

MATHEMATICS

Elementary Statistical Tables

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PREFACE

This set of tables has been designed by RND Publications in collaboration with the Associated Examining Board for use in Advanced level and university courses in Statistics. Each table is preceded by a brief explanation of its contents and we hope that, in general, the lay-out is sufficiently familiar to enable the tables to be used satisfactorily without further explanation. We have resisted the temptation to include excessive material on the use of tables and we leave this to the textbooks. Furthermore, since the tables will be used in examinations, many of the formulae which are expected to be known by the candidates have also been omitted.

We have tried to maintain a degree of consistency in presentation. To this end, we have tabulated the distribution function in Tables 1, 2 and 3. In Tables 4, 6, 7 and 8, the percentage points are tabulated since these distributions are used in many different ways. In Tables 9, 10, 13 and 14, the upper tail critical values are tabulated since the corresponding distributions are used almost exclusively in hypothesis testing.

In Tables 1 and 2, for ease of presentation, as soon as the value of the distribution function reaches unity, all succeeding ones are omitted. Thus if, in using these tables, a blank is obtained as the required probability, this should be interpreted as unity.

In Tables 10, 13 and 14 where non-parametric discrete statistics are tabulated, the values given should be included within the critical region. Furthermore, as explained in the headings, exact significance levels cannot in general be obtained using these statistics. The critical values given are those which ensure a significance level as close as possible to the stated levels. If, in using these tables, a blank is obtained as the required critical value, this means that the nearest achievable significance level to the stated level is 0%. The corresponding critical value is omitted on the grounds that such a test has no practical value.

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TABLE 1 BINOMIAL DISTRIBUTION FUNCTION (CONTINUED)

| x | p | 0.01 | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 | 0.09 | 0.10 | 0.15 | 0.20 | 0.25 | 0.30 | 0.35 | 0.40 | 0.45 | 0.50 | p | x | |
|-------|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---|---|-------|
| | | n = 6 | 0 | .9415 | .8858 | .8330 | .7828 | .7351 | .6899 | .6470 | .6064 | .5679 | .5314 | .3771 | .2621 | .1780 | .1176 | .0754 | .0467 | | | .0277 |
| | 1 | .9985 | .9943 | .9875 | .9784 | .9672 | .9541 | .9392 | .9227 | .9048 | .8857 | .7765 | .6554 | .5339 | .4202 | .3191 | .2333 | .1636 | .1094 | | 1 | 1 |
| | 2 | 1.000 | .9998 | .9995 | .9988 | .9978 | .9962 | .9942 | .9915 | .9882 | .9842 | .9527 | .9011 | .8306 | .7443 | .6471 | .5443 | .4415 | .3438 | | 2 | 2 |
| | 3 | | 1.000 | 1.000 | 1.000 | .9999 | .9998 | .9997 | .9995 | .9992 | .9987 | .9941 | .9830 | .9624 | .9295 | .8826 | .8208 | .7447 | .6563 | | 3 | 3 |
| | 4 | | | | | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | .9999 | .9996 | .9984 | .9954 | .9891 | .9777 | .9590 | .9308 | .8906 | | 4 | 4 |
| | 5 | | | | | | | | | | 1.000 | 1.000 | .9999 | .9998 | .9993 | .9982 | .9959 | .9917 | .9844 | | 5 | 5 |
| | 6 | | | | | | | | | | | | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | | 6 | 6 |
| n = 7 | 0 | .9321 | .8681 | .8080 | .7514 | .6983 | .6485 | .6017 | .5578 | .5168 | .4783 | .3206 | .2097 | .1335 | .0824 | .0490 | .0280 | .0152 | .0078 | | 0 | 0 |
| | 1 | .9980 | .9921 | .9829 | .9706 | .9556 | .9382 | .9187 | .8974 | .8745 | .8503 | .7166 | .5767 | .4449 | .3294 | .2338 | .1586 | .1024 | .0625 | | 1 | 1 |
| | 2 | 1.000 | .9997 | .9991 | .9980 | .9962 | .9937 | .9903 | .9860 | .9807 | .9743 | .9262 | .8520 | .7564 | .6471 | .5323 | .4199 | .3164 | .2266 | | 2 | 2 |
| | 3 | | 1.000 | 1.000 | .9999 | .9998 | .9996 | .9993 | .9988 | .9982 | .9973 | .9879 | .9667 | .9294 | .8740 | .8002 | .7102 | .6083 | .5000 | | 3 | 3 |
| | 4 | | | | 1.000 | 1.000 | 1.000 | 1.000 | .9999 | .9999 | .9998 | .9988 | .9953 | .9871 | .9712 | .9444 | .9037 | .8471 | .7734 | | 4 | 4 |
| | 5 | | | | | | | 1.000 | 1.000 | 1.000 | .9999 | .9996 | .9987 | .9962 | .9910 | .9812 | .9643 | .9375 | | 5 | 5 | |
| | 6 | | | | | | | | | | 1.000 | 1.000 | .9999 | .9998 | .9994 | .9984 | .9963 | .9922 | | 6 | 6 | |
| | 7 | | | | | | | | | | | | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | | 7 | 7 | |
| n = 8 | 0 | .9227 | .8508 | .7837 | .7214 | .6634 | .6096 | .5596 | .5132 | .4703 | .4305 | .2725 | .1678 | .1001 | .0576 | .0319 | .0168 | .0084 | .0039 | | 0 | 0 |
| | 1 | .9973 | .9897 | .9777 | .9619 | .9428 | .9208 | .8965 | .8702 | .8423 | .8131 | .6572 | .5033 | .3671 | .2553 | .1691 | .1064 | .0632 | .0352 | | 1 | 1 |
| | 2 | .9999 | .9996 | .9987 | .9969 | .9942 | .9904 | .9853 | .9789 | .9711 | .9619 | .8948 | .7969 | .6785 | .5518 | .4278 | .3154 | .2201 | .1445 | | 2 | 2 |
| | 3 | 1.000 | 1.000 | .9999 | .9998 | .9996 | .9993 | .9987 | .9978 | .9966 | .9950 | .9786 | .9437 | .8862 | .8059 | .7064 | .5941 | .4770 | .3633 | | 3 | 3 |
| | 4 | | | 1.000 | 1.000 | 1.000 | 1.000 | .9999 | .9999 | .9997 | .9996 | .9971 | .9896 | .9727 | .9420 | .8939 | .8263 | .7396 | .6367 | | 4 | 4 |
| | 5 | | | | | | | 1.000 | 1.000 | 1.000 | 1.000 | .9998 | .9988 | .9958 | .9887 | .9747 | .9502 | .9115 | .8555 | | 5 | 5 |
| | 6 | | | | | | | | | | | 1.000 | .9999 | .9996 | .9987 | .9964 | .9915 | .9819 | .9648 | | 6 | 6 |
| | 7 | | | | | | | | | | | | 1.000 | 1.000 | .9999 | .9998 | .9993 | .9983 | .9961 | | 7 | 7 |
| | 8 | | | | | | | | | | | | | | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | | 8 | 8 |

TABLE 1 BINOMIAL DISTRIBUTION FUNCTION (CONTINUED)

| x \ p | p | | | | | | | | | | | | | | | | | | p \ x | | |
|--------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----|
| | 0.01 | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 | 0.09 | 0.10 | 0.15 | 0.20 | 0.25 | 0.30 | 0.35 | 0.40 | 0.45 | 0.50 | | | |
| n = 9 | 0 | .9135 | .8337 | .7602 | .6925 | .6302 | .5730 | .5204 | .4722 | .4279 | .3874 | .2316 | .1342 | .0751 | .0404 | .0207 | .0101 | .0046 | .0020 | 0 | |
| | 1 | .9966 | .9869 | .9718 | .9522 | .9288 | .9022 | .8729 | .8417 | .8088 | .7748 | .5995 | .4362 | .3003 | .1960 | .1211 | .0705 | .0385 | .0195 | 1 | |
| | 2 | .9999 | .9994 | .9980 | .9955 | .9916 | .9862 | .9791 | .9702 | .9595 | .9470 | .8591 | .7382 | .6007 | .4628 | .3373 | .2318 | .1495 | .0898 | 2 | |
| | 3 | 1.000 | 1.000 | .9999 | .9997 | .9994 | .9987 | .9977 | .9963 | .9943 | .9917 | .9661 | .9144 | .8343 | .7297 | .6089 | .4826 | .3614 | .2539 | 3 | |
| | 4 | | | 1.000 | 1.000 | 1.000 | .9999 | .9998 | .9997 | .9995 | .9991 | .9944 | .9804 | .9511 | .9012 | .8283 | .7334 | .6214 | .5000 | 4 | |
| | 5 | | | | | | 1.000 | 1.000 | 1.000 | 1.000 | .9999 | .9994 | .9969 | .9900 | .9747 | .9464 | .9006 | .8342 | .7461 | 5 | |
| | 6 | | | | | | | | | | 1.000 | 1.000 | .9997 | .9987 | .9957 | .9888 | .9750 | .9502 | .9102 | 6 | |
| | 7 | | | | | | | | | | | | 1.000 | .9999 | .9996 | .9986 | .9962 | .9909 | .9805 | 7 | |
| | 8 | | | | | | | | | | | | | 1.000 | 1.000 | .9999 | .9997 | .9992 | .9980 | 8 | |
| 9 | | | | | | | | | | | | | | | 1.000 | 1.000 | 1.000 | 1.000 | 9 | | |
| n = 10 | 0 | .9044 | .8171 | .7374 | .6648 | .5987 | .5386 | .4840 | .4344 | .3894 | .3487 | .1969 | .1074 | .0563 | .0282 | .0135 | .0060 | .0025 | .0010 | 0 | |
| | 1 | .9957 | .9838 | .9655 | .9418 | .9139 | .8824 | .8483 | .8121 | .7746 | .7361 | .5443 | .3758 | .2440 | .1493 | .0860 | .0464 | .0233 | .0107 | 1 | |
| | 2 | .9999 | .9991 | .9972 | .9938 | .9885 | .9812 | .9717 | .9599 | .9460 | .9298 | .8202 | .6778 | .5256 | .3828 | .2616 | .1673 | .0996 | .0547 | 2 | |
| | 3 | 1.000 | 1.000 | .9999 | .9996 | .9990 | .9980 | .9964 | .9942 | .9912 | .9872 | .9500 | .8791 | .7759 | .6496 | .5138 | .3823 | .2660 | .1719 | 3 | |
| | 4 | | | 1.000 | 1.000 | .9999 | .9998 | .9997 | .9994 | .9990 | .9984 | .9901 | .9672 | .9219 | .8497 | .7515 | .6331 | .5044 | .3770 | 4 | |
| | 5 | | | | | 1.000 | 1.000 | 1.000 | 1.000 | .9999 | .9999 | .9986 | .9936 | .9803 | .9527 | .9051 | .8338 | .7384 | .6230 | 5 | |
| | 6 | | | | | | | | | 1.000 | 1.000 | .9999 | .9991 | .9965 | .9894 | .9740 | .9452 | .8980 | .8281 | 6 | |
| | 7 | | | | | | | | | | | 1.000 | .9999 | .9996 | .9984 | .9952 | .9877 | .9726 | .9453 | 7 | |
| | 8 | | | | | | | | | | | | 1.000 | 1.000 | .9999 | .9995 | .9983 | .9955 | .9893 | 8 | |
| | 9 | | | | | | | | | | | | | | 1.000 | 1.000 | .9999 | .9997 | .9990 | 9 | |
| 10 | | | | | | | | | | | | | | | | 1.000 | 1.000 | 1.000 | 10 | | |
| n = 11 | 0 | .8953 | .8007 | .7153 | .6382 | .5688 | .5063 | .4501 | .3996 | .3544 | .3138 | .1673 | .0859 | .0422 | .0198 | .0088 | .0036 | .0014 | .0005 | 0 | |
| | 1 | .9948 | .9805 | .9587 | .9308 | .8981 | .8618 | .8228 | .7819 | .7399 | .6974 | .4922 | .3221 | .1971 | .1130 | .0606 | .0302 | .0139 | .0059 | 1 | |
| | 2 | .9998 | .9988 | .9963 | .9917 | .9848 | .9752 | .9630 | .9481 | .9305 | .9104 | .7788 | .6174 | .4552 | .3127 | .2001 | .1189 | .0652 | .0327 | 2 | |
| | 3 | 1.000 | 1.000 | .9998 | .9993 | .9984 | .9970 | .9947 | .9915 | .9871 | .9815 | .9306 | .8389 | .7133 | .5696 | .4256 | .2963 | .1911 | .1133 | 3 | |
| | 4 | | | 1.000 | 1.000 | .9999 | .9997 | .9995 | .9990 | .9983 | .9972 | .9841 | .9496 | .8854 | .7897 | .6683 | .5328 | .3971 | .2744 | 4 | |
| | 5 | | | | | 1.000 | 1.000 | 1.000 | .9999 | .9998 | .9997 | .9973 | .9883 | .9657 | .9218 | .8513 | .7535 | .6331 | .5000 | 5 | |
| | 6 | | | | | | | | | 1.000 | 1.000 | 1.000 | .9997 | .9980 | .9924 | .9784 | .9499 | .9006 | .8262 | .7256 | 6 |
| | 7 | | | | | | | | | | | | 1.000 | .9998 | .9988 | .9957 | .9878 | .9707 | .9390 | .8867 | 7 |
| | 8 | | | | | | | | | | | | | 1.000 | .9999 | .9994 | .9980 | .9941 | .9852 | .9673 | 8 |
| | 9 | | | | | | | | | | | | | | 1.000 | 1.000 | .9998 | .9993 | .9978 | .9941 | 9 |
| | 10 | | | | | | | | | | | | | | | | 1.000 | 1.000 | .9998 | .9995 | 10 |
| 11 | | | | | | | | | | | | | | | | | | 1.000 | 1.000 | 11 | |

TABLE 1 BINOMIAL DISTRIBUTION FUNCTION (CONTINUED)

| x \ p | p | | | | | | | | | | | | | | | | | | p \ x | |
|--------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----|
| | 0.01 | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 | 0.09 | 0.10 | 0.15 | 0.20 | 0.25 | 0.30 | 0.35 | 0.40 | 0.45 | 0.50 | | |
| n = 12 | 0 | .8864 | .7847 | .6938 | .6127 | .5404 | .4759 | .4186 | .3677 | .3225 | .2824 | .1422 | .0687 | .0317 | .0138 | .0057 | .0022 | .0008 | .0002 | 0 |
| | 1 | .9938 | .9769 | .9514 | .9191 | .8816 | .8405 | .7967 | .7513 | .7052 | .6590 | .4435 | .2749 | .1584 | .0850 | .0424 | .0196 | .0083 | .0032 | 1 |
| | 2 | .9998 | .9985 | .9952 | .9893 | .9804 | .9684 | .9532 | .9348 | .9134 | .8891 | .7358 | .5583 | .3907 | .2528 | .1513 | .0834 | .0421 | .0193 | 2 |
| | 3 | 1.000 | .9999 | .9997 | .9990 | .9978 | .9957 | .9925 | .9880 | .9820 | .9744 | .9078 | .7946 | .6488 | .4925 | .3467 | .2253 | .1345 | .0730 | 3 |
| | 4 | | 1.000 | 1.000 | .9999 | .9998 | .9996 | .9991 | .9984 | .9973 | .9957 | .9761 | .9274 | .8424 | .7237 | .5833 | .4382 | .3044 | .1938 | 4 |
| | 5 | | | | 1.000 | 1.000 | 1.000 | .9999 | .9998 | .9997 | .9995 | .9954 | .9806 | .9456 | .8822 | .7873 | .6652 | .5269 | .3872 | 5 |
| | 6 | | | | | | | 1.000 | 1.000 | 1.000 | .9999 | .9993 | .9961 | .9857 | .9614 | .9154 | .8418 | .7393 | .6128 | 6 |
| | 7 | | | | | | | | | 1.000 | .9999 | .9994 | .9972 | .9905 | .9745 | .9427 | .8883 | .8062 | | 7 |
| | 8 | | | | | | | | | | 1.000 | .9999 | .9996 | .9983 | .9944 | .9847 | .9644 | .9270 | | 8 |
| | 9 | | | | | | | | | | | 1.000 | 1.000 | .9998 | .9992 | .9972 | .9921 | .9807 | | 9 |
| | 10 | | | | | | | | | | | | | 1.000 | .9999 | .9997 | .9989 | .9968 | | 10 |
| | 11 | | | | | | | | | | | | | | 1.000 | 1.000 | .9999 | .9998 | | 11 |
| | 12 | | | | | | | | | | | | | | | | 1.000 | 1.000 | | 12 |
| n = 13 | 0 | .8775 | .7690 | .6730 | .5882 | .5133 | .4474 | .3893 | .3383 | .2935 | .2542 | .1209 | .0550 | .0238 | .0097 | .0037 | .0013 | .0004 | .0001 | 0 |
| | 1 | .9928 | .9730 | .9436 | .9068 | .8646 | .8186 | .7702 | .7206 | .6707 | .6213 | .3983 | .2336 | .1267 | .0637 | .0296 | .0126 | .0049 | .0017 | 1 |
| | 2 | .9997 | .9980 | .9938 | .9865 | .9755 | .9608 | .9422 | .9201 | .8946 | .8661 | .6920 | .5017 | .3326 | .2025 | .1132 | .0579 | .0269 | .0112 | 2 |
| | 3 | 1.000 | .9999 | .9995 | .9986 | .9969 | .9940 | .9897 | .9837 | .9758 | .9658 | .8820 | .7473 | .5843 | .4206 | .2783 | .1686 | .0929 | .0461 | 3 |
| | 4 | | 1.000 | 1.000 | .9999 | .9997 | .9993 | .9987 | .9976 | .9959 | .9935 | .9658 | .9009 | .7940 | .6543 | .5005 | .3530 | .2279 | .1334 | 4 |
| | 5 | | | | 1.000 | 1.000 | .9999 | .9999 | .9997 | .9995 | .9991 | .9925 | .9700 | .9198 | .8346 | .7159 | .5744 | .4268 | .2905 | 5 |
| | 6 | | | | | | 1.000 | 1.000 | 1.000 | .9999 | .9999 | .9987 | .9930 | .9757 | .9376 | .8705 | .7712 | .6437 | .5000 | 6 |
| | 7 | | | | | | | | 1.000 | 1.000 | .9998 | .9988 | .9944 | .9818 | .9538 | .9023 | .8212 | .7095 | | 7 |
| | 8 | | | | | | | | | 1.000 | .9998 | .9990 | .9960 | .9874 | .9679 | .9302 | .8666 | | | 8 |
| | 9 | | | | | | | | | | 1.000 | .9999 | .9993 | .9975 | .9922 | .9797 | .9539 | | | 9 |
| | 10 | | | | | | | | | | | 1.000 | .9999 | .9997 | .9987 | .9959 | .9888 | | | 10 |
| | 11 | | | | | | | | | | | | 1.000 | 1.000 | .9999 | .9995 | .9983 | | | 11 |
| | 12 | | | | | | | | | | | | | | 1.000 | 1.000 | .9999 | | | 12 |
| | 13 | | | | | | | | | | | | | | | | | 1.000 | | 13 |

