |
| 33 | 29–123 | 44–151 | 61–179 | 78–209 | 97–239 | 117–270 | 25–127 | 39–156 | 55–185 | 72–215 | 90–246 | 110–277 |
| 34 | 30–126 | 45–155 | 62–184 | 79–215 | 99–245 | 120–276 | 26–130 | 40–160 | 56–190 | 73–221 | 92–252 | 112–284 |
| **35** | 30–130 | 46–159 | 63–189 | 81–220 | 101–251 | 122–283 | 26–134 | 41–164 | 57–195 | 75–226 | 94–258 | 114–291 |
| 36 | 31–133 | 47–163 | 65–193 | 83–225 | 103–257 | 125–289 | 27–137 | 42–168 | 58–200 | 76–232 | 96–264 | 117–297 |
| 37 | 32–136 | 48–167 | 66–198 | 84–231 | 105–263 | 127–296 | 28–140 | 43–172 | 60–204 | 78–237 | 98–270 | 119–304 |
| 38 | 32–140 | 49–171 | 67–203 | 86–236 | 107–269 | 129–303 | 28–144 | 44–176 | 61–209 | 79–243 | 100–276 | 121–311 |
| 39 | 33–143 | 50–175 | 69–207 | 88–241 | 109–275 | 132–309 | 29–147 | 45–180 | 62–214 | 81–248 | 102–282 | 123–318 |
| **40** | 34–146 | 51–179 | 70–212 | 90–246 | 111–281 | 134–316 | 29–151 | 46–184 | 63–219 | 82–254 | 103–289 | 126–324 |
| 41 | 34–150 | 52–183 | 72–216 | 91–252 | 113–287 | 137–322 | 30–154 | 46–189 | 65–223 | 84–259 | 105–295 | 128–331 |
| 42 | 35–153 | 53–187 | 73–221 | 93–257 | 116–292 | 139–329 | 31–157 | 47–193 | 66–228 | 85–265 | 107–301 | 130–338 |
| 43 | 35–157 | 54–191 | 74–226 | 95–262 | 118–298 | 142–335 | 31–161 | 48–197 | 67–233 | 87–270 | 109–307 | 133–344 |
| 44 | 36–160 | 55–195 | 76–230 | 97–267 | 120–304 | 144–342 | 32–164 | 49–201 | 68–238 | 88–276 | 111–313 | 135–351 |
| **45** | 37–163 | 56–199 | 77–235 | 98–273 | 122–310 | 147–348 | 32–168 | 50–205 | 69–243 | 90–281 | 113–319 | 137–358 |
| 46 | 37–167 | 57–203 | 78–240 | 100–278 | 124–316 | 149–355 | 33–171 | 51–209 | 71–247 | 91–287 | 115–325 | 139–365 |
| 47 | 38–170 | 58–207 | 80–244 | 102–283 | 126–322 | 152–361 | 34–174 | 52–213 | 72–252 | 93–292 | 117–331 | 142–371 |
| 48 | 39–173 | 59–211 | 81–249 | 103–289 | 128–328 | 154–368 | 34–178 | 53–217 | 73–257 | 95–297 | 118–338 | 144–378 |
| 49 | 39–177 | 60–215 | 82–254 | 105–294 | 130–334 | 157–374 | 35–181 | 54–221 | 74–262 | 96–303 | 120–344 | 146–385 |
| **50** | 40–180 | 61–219 | 84–258 | 107–299 | 132–340 | 159–381 | 36–184 | 55–225 | 76–266 | 98–308 | 122–350 | 148–392 |

*Source:* The data of this table are from *Documenta Geigy Scientific Tables*, 6th edition.