TABLE 1 BINOMIAL DISTRIBUTION FUNCTION (CONTINUED)

| x \ p | p | | | | | | | | | | | | | | | | | | p \ x | | |
|--------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----|
| | 0.01 | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 | 0.09 | 0.10 | 0.15 | 0.20 | 0.25 | 0.30 | 0.35 | 0.40 | 0.45 | 0.50 | | | |
| n = 14 | 0 | .8687 | .7536 | .6528 | .5647 | .4877 | .4205 | .3620 | .3112 | .2670 | .2288 | .1028 | .0440 | .0178 | .0068 | .0024 | .0008 | .0002 | .0001 | 0 | |
| | 1 | .9916 | .9690 | .9355 | .8941 | .8470 | .7963 | .7436 | .6900 | .6368 | .5846 | .3567 | .1979 | .1010 | .0475 | .0205 | .0081 | .0029 | .0009 | 1 | |
| | 2 | .9997 | .9975 | .9923 | .9833 | .9699 | .9522 | .9302 | .9042 | .8745 | .8416 | .6479 | .4481 | .2811 | .1608 | .0839 | .0398 | .0170 | .0065 | 2 | |
| | 3 | 1.000 | .9999 | .9994 | .9981 | .9958 | .9920 | .9864 | .9786 | .9685 | .9559 | .8535 | .6982 | .5213 | .3552 | .2205 | .1243 | .0632 | .0287 | 3 | |
| | 4 | | 1.000 | 1.000 | .9998 | .9996 | .9990 | .9980 | .9965 | .9941 | .9908 | .9533 | .8702 | .7415 | .5842 | .4227 | .2793 | .1672 | .0898 | 4 | |
| | 5 | | | | 1.000 | 1.000 | .9999 | .9998 | .9996 | .9992 | .9985 | .9885 | .9561 | .8883 | .7805 | .6405 | .4859 | .3373 | .2120 | 5 | |
| | 6 | | | | | | 1.000 | 1.000 | 1.000 | .9999 | .9998 | .9978 | .9884 | .9617 | .9067 | .8164 | .6925 | .5461 | .3953 | 6 | |
| | 7 | | | | | | | | | 1.000 | 1.000 | .9997 | .9976 | .9897 | .9685 | .9247 | .8499 | .7414 | .6047 | 7 | |
| | 8 | | | | | | | | | | | 1.000 | .9996 | .9978 | .9917 | .9757 | .9417 | .8811 | .7880 | 8 | |
| | 9 | | | | | | | | | | | | 1.000 | .9997 | .9983 | .9940 | .9825 | .9574 | .9102 | 9 | |
| | 10 | | | | | | | | | | | | | 1.000 | .9998 | .9989 | .9961 | .9886 | .9713 | 10 | |
| | 11 | | | | | | | | | | | | | | 1.000 | .9999 | .9994 | .9978 | .9935 | 11 | |
| | 12 | | | | | | | | | | | | | | | 1.000 | .9999 | .9997 | .9991 | 12 | |
| | 13 | | | | | | | | | | | | | | | | 1.000 | 1.000 | .9999 | 13 | |
| 14 | | | | | | | | | | | | | | | | | | 1.000 | 14 | | |
| n = 15 | 0 | .8601 | .7386 | .6333 | .5421 | .4633 | .3953 | .3367 | .2863 | .2430 | .2059 | .0874 | .0352 | .0134 | .0047 | .0016 | .0005 | .0001 | .0000 | 0 | |
| | 1 | .9904 | .9647 | .9270 | .8809 | .8290 | .7738 | .7168 | .6597 | .6035 | .5490 | .3186 | .1671 | .0802 | .0353 | .0142 | .0052 | .0017 | .0005 | 1 | |
| | 2 | .9996 | .9970 | .9906 | .9797 | .9638 | .9429 | .9171 | .8870 | .8531 | .8159 | .6042 | .3980 | .2361 | .1268 | .0617 | .0271 | .0107 | .0037 | 2 | |
| | 3 | 1.000 | .9998 | .9992 | .9976 | .9945 | .9896 | .9825 | .9727 | .9601 | .9444 | .8227 | .6482 | .4613 | .2969 | .1727 | .0905 | .0424 | .0176 | 3 | |
| | 4 | | 1.000 | .9999 | .9998 | .9994 | .9986 | .9972 | .9950 | .9918 | .9873 | .9383 | .8358 | .6865 | .5155 | .3519 | .2173 | .1204 | .0592 | 4 | |
| | 5 | | | 1.000 | 1.000 | .9999 | .9999 | .9997 | .9993 | .9987 | .9978 | .9832 | .9389 | .8516 | .7216 | .5643 | .4032 | .2608 | .1509 | 5 | |
| | 6 | | | | | 1.000 | 1.000 | 1.000 | .9999 | .9998 | .9997 | .9964 | .9819 | .9434 | .8689 | .7548 | .6098 | .4522 | .3036 | 6 | |
| | 7 | | | | | | | | 1.000 | 1.000 | 1.000 | .9994 | .9958 | .9827 | .9500 | .8868 | .7869 | .6535 | .5000 | 7 | |
| | 8 | | | | | | | | | | | .9999 | .9992 | .9958 | .9848 | .9578 | .9050 | .8182 | .6964 | 8 | |
| | 9 | | | | | | | | | | | | 1.000 | .9999 | .9992 | .9963 | .9876 | .9662 | .9231 | .8491 | 9 |
| | 10 | | | | | | | | | | | | | 1.000 | .9999 | .9993 | .9972 | .9907 | .9745 | .9408 | 10 |
| | 11 | | | | | | | | | | | | | | 1.000 | .9999 | .9995 | .9981 | .9937 | .9824 | 11 |
| | 12 | | | | | | | | | | | | | | | 1.000 | .9999 | .9997 | .9989 | .9963 | 12 |
| | 13 | | | | | | | | | | | | | | | | 1.000 | 1.000 | .9999 | .9995 | 13 |
| 14 | | | | | | | | | | | | | | | | | | 1.000 | 1.000 | 14 | |

TABLE 1 BINOMIAL DISTRIBUTION FUNCTION (CONTINUED)

| x \ p | | 0.01 | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 | 0.09 | 0.10 | 0.15 | 0.20 | 0.25 | 0.30 | 0.35 | 0.40 | 0.45 | 0.50 | p \ x | |
|--------|----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----|
| n = 20 | 0 | .8179 | .6676 | .5438 | .4420 | .3585 | .2901 | .2342 | .1887 | .1516 | .1216 | .0388 | .0115 | .0032 | .0008 | .0002 | .0000 | .0000 | .0000 | 0 | |
| | 1 | .9831 | .9401 | .8802 | .8103 | .7358 | .6605 | .5869 | .5169 | .4516 | .3917 | .1756 | .0692 | .0243 | .0076 | .0021 | .0005 | .0001 | .0000 | 1 | |
| | 2 | .9990 | .9929 | .9790 | .9561 | .9245 | .8850 | .8390 | .7879 | .7334 | .6769 | .4049 | .2061 | .0913 | .0355 | .0121 | .0036 | .0009 | .0002 | 2 | |
| | 3 | 1.000 | .9994 | .9973 | .9926 | .9841 | .9710 | .9529 | .9294 | .9007 | .8670 | .6477 | .4114 | .2252 | .1071 | .0444 | .0160 | .0049 | .0013 | 3 | |
| | 4 | | 1.000 | .9997 | .9990 | .9974 | .9944 | .9893 | .9817 | .9710 | .9568 | .8298 | .6296 | .4148 | .2375 | .1182 | .0510 | .0189 | .0059 | 4 | |
| | 5 | | | 1.000 | .9999 | .9997 | .9991 | .9981 | .9962 | .9932 | .9887 | .9327 | .8042 | .6172 | .4164 | .2454 | .1256 | .0553 | .0207 | 5 | |
| | 6 | | | | 1.000 | 1.000 | .9999 | .9997 | .9994 | .9987 | .9976 | .9781 | .9133 | .7858 | .6080 | .4166 | .2500 | .1299 | .0577 | 6 | |
| | 7 | | | | | | 1.000 | 1.000 | .9999 | .9998 | .9996 | .9941 | .9679 | .8982 | .7723 | .6010 | .4159 | .2520 | .1316 | 7 | |
| | 8 | | | | | | | | 1.000 | 1.000 | .9999 | .9987 | .9900 | .9591 | .8867 | .7624 | .5956 | .4143 | .2517 | 8 | |
| | 9 | | | | | | | | | | 1.000 | .9998 | .9974 | .9861 | .9520 | .8782 | .7553 | .5914 | .4119 | 9 | |
| | 10 | | | | | | | | | | | 1.000 | .9994 | .9961 | .9829 | .9468 | .8725 | .7507 | .5881 | 10 | |
| | 11 | | | | | | | | | | | | .9999 | .9991 | .9949 | .9804 | .9435 | .8692 | .7483 | 11 | |
| | 12 | | | | | | | | | | | | | 1.000 | .9998 | .9987 | .9940 | .9790 | .9420 | .8684 | 12 |
| | 13 | | | | | | | | | | | | | | 1.000 | .9997 | .9985 | .9935 | .9786 | .9423 | 13 |
| | 14 | | | | | | | | | | | | | | | 1.000 | .9997 | .9984 | .9936 | .9793 | 14 |
| | 15 | | | | | | | | | | | | | | | | 1.000 | .9997 | .9985 | .9941 | 15 |
| | 16 | | | | | | | | | | | | | | | | | 1.000 | .9997 | .9987 | 16 |
| | 17 | | | | | | | | | | | | | | | | | | 1.000 | .9998 | 17 |
| | 18 | | | | | | | | | | | | | | | | | | | 1.000 | 18 |

TABLE 1 BINOMIAL DISTRIBUTION FUNCTION (CONTINUED)

| x \ p | p | | | | | | | | | | | | | | | | | p \ x | |
|----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| | 0.01 | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 | 0.09 | 0.10 | 0.15 | 0.20 | 0.25 | 0.30 | 0.35 | 0.40 | 0.45 | | 0.50 |
| n = 25 0 | .7778 | .6035 | .4670 | .3604 | .2774 | .2129 | .1630 | .1244 | .0946 | .0718 | .0172 | .0038 | .0008 | .0001 | .0000 | .0000 | .0000 | .0000 | 0 |
| 1 | .9742 | .9114 | .8280 | .7358 | .6424 | .5527 | .4696 | .3947 | .3286 | .2712 | .0931 | .0274 | .0070 | .0016 | .0003 | .0001 | .0000 | .0000 | 1 |
| 2 | .9980 | .9868 | .9620 | .9235 | .8729 | .8129 | .7466 | .6768 | .6063 | .5371 | .2537 | .0982 | .0321 | .0090 | .0021 | .0004 | .0001 | .0000 | 2 |
| 3 | .9999 | .9986 | .9938 | .9835 | .9659 | .9402 | .9064 | .8649 | .8169 | .7636 | .4711 | .2340 | .0962 | .0332 | .0097 | .0024 | .0005 | .0001 | 3 |
| 4 | 1.000 | .9999 | .9992 | .9972 | .9928 | .9850 | .9726 | .9549 | .9314 | .9020 | .6821 | .4207 | .2137 | .0905 | .0320 | .0095 | .0023 | .0005 | 4 |
| 5 | | 1.000 | .9999 | .9996 | .9988 | .9969 | .9935 | .9877 | .9790 | .9666 | .8385 | .6167 | .3783 | .1935 | .0826 | .0294 | .0086 | .0020 | 5 |
| 6 | | | 1.000 | 1.000 | .9998 | .9995 | .9987 | .9972 | .9946 | .9905 | .9305 | .7800 | .5611 | .3407 | .1734 | .0736 | .0258 | .0073 | 6 |
| 7 | | | | | 1.000 | .9999 | .9998 | .9995 | .9989 | .9977 | .9745 | .8909 | .7265 | .5118 | .3061 | .1536 | .0639 | .0216 | 7 |
| 8 | | | | | | 1.000 | 1.000 | .9999 | .9998 | .9995 | .9920 | .9532 | .8506 | .6769 | .4668 | .2735 | .1340 | .0539 | 8 |
| 9 | | | | | | | | 1.000 | 1.000 | .9999 | .9979 | .9827 | .9287 | .8106 | .6303 | .4246 | .2424 | .1148 | 9 |
| 10 | | | | | | | | | | 1.000 | .9995 | .9944 | .9703 | .9022 | .7712 | .5858 | .3843 | .2122 | 10 |
| 11 | | | | | | | | | | | .9999 | .9985 | .9893 | .9558 | .8746 | .7323 | .5426 | .3450 | 11 |
| 12 | | | | | | | | | | | 1.000 | .9996 | .9966 | .9825 | .9396 | .8462 | .6937 | .5000 | 12 |
| 13 | | | | | | | | | | | | .9999 | .9991 | .9940 | .9745 | .9222 | .8173 | .6550 | 13 |
| 14 | | | | | | | | | | | | 1.000 | .9998 | .9982 | .9907 | .9656 | .9040 | .7878 | 14 |
| 15 | | | | | | | | | | | | | 1.000 | .9995 | .9971 | .9868 | .9560 | .8852 | 15 |
| 16 | | | | | | | | | | | | | | .9999 | .9992 | .9957 | .9826 | .9461 | 16 |
| 17 | | | | | | | | | | | | | | 1.000 | .9998 | .9988 | .9942 | .9784 | 17 |
| 18 | | | | | | | | | | | | | | | 1.000 | .9997 | .9984 | .9927 | 18 |
| 19 | | | | | | | | | | | | | | | | .9999 | .9996 | .9980 | 19 |
| 20 | | | | | | | | | | | | | | | | 1.000 | .9999 | .9995 | 20 |
| 21 | | | | | | | | | | | | | | | | | 1.000 | .9999 | 21 |
| 22 | | | | | | | | | | | | | | | | | | 1.000 | 22 |

TABLE 1 BINOMIAL DISTRIBUTION FUNCTION (CONTINUED)

| x \ p | p | | | | | | | | | | | | | | | | | p \ x | | | | | | |
|----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----|
| | 0.01 | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 | 0.09 | 0.10 | 0.15 | 0.20 | 0.25 | 0.30 | 0.35 | 0.40 | 0.45 | | 0.50 | | | | | |
| n = 30 0 | .7397 | .5455 | .4010 | .2939 | .2146 | .1563 | .1134 | .0820 | .0591 | .0424 | .0076 | .0012 | .0002 | .0000 | .0000 | .0000 | .0000 | .0000 | 0 | | | | | |
| 1 | .9639 | .8795 | .7731 | .6612 | .5535 | .4555 | .3694 | .2958 | .2343 | .1837 | .0480 | .0105 | .0020 | .0003 | .0000 | .0000 | .0000 | .0000 | 1 | | | | | |
| 2 | .9967 | .9783 | .9399 | .8831 | .8122 | .7324 | .6487 | .5654 | .4855 | .4114 | .1514 | .0442 | .0106 | .0021 | .0003 | .0000 | .0000 | .0000 | 2 | | | | | |
| 3 | .9998 | .9971 | .9881 | .9694 | .9392 | .8974 | .8450 | .7842 | .7175 | .6474 | .3217 | .1227 | .0374 | .0093 | .0019 | .0003 | .0000 | .0000 | 3 | | | | | |
| 4 | 1.000 | .9997 | .9982 | .9937 | .9844 | .9685 | .9447 | .9126 | .8723 | .8245 | .5245 | .2552 | .0979 | .0302 | .0075 | .0015 | .0002 | .0000 | 4 | | | | | |
| 5 | | 1.000 | .9998 | .9989 | .9967 | .9921 | .9838 | .9707 | .9519 | .9268 | .7106 | .4275 | .2026 | .0766 | .0233 | .0057 | .0011 | .0002 | 5 | | | | | |
| 6 | | | 1.000 | .9999 | .9994 | .9983 | .9960 | .9918 | .9848 | .9742 | .8474 | .6070 | .3481 | .1595 | .0586 | .0172 | .0040 | .0007 | 6 | | | | | |
| 7 | | | | 1.000 | .9999 | .9997 | .9992 | .9980 | .9959 | .9922 | .9302 | .7608 | .5143 | .2814 | .1238 | .0435 | .0121 | .0026 | 7 | | | | | |
| 8 | | | | | 1.000 | 1.000 | .9999 | .9996 | .9990 | .9980 | .9722 | .8713 | .6736 | .4315 | .2247 | .0940 | .0312 | .0081 | 8 | | | | | |
| 9 | | | | | | | 1.000 | .9999 | .9998 | .9995 | .9903 | .9389 | .8034 | .5888 | .3575 | .1763 | .0694 | .0214 | 9 | | | | | |
| 10 | | | | | | | | 1.000 | 1.000 | .9999 | .9971 | .9744 | .8943 | .7304 | .5078 | .2915 | .1350 | .0494 | 10 | | | | | |
| 11 | | | | | | | | | 1.000 | .9992 | .9905 | .9493 | .8407 | .6548 | .4311 | .2327 | .1002 | | 11 | | | | | |
| 12 | | | | | | | | | | .9998 | .9969 | .9784 | .9155 | .7802 | .5785 | .3592 | .1808 | | 12 | | | | | |
| 13 | | | | | | | | | | | 1.000 | .9991 | .9918 | .9599 | .8737 | .7145 | .5025 | .2923 | 13 | | | | | |
| 14 | | | | | | | | | | | | .9998 | .9973 | .9831 | .9348 | .8246 | .6448 | .4278 | 14 | | | | | |
| 15 | | | | | | | | | | | | | .9999 | .9992 | .9936 | .9699 | .9029 | .7691 | .5722 | 15 | | | | |
| 16 | | | | | | | | | | | | | | 1.000 | .9998 | .9979 | .9876 | .9519 | .8644 | .7077 | 16 | | | |
| 17 | | | | | | | | | | | | | | | .9999 | .9994 | .9955 | .9788 | .9286 | .8192 | 17 | | | |
| 18 | | | | | | | | | | | | | | | | 1.000 | .9998 | .9986 | .9917 | .9666 | .8998 | 18 | | |
| 19 | | | | | | | | | | | | | | | | | 1.000 | .9996 | .9971 | .9862 | .9506 | 19 | | |
| 20 | | | | | | | | | | | | | | | | | | .9999 | .9991 | .9950 | .9786 | 20 | | |
| 21 | | | | | | | | | | | | | | | | | | | 1.000 | .9998 | .9984 | .9919 | 21 | |
| 22 | | | | | | | | | | | | | | | | | | | | 1.000 | .9996 | .9974 | 22 | |
| 23 | | | | | | | | | | | | | | | | | | | | | .9999 | .9993 | 23 | |
| 24 | | | | | | | | | | | | | | | | | | | | | | 1.000 | .9998 | 24 |
| 25 | | | | | | | | | | | | | | | | | | | | | | | 1.000 | 25 |

TABLE 1 BINOMIAL DISTRIBUTION FUNCTION (CONTINUED)

| x | p | p | | | | | | | | | | | | | | | | | p | x |
|--------|----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----|
| | | 0.01 | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 | 0.09 | 0.10 | 0.15 | 0.20 | 0.25 | 0.30 | 0.35 | 0.40 | 0.45 | | |
| n = 40 | 0 | .6690 | .4457 | .2957 | .1954 | .1285 | .0842 | .0549 | .0356 | .0230 | .0148 | .0015 | .0001 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | 0 |
| | 1 | .9393 | .8095 | .6615 | .5210 | .3991 | .2990 | .2201 | .1594 | .1140 | .0805 | .0121 | .0015 | .0001 | .0000 | .0000 | .0000 | .0000 | .0000 | 1 |
| | 2 | .9925 | .9543 | .8822 | .7855 | .6767 | .5665 | .4625 | .3694 | .2894 | .2228 | .0486 | .0079 | .0010 | .0001 | .0000 | .0000 | .0000 | .0000 | 2 |
| | 3 | .9993 | .9918 | .9686 | .9252 | .8619 | .7827 | .6937 | .6007 | .5092 | .4231 | .1302 | .0285 | .0047 | .0006 | .0001 | .0000 | .0000 | .0000 | 3 |
| | 4 | 1.000 | .9988 | .9933 | .9790 | .9520 | .9104 | .8546 | .7868 | .7103 | .6290 | .2633 | .0759 | .0160 | .0026 | .0003 | .0000 | .0000 | .0000 | 4 |
| | 5 | | .9999 | .9988 | .9951 | .9861 | .9691 | .9419 | .9033 | .8535 | .7937 | .4325 | .1613 | .0433 | .0086 | .0013 | .0001 | .0000 | .0000 | 5 |
| | 6 | | 1.000 | .9998 | .9990 | .9966 | .9909 | .9801 | .9624 | .9361 | .9005 | .6067 | .2859 | .0962 | .0238 | .0044 | .0006 | .0001 | .0000 | 6 |
| | 7 | | | 1.000 | .9998 | .9993 | .9977 | .9942 | .9873 | .9758 | .9581 | .7559 | .4371 | .1820 | .0553 | .0124 | .0021 | .0002 | .0000 | 7 |
| | 8 | | | | 1.000 | .9999 | .9995 | .9985 | .9963 | .9919 | .9845 | .8646 | .5931 | .2998 | .1110 | .0303 | .0061 | .0009 | .0001 | 8 |
| | 9 | | | | | 1.000 | .9999 | .9997 | .9990 | .9976 | .9949 | .9328 | .7318 | .4395 | .1959 | .0644 | .0156 | .0027 | .0003 | 9 |
| | 10 | | | | | | 1.000 | .9999 | .9998 | .9994 | .9985 | .9701 | .8392 | .5839 | .3087 | .1215 | .0352 | .0074 | .0011 | 10 |
| | 11 | | | | | | | 1.000 | 1.000 | .9999 | .9996 | .9880 | .9125 | .7151 | .4406 | .2053 | .0709 | .0179 | .0032 | 11 |
| | 12 | | | | | | | | 1.000 | .9999 | .9957 | .9568 | .8209 | .5772 | .3143 | .1285 | .0386 | .0083 | | 12 |
| | 13 | | | | | | | | | 1.000 | .9986 | .9806 | .8968 | .7032 | .4408 | .2112 | .0751 | .0192 | | 13 |
| | 14 | | | | | | | | | | .9996 | .9921 | .9456 | .8074 | .5721 | .3174 | .1326 | .0403 | | 14 |
| | 15 | | | | | | | | | | .9999 | .9971 | .9738 | .8849 | .6946 | .4402 | .2142 | .0769 | | 15 |
| | 16 | | | | | | | | | | 1.000 | .9990 | .9884 | .9367 | .7978 | .5681 | .3185 | .1341 | | 16 |
| | 17 | | | | | | | | | | | .9997 | .9953 | .9680 | .8761 | .6885 | .4391 | .2148 | | 17 |
| | 18 | | | | | | | | | | | .9999 | .9983 | .9852 | .9301 | .7911 | .5651 | .3179 | | 18 |
| | 19 | | | | | | | | | | | 1.000 | .9994 | .9937 | .9637 | .8702 | .6844 | .4373 | | 19 |
| | 20 | | | | | | | | | | | | .9998 | .9976 | .9827 | .9256 | .7870 | .5627 | | 20 |
| | 21 | | | | | | | | | | | | 1.000 | .9991 | .9925 | .9608 | .8669 | .6821 | | 21 |
| | 22 | | | | | | | | | | | | | .9997 | .9970 | .9811 | .9233 | .7852 | | 22 |
| | 23 | | | | | | | | | | | | | .9999 | .9989 | .9917 | .9595 | .8659 | | 23 |
| | 24 | | | | | | | | | | | | | 1.000 | .9996 | .9966 | .9804 | .9231 | | 24 |
| | 25 | | | | | | | | | | | | | | .9999 | .9988 | .9914 | .9597 | | 25 |
| | 26 | | | | | | | | | | | | | | 1.000 | .9996 | .9966 | .9808 | | 26 |
| | 27 | | | | | | | | | | | | | | | .9999 | .9988 | .9917 | | 27 |
| | 28 | | | | | | | | | | | | | | | 1.000 | .9996 | .9968 | | 28 |
| | 29 | | | | | | | | | | | | | | | | .9999 | .9989 | | 29 |
| | 30 | | | | | | | | | | | | | | | | 1.000 | .9997 | | 30 |
| | 31 | | | | | | | | | | | | | | | | | .9999 | | 31 |
| | 32 | | | | | | | | | | | | | | | | | 1.000 | | 32 |

TABLE 1 BINOMIAL DISTRIBUTION FUNCTION (CONTINUED)

| x | p | p | | | | | | | | | | | | | | | | | x | | |
|--------|----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----|
| | | 0.01 | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 | 0.09 | 0.10 | 0.15 | 0.20 | 0.25 | 0.30 | 0.35 | 0.40 | 0.45 | | 0.50 | |
| n = 50 | 0 | .6050 | .3642 | .2181 | .1299 | .0769 | .0453 | .0266 | .0155 | .0090 | .0052 | .0003 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | 0 | |
| | 1 | .9106 | .7358 | .5553 | .4005 | .2794 | .1900 | .1265 | .0827 | .0532 | .0338 | .0029 | .0002 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | 1 | |
| | 2 | .9862 | .9216 | .8108 | .6767 | .5405 | .4162 | .3108 | .2260 | .1605 | .1117 | .0142 | .0013 | .0001 | .0000 | .0000 | .0000 | .0000 | .0000 | 2 | |
| | 3 | .9984 | .9822 | .9372 | .8609 | .7604 | .6473 | .5327 | .4253 | .3303 | .2503 | .0460 | .0057 | .0005 | .0000 | .0000 | .0000 | .0000 | .0000 | 3 | |
| | 4 | .9999 | .9968 | .9832 | .9510 | .8964 | .8206 | .7290 | .6290 | .5277 | .4312 | .1121 | .0185 | .0021 | .0002 | .0000 | .0000 | .0000 | .0000 | 4 | |
| | 5 | 1.000 | .9995 | .9963 | .9856 | .9622 | .9224 | .8650 | .7919 | .7072 | .6161 | .2194 | .0480 | .0070 | .0007 | .0001 | .0000 | .0000 | .0000 | 5 | |
| | 6 | | .9999 | .9993 | .9964 | .9882 | .9711 | .9417 | .8981 | .8404 | .7702 | .3613 | .1034 | .0194 | .0025 | .0002 | .0000 | .0000 | .0000 | 6 | |
| | 7 | | 1.000 | .9999 | .9992 | .9968 | .9906 | .9780 | .9562 | .9232 | .8779 | .5188 | .1904 | .0453 | .0073 | .0008 | .0001 | .0000 | .0000 | 7 | |
| | 8 | | | 1.000 | .9999 | .9992 | .9973 | .9927 | .9833 | .9672 | .9421 | .6681 | .3073 | .0916 | .0183 | .0025 | .0002 | .0000 | .0000 | 8 | |
| | 9 | | | | 1.000 | .9998 | .9993 | .9978 | .9944 | .9875 | .9755 | .7911 | .4437 | .1637 | .0402 | .0067 | .0008 | .0001 | .0000 | 9 | |
| | 10 | | | | | 1.000 | .9998 | .9994 | .9983 | .9957 | .9906 | .8801 | .5836 | .2622 | .0789 | .0160 | .0022 | .0002 | .0000 | 10 | |
| | 11 | | | | | | 1.000 | .9999 | .9995 | .9987 | .9968 | .9372 | .7107 | .3816 | .1390 | .0342 | .0057 | .0006 | .0000 | 11 | |
| | 12 | | | | | | | 1.000 | .9999 | .9996 | .9990 | .9699 | .8139 | .5110 | .2229 | .0661 | .0133 | .0018 | .0002 | 12 | |
| | 13 | | | | | | | | 1.000 | .9999 | .9997 | .9868 | .8894 | .6370 | .3279 | .1163 | .0280 | .0045 | .0005 | 13 | |
| | 14 | | | | | | | | | 1.000 | .9999 | .9947 | .9393 | .7481 | .4468 | .1878 | .0540 | .0104 | .0013 | 14 | |
| | 15 | | | | | | | | | | 1.000 | .9981 | .9692 | .8369 | .5692 | .2801 | .0955 | .0220 | .0033 | 15 | |
| | 16 | | | | | | | | | | | .9993 | .9856 | .9017 | .6839 | .3889 | .1561 | .0427 | .0077 | 16 | |
| | 17 | | | | | | | | | | | .9998 | .9937 | .9449 | .7822 | .5060 | .2369 | .0765 | .0164 | 17 | |
| | 18 | | | | | | | | | | | .9999 | .9975 | .9713 | .8594 | .6216 | .3356 | .1273 | .0325 | 18 | |
| | 19 | | | | | | | | | | | 1.000 | .9991 | .9861 | .9152 | .7264 | .4465 | .1974 | .0595 | 19 | |
| | 20 | | | | | | | | | | | | .9997 | .9937 | .9522 | .8139 | .5610 | .2862 | .1013 | 20 | |
| | 21 | | | | | | | | | | | | .9999 | .9974 | .9749 | .8813 | .6701 | .3900 | .1611 | 21 | |
| | 22 | | | | | | | | | | | | 1.000 | .9990 | .9877 | .9290 | .7660 | .5019 | .2399 | 22 | |
| | 23 | | | | | | | | | | | | | .9996 | .9944 | .9604 | .8438 | .6134 | .3359 | 23 | |
| | 24 | | | | | | | | | | | | | .9999 | .9976 | .9793 | .9022 | .7160 | .4439 | 24 | |
| | 25 | | | | | | | | | | | | | 1.000 | .9991 | .9900 | .9427 | .8034 | .5561 | 25 | |
| | 26 | | | | | | | | | | | | | | .9997 | .9955 | .9686 | .8721 | .6641 | 26 | |
| | 27 | | | | | | | | | | | | | | .9999 | .9981 | .9840 | .9220 | .7601 | 27 | |
| | 28 | | | | | | | | | | | | | | 1.000 | .9993 | .9924 | .9556 | .8389 | 28 | |
| | 29 | | | | | | | | | | | | | | | .9997 | .9966 | .9765 | .8987 | 29 | |
| | 30 | | | | | | | | | | | | | | | .9999 | .9986 | .9884 | .9405 | 30 | |
| | 31 | | | | | | | | | | | | | | | 1.000 | .9995 | .9947 | .9675 | 31 | |
| | 32 | | | | | | | | | | | | | | | | .9998 | .9978 | .9836 | 32 | |
| | 33 | | | | | | | | | | | | | | | | .9999 | .9991 | .9923 | 33 | |
| | 34 | | | | | | | | | | | | | | | | 1.000 | .9997 | .9967 | 34 | |
| | 35 | | | | | | | | | | | | | | | | | .9999 | .9987 | 35 | |
| | 36 | | | | | | | | | | | | | | | | | 1.000 | .9995 | 36 | |
| | 37 | | | | | | | | | | | | | | | | | | .9998 | 37 | |
| | 38 | | | | | | | | | | | | | | | | | | | 1.000 | 38 |

TABLE 2 POISSON DISTRIBUTION FUNCTION

The table gives the probability that a Poisson random variable X with mean m is less than or equal to x , i.e.

$$P(X \leq x) = \sum_{r=0}^x m^r \frac{e^{-m}}{r!}$$

| $x \backslash m$ | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1.0 | 1.2 | 1.4 | 1.6 | 1.8 | $m \backslash x$ |
|------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------------------|
| 0 | .9048 | .8187 | .7408 | .6703 | .6065 | .5488 | .4966 | .4493 | .4066 | .3679 | .3012 | .2466 | .2019 | .1653 | 0 |
| 1 | .9953 | .9825 | .9631 | .9384 | .9098 | .8781 | .8442 | .8088 | .7725 | .7358 | .6626 | .5918 | .5249 | .4628 | 1 |
| 2 | .9998 | .9989 | .9964 | .9921 | .9856 | .9769 | .9659 | .9526 | .9371 | .9197 | .8795 | .8335 | .7834 | .7306 | 2 |
| 3 | 1.000 | .9999 | .9997 | .9992 | .9982 | .9966 | .9942 | .9909 | .9865 | .9810 | .9662 | .9463 | .9212 | .8913 | 3 |
| 4 | | 1.000 | 1.000 | .9999 | .9998 | .9996 | .9992 | .9986 | .9977 | .9963 | .9923 | .9857 | .9763 | .9636 | 4 |
| 5 | | | | 1.000 | 1.000 | 1.000 | .9999 | .9998 | .9997 | .9994 | .9985 | .9968 | .9940 | .9896 | 5 |
| 6 | | | | | | | 1.000 | 1.000 | 1.000 | .9999 | .9997 | .9994 | .9987 | .9974 | 6 |
| 7 | | | | | | | | | | 1.000 | 1.000 | .9999 | .9997 | .9994 | 7 |
| 8 | | | | | | | | | | | | 1.000 | 1.000 | .9999 | 8 |
| 9 | | | | | | | | | | | | | | 1.000 | 9 |

TABLE 2 POISSON DISTRIBUTION FUNCTION (CONTINUED)

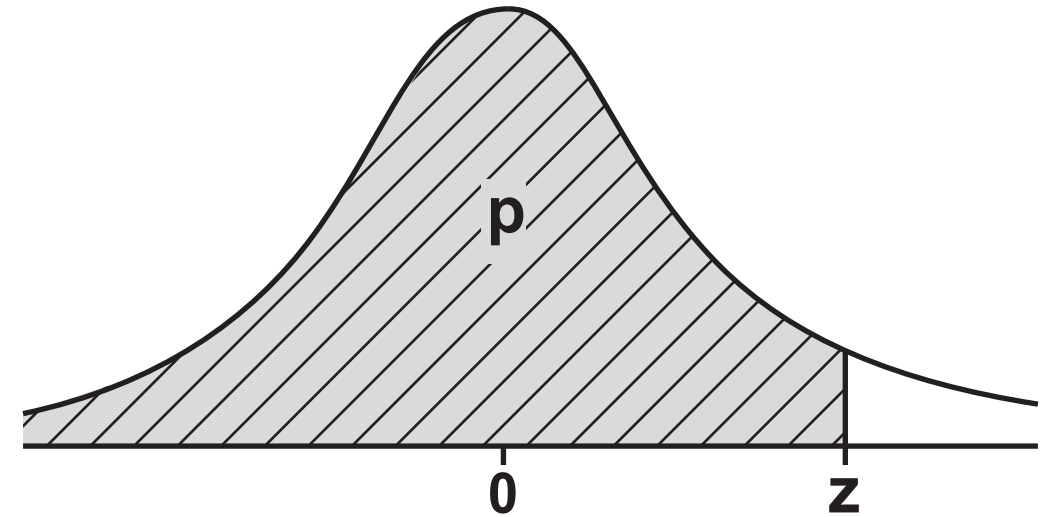
| $x \backslash m$ | 2.0 | 2.2 | 2.4 | 2.6 | 2.8 | 3.0 | 3.2 | 3.4 | 3.6 | 3.8 | 4.0 | 4.5 | 5.0 | 5.5 | $m \backslash x$ |
|------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------------------|
| 0 | .1353 | .1108 | .0907 | .0743 | .0608 | .0498 | .0408 | .0334 | .0273 | .0224 | .0183 | .0111 | .0067 | .0041 | 0 |
| 1 | .4060 | .3546 | .3084 | .2674 | .2311 | .1991 | .1712 | .1468 | .1257 | .1074 | .0916 | .0611 | .0404 | .0266 | 1 |
| 2 | .6767 | .6227 | .5697 | .5184 | .4695 | .4232 | .3799 | .3397 | .3027 | .2689 | .2381 | .1736 | .1247 | .0884 | 2 |
| 3 | .8571 | .8194 | .7787 | .7360 | .6919 | .6472 | .6025 | .5584 | .5152 | .4735 | .4335 | .3423 | .2650 | .2017 | 3 |
| 4 | .9473 | .9275 | .9041 | .8774 | .8477 | .8153 | .7806 | .7442 | .7064 | .6678 | .6288 | .5321 | .4405 | .3575 | 4 |
| 5 | .9834 | .9751 | .9643 | .9510 | .9349 | .9161 | .8946 | .8705 | .8441 | .8156 | .7851 | .7029 | .6160 | .5289 | 5 |
| 6 | .9955 | .9925 | .9884 | .9828 | .9756 | .9665 | .9554 | .9421 | .9267 | .9091 | .8893 | .8311 | .7622 | .6860 | 6 |
| 7 | .9989 | .9980 | .9967 | .9947 | .9919 | .9881 | .9832 | .9769 | .9692 | .9599 | .9489 | .9134 | .8666 | .8095 | 7 |
| 8 | .9998 | .9995 | .9991 | .9985 | .9976 | .9962 | .9943 | .9917 | .9883 | .9840 | .9786 | .9597 | .9319 | .8944 | 8 |
| 9 | 1.000 | .9999 | .9998 | .9996 | .9993 | .9989 | .9982 | .9973 | .9960 | .9942 | .9919 | .9829 | .9682 | .9462 | 9 |
| 10 | | 1.000 | 1.000 | .9999 | .9998 | .9997 | .9995 | .9992 | .9987 | .9981 | .9972 | .9933 | .9863 | .9747 | 10 |
| 11 | | | | 1.000 | 1.000 | .9999 | .9999 | .9998 | .9996 | .9994 | .9991 | .9976 | .9945 | .9890 | 11 |
| 12 | | | | | | 1.000 | 1.000 | .9999 | .9999 | .9998 | .9997 | .9992 | .9980 | .9955 | 12 |
| 13 | | | | | | | | 1.000 | 1.000 | 1.000 | .9999 | .9997 | .9993 | .9983 | 13 |
| 14 | | | | | | | | | | | 1.000 | .9999 | .9998 | .9994 | 14 |
| 15 | | | | | | | | | | | | 1.000 | .9999 | .9998 | 15 |
| 16 | | | | | | | | | | | | | 1.000 | .9999 | 16 |
| 17 | | | | | | | | | | | | | | 1.000 | 17 |

TABLE 2 POISSON DISTRIBUTION FUNCTION (CONTINUED)

| $\begin{matrix} m \\ x \end{matrix}$ | 6.0 | 6.5 | 7.0 | 7.5 | 8.0 | 8.5 | 9.0 | 9.5 | 10.0 | 11.0 | 12.0 | 13.0 | 14.0 | 15.0 | $\begin{matrix} m \\ x \end{matrix}$ | | | | |
|--------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------------------------------------|-------|-------|-------|----|
| 0 | .0025 | .0015 | .0009 | .0006 | .0003 | .0002 | .0001 | .0001 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | 0 | | | | |
| 1 | .0174 | .0113 | .0073 | .0047 | .0030 | .0019 | .0012 | .0008 | .0005 | .0002 | .0001 | .0000 | .0000 | .0000 | 1 | | | | |
| 2 | .0620 | .0430 | .0296 | .0203 | .0138 | .0093 | .0062 | .0042 | .0028 | .0012 | .0005 | .0002 | .0001 | .0000 | 2 | | | | |
| 3 | .1512 | .1118 | .0818 | .0591 | .0424 | .0301 | .0212 | .0149 | .0103 | .0049 | .0023 | .0011 | .0005 | .0002 | 3 | | | | |
| 4 | .2851 | .2237 | .1730 | .1321 | .0996 | .0744 | .0550 | .0403 | .0293 | .0151 | .0076 | .0037 | .0018 | .0009 | 4 | | | | |
| 5 | .4457 | .3690 | .3007 | .2414 | .1912 | .1496 | .1157 | .0885 | .0671 | .0375 | .0203 | .0107 | .0055 | .0028 | 5 | | | | |
| 6 | .6063 | .5265 | .4497 | .3782 | .3134 | .2562 | .2068 | .1649 | .1301 | .0786 | .0458 | .0259 | .0142 | .0076 | 6 | | | | |
| 7 | .7440 | .6728 | .5987 | .5246 | .4530 | .3856 | .3239 | .2687 | .2202 | .1432 | .0895 | .0540 | .0316 | .0180 | 7 | | | | |
| 8 | .8472 | .7916 | .7291 | .6620 | .5925 | .5231 | .4557 | .3918 | .3328 | .2320 | .1550 | .0998 | .0621 | .0374 | 8 | | | | |
| 9 | .9161 | .8774 | .8305 | .7764 | .7166 | .6530 | .5874 | .5218 | .4579 | .3405 | .2424 | .1658 | .1094 | .0699 | 9 | | | | |
| 10 | .9574 | .9332 | .9015 | .8622 | .8159 | .7634 | .7060 | .6453 | .5830 | .4599 | .3472 | .2517 | .1757 | .1185 | 10 | | | | |
| 11 | .9799 | .9661 | .9467 | .9208 | .8881 | .8487 | .8030 | .7520 | .6968 | .5793 | .4616 | .3532 | .2600 | .1848 | 11 | | | | |
| 12 | .9912 | .9840 | .9730 | .9573 | .9362 | .9091 | .8758 | .8364 | .7916 | .6887 | .5760 | .4631 | .3585 | .2676 | 12 | | | | |
| 13 | .9964 | .9929 | .9872 | .9784 | .9658 | .9486 | .9261 | .8981 | .8645 | .7813 | .6815 | .5730 | .4644 | .3632 | 13 | | | | |
| 14 | .9986 | .9970 | .9943 | .9897 | .9827 | .9726 | .9585 | .9400 | .9165 | .8540 | .7720 | .6751 | .5704 | .4657 | 14 | | | | |
| 15 | .9995 | .9988 | .9976 | .9954 | .9918 | .9862 | .9780 | .9665 | .9513 | .9074 | .8444 | .7636 | .6694 | .5681 | 15 | | | | |
| 16 | .9998 | .9996 | .9990 | .9980 | .9963 | .9934 | .9889 | .9823 | .9730 | .9441 | .8987 | .8355 | .7559 | .6641 | 16 | | | | |
| 17 | .9999 | .9998 | .9996 | .9992 | .9984 | .9970 | .9947 | .9911 | .9857 | .9678 | .9370 | .8905 | .8272 | .7489 | 17 | | | | |
| 18 | 1.000 | .9999 | .9999 | .9997 | .9993 | .9987 | .9976 | .9957 | .9928 | .9823 | .9626 | .9302 | .8826 | .8195 | 18 | | | | |
| 19 | | 1.000 | 1.000 | .9999 | .9997 | .9995 | .9989 | .9980 | .9965 | .9907 | .9787 | .9573 | .9235 | .8752 | 19 | | | | |
| 20 | | | | 1.000 | .9999 | .9998 | .9996 | .9991 | .9984 | .9953 | .9884 | .9750 | .9521 | .9170 | 20 | | | | |
| 21 | | | | | 1.000 | .9999 | .9998 | .9996 | .9993 | .9977 | .9939 | .9859 | .9712 | .9469 | 21 | | | | |
| 22 | | | | | | 1.000 | .9999 | .9999 | .9997 | .9990 | .9970 | .9924 | .9833 | .9673 | 22 | | | | |
| 23 | | | | | | | 1.000 | .9999 | .9999 | .9995 | .9985 | .9960 | .9907 | .9805 | 23 | | | | |
| 24 | | | | | | | | 1.000 | 1.000 | .9998 | .9993 | .9980 | .9950 | .9888 | 24 | | | | |
| 25 | | | | | | | | | | .9999 | .9997 | .9990 | .9974 | .9938 | 25 | | | | |
| 26 | | | | | | | | | | | 1.000 | .9999 | .9995 | .9987 | 26 | | | | |
| 27 | | | | | | | | | | | | .9999 | .9998 | .9994 | 27 | | | | |
| 28 | | | | | | | | | | | | | 1.000 | .9999 | 28 | | | | |
| 29 | | | | | | | | | | | | | | 1.000 | .9999 | 29 | | | |
| 30 | | | | | | | | | | | | | | | .9999 | 30 | | | |
| 31 | | | | | | | | | | | | | | | | 1.000 | .9999 | 31 | |
| 32 | | | | | | | | | | | | | | | | | | 1.000 | 32 |