## TABLE 12 Fisher's *z* transformation

| *r* | *z* | *r* | *z* | *r* | *z* | *r* | *z* | *r* | *z* |
|---|---|---|---|---|---|---|---|---|---|
| .00 | .000 | | | | | | | | |
| .01 | .010 | .21 | .213 | .41 | .436 | .61 | .709 | .81 | 1.127 |
| .02 | .020 | .22 | .224 | .42 | .448 | .62 | .725 | .82 | 1.157 |
| .03 | .030 | .23 | .234 | .43 | .460 | .63 | .741 | .83 | 1.188 |
| .04 | .040 | .24 | .245 | .44 | .472 | .64 | .758 | .84 | 1.221 |
| .05 | .050 | .25 | .255 | .45 | .485 | .65 | .775 | .85 | 1.256 |
| .06 | .060 | .26 | .266 | .46 | .497 | .66 | .793 | .86 | 1.293 |
| .07 | .070 | .27 | .277 | .47 | .510 | .67 | .811 | .87 | 1.333 |
| .08 | .080 | .28 | .288 | .48 | .523 | .68 | .829 | .88 | 1.376 |
| .09 | .090 | .29 | .299 | .49 | .536 | .69 | .848 | .89 | 1.422 |
| .10 | .100 | .30 | .310 | .50 | .549 | .70 | .867 | .90 | 1.472 |
| .11 | .110 | .31 | .321 | .51 | .563 | .71 | .887 | .91 | 1.528 |
| .12 | .121 | .32 | .332 | .52 | .576 | .72 | .908 | .92 | 1.589 |
| .13 | .131 | .33 | .343 | .53 | .590 | .73 | .929 | .93 | 1.658 |
| .14 | .141 | .34 | .354 | .54 | .604 | .74 | .950 | .94 | 1.738 |
| .15 | .151 | .35 | .365 | .55 | .618 | .75 | .973 | .95 | 1.832 |
| .16 | .161 | .36 | .377 | .56 | .633 | .76 | .996 | .96 | 1.946 |
| .17 | .172 | .37 | .388 | .57 | .648 | .77 | 1.020 | .97 | 2.092 |
| .18 | .182 | .38 | .400 | .58 | .662 | .78 | 1.045 | .98 | 2.298 |
| .19 | .192 | .39 | .412 | .59 | .678 | .79 | 1.071 | .99 | 2.647 |
| .20 | .203 | .40 | .424 | .60 | .693 | .80 | 1.099 | | |

## TABLE 13 Two-tailed upper critical values for the Spearman rank-correlation coefficient ($r_s$)

| | α | | | |
|---|---|---|---|---|
| *n* | .10 | .05 | .02 | .01 |
| 1 | — | — | — | — |
| 2 | — | — | — | — |
| 3 | — | — | — | — |
| 4 | 1.0 | — | — | — |
| 5 | .900 | 1.0 | 1.0 | — |
| 6 | .829 | .886 | .943 | 1.0 |
| 7 | .714 | .786 | .893 | .929 |
| 8 | .643 | .738 | .833 | .881 |
| 9 | .600 | .683 | .783 | .833 |

*Source:* The data for this table have been adapted from E. G. Olds (1938), "Distributions of Sums of Squares of Rank Differences for Small Numbers of Individuals," *Annals of Mathematical Statistics, 9,* 133–148.

**TABLE 14 Critical values for the Kruskal-Wallis test statistic ($H$) for selected sample sizes for $k = 3$**

| | | | α | | | |
|---|---|---|---|---|---|---|
| $n_1$ | $n_2$ | $n_3$ | .10 | .05 | .02 | .01 |
| 1 | 1 | 2 | — | — | — | — |
| 1 | 1 | 3 | — | — | — | — |
| 1 | 1 | 4 | — | — | — | — |
| 1 | 1 | 5 | — | — | — | — |
| 1 | 2 | 2 | — | — | — | — |
| 1 | 2 | 3 | 4.286 | — | — | — |
| 1 | 2 | 4 | 4.500 | — | — | — |
| 1 | 2 | 5 | 4.200 | 5.000 | — | — |
| 1 | 3 | 3 | 4.571 | 5.143 | — | — |
| 1 | 3 | 4 | 4.056 | 5.389 | — | — |
| 1 | 3 | 5 | 4.018 | 4.960 | 6.400 | — |
| 1 | 4 | 4 | 4.167 | 4.967 | 6.667 | — |
| 1 | 4 | 5 | 3.987 | 4.986 | 6.431 | 6.954 |
| 1 | 5 | 5 | 4.109 | 5.127 | 6.146 | 7.309 |
| 2 | 2 | 2 | 4.571 | — | — | — |
| 2 | 2 | 3 | 4.500 | 4.714 | — | — |
| 2 | 2 | 4 | 4.500 | 5.333 | 6.000 | — |
| 2 | 2 | 5 | 4.373 | 5.160 | 6.000 | 6.533 |
| 2 | 3 | 3 | 4.694 | 5.361 | 6.250 | — |
| 2 | 3 | 4 | 4.511 | 5.444 | 6.144 | 6.444 |
| 2 | 3 | 5 | 4.651 | 5.251 | 6.294 | 6.909 |
| 2 | 4 | 4 | 4.554 | 5.454 | 6.600 | 7.036 |
| 2 | 4 | 5 | 4.541 | 5.273 | 6.541 | 7.204 |
| 2 | 5 | 5 | 4.623 | 5.338 | 6.469 | 7.392 |
| 3 | 3 | 3 | 5.067 | 5.689 | 6.489 | 7.200 |
| 3 | 3 | 4 | 4.709 | 5.791 | 6.564 | 7.000 |
| 3 | 3 | 5 | 4.533 | 5.648 | 6.533 | 7.079 |
| 3 | 4 | 4 | 4.546 | 5.598 | 6.712 | 7.212 |
| 3 | 4 | 5 | 4.549 | 5.656 | 6.703 | 7.477 |
| 3 | 5 | 5 | 4.571 | 5.706 | 6.866 | 7.622 |
| 4 | 4 | 4 | 4.654 | 5.692 | 6.962 | 7.654 |
| 4 | 4 | 5 | 4.668 | 5.657 | 6.976 | 7.760 |
| 4 | 5 | 5 | 4.523 | 5.666 | 7.000 | 7.903 |
| 5 | 5 | 5 | 4.580 | 5.780 | 7.220 | 8.000 |