TABLE 3 NORMAL DISTRIBUTION FUNCTION

The table gives the probability p that a normally distributed random variable Z with zero mean and unit variance is less than or equal to z .



| z | .00 | .01 | .02 | .03 | .04 | .05 | .06 | .07 | .08 | .09 |
|----------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| 0.0 | .50000 | .50399 | .50798 | .51197 | .51595 | .51994 | .52392 | .52790 | .53188 | .53586 |
| 0.1 | .53983 | .54380 | .54776 | .55172 | .55567 | .55962 | .56356 | .56749 | .57142 | .57535 |
| 0.2 | .57926 | .58317 | .58706 | .59095 | .59483 | .59871 | .60257 | .60642 | .61026 | .61409 |
| 0.3 | .61791 | .62172 | .62552 | .62930 | .63307 | .63683 | .64058 | .64431 | .64803 | .65173 |
| 0.4 | .65542 | .65910 | .66276 | .66640 | .67003 | .67364 | .67724 | .68082 | .68439 | .68793 |
| 0.5 | .69146 | .69497 | .69847 | .70194 | .70540 | .70884 | .71226 | .71566 | .71904 | .72240 |
| 0.6 | .72575 | .72907 | .73237 | .73565 | .73891 | .74215 | .74537 | .74857 | .75175 | .75490 |
| 0.7 | .75804 | .76115 | .76424 | .76730 | .77035 | .77337 | .77637 | .77935 | .78230 | .78524 |
| 0.8 | .78814 | .79103 | .79389 | .79673 | .79955 | .80234 | .80511 | .80785 | .81057 | .81327 |
| 0.9 | .81594 | .81859 | .82121 | .82381 | .82639 | .82894 | .83147 | .83398 | .83646 | .83891 |
| 1.0 | .84134 | .84375 | .84614 | .84849 | .85083 | .85314 | .85543 | .85769 | .85993 | .86214 |
| 1.1 | .86433 | .86650 | .86864 | .87076 | .87286 | .87493 | .87698 | .87900 | .88100 | .88298 |
| 1.2 | .88493 | .88686 | .88877 | .89065 | .89251 | .89435 | .89617 | .89796 | .89973 | .90147 |
| 1.3 | .90320 | .90490 | .90658 | .90824 | .90988 | .91149 | .91309 | .91466 | .91621 | .91774 |
| 1.4 | .91924 | .92073 | .92220 | .92364 | .92507 | .92647 | .92785 | .92922 | .93056 | .93189 |
| 1.5 | .93319 | .93448 | .93574 | .93699 | .93822 | .93943 | .94062 | .94179 | .94295 | .94408 |

TABLE 3 NORMAL DISTRIBUTION FUNCTION (CONTINUED)

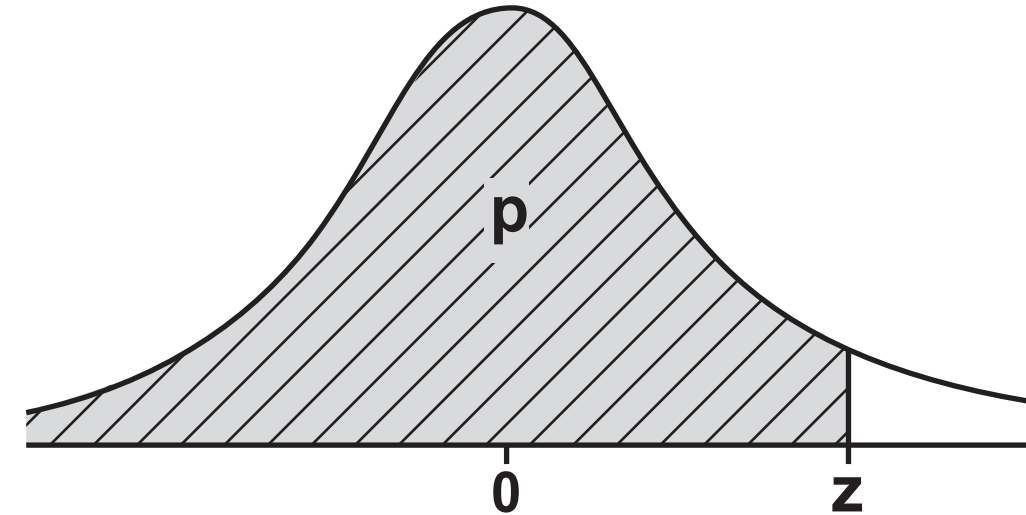
| z | .00 | .01 | .02 | .03 | .04 | .05 | .06 | .07 | .08 | .09 |
|----------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| 1.6 | .94520 | .94630 | .94738 | .94845 | .94950 | .95053 | .95154 | .95254 | .95352 | .95449 |
| 1.7 | .95543 | .95637 | .95728 | .95818 | .95907 | .95994 | .96080 | .96164 | .96246 | .96327 |
| 1.8 | .96407 | .96485 | .96562 | .96638 | .96712 | .96784 | .96856 | .96926 | .96995 | .97062 |
| 1.9 | .97128 | .97193 | .97257 | .97320 | .97381 | .97441 | .97500 | .97558 | .97615 | .97670 |
| 2.0 | .97725 | .97778 | .97831 | .97882 | .97932 | .97982 | .98030 | .98077 | .98124 | .98169 |
| 2.1 | .98214 | .98257 | .98300 | .98341 | .98382 | .98422 | .98461 | .98500 | .98537 | .98574 |
| 2.2 | .98610 | .98645 | .98679 | .98713 | .98745 | .98778 | .98809 | .98840 | .98870 | .98899 |
| 2.3 | .98928 | .98956 | .98983 | .99010 | .99036 | .99061 | .99086 | .99111 | .99134 | .99158 |
| 2.4 | .99180 | .99202 | .99224 | .99245 | .99266 | .99286 | .99305 | .99324 | .99343 | .99361 |
| 2.5 | .99379 | .99396 | .99413 | .99430 | .99446 | .99461 | .99477 | .99492 | .99506 | .99520 |
| 2.6 | .99534 | .99547 | .99560 | .99573 | .99585 | .99598 | .99609 | .99621 | .99632 | .99643 |
| 2.7 | .99653 | .99664 | .99674 | .99683 | .99693 | .99702 | .99711 | .99720 | .99728 | .99736 |
| 2.8 | .99744 | .99752 | .99760 | .99767 | .99774 | .99781 | .99788 | .99795 | .99801 | .99807 |
| 2.9 | .99813 | .99819 | .99825 | .99831 | .99836 | .99841 | .99846 | .99851 | .99856 | .99861 |
| 3.0 | .99865 | .99869 | .99874 | .99878 | .99882 | .99886 | .99889 | .99893 | .99896 | .99900 |
| 3.1 | .99903 | .99906 | .99910 | .99913 | .99916 | .99918 | .99921 | .99924 | .99926 | .99929 |
| 3.2 | .99931 | .99934 | .99936 | .99938 | .99940 | .99942 | .99944 | .99946 | .99948 | .99950 |
| 3.3 | .99952 | .99953 | .99955 | .99957 | .99958 | .99960 | .99961 | .99962 | .99964 | .99965 |
| 3.4 | .99966 | .99968 | .99969 | .99970 | .99971 | .99972 | .99973 | .99974 | .99975 | .99976 |
| 3.5 | .99977 | .99978 | .99978 | .99979 | .99980 | .99981 | .99981 | .99982 | .99983 | .99983 |
| 3.6 | .99984 | .99985 | .99985 | .99986 | .99986 | .99987 | .99987 | .99988 | .99988 | .99989 |
| 3.7 | .99989 | .99990 | .99990 | .99990 | .99991 | .99991 | .99992 | .99992 | .99992 | .99992 |
| 3.8 | .99993 | .99993 | .99993 | .99994 | .99994 | .99994 | .99994 | .99995 | .99995 | .99995 |
| 3.9 | .99995 | .99995 | .99996 | .99996 | .99996 | .99996 | .99996 | .99996 | .99997 | .99997 |

TABLE 4 PERCENTAGE POINTS OF THE NORMAL DISTRIBUTION

The table gives the values of z satisfying

$$P(Z \leq z) = p$$

where Z is a normally distributed random variable with zero mean and unit variance.



| p | .00 | .01 | .02 | .03 | .04 | .05 | .06 | .07 | .08 | .09 |
|-------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| 0.50 | 0.000 | 0.025 | 0.050 | 0.075 | 0.100 | 0.126 | 0.151 | 0.176 | 0.202 | 0.228 |
| 0.60 | 0.253 | 0.279 | 0.305 | 0.332 | 0.358 | 0.385 | 0.412 | 0.440 | 0.468 | 0.496 |
| 0.70 | 0.524 | 0.553 | 0.583 | 0.613 | 0.643 | 0.674 | 0.706 | 0.739 | 0.772 | 0.806 |
| 0.80 | 0.842 | 0.878 | 0.915 | 0.954 | 0.994 | 1.036 | 1.080 | 1.126 | 1.175 | 1.227 |
| 0.90 | 1.282 | 1.341 | 1.405 | 1.476 | 1.555 | | | | | |

| p | .000 | .001 | .002 | .003 | .004 | .005 | .006 | .007 | .008 | .009 |
|-------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| 0.95 | 1.645 | 1.655 | 1.665 | 1.675 | 1.685 | 1.695 | 1.706 | 1.717 | 1.728 | 1.739 |
| 0.96 | 1.751 | 1.762 | 1.774 | 1.787 | 1.799 | 1.812 | 1.825 | 1.838 | 1.852 | 1.866 |
| 0.97 | 1.881 | 1.896 | 1.911 | 1.927 | 1.943 | 1.960 | 1.977 | 1.995 | 2.014 | 2.034 |
| 0.98 | 2.054 | 2.075 | 2.097 | 2.120 | 2.144 | 2.170 | 2.197 | 2.226 | 2.257 | 2.290 |
| 0.99 | 2.326 | 2.366 | 2.409 | 2.457 | 2.512 | 2.576 | 2.652 | 2.748 | 2.878 | 3.090 |

TABLE 5 CONTROL CHART LIMITS FOR SAMPLE RANGE

The table gives

- (i) values of k satisfying $\sigma = kE(W)$, where $E(W)$ may be estimated by W ,
- (ii) values of $D_{1-\alpha}$ satisfying $P(W \leq D_{1-\alpha}\sigma) = 1 - \alpha$,
- (iii) values of $D'_{1-\alpha}$ satisfying $P(W \leq D'_{1-\alpha}E(W)) = 1 - \alpha$,

where W is the range of a random sample of size n from a normal distribution with standard deviation σ .

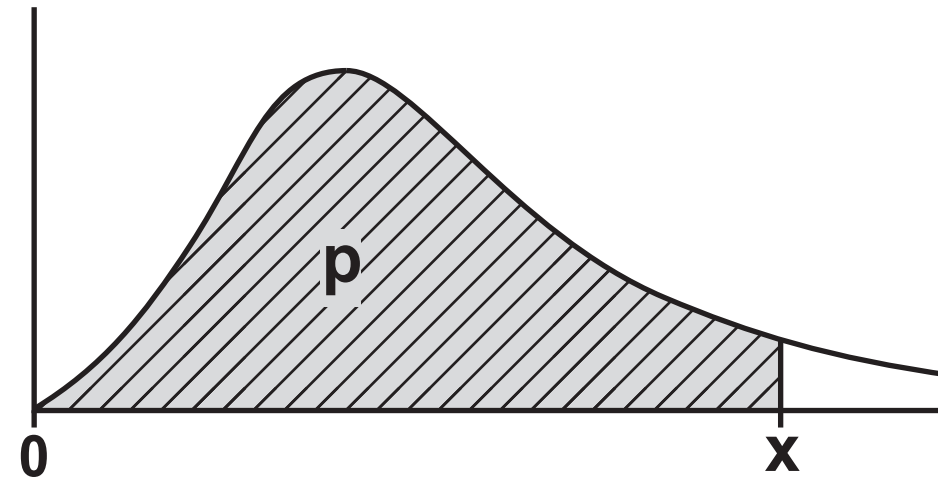
| n | k | D_{.975} | D_{.999} | D'_{.975} | D'_{.999} |
|----------|----------|-------------------------|-------------------------|--------------------------|--------------------------|
| 2 | 0.886 | 3.170 | 4.654 | 2.809 | 4.124 |
| 3 | 0.591 | 3.682 | 5.064 | 2.176 | 2.992 |
| 4 | 0.486 | 3.984 | 5.309 | 1.935 | 2.579 |
| 5 | 0.430 | 4.197 | 5.484 | 1.804 | 2.358 |
| 6 | 0.395 | 4.361 | 5.619 | 1.721 | 2.217 |
| 7 | 0.370 | 4.493 | 5.729 | 1.662 | 2.119 |
| 8 | 0.351 | 4.605 | 5.823 | 1.617 | 2.045 |
| 9 | 0.337 | 4.700 | 5.903 | 1.583 | 1.988 |
| 10 | 0.325 | 4.785 | 5.974 | 1.555 | 1.941 |

TABLE 6 PERCENTAGE POINTS OF THE χ^2 -DISTRIBUTION

The table gives the values of x satisfying

$$P(X \leq x) = p$$

where X is a χ^2 random variable with v degrees of freedom.



| $v \backslash p$ | 0.005 | 0.01 | 0.025 | 0.05 | 0.1 | 0.9 | 0.95 | 0.975 | 0.99 | 0.995 |
|------------------|---------|--------|-------|-------|-------|--------|--------|--------|--------|--------|
| 1 | 0.00004 | 0.0002 | 0.001 | 0.004 | 0.016 | 2.706 | 3.841 | 5.024 | 6.635 | 7.879 |
| 2 | 0.010 | 0.020 | 0.051 | 0.103 | 0.211 | 4.605 | 5.991 | 7.378 | 9.210 | 10.597 |
| 3 | 0.072 | 0.115 | 0.216 | 0.352 | 0.584 | 6.251 | 7.815 | 9.348 | 11.345 | 12.838 |
| 4 | 0.207 | 0.297 | 0.484 | 0.711 | 1.064 | 7.779 | 9.488 | 11.143 | 13.277 | 14.860 |
| 5 | 0.412 | 0.554 | 0.831 | 1.145 | 1.610 | 9.236 | 11.070 | 12.833 | 15.086 | 16.750 |
| 6 | 0.676 | 0.872 | 1.237 | 1.635 | 2.204 | 10.645 | 12.592 | 14.449 | 16.812 | 18.548 |
| 7 | 0.989 | 1.239 | 1.690 | 2.167 | 2.833 | 12.017 | 14.067 | 16.013 | 18.475 | 20.278 |
| 8 | 1.344 | 1.646 | 2.180 | 2.733 | 3.490 | 13.362 | 15.507 | 17.535 | 20.090 | 21.955 |
| 9 | 1.735 | 2.088 | 2.700 | 3.325 | 4.168 | 14.684 | 16.919 | 19.023 | 21.666 | 23.589 |
| 10 | 2.156 | 2.558 | 3.247 | 3.940 | 4.865 | 15.987 | 18.307 | 20.483 | 23.209 | 25.188 |
| 11 | 2.603 | 3.053 | 3.816 | 4.575 | 5.578 | 17.275 | 19.675 | 21.920 | 24.725 | 26.757 |
| 12 | 3.074 | 3.571 | 4.404 | 5.226 | 6.304 | 18.549 | 21.026 | 23.337 | 26.217 | 28.300 |
| 13 | 3.565 | 4.107 | 5.009 | 5.892 | 7.042 | 19.812 | 22.362 | 24.736 | 27.688 | 29.819 |
| 14 | 4.075 | 4.660 | 5.629 | 6.571 | 7.790 | 21.064 | 23.685 | 26.119 | 29.141 | 31.319 |
| 15 | 4.601 | 5.229 | 6.262 | 7.261 | 8.547 | 22.307 | 24.996 | 27.488 | 30.578 | 32.801 |

TABLE 6 PERCENTAGE POINTS OF THE χ^2 -DISTRIBUTION (CONTINUED)

| ν \ p | 0.005 | 0.01 | 0.025 | 0.05 | 0.1 | 0.9 | 0.95 | 0.975 | 0.99 | 0.995 |
|-----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 16 | 5.142 | 5.812 | 6.908 | 7.962 | 9.312 | 23.542 | 26.296 | 28.845 | 32.000 | 34.267 |
| 17 | 5.697 | 6.408 | 7.564 | 8.672 | 10.085 | 24.769 | 27.587 | 30.191 | 33.409 | 35.718 |
| 18 | 6.265 | 7.015 | 8.231 | 9.390 | 10.865 | 25.989 | 28.869 | 31.526 | 34.805 | 37.156 |
| 19 | 6.844 | 7.633 | 8.907 | 10.117 | 11.651 | 27.204 | 30.144 | 32.852 | 36.191 | 38.582 |
| 20 | 7.434 | 8.260 | 9.591 | 10.851 | 12.443 | 28.412 | 31.410 | 34.170 | 37.566 | 39.997 |
| 21 | 8.034 | 8.897 | 10.283 | 11.591 | 13.240 | 29.615 | 32.671 | 35.479 | 38.932 | 41.401 |
| 22 | 8.643 | 9.542 | 10.982 | 12.338 | 14.041 | 30.813 | 33.924 | 36.781 | 40.289 | 42.796 |
| 23 | 9.260 | 10.196 | 11.689 | 13.091 | 14.848 | 32.007 | 35.172 | 38.076 | 41.638 | 44.181 |
| 24 | 9.886 | 10.856 | 12.401 | 13.848 | 15.659 | 33.196 | 36.415 | 39.364 | 42.980 | 45.559 |
| 25 | 10.520 | 11.524 | 13.120 | 14.611 | 16.473 | 34.382 | 37.652 | 40.646 | 44.314 | 46.928 |
| 26 | 11.160 | 12.198 | 13.844 | 15.379 | 17.292 | 35.563 | 38.885 | 41.923 | 45.642 | 48.290 |
| 27 | 11.808 | 12.879 | 14.573 | 16.151 | 18.114 | 36.741 | 40.113 | 43.195 | 46.963 | 49.645 |
| 28 | 12.461 | 13.565 | 15.308 | 16.928 | 18.939 | 37.916 | 41.337 | 44.461 | 48.278 | 50.993 |
| 29 | 13.121 | 14.256 | 16.047 | 17.708 | 19.768 | 39.087 | 42.557 | 45.722 | 49.588 | 52.336 |
| 30 | 13.787 | 14.953 | 16.791 | 18.493 | 20.599 | 40.256 | 43.773 | 46.979 | 50.892 | 53.672 |
| 31 | 14.458 | 15.655 | 17.539 | 19.281 | 21.434 | 41.422 | 44.985 | 48.232 | 52.191 | 55.003 |
| 32 | 15.134 | 16.362 | 18.291 | 20.072 | 22.271 | 42.585 | 46.194 | 49.480 | 53.486 | 56.328 |
| 33 | 15.815 | 17.074 | 19.047 | 20.867 | 23.110 | 43.745 | 47.400 | 50.725 | 54.776 | 57.648 |
| 34 | 16.501 | 17.789 | 19.806 | 21.664 | 23.952 | 44.903 | 48.602 | 51.966 | 56.061 | 58.964 |
| 35 | 17.192 | 18.509 | 20.569 | 22.465 | 24.797 | 46.059 | 49.802 | 53.203 | 57.342 | 60.275 |

TABLE 6 PERCENTAGE POINTS OF THE χ^2 -DISTRIBUTION (CONTINUED)

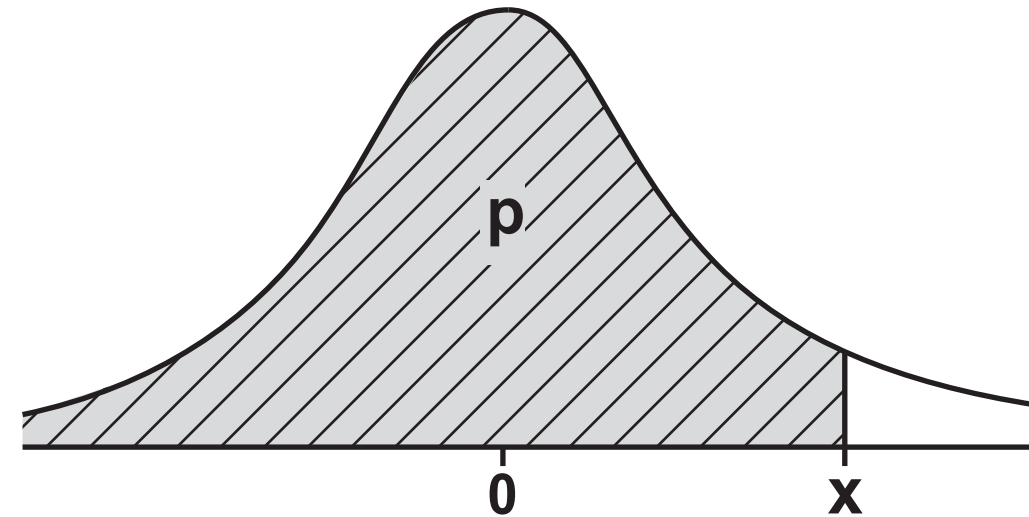
| ν \ p | 0.005 | 0.01 | 0.025 | 0.05 | 0.1 | 0.9 | 0.95 | 0.975 | 0.99 | 0.995 |
|-----------|--------|--------|--------|--------|--------|---------|---------|---------|---------|---------|
| 36 | 17.887 | 19.233 | 21.336 | 23.269 | 25.643 | 47.212 | 50.998 | 54.437 | 58.619 | 61.581 |
| 37 | 18.586 | 19.960 | 22.106 | 24.075 | 26.492 | 48.363 | 52.192 | 55.668 | 59.892 | 62.883 |
| 38 | 19.289 | 20.691 | 22.878 | 24.884 | 27.343 | 49.513 | 53.384 | 56.896 | 61.162 | 64.181 |
| 39 | 19.996 | 21.426 | 23.654 | 25.695 | 28.196 | 50.660 | 54.572 | 58.120 | 62.428 | 65.476 |
| 40 | 20.707 | 22.164 | 24.433 | 26.509 | 29.051 | 51.805 | 55.758 | 59.342 | 63.691 | 66.766 |
| 45 | 24.311 | 25.901 | 28.366 | 30.612 | 33.350 | 57.505 | 61.656 | 65.410 | 69.957 | 73.166 |
| 50 | 27.991 | 29.707 | 32.357 | 34.764 | 37.689 | 63.167 | 67.505 | 71.420 | 76.154 | 79.490 |
| 55 | 31.735 | 33.570 | 36.398 | 38.958 | 42.060 | 68.796 | 73.311 | 77.380 | 82.292 | 85.749 |
| 60 | 35.534 | 37.485 | 40.482 | 43.188 | 46.459 | 74.397 | 79.082 | 83.298 | 88.379 | 91.952 |
| 65 | 39.383 | 41.444 | 44.603 | 47.450 | 50.883 | 79.973 | 84.821 | 89.177 | 94.422 | 98.105 |
| 70 | 43.275 | 45.442 | 48.758 | 51.739 | 55.329 | 85.527 | 90.531 | 95.023 | 100.425 | 104.215 |
| 75 | 47.206 | 49.475 | 52.942 | 56.054 | 59.795 | 91.061 | 96.217 | 100.839 | 106.393 | 110.286 |
| 80 | 51.172 | 53.540 | 57.153 | 60.391 | 64.278 | 96.578 | 101.879 | 106.629 | 112.329 | 116.321 |
| 85 | 55.170 | 57.634 | 61.389 | 64.749 | 68.777 | 102.079 | 107.522 | 112.393 | 118.236 | 122.325 |
| 90 | 59.196 | 61.754 | 65.647 | 69.126 | 73.291 | 107.565 | 113.145 | 118.136 | 124.116 | 128.299 |
| 95 | 63.250 | 65.898 | 69.925 | 73.520 | 77.818 | 113.038 | 118.752 | 123.858 | 129.973 | 134.247 |
| 100 | 67.328 | 70.065 | 74.222 | 77.929 | 82.358 | 118.498 | 124.342 | 129.561 | 135.807 | 140.169 |

TABLE 7 PERCENTAGE POINTS OF THE STUDENT'S t-DISTRIBUTION

The table gives the values of x satisfying

$$P(X \leq x) = p$$

where X is a random variable having the Student's t -distribution with v degrees of freedom.



| $v \backslash p$ | 0.9 | 0.95 | 0.975 | 0.99 | 0.995 |
|------------------|-------|-------|--------|--------|--------|
| 1 | 3.078 | 6.314 | 12.706 | 31.821 | 63.657 |
| 2 | 1.886 | 2.920 | 4.303 | 6.965 | 9.925 |
| 3 | 1.638 | 2.353 | 3.182 | 4.541 | 5.841 |
| 4 | 1.533 | 2.132 | 2.776 | 3.747 | 4.604 |
| 5 | 1.476 | 2.015 | 2.571 | 3.365 | 4.032 |
| 6 | 1.440 | 1.943 | 2.447 | 3.143 | 3.707 |
| 7 | 1.415 | 1.895 | 2.365 | 2.998 | 3.499 |
| 8 | 1.397 | 1.860 | 2.306 | 2.896 | 3.355 |
| 9 | 1.383 | 1.833 | 2.262 | 2.821 | 3.250 |
| 10 | 1.372 | 1.812 | 2.228 | 2.764 | 3.169 |
| 11 | 1.363 | 1.796 | 2.201 | 2.718 | 3.106 |
| 12 | 1.356 | 1.782 | 2.179 | 2.681 | 3.055 |
| 13 | 1.350 | 1.771 | 2.160 | 2.650 | 3.012 |
| 14 | 1.345 | 1.761 | 2.145 | 2.624 | 2.977 |

| $v \backslash p$ | 0.9 | 0.95 | 0.975 | 0.99 | 0.995 |
|------------------|-------|-------|-------|-------|-------|
| 15 | 1.341 | 1.753 | 2.131 | 2.602 | 2.947 |
| 16 | 1.337 | 1.746 | 2.120 | 2.583 | 2.921 |
| 17 | 1.333 | 1.740 | 2.110 | 2.567 | 2.898 |
| 18 | 1.330 | 1.734 | 2.101 | 2.552 | 2.878 |
| 19 | 1.328 | 1.729 | 2.093 | 2.539 | 2.861 |
| 20 | 1.325 | 1.725 | 2.086 | 2.528 | 2.845 |
| 21 | 1.323 | 1.721 | 2.080 | 2.518 | 2.831 |
| 22 | 1.321 | 1.717 | 2.074 | 2.508 | 2.819 |
| 23 | 1.319 | 1.714 | 2.069 | 2.500 | 2.807 |
| 24 | 1.318 | 1.711 | 2.064 | 2.492 | 2.797 |
| 25 | 1.316 | 1.708 | 2.060 | 2.485 | 2.787 |
| 26 | 1.315 | 1.706 | 2.056 | 2.479 | 2.779 |
| 27 | 1.314 | 1.703 | 2.052 | 2.473 | 2.771 |
| 28 | 1.313 | 1.701 | 2.048 | 2.467 | 2.763 |

TABLE 7 PERCENTAGE POINTS OF THE STUDENT'S t-DISTRIBUTION (CONTINUED)

| $v \backslash p$ | 0.9 | 0.95 | 0.975 | 0.99 | 0.995 |
|------------------|-------|-------|-------|-------|-------|
| 29 | 1.311 | 1.699 | 2.045 | 2.462 | 2.756 |
| 30 | 1.310 | 1.697 | 2.042 | 2.457 | 2.750 |
| 31 | 1.309 | 1.696 | 2.040 | 2.453 | 2.744 |
| 32 | 1.309 | 1.694 | 2.037 | 2.449 | 2.738 |
| 33 | 1.308 | 1.692 | 2.035 | 2.445 | 2.733 |
| 34 | 1.307 | 1.691 | 2.032 | 2.441 | 2.728 |
| 35 | 1.306 | 1.690 | 2.030 | 2.438 | 2.724 |
| 36 | 1.306 | 1.688 | 2.028 | 2.434 | 2.719 |
| 37 | 1.305 | 1.687 | 2.026 | 2.431 | 2.715 |
| 38 | 1.304 | 1.686 | 2.024 | 2.429 | 2.712 |
| 39 | 1.304 | 1.685 | 2.023 | 2.426 | 2.708 |
| 40 | 1.303 | 1.684 | 2.021 | 2.423 | 2.704 |
| 45 | 1.301 | 1.679 | 2.014 | 2.412 | 2.690 |
| 50 | 1.299 | 1.676 | 2.009 | 2.403 | 2.678 |

| $v \backslash p$ | 0.9 | 0.95 | 0.975 | 0.99 | 0.995 |
|------------------|-------|-------|-------|-------|-------|
| 55 | 1.297 | 1.673 | 2.004 | 2.396 | 2.668 |
| 60 | 1.296 | 1.671 | 2.000 | 2.390 | 2.660 |
| 65 | 1.295 | 1.669 | 1.997 | 2.385 | 2.654 |
| 70 | 1.294 | 1.667 | 1.994 | 2.381 | 2.648 |
| 75 | 1.293 | 1.665 | 1.992 | 2.377 | 2.643 |
| 80 | 1.292 | 1.664 | 1.990 | 2.374 | 2.639 |
| 85 | 1.292 | 1.663 | 1.988 | 2.371 | 2.635 |
| 90 | 1.291 | 1.662 | 1.987 | 2.368 | 2.632 |
| 95 | 1.291 | 1.661 | 1.985 | 2.366 | 2.629 |
| 100 | 1.290 | 1.660 | 1.984 | 2.364 | 2.626 |
| 125 | 1.288 | 1.657 | 1.979 | 2.357 | 2.616 |
| 150 | 1.287 | 1.655 | 1.976 | 2.351 | 2.609 |
| 200 | 1.286 | 1.653 | 1.972 | 2.345 | 2.601 |
| ∞ | 1.282 | 1.645 | 1.960 | 2.326 | 2.576 |

TABLE 8 PERCENTAGE POINTS OF THE F-DISTRIBUTION

The tables give the values of x satisfying

$$P(X \leq x) = p$$

where X is a random variable having the F-distribution with v_1 degrees of freedom in the numerator and v_2 degrees of freedom in the denominator.

TABLE 8 PERCENTAGE POINTS OF THE F-DISTRIBUTION (CONTINUED)

The table below corresponds to $p = 0.995$ and should be used for one-tail tests at significance level 0.5% or two-tail tests at significance level 1%.

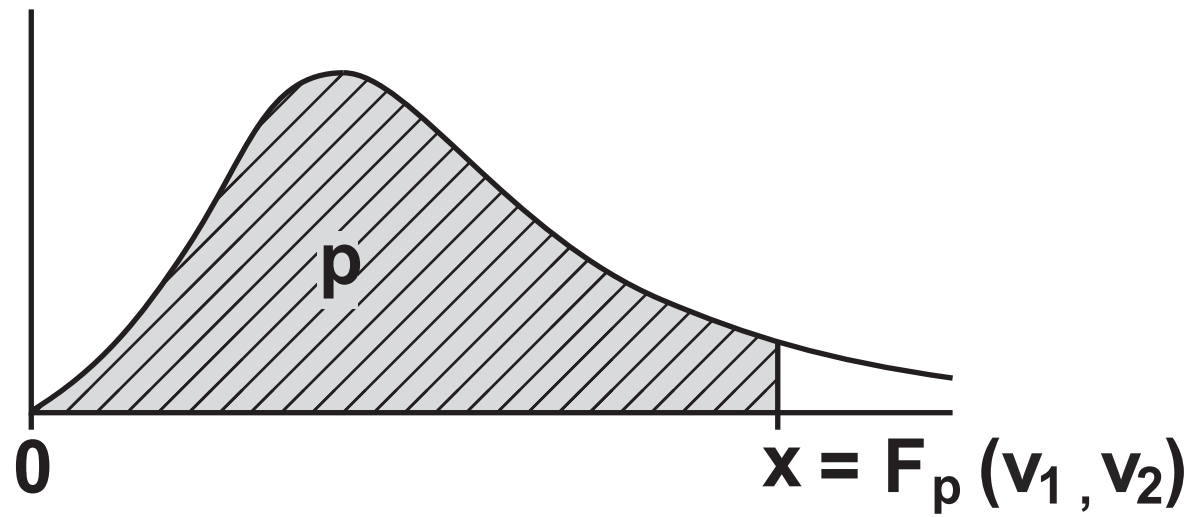
| $V_2 \backslash V_1$ | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 15 | 20 | 25 | 30 | 40 | 50 | 100 | ∞ |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------|
| 1 | 16211 | 20000 | 21615 | 22500 | 23056 | 23437 | 23715 | 23925 | 24091 | 24224 | 24334 | 24426 | 24630 | 24836 | 24960 | 25044 | 25148 | 25211 | 25337 | 25465 |
| 2 | 198.5 | 199.0 | 199.2 | 1992 | 199.3 | 199.3 | 199.4 | 199.4 | 199.4 | 199.4 | 199.4 | 199.4 | 199.4 | 199.4 | 199.5 | 199.5 | 199.5 | 199.5 | 199.5 | 199.5 |
| 3 | 55.55 | 49.80 | 47.47 | 46.19 | 45.39 | 44.84 | 44.43 | 44.13 | 43.88 | 43.69 | 43.52 | 43.39 | 43.09 | 42.78 | 42.59 | 42.47 | 42.31 | 42.21 | 42.02 | 41.83 |
| 4 | 31.33 | 26.28 | 24.26 | 23.15 | 22.46 | 21.97 | 21.62 | 21.35 | 21.14 | 20.97 | 20.82 | 20.71 | 20.44 | 20.17 | 20.00 | 19.89 | 19.75 | 19.67 | 19.50 | 19.32 |
| 5 | 22.78 | 18.31 | 16.53 | 15.56 | 14.94 | 14.51 | 14.20 | 13.96 | 13.77 | 13.62 | 13.49 | 13.38 | 13.15 | 12.90 | 12.76 | 12.66 | 12.53 | 12.45 | 12.30 | 12.14 |
| 6 | 18.64 | 14.54 | 12.92 | 12.03 | 11.46 | 11.07 | 10.79 | 10.57 | 10.39 | 10.25 | 10.13 | 10.03 | 9.814 | 9.589 | 9.451 | 9.358 | 9.241 | 9.170 | 9.026 | 8.879 |
| 7 | 16.24 | 12.40 | 10.88 | 10.05 | 9.522 | 9.155 | 8.885 | 8.678 | 8.514 | 8.380 | 8.270 | 8.176 | 7.968 | 7.754 | 7.623 | 7.534 | 7.422 | 7.354 | 7.217 | 7.076 |
| 8 | 14.69 | 11.04 | 9.596 | 8.805 | 8.302 | 7.952 | 7.694 | 7.496 | 7.339 | 7.211 | 7.104 | 7.015 | 6.814 | 6.608 | 6.482 | 6.396 | 6.288 | 6.222 | 6.088 | 5.951 |
| 9 | 13.61 | 10.11 | 8.717 | 7.956 | 7.471 | 7.134 | 6.885 | 6.693 | 6.541 | 6.417 | 6.314 | 6.227 | 6.032 | 5.832 | 5.708 | 5.625 | 5.519 | 5.454 | 5.322 | 5.188 |
| 10 | 12.83 | 9.427 | 8.081 | 7.343 | 6.872 | 6.545 | 6.302 | 6.116 | 5.968 | 5.847 | 5.746 | 5.661 | 5.471 | 5.274 | 5.153 | 5.071 | 4.966 | 4.902 | 4.772 | 4.639 |
| 11 | 12.23 | 8.912 | 7.600 | 6.881 | 6.422 | 6.102 | 5.865 | 5.682 | 5.537 | 5.418 | 5.320 | 5.236 | 5.049 | 4.855 | 4.736 | 4.654 | 4.551 | 4.488 | 4.359 | 4.226 |
| 12 | 11.75 | 8.510 | 7.226 | 6.521 | 6.071 | 5.757 | 5.525 | 5.345 | 5.202 | 5.085 | 4.988 | 4.906 | 4.721 | 4.530 | 4.412 | 4.331 | 4.228 | 4.165 | 4.037 | 3.904 |
| 13 | 11.37 | 8.186 | 6.926 | 6.233 | 5.791 | 5.482 | 5.253 | 5.076 | 4.935 | 4.820 | 4.724 | 4.643 | 4.460 | 4.270 | 4.153 | 4.073 | 3.970 | 3.908 | 3.780 | 3.647 |
| 14 | 11.06 | 7.922 | 6.680 | 5.998 | 5.562 | 5.257 | 5.031 | 4.857 | 4.717 | 4.603 | 4.508 | 4.428 | 4.247 | 4.059 | 3.942 | 3.862 | 3.760 | 3.698 | 3.569 | 3.436 |
| 15 | 10.80 | 7.701 | 6.476 | 5.803 | 5.372 | 5.071 | 4.847 | 4.674 | 4.536 | 4.424 | 4.329 | 4.250 | 4.070 | 3.883 | 3.766 | 3.687 | 3.585 | 3.523 | 3.394 | 3.260 |
| 16 | 10.58 | 7.514 | 6.303 | 5.638 | 5.212 | 4.913 | 4.692 | 4.521 | 4.384 | 4.272 | 4.179 | 4.099 | 3.920 | 3.734 | 3.618 | 3.539 | 3.437 | 3.375 | 3.246 | 3.112 |
| 17 | 10.38 | 7.354 | 6.156 | 5.497 | 5.075 | 4.779 | 4.559 | 4.389 | 4.254 | 4.142 | 4.050 | 3.971 | 3.793 | 3.607 | 3.492 | 3.412 | 3.311 | 3.248 | 3.119 | 2.984 |
| 18 | 10.22 | 7.215 | 6.028 | 5.375 | 4.956 | 4.663 | 4.445 | 4.276 | 4.141 | 4.030 | 3.938 | 3.860 | 3.683 | 3.498 | 3.382 | 3.303 | 3.201 | 3.139 | 3.009 | 2.873 |
| 19 | 10.07 | 7.093 | 5.916 | 5.268 | 4.853 | 4.561 | 4.345 | 4.177 | 4.043 | 3.933 | 3.841 | 3.763 | 3.587 | 3.402 | 3.287 | 3.208 | 3.106 | 3.043 | 2.913 | 2.776 |
| 20 | 9.944 | 6.986 | 5.818 | 5.174 | 4.762 | 4.472 | 4.257 | 4.090 | 3.956 | 3.847 | 3.756 | 3.678 | 3.502 | 3.318 | 3.203 | 3.123 | 3.022 | 2.959 | 2.828 | 2.690 |
| 25 | 9.475 | 6.598 | 5.462 | 4.835 | 4.433 | 4.150 | 3.939 | 3.776 | 3.645 | 3.537 | 3.447 | 3.370 | 3.196 | 3.013 | 2.898 | 2.819 | 2.716 | 2.652 | 2.519 | 2.377 |
| 30 | 9.180 | 6.355 | 5.239 | 4.623 | 4.228 | 3.949 | 3.742 | 3.580 | 3.450 | 3.344 | 3.255 | 3.179 | 3.006 | 2.823 | 2.708 | 2.628 | 2.524 | 2.459 | 2.323 | 2.176 |
| 40 | 8.828 | 6.066 | 4.976 | 4.374 | 3.986 | 3.713 | 3.509 | 3.350 | 3.222 | 3.117 | 3.028 | 2.953 | 2.781 | 2.598 | 2.482 | 2.401 | 2.296 | 2.230 | 2.088 | 1.932 |
| 50 | 8.626 | 5.902 | 4.826 | 4.232 | 3.849 | 3.579 | 3.376 | 3.219 | 3.092 | 2.988 | 2.900 | 2.825 | 2.653 | 2.470 | 2.353 | 2.272 | 2.164 | 2.097 | 1.951 | 1.786 |
| 100 | 8.241 | 5.589 | 4.542 | 3.963 | 3.589 | 3.325 | 3.127 | 2.972 | 2.847 | 2.744 | 2.657 | 2.583 | 2.411 | 2.227 | 2.108 | 2.024 | 1.912 | 1.840 | 1.681 | 1.485 |
| ∞ | 7.879 | 5.298 | 4.279 | 3.715 | 3.350 | 3.091 | 2.897 | 2.744 | 2.621 | 2.519 | 2.432 | 2.358 | 2.187 | 2.000 | 1.877 | 1.789 | 1.669 | 1.590 | 1.402 | 1.000 |

TABLE 8 PERCENTAGE POINTS OF THE F-DISTRIBUTION (CONTINUED)

The table below corresponds to $p = 0.99$ and should be used for one-tail tests at significance level 1% or two-tail tests at significance level 2%.