*Source:* The data for this table have been adapted from Table F of *A Nonparametric Introduction to Statistics* by C.H. Kraft and C. Van Eeden, Macmillan, New York, 1968.

## TABLE 15 Critical values for the studentized range statistic $q^*$, $\alpha = .05$

| ν | *k*: | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 17.97 | 26.98 | 32.82 | 37.08 | 40.41 | 43.12 | 45.40 | 47.36 | 49.07 |
| 2 | | 6.085 | 8.331 | 9.798 | 10 88 | 11.74 | 12.44 | 13.03 | 13.54 | 13.99 |
| 3 | | 4.501 | 5.910 | 6.825 | 7.502 | 8.037 | 8.478 | 8.853 | 9.177 | 9.462 |
| 4 | | 3.927 | 5.040 | 5.757 | 6.287 | 6.707 | 7.053 | 7.347 | 7.602 | 7.826 |
| 5 | | 3.635 | 4.602 | 5.218 | 5.673 | 6.033 | 5.330 | 6.582 | 6.802 | 6.995 |
| 6 | | 3.461 | 4.339 | 4.896 | 5.305 | 5.628 | 5.895 | 6.122 | 6.319 | 6.493 |
| 7 | | 3.344 | 4.165 | 4.681 | 5.060 | 5.359 | 5 606 | 5.815 | 5.998 | 6.158 |
| 8 | | 3.261 | 4.041 | 4.529 | 4.886 | 5.167 | 5.399 | 5.597 | 5.767 | 5.918 |
| 9 | | 3.199 | 3.949 | 4.415 | 4.756 | 5.024 | 5.244 | 5.432 | 5.595 | 5.739 |
| 10 | | 3.151 | 3.877 | 4.327 | 4.654 | 4.912 | 5.124 | 5.305 | 5.461 | 5.599 |
| 11 | | 3.113 | 3.820 | 4.256 | 4.574 | 4.823 | 5.028 | 5.202 | 5.353 | 5.487 |
| 12 | | 3.082 | 3.773 | 4.199 | 4.508 | 4.751 | 4.950 | 5.119 | 5.265 | 5.395 |
| 13 | | 3.055 | 3.735 | 4.151 | 4.453 | 4.690 | 4.885 | 5.049 | 5.192 | 5.318 |
| 14 | | 3.033 | 3.702 | 4.111 | 4.407 | 4.639 | 4.829 | 4.990 | 5.131 | 5.254 |
| 15 | | 3.014 | 3.674 | 4.076 | 4.367 | 4.595 | 4.782 | 4.940 | 5.077 | 5.198 |
| 16 | | 2.998 | 3.649 | 4.046 | 4.333 | 4.557 | 4.741 | 4.897 | 5.031 | 5.150 |
| 17 | | 2.984 | 3.628 | 4.020 | 4.303 | 4.524 | 4.705 | 4.858 | 4.991 | 5.108 |
| 13 | | 2.971 | 3.609 | 3.997 | 4.277 | 4.495 | 4.673 | 4.824 | 4.956 | 5.071 |
| 19 | | 2.960 | 3.593 | 3.977 | 4.253 | 4.469 | 4.645 | 4.794 | 4.924 | 5.038 |
| 20 | | 2.950 | 3.578 | 3.958 | 4.232 | 4.445 | 4.620 | 4.768 | 4.896 | 5.008 |
| 24 | | 2.919 | 3.532 | 3.901 | 4.166 | 4.373 | 4.541 | 4.684 | 4.807 | 4.915 |
| 30 | | 2.888 | 3.486 | 3.845 | 4.102 | 4.302 | 4.464 | 4.602 | 4.720 | 4.824 |
| 40 | | 2.858 | 3.442 | 3.791 | 4.039 | 4.232 | 4.389 | 4.521 | 4.635 | 4.735 |
| 6O | | 2.829 | 3.399 | 3.737 | 3.977 | 4.163 | 4.314 | 4.441 | 4.550 | 4.646 |
| 120 | | 2.800 | 3.356 | 3.685 | 3.917 | 4.096 | 4.241 | 4.363 | 4.468 | 4.560 |
| ∞ | | 2.772 | 3.314 | 3.633 | 3.858 | 4.030 | 4.170 | 4.286 | 4.387 | 4.474 |