| $V_2 \backslash V_1$ | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 15 | 20 | 25 | 30 | 40 | 50 | 100 | ∞ |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------|
| 1 | 4052 | 5000 | 5403 | 5625 | 5764 | 5859 | 5928 | 5981 | 6022 | 6056 | 6083 | 6106 | 6158 | 6209 | 6240 | 6261 | 6287 | 6303 | 6334 | 6366 |
| 2 | 98.50 | 99.00 | 99.17 | 99.25 | 99.30 | 99.33 | 99.36 | 99.37 | 99.39 | 99.40 | 99.41 | 99.42 | 99.43 | 99.45 | 99.46 | 99.47 | 99.47 | 99.48 | 99.49 | 99.50 |
| 3 | 34.12 | 30.82 | 29.46 | 28.71 | 28.24 | 27.91 | 27.67 | 27.49 | 27.35 | 27.23 | 27.13 | 27.05 | 26.87 | 26.69 | 26.58 | 26.51 | 26.41 | 26.35 | 26.24 | 26.13 |
| 4 | 21.20 | 18.00 | 16.69 | 15.98 | 15.52 | 15.21 | 14.98 | 14.80 | 14.66 | 14.55 | 14.45 | 14.37 | 14.20 | 14.02 | 13.91 | 13.84 | 13.75 | 13.69 | 13.58 | 13.46 |
| 5 | 16.26 | 13.27 | 12.06 | 11.39 | 10.97 | 10.67 | 10.46 | 10.29 | 10.16 | 10.05 | 9.963 | 9.888 | 9.722 | 9.553 | 9.449 | 9.379 | 9.291 | 9.238 | 9.130 | 9.020 |
| 6 | 13.75 | 10.93 | 9.780 | 9.148 | 8.746 | 8.466 | 8.260 | 8.102 | 7.976 | 7.874 | 7.790 | 7.718 | 7.559 | 7.396 | 7.296 | 7.229 | 7.143 | 7.091 | 6.987 | 6.880 |
| 7 | 12.25 | 9.547 | 8.451 | 7.847 | 7.460 | 7.191 | 6.993 | 6.840 | 6.719 | 6.620 | 6.538 | 6.469 | 6.314 | 6.155 | 6.058 | 5.992 | 5.908 | 5.858 | 5.755 | 5.650 |
| 8 | 11.26 | 8.649 | 7.591 | 7.006 | 6.632 | 6.371 | 6.178 | 6.029 | 5.911 | 5.814 | 5.734 | 5.667 | 5.515 | 5.359 | 5.263 | 5.198 | 5.116 | 5.065 | 4.963 | 4.860 |
| 9 | 10.56 | 8.022 | 6.992 | 6.422 | 6.057 | 5.802 | 5.613 | 5.467 | 5.351 | 5.257 | 5.178 | 5.111 | 4.962 | 4.808 | 4.713 | 4.649 | 4.567 | 4.517 | 4.415 | 4.311 |
| 10 | 10.04 | 7.559 | 6.552 | 5.994 | 5.636 | 5.386 | 5.200 | 5.057 | 4.942 | 4.849 | 4.772 | 4.706 | 4.558 | 4.405 | 4.311 | 4.247 | 4.165 | 4.115 | 4.014 | 3.909 |
| 11 | 9.646 | 7.206 | 6.217 | 5.668 | 5.316 | 5.069 | 4.886 | 4.744 | 4.632 | 4.539 | 4.462 | 4.397 | 4.251 | 4.099 | 4.005 | 3.941 | 3.860 | 3.810 | 3.708 | 3.602 |
| 12 | 9.330 | 6.927 | 5.953 | 5.412 | 5.064 | 4.821 | 4.640 | 4.499 | 4.388 | 4.296 | 4.220 | 4.155 | 4.010 | 3.858 | 3.765 | 3.701 | 3.619 | 3.569 | 3.467 | 3.361 |
| 13 | 9.074 | 6.701 | 5.739 | 5.205 | 4.862 | 4.620 | 4.441 | 4.302 | 4.191 | 4.100 | 4.025 | 3.960 | 3.815 | 3.665 | 3.571 | 3.507 | 3.425 | 3.375 | 3.272 | 3.165 |
| 14 | 8.862 | 6.515 | 5.564 | 5.035 | 4.695 | 4.456 | 4.278 | 4.140 | 4.030 | 3.939 | 3.864 | 3.800 | 3.656 | 3.505 | 3.412 | 3.348 | 3.266 | 3.215 | 3.112 | 3.004 |
| 15 | 8.683 | 6.359 | 5.417 | 4.893 | 4.556 | 4.318 | 4.142 | 4.004 | 3.895 | 3.805 | 3.730 | 3.666 | 3.522 | 3.372 | 3.278 | 3.214 | 3.132 | 3.081 | 2.977 | 2.868 |
| 16 | 8.531 | 6.226 | 5.292 | 4.773 | 4.437 | 4.202 | 4.026 | 3.890 | 3.780 | 3.691 | 3.616 | 3.553 | 3.409 | 3.259 | 3.165 | 3.101 | 3.018 | 2.967 | 2.863 | 2.753 |
| 17 | 8.400 | 6.112 | 5.185 | 4.669 | 4.336 | 4.102 | 3.927 | 3.791 | 3.682 | 3.593 | 3.519 | 3.455 | 3.312 | 3.162 | 3.068 | 3.003 | 2.920 | 2.869 | 2.764 | 2.653 |
| 18 | 8.285 | 6.013 | 5.092 | 4.579 | 4.248 | 4.015 | 3.841 | 3.705 | 3.597 | 3.508 | 3.434 | 3.371 | 3.227 | 3.077 | 2.983 | 2.919 | 2.835 | 2.784 | 2.678 | 2.566 |
| 19 | 8.185 | 5.926 | 5.010 | 4.500 | 4.171 | 3.939 | 3.765 | 3.631 | 3.523 | 3.434 | 3.360 | 3.297 | 3.153 | 3.003 | 2.909 | 2.844 | 2.761 | 2.709 | 2.602 | 2.489 |
| 20 | 8.096 | 5.849 | 4.938 | 4.431 | 4.103 | 3.871 | 3.699 | 3.564 | 3.457 | 3.368 | 3.294 | 3.231 | 3.088 | 2.938 | 2.843 | 2.778 | 2.695 | 2.643 | 2.535 | 2.421 |
| 25 | 7.770 | 5.568 | 4.675 | 4.177 | 3.855 | 3.627 | 3.457 | 3.324 | 3.217 | 3.129 | 3.056 | 2.993 | 2.850 | 2.699 | 2.604 | 2.538 | 2.453 | 2.400 | 2.289 | 2.169 |
| 30 | 7.562 | 5.390 | 4.510 | 4.018 | 3.699 | 3.473 | 3.304 | 3.173 | 3.067 | 2.979 | 2.906 | 2.843 | 2.700 | 2.549 | 2.453 | 2.386 | 2.299 | 2.245 | 2.131 | 2.006 |
| 40 | 7.314 | 5.179 | 4.313 | 3.828 | 3.514 | 3.291 | 3.124 | 2.993 | 2.888 | 2.801 | 2.727 | 2.665 | 2.522 | 2.369 | 2.271 | 2.203 | 2.114 | 2.058 | 1.938 | 1.805 |
| 50 | 7.171 | 5.057 | 4.199 | 3.720 | 3.408 | 3.186 | 3.020 | 2.890 | 2.785 | 2.698 | 2.625 | 2.562 | 2.419 | 2.265 | 2.167 | 2.098 | 2.007 | 1.949 | 1.825 | 1.683 |
| 100 | 6.895 | 4.824 | 3.984 | 3.513 | 3.206 | 2.988 | 2.823 | 2.694 | 2.590 | 2.503 | 2.430 | 2.368 | 2.223 | 2.067 | 1.965 | 1.893 | 1.797 | 1.735 | 1.598 | 1.427 |
| ∞ | 6.635 | 4.605 | 3.782 | 3.319 | 3.017 | 2.802 | 2.639 | 2.511 | 2.407 | 2.321 | 2.248 | 2.185 | 2.039 | 1.878 | 1.773 | 1.696 | 1.592 | 1.523 | 1.358 | 1.000 |

TABLE 8 PERCENTAGE POINTS OF THE F-DISTRIBUTION (CONTINUED)



The relationship

$$F_p(v_1, v_2) = 1/F_{1-p}(v_2, v_1)$$

can be used to find the percentage points in the lower tail.

TABLE 8 PERCENTAGE POINTS OF THE F-DISTRIBUTION (CONTINUED)

The table below corresponds to $p = 0.975$ and should be used for one-tail tests at significance level 2.5% or two-tail tests at significance level 5%.

| $V_2 \backslash V_1$ | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 15 | 20 | 25 | 30 | 40 | 50 | 100 | ∞ |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------|
| 1 | 647.8 | 799.5 | 864.2 | 899.6 | 921.8 | 937.1 | 948.2 | 956.7 | 963.3 | 968.6 | 973.0 | 976.7 | 984.9 | 993.1 | 998.1 | 1001 | 1006 | 1008 | 1013 | 1018 |
| 2 | 38.51 | 39.00 | 39.17 | 39.25 | 39.30 | 39.33 | 39.36 | 39.37 | 39.39 | 39.40 | 39.41 | 39.42 | 39.43 | 39.45 | 39.46 | 39.47 | 39.47 | 39.48 | 39.49 | 39.50 |
| 3 | 17.44 | 16.04 | 15.44 | 15.10 | 14.89 | 14.74 | 14.62 | 14.54 | 14.47 | 14.42 | 14.37 | 14.34 | 14.25 | 14.17 | 14.12 | 14.08 | 14.04 | 14.01 | 13.96 | 13.90 |
| 4 | 12.22 | 10.65 | 9.979 | 9.605 | 9.364 | 9.197 | 9.074 | 8.980 | 8.905 | 8.844 | 8.794 | 8.751 | 8.657 | 8.560 | 8.501 | 8.461 | 8.411 | 8.381 | 8.319 | 8.257 |
| 5 | 10.01 | 8.434 | 7.764 | 7.388 | 7.146 | 6.978 | 6.853 | 6.757 | 6.681 | 6.619 | 6.568 | 6.525 | 6.428 | 6.329 | 6.268 | 6.227 | 6.175 | 6.144 | 6.080 | 6.015 |
| 6 | 8.813 | 7.260 | 6.599 | 6.227 | 5.988 | 5.820 | 5.695 | 5.600 | 5.523 | 5.461 | 5.410 | 5.366 | 5.269 | 5.168 | 5.107 | 5.065 | 5.012 | 4.980 | 4.915 | 4.849 |
| 7 | 8.073 | 6.542 | 5.890 | 5.523 | 5.285 | 5.119 | 4.995 | 4.899 | 4.823 | 4.761 | 4.709 | 4.666 | 4.568 | 4.467 | 4.405 | 4.362 | 4.309 | 4.276 | 4.210 | 4.142 |
| 8 | 7.571 | 6.059 | 5.416 | 5.053 | 4.817 | 4.652 | 4.529 | 4.433 | 4.357 | 4.295 | 4.243 | 4.200 | 4.101 | 3.999 | 3.937 | 3.894 | 3.840 | 3.807 | 3.739 | 3.670 |
| 9 | 7.209 | 5.715 | 5.078 | 4.718 | 4.484 | 4.320 | 4.197 | 4.102 | 4.026 | 3.964 | 3.912 | 3.868 | 3.769 | 3.667 | 3.604 | 3.560 | 3.505 | 3.472 | 3.403 | 3.333 |
| 10 | 6.937 | 5.456 | 4.826 | 4.468 | 4.236 | 4.072 | 3.950 | 3.855 | 3.779 | 3.717 | 3.665 | 3.621 | 3.522 | 3.419 | 3.355 | 3.311 | 3.255 | 3.221 | 3.152 | 3.080 |
| 11 | 6.724 | 5.256 | 4.630 | 4.275 | 4.044 | 3.881 | 3.759 | 3.664 | 3.588 | 3.526 | 3.474 | 3.430 | 3.330 | 3.226 | 3.162 | 3.118 | 3.061 | 3.027 | 2.956 | 2.883 |
| 12 | 6.554 | 5.096 | 4.474 | 4.121 | 3.891 | 3.728 | 3.607 | 3.512 | 3.436 | 3.374 | 3.321 | 3.277 | 3.177 | 3.073 | 3.008 | 2.963 | 2.906 | 2.871 | 2.800 | 2.725 |
| 13 | 6.414 | 4.965 | 4.347 | 3.996 | 3.767 | 3.604 | 3.483 | 3.388 | 3.312 | 3.250 | 3.197 | 3.153 | 3.053 | 2.948 | 2.882 | 2.837 | 2.780 | 2.744 | 2.671 | 2.595 |
| 14 | 6.298 | 4.857 | 4.242 | 3.892 | 3.663 | 3.501 | 3.380 | 3.285 | 3.209 | 3.147 | 3.095 | 3.050 | 2.949 | 2.844 | 2.778 | 2.732 | 2.674 | 2.638 | 2.565 | 2.487 |
| 15 | 6.200 | 4.765 | 4.153 | 3.804 | 3.576 | 3.415 | 3.293 | 3.199 | 3.123 | 3.060 | 3.008 | 2.963 | 2.862 | 2.756 | 2.689 | 2.644 | 2.585 | 2.549 | 2.474 | 2.395 |
| 16 | 6.115 | 4.687 | 4.077 | 3.729 | 3.502 | 3.341 | 3.219 | 3.125 | 3.049 | 2.986 | 2.934 | 2.889 | 2.788 | 2.681 | 2.614 | 2.568 | 2.509 | 2.472 | 2.396 | 2.316 |
| 17 | 6.042 | 4.619 | 4.011 | 3.665 | 3.438 | 3.277 | 3.156 | 3.061 | 2.985 | 2.922 | 2.870 | 2.825 | 2.723 | 2.616 | 2.548 | 2.502 | 2.442 | 2.405 | 2.329 | 2.247 |
| 18 | 5.978 | 4.560 | 3.954 | 3.608 | 3.382 | 3.221 | 3.100 | 3.005 | 2.929 | 2.866 | 2.814 | 2.769 | 2.667 | 2.559 | 2.491 | 2.445 | 2.384 | 2.347 | 2.269 | 2.187 |
| 19 | 5.922 | 4.508 | 3.903 | 3.559 | 3.333 | 3.172 | 3.051 | 2.956 | 2.880 | 2.817 | 2.765 | 2.720 | 2.617 | 2.509 | 2.441 | 2.394 | 2.333 | 2.295 | 2.217 | 2.133 |
| 20 | 5.871 | 4.461 | 3.859 | 3.515 | 3.289 | 3.128 | 3.007 | 2.913 | 2.837 | 2.774 | 2.721 | 2.676 | 2.573 | 2.464 | 2.396 | 2.349 | 2.287 | 2.249 | 2.170 | 2.085 |
| 25 | 5.686 | 4.291 | 3.694 | 3.353 | 3.129 | 2.969 | 2.848 | 2.753 | 2.677 | 2.613 | 2.560 | 2.515 | 2.411 | 2.300 | 2.230 | 2.182 | 2.118 | 2.079 | 1.996 | 1.906 |
| 30 | 5.568 | 4.182 | 3.589 | 3.250 | 3.026 | 2.867 | 2.746 | 2.651 | 2.575 | 2.511 | 2.458 | 2.412 | 2.307 | 2.195 | 2.124 | 2.074 | 2.009 | 1.968 | 1.882 | 1.787 |
| 40 | 5.424 | 4.051 | 3.463 | 3.126 | 2.904 | 2.744 | 2.624 | 2.529 | 2.452 | 2.388 | 2.334 | 2.288 | 2.182 | 2.068 | 1.994 | 1.943 | 1.875 | 1.832 | 1.741 | 1.637 |
| 50 | 5.340 | 3.975 | 3.390 | 3.054 | 2.833 | 2.674 | 2.553 | 2.458 | 2.381 | 2.317 | 2.263 | 2.216 | 2.109 | 1.993 | 1.919 | 1.866 | 1.796 | 1.752 | 1.656 | 1.545 |
| 100 | 5.179 | 3.828 | 3.250 | 2.917 | 2.696 | 2.537 | 2.417 | 2.321 | 2.244 | 2.179 | 2.124 | 2.077 | 1.968 | 1.849 | 1.770 | 1.715 | 1.640 | 1.592 | 1.483 | 1.347 |
| ∞ | 5.024 | 3.689 | 3.116 | 2.786 | 2.567 | 2.408 | 2.288 | 2.192 | 2.114 | 2.048 | 1.993 | 1.945 | 1.833 | 1.708 | 1.626 | 1.566 | 1.484 | 1.428 | 1.296 | 1.000 |

TABLE 8 PERCENTAGE POINTS OF THE F-DISTRIBUTION (CONTINUED)

The table below corresponds to $p = 0.95$ and should be used for one-tail tests at significance level 5% or two-tail tests at significance level 10%.

| $V_2 \backslash V_1$ | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 15 | 20 | 25 | 30 | 40 | 50 | 100 | ∞ |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------|
| 1 | 161.4 | 199.5 | 215.7 | 224.6 | 230.2 | 234.0 | 236.8 | 238.9 | 240.5 | 241.9 | 243.0 | 243.9 | 246.0 | 248.0 | 249.3 | 250.1 | 251.1 | 251.8 | 253.0 | 245.3 |
| 2 | 18.51 | 19.00 | 19.16 | 19.25 | 19.30 | 19.33 | 19.35 | 19.37 | 19.39 | 19.40 | 19.41 | 19.41 | 19.43 | 19.45 | 19.46 | 19.46 | 19.47 | 19.48 | 19.49 | 19.50 |
| 3 | 10.13 | 9.552 | 9.277 | 9.117 | 9.013 | 8.941 | 8.887 | 8.845 | 8.812 | 8.786 | 8.763 | 8.745 | 8.703 | 8.660 | 8.634 | 8.617 | 8.594 | 8.581 | 8.554 | 8.526 |
| 4 | 7.709 | 6.944 | 6.591 | 6.388 | 6.256 | 6.163 | 6.094 | 6.041 | 5.999 | 5.964 | 5.936 | 5.912 | 5.858 | 5.803 | 5.769 | 5.746 | 5.717 | 5.699 | 5.664 | 5.628 |
| 5 | 6.608 | 5.786 | 5.409 | 5.192 | 5.050 | 4.950 | 4.876 | 4.818 | 4.772 | 4.735 | 4.704 | 4.678 | 4.619 | 4.558 | 4.521 | 4.496 | 4.464 | 4.444 | 4.405 | 4.365 |
| 6 | 5.987 | 5.143 | 4.757 | 4.534 | 4.387 | 4.284 | 4.207 | 4.147 | 4.099 | 4.060 | 4.027 | 4.000 | 3.938 | 3.874 | 3.835 | 3.808 | 3.774 | 3.754 | 3.712 | 3.669 |
| 7 | 5.591 | 4.737 | 4.347 | 4.120 | 3.972 | 3.866 | 3.787 | 3.726 | 3.677 | 3.637 | 3.603 | 3.575 | 3.511 | 3.445 | 3.404 | 3.376 | 3.340 | 3.319 | 3.275 | 3.230 |
| 8 | 5.318 | 4.459 | 4.066 | 3.838 | 3.687 | 3.581 | 3.500 | 3.438 | 3.388 | 3.347 | 3.313 | 3.284 | 3.218 | 3.150 | 3.108 | 3.079 | 3.043 | 3.020 | 2.975 | 2.928 |
| 9 | 5.117 | 4.256 | 3.863 | 3.633 | 3.482 | 3.374 | 3.293 | 3.230 | 3.179 | 3.137 | 3.102 | 3.073 | 3.006 | 2.936 | 2.893 | 2.864 | 2.826 | 2.803 | 2.756 | 2.707 |
| 10 | 4.965 | 4.103 | 3.708 | 3.478 | 3.326 | 3.217 | 3.135 | 3.072 | 3.020 | 2.978 | 2.943 | 2.913 | 2.845 | 2.774 | 2.730 | 2.700 | 2.661 | 2.637 | 2.588 | 2.538 |
| 11 | 4.844 | 3.982 | 3.587 | 3.357 | 3.204 | 3.095 | 3.012 | 2.948 | 2.896 | 2.854 | 2.818 | 2.788 | 2.719 | 2.646 | 2.601 | 2.570 | 2.531 | 2.507 | 2.457 | 2.404 |
| 12 | 4.747 | 3.885 | 3.490 | 3.259 | 3.106 | 2.996 | 2.913 | 2.849 | 2.796 | 2.753 | 2.717 | 2.687 | 2.617 | 2.544 | 2.498 | 2.466 | 2.426 | 2.401 | 2.350 | 2.296 |
| 13 | 4.667 | 3.806 | 3.411 | 3.179 | 3.025 | 2.915 | 2.832 | 2.767 | 2.714 | 2.671 | 2.635 | 2.604 | 2.533 | 2.459 | 2.412 | 2.380 | 2.339 | 2.314 | 2.261 | 2.206 |
| 14 | 4.600 | 3.739 | 3.344 | 3.112 | 2.958 | 2.848 | 2.764 | 2.699 | 2.646 | 2.602 | 2.565 | 2.534 | 2.463 | 2.388 | 2.341 | 2.308 | 2.266 | 2.241 | 2.187 | 2.131 |
| 15 | 4.543 | 3.682 | 3.287 | 3.056 | 2.901 | 2.790 | 2.707 | 2.641 | 2.588 | 2.544 | 2.507 | 2.475 | 2.403 | 2.328 | 2.280 | 2.247 | 2.204 | 2.178 | 2.123 | 2.066 |
| 16 | 4.494 | 3.634 | 3.239 | 3.007 | 2.852 | 2.741 | 2.657 | 2.591 | 2.538 | 2.494 | 2.456 | 2.425 | 2.352 | 2.276 | 2.227 | 2.194 | 2.151 | 2.124 | 2.068 | 2.010 |
| 17 | 4.451 | 3.592 | 3.197 | 2.965 | 2.810 | 2.699 | 2.614 | 2.548 | 2.494 | 2.450 | 2.413 | 2.381 | 2.308 | 2.230 | 2.181 | 2.148 | 2.104 | 2.077 | 2.020 | 1.960 |
| 18 | 4.414 | 3.555 | 3.160 | 2.928 | 2.773 | 2.661 | 2.577 | 2.510 | 2.456 | 2.412 | 2.374 | 2.342 | 2.269 | 2.191 | 2.141 | 2.107 | 2.063 | 2.035 | 1.978 | 1.917 |
| 19 | 4.381 | 3.522 | 3.127 | 2.895 | 2.740 | 2.628 | 2.544 | 2.477 | 2.423 | 2.378 | 2.340 | 2.308 | 2.234 | 2.155 | 2.106 | 2.071 | 2.026 | 1.999 | 1.940 | 1.878 |
| 20 | 4.351 | 3.493 | 3.098 | 2.866 | 2.711 | 2.599 | 2.514 | 2.447 | 2.393 | 2.348 | 2.310 | 2.278 | 2.203 | 2.124 | 2.074 | 2.039 | 1.994 | 1.966 | 1.907 | 1.843 |
| 25 | 4.242 | 3.385 | 2.991 | 2.759 | 2.603 | 2.490 | 2.405 | 2.337 | 2.282 | 2.236 | 2.198 | 2.165 | 2.089 | 2.007 | 1.955 | 1.919 | 1.872 | 1.842 | 1.779 | 1.711 |
| 30 | 4.171 | 3.316 | 2.922 | 2.690 | 2.534 | 2.421 | 2.334 | 2.266 | 2.211 | 2.165 | 2.126 | 2.092 | 2.015 | 1.932 | 1.878 | 1.841 | 1.792 | 1.761 | 1.695 | 1.622 |
| 40 | 4.085 | 3.232 | 2.839 | 2.606 | 2.449 | 2.336 | 2.249 | 2.180 | 2.124 | 2.077 | 2.038 | 2.003 | 1.924 | 1.839 | 1.783 | 1.744 | 1.693 | 1.660 | 1.589 | 1.509 |
| 50 | 4.034 | 3.183 | 2.790 | 2.557 | 2.400 | 2.286 | 2.199 | 2.130 | 2.073 | 2.026 | 1.986 | 1.952 | 1.871 | 1.784 | 1.727 | 1.687 | 1.634 | 1.599 | 1.525 | 1.438 |
| 100 | 3.936 | 3.087 | 2.696 | 2.463 | 2.305 | 2.191 | 2.103 | 2.032 | 1.975 | 1.927 | 1.886 | 1.850 | 1.768 | 1.676 | 1.616 | 1.573 | 1.515 | 1.477 | 1.392 | 1.283 |
| ∞ | 3.841 | 2.996 | 2.605 | 2.372 | 2.214 | 2.099 | 2.010 | 1.938 | 1.880 | 1.831 | 1.789 | 1.752 | 1.666 | 1.571 | 1.506 | 1.459 | 1.394 | 1.350 | 1.243 | 1.000 |

TABLE 9 CRITICAL VALUES OF THE PRODUCT MOMENT CORRELATION COEFFICIENT

The table gives the critical values, for different significance levels, of the sample product moment correlation coefficient r based on n independent pairs of observations from a bivariate normal distribution with correlation coefficient $\rho = 0$.

| One tail Two tail n | 10% 20% | 5% 10% | 2.5% 5% | 1% 2% | 0.5% 1% |
|---------------------------|------------|-----------|------------|----------|------------|
| 4 | 0.8000 | 0.9000 | 0.9500 | 0.9800 | 0.9900 |
| 5 | 0.6870 | 0.8054 | 0.8783 | 0.9343 | 0.9587 |
| 6 | 0.6084 | 0.7293 | 0.8114 | 0.8822 | 0.9172 |
| 7 | 0.5509 | 0.6694 | 0.7545 | 0.8329 | 0.8745 |
| 8 | 0.5067 | 0.6215 | 0.7067 | 0.7887 | 0.8343 |
| 9 | 0.4716 | 0.5822 | 0.6664 | 0.7498 | 0.7977 |
| 10 | 0.4428 | 0.5494 | 0.6319 | 0.7155 | 0.7646 |
| 11 | 0.4187 | 0.5214 | 0.6021 | 0.6851 | 0.7348 |
| 12 | 0.3981 | 0.4973 | 0.5760 | 0.6581 | 0.7079 |
| 13 | 0.3802 | 0.4762 | 0.5529 | 0.6339 | 0.6835 |
| 14 | 0.3646 | 0.4575 | 0.5324 | 0.6120 | 0.6614 |
| 15 | 0.3507 | 0.4409 | 0.5140 | 0.5923 | 0.6411 |
| 16 | 0.3383 | 0.4259 | 0.4973 | 0.5742 | 0.6226 |
| 17 | 0.3271 | 0.4124 | 0.4821 | 0.5577 | 0.6055 |
| 18 | 0.3170 | 0.4000 | 0.4683 | 0.5425 | 0.5897 |
| 19 | 0.3077 | 0.3887 | 0.4555 | 0.5285 | 0.5751 |
| 20 | 0.2992 | 0.3783 | 0.4438 | 0.5155 | 0.5614 |
| 21 | 0.2914 | 0.3687 | 0.4329 | 0.5034 | 0.5487 |
| 22 | 0.2841 | 0.3598 | 0.4227 | 0.4921 | 0.5368 |
| 23 | 0.2774 | 0.3515 | 0.4132 | 0.4815 | 0.5256 |
| 24 | 0.2711 | 0.3438 | 0.4044 | 0.4716 | 0.5151 |
| 25 | 0.2653 | 0.3365 | 0.3961 | 0.4622 | 0.5052 |
| 26 | 0.2598 | 0.3297 | 0.3882 | 0.4534 | 0.4958 |
| 27 | 0.2546 | 0.3233 | 0.3809 | 0.4451 | 0.4869 |
| 28 | 0.2497 | 0.3172 | 0.3739 | 0.4372 | 0.4785 |

TABLE 9 CRITICAL VALUES OF THE PRODUCT MOMENT CORRELATION COEFFICIENT (CONTINUED)

| One tail Two tail n | 10% 20% | 5% 10% | 2.5% 5% | 1% 2% | 0.5% 1% |
|---------------------------|------------|-----------|------------|----------|------------|
| 29 | 0.2451 | 0.3115 | 0.3673 | 0.4297 | 0.4705 |
| 30 | 0.2407 | 0.3061 | 0.3610 | 0.4226 | 0.4629 |
| 31 | 0.2366 | 0.3009 | 0.3550 | 0.4158 | 0.4556 |
| 32 | 0.2327 | 0.2960 | 0.3494 | 0.4093 | 0.4487 |
| 33 | 0.2289 | 0.2913 | 0.3440 | 0.4032 | 0.4421 |
| 34 | 0.2254 | 0.2869 | 0.3388 | 0.3972 | 0.4357 |
| 35 | 0.2220 | 0.2826 | 0.3338 | 0.3916 | 0.4296 |
| 36 | 0.2187 | 0.2785 | 0.3291 | 0.3862 | 0.4238 |
| 37 | 0.2156 | 0.2746 | 0.3246 | 0.3810 | 0.4182 |
| 38 | 0.2126 | 0.2709 | 0.3202 | 0.3760 | 0.4128 |
| 39 | 0.2097 | 0.2673 | 0.3160 | 0.3712 | 0.4076 |
| 40 | 0.2070 | 0.2638 | 0.3120 | 0.3665 | 0.4026 |
| 41 | 0.2043 | 0.2605 | 0.3081 | 0.3621 | 0.3978 |
| 42 | 0.2018 | 0.2573 | 0.3044 | 0.3578 | 0.3932 |
| 43 | 0.1993 | 0.2542 | 0.3008 | 0.3536 | 0.3887 |
| 44 | 0.1970 | 0.2512 | 0.2973 | 0.3496 | 0.3843 |
| 45 | 0.1947 | 0.2483 | 0.2940 | 0.3457 | 0.3801 |
| 46 | 0.1925 | 0.2455 | 0.2907 | 0.3420 | 0.3761 |
| 47 | 0.1903 | 0.2429 | 0.2876 | 0.3384 | 0.3721 |
| 48 | 0.1883 | 0.2403 | 0.2845 | 0.3348 | 0.3683 |
| 49 | 0.1863 | 0.2377 | 0.2816 | 0.3314 | 0.3646 |
| 50 | 0.1843 | 0.2353 | 0.2787 | 0.3281 | 0.3610 |
| 60 | 0.1678 | 0.2144 | 0.2542 | 0.2997 | 0.3301 |
| 70 | 0.1550 | 0.1982 | 0.2352 | 0.2776 | 0.3060 |
| 80 | 0.1448 | 0.1852 | 0.2199 | 0.2597 | 0.2864 |
| 90 | 0.1364 | 0.1745 | 0.2072 | 0.2449 | 0.2702 |
| 100 | 0.1292 | 0.1654 | 0.1966 | 0.2324 | 0.2565 |

TABLE 10 CRITICAL VALUES OF THE SPEARMAN RANK CORRELATION COEFFICIENT

The table gives the critical values, for different significance levels, of the Spearman rank correlation coefficient r_s for various sample sizes n . It should be noted that, since r_s is discrete, exact significance levels cannot in general be achieved. The critical values given are those whose significance levels are nearest to the stated values.

| One tail Two tail n | 10% 20% | 5% 10% | 2.5% 5% | 1% 2% | 0.5% 1% |
|---------------------------|------------|-----------|------------|----------|------------|
| 4 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 5 | 0.7000 | 0.9000 | 0.9000 | 1.0000 | 1.0000 |
| 6 | 0.6571 | 0.7714 | 0.8286 | 0.9429 | 0.9429 |
| 7 | 0.5714 | 0.6786 | 0.7857 | 0.8571 | 0.8929 |
| 8 | 0.5476 | 0.6429 | 0.7381 | 0.8095 | 0.8571 |
| 9 | 0.4833 | 0.6000 | 0.6833 | 0.7667 | 0.8167 |
| 10 | 0.4424 | 0.5636 | 0.6485 | 0.7333 | 0.7818 |
| 11 | 0.4182 | 0.5273 | 0.6091 | 0.7000 | 0.7545 |
| 12 | 0.3986 | 0.5035 | 0.5874 | 0.6713 | 0.7273 |
| 13 | 0.3791 | 0.4780 | 0.5604 | 0.6484 | 0.6978 |
| 14 | 0.3670 | 0.4593 | 0.5385 | 0.6220 | 0.6747 |
| 15 | 0.3500 | 0.4429 | 0.5179 | 0.6000 | 0.6536 |
| 16 | 0.3382 | 0.4265 | 0.5029 | 0.5824 | 0.6324 |
| 17 | 0.3271 | 0.4124 | 0.4821 | 0.5577 | 0.6055 |
| 18 | 0.3170 | 0.4000 | 0.4683 | 0.5425 | 0.5897 |
| 19 | 0.3077 | 0.3887 | 0.4555 | 0.5285 | 0.5751 |
| 20 | 0.2992 | 0.3783 | 0.4438 | 0.5155 | 0.5614 |
| 21 | 0.2914 | 0.3687 | 0.4329 | 0.5034 | 0.5487 |
| 22 | 0.2841 | 0.3598 | 0.4227 | 0.4921 | 0.5368 |
| 23 | 0.2774 | 0.3515 | 0.4132 | 0.4815 | 0.5256 |
| 24 | 0.2711 | 0.3438 | 0.4044 | 0.4716 | 0.5151 |
| 25 | 0.2653 | 0.3365 | 0.3961 | 0.4622 | 0.5052 |
| 26 | 0.2598 | 0.3297 | 0.3882 | 0.4534 | 0.4958 |
| 27 | 0.2546 | 0.3233 | 0.3809 | 0.4451 | 0.4869 |

TABLE 10 CRITICAL VALUES OF THE SPEARMAN RANK CORRELATION COEFFICIENT (CONTINUED)

| One tail Two tail n | 10% 20% | 5% 10% | 2.5% 5% | 1% 2% | 0.5% 1% |
|---------------------------|------------|-----------|------------|----------|------------|
| 28 | 0.2497 | 0.3172 | 0.3739 | 0.4372 | 0.4785 |
| 29 | 0.2451 | 0.3115 | 0.3673 | 0.4297 | 0.4705 |
| 30 | 0.2407 | 0.3061 | 0.3610 | 0.4226 | 0.4629 |
| 31 | 0.2366 | 0.3009 | 0.3550 | 0.4158 | 0.4556 |
| 32 | 0.2327 | 0.2960 | 0.3494 | 0.4093 | 0.4487 |
| 33 | 0.2289 | 0.2913 | 0.3440 | 0.4032 | 0.4421 |
| 34 | 0.2254 | 0.2869 | 0.3388 | 0.3972 | 0.4357 |
| 35 | 0.2220 | 0.2826 | 0.3338 | 0.3916 | 0.4296 |
| 36 | 0.2187 | 0.2785 | 0.3291 | 0.3862 | 0.4238 |
| 37 | 0.2156 | 0.2746 | 0.3246 | 0.3810 | 0.4182 |
| 38 | 0.2126 | 0.2709 | 0.3202 | 0.3760 | 0.4128 |
| 39 | 0.2097 | 0.2673 | 0.3160 | 0.3712 | 0.4076 |
| 40 | 0.2070 | 0.2638 | 0.3120 | 0.3665 | 0.4026 |
| 41 | 0.2043 | 0.2605 | 0.3081 | 0.3621 | 0.3978 |
| 42 | 0.2018 | 0.2573 | 0.3044 | 0.3578 | 0.3932 |
| 43 | 0.1993 | 0.2542 | 0.3008 | 0.3536 | 0.3887 |
| 44 | 0.1970 | 0.2512 | 0.2973 | 0.3496 | 0.3843 |
| 45 | 0.1947 | 0.2483 | 0.2940 | 0.3457 | 0.3801 |
| 46 | 0.1925 | 0.2455 | 0.2907 | 0.3420 | 0.3761 |
| 47 | 0.1903 | 0.2429 | 0.2876 | 0.3384 | 0.3721 |
| 48 | 0.1883 | 0.2403 | 0.2845 | 0.3348 | 0.3683 |
| 49 | 0.1863 | 0.2377 | 0.2816 | 0.3314 | 0.3646 |
| 50 | 0.1843 | 0.2353 | 0.2787 | 0.3281 | 0.3610 |
| 60 | 0.1678 | 0.2144 | 0.2542 | 0.2997 | 0.3301 |
| 70 | 0.1550 | 0.1982 | 0.2352 | 0.2776 | 0.3060 |
| 80 | 0.1448 | 0.1852 | 0.2199 | 0.2597 | 0.2864 |
| 90 | 0.1364 | 0.1745 | 0.2072 | 0.2449 | 0.2702 |
| 100 | 0.1292 | 0.1654 | 0.1966 | 0.2324 | 0.2565 |

TABLE 11 THE FISHER z-TRANSFORMATION

The table gives the values of the function $z(r) = \tanh^{-1} r$.

For $r < 0$, the relationship $z(r) = -z(-r)$ may be used.

| r | .00 | .01 | .02 | .03 | .04 | .05 | .06 | .07 | .08 | .09 |
|----------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| 0.00 | 0.0000 | 0.0100 | 0.0200 | 0.0300 | 0.0400 | 0.0500 | 0.0601 | 0.0701 | 0.0802 | 0.0902 |
| 0.10 | 0.1003 | 0.1104 | 0.1206 | 0.1307 | 0.1409 | 0.1511 | 0.1614 | 0.1717 | 0.1820 | 0.1923 |
| 0.20 | 0.2027 | 0.2132 | 0.2237 | 0.2342 | 0.2448 | 0.2554 | 0.2661 | 0.2769 | 0.2877 | 0.2986 |
| 0.30 | 0.3095 | 0.3205 | 0.3316 | 0.3428 | 0.3541 | 0.3654 | 0.3769 | 0.3884 | 0.4001 | 0.4118 |
| 0.40 | 0.4236 | 0.4356 | 0.4477 | 0.4599 | 0.4722 | 0.4847 | 0.4973 | 0.5101 | 0.5230 | 0.5361 |
| 0.50 | 0.5493 | 0.5627 | 0.5763 | 0.5901 | 0.6042 | 0.6184 | 0.6328 | 0.6475 | 0.6625 | 0.6777 |
| 0.60 | 0.6931 | 0.7089 | 0.7250 | 0.7414 | 0.7582 | 0.7753 | 0.7928 | 0.8107 | 0.8291 | 0.8480 |
| 0.70 | 0.8673 | 0.8872 | 0.9076 | 0.9287 | 0.9505 | 0.9730 | 0.9962 | 1.0203 | 1.0454 | 1.0714 |
| 0.80 | 1.0986 | 1.1270 | 1.1568 | 1.1881 | 1.2212 | 1.2562 | 1.2933 | 1.3331 | 1.3758 | 1.4219 |

| r | .000 | .001 | .002 | .003 | .004 | .005 | .006 | .007 | .008 | .009 |
|----------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| 0.900 | 1.4722 | 1.4775 | 1.4828 | 1.4882 | 1.4937 | 1.4992 | 1.5047 | 1.5103 | 1.5160 | 1.5217 |
| 0.910 | 1.5275 | 1.5334 | 1.5393 | 1.5453 | 1.5513 | 1.5574 | 1.5636 | 1.5698 | 1.5762 | 1.5826 |
| 0.920 | 1.5890 | 1.5956 | 1.6022 | 1.6089 | 1.6157 | 1.6226 | 1.6296 | 1.6366 | 1.6438 | 1.6510 |
| 0.930 | 1.6584 | 1.6658 | 1.6734 | 1.6811 | 1.6888 | 1.6967 | 1.7047 | 1.7129 | 1.7211 | 1.7295 |
| 0.940 | 1.7380 | 1.7467 | 1.7555 | 1.7645 | 1.7736 | 1.7828 | 1.7923 | 1.8019 | 1.8117 | 1.8216 |
| 0.950 | 1.8318 | 1.8421 | 1.8527 | 1.8635 | 1.8745 | 1.8857 | 1.8972 | 1.9090 | 1.9210 | 1.9333 |
| 0.960 | 1.9459 | 1.9588 | 1.9721 | 1.9857 | 1.9996 | 2.0139 | 2.0287 | 2.0439 | 2.0595 | 2.0756 |
| 0.970 | 2.0923 | 2.1095 | 2.1273 | 2.1457 | 2.1649 | 2.1847 | 2.2054 | 2.2269 | 2.2494 | 2.2729 |
| 0.980 | 2.2976 | 2.3235 | 2.3507 | 2.3796 | 2.4101 | 2.4427 | 2.4774 | 2.5147 | 2.5550 | 2.5987 |
| 0.990 | 2.6467 | 2.6996 | 2.7587 | 2.8257 | 2.9031 | 2.9945 | 3.1063 | 3.2504 | 3.4534 | 3.8002 |

TABLE 12 THE INVERSE FISHER z-TRANSFORMATION

The table gives the values of the function $r(z) = \tanh z$.