| | *k*: | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 5.059 | 51.96 | 53.20 | 54.33 | 55.36 | 56.32 | 57.22 | 58.04 | 58.83 |
| 2 | | 14.39 | 14.75 | 15.08 | 15.38 | 15.65 | 1.591 | 16.14 | 16.37 | 16.57 |
| 3 | | 9.717 | 9.946 | 10.15 | 10.35 | 10.53 | 10.69 | 10.84 | 10 98 | 11.11 |
| 4 | | 8.027 | 8.208 | 8.373 | 8.525 | 8664 | 8.794 | 8.914 | 9.028 | 9.134 |
| 5 | | 7.168 | 7.324 | 7.466 | 7.596 | 7.717 | 7.828 | 7.932 | 8.030 | 8.122 |
| 6 | | 6.649 | 6.789 | 6.917 | 7.034 | 7.143 | 7.244 | 7.338 | 7.426 | 7.508 |
| 7 | | 6.302 | 6.431 | 6.550 | 6.658 | 6.759 | 6.852 | 6.939 | 7.020 | 7.097 |
| 8 | | 6.054 | 6.175 | 6.287 | 6.389 | 6.483 | 6.571 | 6.653 | 6.729 | 6.802 |
| 9 | | 5.867 | 5.983 | 6.089 | 6.186 | 6.276 | 6.359 | 6.437 | 6.510 | 6.579 |
| 10 | | 5.722 | 5.833 | 5.935 | 6.028 | 6.114 | 6.194 | 6.269 | 6.339 | 6.405 |
| 11 | | 5.605 | 5.713 | 5.811 | 5.901 | 5.984 | 6.062 | 6.134 | 6.202 | 6.265 |
| 12 | | 5.511 | 5.615 | 5.710 | 5.798 | 5.878 | 5.953 | 6.023 | 6.089 | 6.151 |
| 13 | | 5.431 | 5.533 | 5.625 | 5.711 | 5.789 | 5.862 | 5.931 | 5.995 | 6.055 |
| 14 | | 5.364 | 5.463 | 5.554 | 5.637 | 5.714 | 5.786 | 5.852 | 5.915 | 5.974 |
| 15 | | 5.306 | 5.404 | 5.493 | 5.574 | 5.649 | 5.720 | 5.785 | 5.846 | 5.904 |
| 16 | | 5.256 | 5.352 | 5.439 | 5.520 | 5.593 | 5.662 | 5.727 | 5.786 | 5.843 |
| 17 | | 5.212 | 5.307 | 5.392 | 5.471 | 5.544 | 5.612 | 5.675 | 5.734 | 5.790 |
| 18 | | 5.174 | 5.267 | 5.352 | 5.429 | 5.501 | 5.568 | 5.630 | 5.688 | 5.242 |
| 19 | | 5.140 | 5.231 | 5.315 | 5.391 | 5.462 | 5.528 | 5.589 | 5.647 | 5.701 |
| 20 | | 5.108 | 5.199 | 5.282 | 5.357 | 5.427 | 5.493 | 5.553 | 5.610 | 5.663 |
| 24 | | 5.012 | 5.099 | 5.179 | 5.251 | 5.319 | 5.381 | 5.439 | 5.494 | 5.545 |
| 30 | | 4.917 | 5.001 | 5.077 | 5.147 | 5.211 | 5.271 | 5.327 | 5.379 | 5.42S |
| 40 | | 4.824 | 4.904 | 4.977 | 5.044 | 5.106 | 5.163 | 5.216 | 5.266 | 5.313 |
| 50 | | 4.732 | 4.808 | 4.878 | 4.942 | 5.001 | 5.056 | 5.107 | 5.154 | 5.199 |
| 120 | | 4.641 | 4.714 | 4.781 | 4.842 | 4.893 | 4.950 | 4.998 | 5.044 | 5.086 |
| ∞ | | 4.522 | 4.622 | 4.685 | 4.743 | 4.796 | 4.845 | 4.891 | 4.934 | 4.974 |

*$q_{k,\nu,.05}$ = upper 5th percentile of a $q_{k,\nu}$ distribution