For $z < 0$, the relationship $r(z) = -r(-z)$ may be used.

| z | .00 | .01 | .02 | .03 | .04 | .05 | .06 | .07 | .08 | .09 |
|----------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| 0.00 | 0.0000 | 0.0100 | 0.0200 | 0.0300 | 0.0400 | 0.0500 | 0.0599 | 0.0699 | 0.0798 | 0.0898 |
| 0.10 | 0.0997 | 0.1096 | 0.1194 | 0.1293 | 0.1391 | 0.1489 | 0.1586 | 0.1684 | 0.1781 | 0.1877 |
| 0.20 | 0.1974 | 0.2070 | 0.2165 | 0.2260 | 0.2355 | 0.2449 | 0.2543 | 0.2636 | 0.2729 | 0.2821 |
| 0.30 | 0.2913 | 0.3004 | 0.3095 | 0.3185 | 0.3275 | 0.3364 | 0.3452 | 0.3540 | 0.3627 | 0.3714 |
| 0.40 | 0.3799 | 0.3885 | 0.3969 | 0.4053 | 0.4136 | 0.4219 | 0.4301 | 0.4382 | 0.4462 | 0.4542 |
| 0.50 | 0.4621 | 0.4699 | 0.4777 | 0.4854 | 0.4930 | 0.5005 | 0.5080 | 0.5154 | 0.5227 | 0.5299 |
| 0.60 | 0.5370 | 0.5441 | 0.5511 | 0.5581 | 0.5649 | 0.5717 | 0.5784 | 0.5850 | 0.5915 | 0.5980 |
| 0.70 | 0.6044 | 0.6107 | 0.6169 | 0.6231 | 0.6291 | 0.6351 | 0.6411 | 0.6469 | 0.6527 | 0.6584 |
| 0.80 | 0.6640 | 0.6696 | 0.6751 | 0.6805 | 0.6858 | 0.6911 | 0.6963 | 0.7014 | 0.7064 | 0.7114 |
| 0.90 | 0.7163 | 0.7211 | 0.7259 | 0.7306 | 0.7352 | 0.7398 | 0.7443 | 0.7487 | 0.7531 | 0.7574 |
| 1.00 | 0.7616 | 0.7658 | 0.7699 | 0.7739 | 0.7779 | 0.7818 | 0.7857 | 0.7895 | 0.7932 | 0.7969 |
| 1.10 | 0.8005 | 0.8041 | 0.8076 | 0.8110 | 0.8144 | 0.8178 | 0.8210 | 0.8243 | 0.8275 | 0.8306 |
| 1.20 | 0.8337 | 0.8367 | 0.8397 | 0.8426 | 0.8455 | 0.8483 | 0.8511 | 0.8538 | 0.8565 | 0.8591 |
| 1.30 | 0.8617 | 0.8643 | 0.8668 | 0.8692 | 0.8717 | 0.8741 | 0.8764 | 0.8787 | 0.8810 | 0.8832 |
| 1.40 | 0.8854 | 0.8875 | 0.8896 | 0.8917 | 0.8937 | 0.8957 | 0.8977 | 0.8996 | 0.9015 | 0.9033 |
| 1.50 | 0.9051 | 0.9069 | 0.9087 | 0.9104 | 0.9121 | 0.9138 | 0.9154 | 0.9170 | 0.9186 | 0.9201 |
| 1.60 | 0.9217 | 0.9232 | 0.9246 | 0.9261 | 0.9275 | 0.9289 | 0.9302 | 0.9316 | 0.9329 | 0.9341 |
| 1.70 | 0.9354 | 0.9366 | 0.9379 | 0.9391 | 0.9402 | 0.9414 | 0.9425 | 0.9436 | 0.9447 | 0.9458 |
| 1.80 | 0.9468 | 0.9478 | 0.9488 | 0.9498 | 0.9508 | 0.9517 | 0.9527 | 0.9536 | 0.9545 | 0.9554 |
| 1.90 | 0.9562 | 0.9571 | 0.9579 | 0.9587 | 0.9595 | 0.9603 | 0.9611 | 0.9618 | 0.9626 | 0.9633 |
| 2.00 | 0.9640 | 0.9647 | 0.9654 | 0.9661 | 0.9667 | 0.9674 | 0.9680 | 0.9687 | 0.9693 | 0.9699 |

TABLE 12 THE INVERSE FISHER z-TRANSFORMATION (CONTINUED)

| z | .00 | .01 | .02 | .03 | .04 | .05 | .06 | .07 | .08 | .09 |
|----------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| 2.10 | 0.9705 | 0.9710 | 0.9716 | 0.9721 | 0.9727 | 0.9732 | 0.9737 | 0.9743 | 0.9748 | 0.9753 |
| 2.20 | 0.9757 | 0.9762 | 0.9767 | 0.9771 | 0.9776 | 0.9780 | 0.9785 | 0.9789 | 0.9793 | 0.9797 |
| 2.30 | 0.9801 | 0.9805 | 0.9809 | 0.9812 | 0.9816 | 0.9820 | 0.9823 | 0.9827 | 0.9830 | 0.9833 |
| 2.40 | 0.9837 | 0.9840 | 0.9843 | 0.9846 | 0.9849 | 0.9852 | 0.9855 | 0.9858 | 0.9861 | 0.9863 |
| 2.50 | 0.9866 | 0.9869 | 0.9871 | 0.9874 | 0.9876 | 0.9879 | 0.9881 | 0.9884 | 0.9886 | 0.9888 |
| 2.60 | 0.9890 | 0.9892 | 0.9895 | 0.9897 | 0.9899 | 0.9901 | 0.9903 | 0.9905 | 0.9906 | 0.9908 |
| 2.70 | 0.9910 | 0.9912 | 0.9914 | 0.9915 | 0.9917 | 0.9919 | 0.9920 | 0.9922 | 0.9923 | 0.9925 |
| 2.80 | 0.9926 | 0.9928 | 0.9929 | 0.9931 | 0.9932 | 0.9933 | 0.9935 | 0.9936 | 0.9937 | 0.9938 |
| 2.90 | 0.9940 | 0.9941 | 0.9942 | 0.9943 | 0.9944 | 0.9945 | 0.9946 | 0.9947 | 0.9949 | 0.9950 |
| 3.00 | 0.9951 | 0.9952 | 0.9952 | 0.9953 | 0.9954 | 0.9955 | 0.9956 | 0.9957 | 0.9958 | 0.9959 |
| 3.10 | 0.9959 | 0.9960 | 0.9961 | 0.9962 | 0.9963 | 0.9963 | 0.9964 | 0.9965 | 0.9965 | 0.9966 |
| 3.20 | 0.9967 | 0.9967 | 0.9968 | 0.9969 | 0.9969 | 0.9970 | 0.9971 | 0.9971 | 0.9972 | 0.9972 |
| 3.30 | 0.9973 | 0.9973 | 0.9974 | 0.9974 | 0.9975 | 0.9975 | 0.9976 | 0.9976 | 0.9977 | 0.9977 |
| 3.40 | 0.9978 | 0.9978 | 0.9979 | 0.9979 | 0.9979 | 0.9980 | 0.9980 | 0.9981 | 0.9981 | 0.9981 |
| 3.50 | 0.9982 | 0.9982 | 0.9982 | 0.9983 | 0.9983 | 0.9984 | 0.9984 | 0.9984 | 0.9984 | 0.9985 |
| 3.60 | 0.9985 | 0.9985 | 0.9986 | 0.9986 | 0.9986 | 0.9986 | 0.9987 | 0.9987 | 0.9987 | 0.9988 |
| 3.70 | 0.9988 | 0.9988 | 0.9988 | 0.9988 | 0.9989 | 0.9989 | 0.9989 | 0.9989 | 0.9990 | 0.9990 |
| 3.80 | 0.9990 | 0.9990 | 0.9990 | 0.9991 | 0.9991 | 0.9991 | 0.9991 | 0.9991 | 0.9991 | 0.9992 |
| 3.90 | 0.9992 | 0.9992 | 0.9992 | 0.9992 | 0.9992 | 0.9993 | 0.9993 | 0.9993 | 0.9993 | 0.9993 |

TABLE 13 CRITICAL VALUES OF THE WILCOXON SIGNED RANK STATISTIC

The table gives the upper tail critical values w_c of the statistic

$$W = \sum_{i=1}^n U_i R_i$$

where R_i denotes the rank of the magnitude of the i th. observation in a sample of size n and $U_i = 1$ or 0 according as to whether this observation is positive or negative. The lower tail critical values are given by $\frac{1}{2}n(n+1) - w_c$. Since W is discrete, exact significance levels cannot in general be achieved. The critical values given are those whose significance levels are nearest to those stated.

| One tail | 10% | 5% | 2.5% | 1% | 0.5% |
|----------|-----|-----|------|----|------|
| Two tail | 20% | 10% | 5% | 2% | 1% |
| n | | | | | |
| 3 | 6 | | | | |
| 4 | 9 | 10 | | | |
| 5 | 13 | 14 | 15 | | |
| 6 | 17 | 19 | 20 | 21 | |
| 7 | 22 | 24 | 26 | 28 | 28 |
| 8 | 28 | 30 | 32 | 34 | 36 |
| 9 | 34 | 37 | 39 | 42 | 43 |
| 10 | 41 | 44 | 47 | 50 | 52 |
| 11 | 48 | 52 | 55 | 59 | 61 |
| 12 | 56 | 61 | 64 | 68 | 71 |
| 13 | 65 | 70 | 74 | 78 | 81 |
| 14 | 74 | 79 | 84 | 89 | 92 |

TABLE 13 CRITICAL VALUES OF THE WILCOXON SIGNED RANK STATISTIC (CONTINUED)

| One tail | 10% | 5% | 2.5% | 1% | 0.5% |
|-----------------|------------|------------|-------------|-----------|-------------|
| Two tail | 20% | 10% | 5% | 2% | 1% |
| n | | | | | |
| 15 | 83 | 90 | 95 | 100 | 104 |
| 16 | 94 | 100 | 106 | 112 | 117 |
| 17 | 104 | 112 | 118 | 125 | 130 |
| 18 | 116 | 124 | 131 | 138 | 143 |
| 19 | 128 | 136 | 144 | 152 | 158 |
| 20 | 140 | 150 | 158 | 167 | 173 |
| 21 | 153 | 163 | 172 | 182 | 188 |
| 22 | 167 | 178 | 187 | 197 | 204 |
| 23 | 181 | 193 | 203 | 214 | 221 |
| 24 | 196 | 208 | 219 | 231 | 239 |
| 25 | 211 | 224 | 235 | 248 | 257 |
| 26 | 227 | 241 | 253 | 266 | 275 |
| 27 | 243 | 258 | 271 | 285 | 294 |
| 28 | 260 | 276 | 289 | 304 | 314 |
| 29 | 278 | 294 | 308 | 324 | 335 |
| 30 | 296 | 313 | 328 | 345 | 356 |
| 32 | 333 | 353 | 369 | 387 | 400 |
| 34 | 373 | 394 | 412 | 433 | 446 |
| 36 | 416 | 438 | 458 | 480 | 495 |
| 38 | 460 | 485 | 506 | 530 | 546 |
| 40 | 506 | 533 | 556 | 582 | 599 |
| 45 | 632 | 664 | 691 | 722 | 743 |
| 50 | 771 | 809 | 841 | 877 | 902 |

TABLE 14 CRITICAL VALUES OF THE MANN-WHITNEY STATISTIC

The table gives the upper tail critical values u_c of the statistic

$$U = \sum_{i=1}^m \sum_{j=1}^n z_{ij}$$

where $Z_{ij}=1$ if $X_i < Y_j$ and $Z_{ij}=0$ if $X_i > Y_j$ given the independent samples X_1, X_2, \dots, X_m and Y_1, Y_2, \dots, Y_n . The lower tail values are given by $mn - u_c$.

TABLE 14 CRITICAL VALUES OF THE MANN-WHITNEY STATISTIC (CONTINUED)

One tail 0.5% Two tail 1%

| n \ m | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
|--------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 45 | 47 | 49 | 51 | 53 | 55 | 57 | 59 | |
| 3 | | | | | | | 21 | 24 | 27 | 30 | 32 | 35 | 38 | 40 | 43 | 46 | 48 | 51 | 54 | 57 | 59 | 62 | 65 | 67 | 70 | 73 | 75 | 78 | 81 | 83 |
| 4 | | | | | 20 | 24 | 27 | 31 | 34 | 38 | 41 | 45 | 48 | 51 | 55 | 58 | 62 | 65 | 69 | 72 | 75 | 79 | 82 | 86 | 89 | 93 | 96 | 99 | 103 | 106 |
| 5 | | | | 20 | 25 | 29 | 33 | 37 | 41 | 46 | 50 | 54 | 58 | 62 | 66 | 70 | 74 | 79 | 83 | 87 | 91 | 95 | 99 | 103 | 107 | 112 | 116 | 120 | 124 | 128 |
| 6 | | | | 24 | 29 | 34 | 39 | 44 | 48 | 53 | 58 | 63 | 68 | 73 | 77 | 82 | 87 | 92 | 97 | 101 | 106 | 111 | 116 | 120 | 125 | 130 | 135 | 140 | 144 | 149 |
| 7 | | | 21 | 27 | 33 | 39 | 44 | 50 | 55 | 61 | 66 | 72 | 77 | 83 | 88 | 94 | 99 | 105 | 110 | 116 | 121 | 127 | 132 | 137 | 143 | 148 | 154 | 159 | 165 | 170 |
| 8 | | | 24 | 31 | 37 | 44 | 50 | 56 | 62 | 69 | 75 | 81 | 87 | 93 | 99 | 105 | 111 | 118 | 124 | 130 | 136 | 142 | 148 | 154 | 160 | 166 | 172 | 178 | 185 | 191 |
| 9 | | | 27 | 34 | 41 | 48 | 55 | 62 | 69 | 76 | 83 | 90 | 97 | 103 | 110 | 117 | 124 | 130 | 137 | 144 | 151 | 157 | 164 | 171 | 177 | 184 | 191 | 198 | 204 | 211 |
| 10 | | | 30 | 38 | 46 | 53 | 61 | 69 | 76 | 84 | 91 | 99 | 106 | 113 | 121 | 128 | 136 | 143 | 150 | 158 | 165 | 172 | 180 | 187 | 195 | 202 | 209 | 217 | 224 | 231 |
| 11 | | | 32 | 41 | 50 | 58 | 66 | 75 | 83 | 91 | 99 | 107 | 115 | 123 | 131 | 140 | 148 | 156 | 164 | 172 | 180 | 188 | 196 | 204 | 212 | 220 | 227 | 235 | 243 | 251 |
| 12 | | | 35 | 45 | 54 | 63 | 72 | 81 | 90 | 99 | 107 | 116 | 125 | 133 | 142 | 151 | 159 | 168 | 177 | 185 | 194 | 203 | 211 | 220 | 228 | 237 | 246 | 254 | 263 | 271 |
| 13 | | 26 | 38 | 48 | 58 | 68 | 77 | 87 | 97 | 106 | 115 | 125 | 134 | 143 | 153 | 162 | 171 | 181 | 190 | 199 | 208 | 218 | 227 | 236 | 245 | 254 | 264 | 273 | 282 | 291 |
| 14 | | 28 | 40 | 51 | 62 | 73 | 83 | 93 | 103 | 113 | 123 | 133 | 143 | 153 | 163 | 173 | 183 | 193 | 203 | 213 | 223 | 233 | 242 | 252 | 262 | 272 | 282 | 292 | 301 | 311 |
| 15 | | 30 | 43 | 55 | 66 | 77 | 88 | 99 | 110 | 121 | 131 | 142 | 153 | 163 | 174 | 184 | 195 | 206 | 216 | 226 | 237 | 247 | 258 | 268 | 279 | 289 | 300 | 310 | 320 | 331 |
| 16 | | 32 | 46 | 58 | 70 | 82 | 94 | 105 | 117 | 128 | 140 | 151 | 162 | 173 | 184 | 196 | 207 | 218 | 229 | 240 | 251 | 262 | 273 | 284 | 295 | 307 | 318 | 329 | 340 | 351 |
| 17 | | 34 | 48 | 62 | 74 | 87 | 99 | 111 | 124 | 136 | 148 | 159 | 171 | 183 | 195 | 207 | 219 | 230 | 242 | 254 | 265 | 277 | 289 | 300 | 312 | 324 | 335 | 347 | 359 | 370 |
| 18 | | 36 | 51 | 65 | 79 | 92 | 105 | 118 | 130 | 143 | 156 | 168 | 181 | 193 | 206 | 218 | 230 | 243 | 255 | 267 | 280 | 292 | 304 | 316 | 329 | 341 | 353 | 365 | 378 | 390 |
| 19 | | 38 | 54 | 69 | 83 | 97 | 110 | 124 | 137 | 150 | 164 | 177 | 190 | 203 | 216 | 229 | 242 | 255 | 268 | 281 | 294 | 307 | 320 | 332 | 345 | 358 | 371 | 384 | 397 | 409 |
| 20 | | 40 | 57 | 72 | 87 | 101 | 116 | 130 | 144 | 158 | 172 | 185 | 199 | 213 | 226 | 240 | 254 | 267 | 281 | 294 | 308 | 321 | 335 | 348 | 362 | 375 | 389 | 402 | 416 | 429 |
| 21 | | 42 | 59 | 75 | 91 | 106 | 121 | 136 | 151 | 165 | 180 | 194 | 208 | 223 | 237 | 251 | 265 | 280 | 294 | 308 | 322 | 336 | 350 | 364 | 378 | 392 | 406 | 420 | 435 | 449 |
| 22 | | 44 | 62 | 79 | 95 | 111 | 127 | 142 | 157 | 172 | 188 | 203 | 218 | 233 | 247 | 262 | 277 | 292 | 307 | 321 | 336 | 351 | 366 | 380 | 395 | 410 | 424 | 439 | 453 | 468 |
| 23 | | 45 | 65 | 82 | 99 | 116 | 132 | 148 | 164 | 180 | 196 | 211 | 227 | 242 | 258 | 273 | 289 | 304 | 320 | 335 | 350 | 366 | 381 | 396 | 411 | 427 | 442 | 457 | 472 | 487 |
| 24 | | 47 | 67 | 86 | 103 | 120 | 137 | 154 | 171 | 187 | 204 | 220 | 236 | 252 | 268 | 284 | 300 | 316 | 332 | 348 | 364 | 380 | 396 | 412 | 428 | 444 | 459 | 475 | 491 | 507 |
| 25 | | 49 | 70 | 89 | 107 | 125 | 143 | 160 | 177 | 195 | 212 | 228 | 245 | 262 | 279 | 295 | 312 | 329 | 345 | 362 | 378 | 395 | 411 | 428 | 444 | 461 | 477 | 494 | 510 | 526 |
| 26 | | 51 | 73 | 93 | 112 | 130 | 148 | 166 | 184 | 202 | 220 | 237 | 254 | 272 | 289 | 307 | 324 | 341 | 358 | 375 | 392 | 410 | 427 | 444 | 461 | 478 | 495 | 512 | 529 | 546 |
| 27 | | 53 | 75 | 96 | 116 | 135 | 154 | 172 | 191 | 209 | 227 | 246 | 264 | 282 | 300 | 318 | 335 | 353 | 371 | 389 | 406 | 424 | 442 | 459 | 477 | 495 | 512 | 530 | 548 | 565 |
| 28 | | 55 | 78 | 99 | 120 | 140 | 159 | 178 | 198 | 217 | 235 | 254 | 273 | 292 | 310 | 329 | 347 | 365 | 384 | 402 | 420 | 439 | 457 | 475 | 494 | 512 | 530 | 548 | 566 | 584 |
| 29 | | 57 | 81 | 103 | 124 | 144 | 165 | 185 | 204 | 224 | 243 | 263 | 282 | 301 | 320 | 340 | 359 | 378 | 397 | 416 | 435 | 453 | 472 | 491 | 510 | 529 | 548 | 566 | 585 | 604 |
| 30 | | 59 | 83 | 106 | 128 | 149 | 170 | 191 | 211 | 231 | 251 | 271 | 291 | 311 | 331 | 351 | 370 | 390 | 409 | 429 | 449 | 468 | 487 | 507 | 526 | 546 | 565 | 584 | 604 | 623 |

TABLE 14 CRITICAL VALUES OF THE MANN-WHITNEY STATISTIC (CONTINUED)

| | | One tail 1% | | | | | | | | | | | | | | Two tail 2% | | | | | | | | | | | | | | |
|-------|---|-------------|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| m \ n | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | | | | | | | | | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 31 | 33 | 35 | 37 | 39 | 41 | 43 | 44 | 46 | 48 | 50 | 52 | 54 | 56 | 58 |
| 3 | | | | | 15 | 18 | 21 | 23 | 26 | 29 | 31 | 34 | 36 | 39 | 42 | 44 | 47 | 50 | 52 | 55 | 57 | 60 | 63 | 65 | 68 | 70 | 73 | 76 | 78 | 81 |
| 4 | | | | 16 | 20 | 23 | 26 | 30 | 33 | 36 | 40 | 43 | 46 | 50 | 53 | 56 | 60 | 63 | 66 | 70 | 73 | 76 | 79 | 83 | 86 | 89 | 93 | 96 | 99 | 103 |
| 5 | | | 15 | 20 | 24 | 28 | 32 | 36 | 40 | 44 | 48 | 52 | 56 | 60 | 64 | 68 | 72 | 76 | 80 | 84 | 88 | 92 | 96 | 100 | 104 | 108 | 112 | 116 | 120 | 124 |
| 6 | | | 18 | 23 | 28 | 33 | 37 | 42 | 47 | 51 | 56 | 61 | 65 | 70 | 75 | 79 | 84 | 89 | 93 | 98 | 102 | 107 | 112 | 116 | 121 | 126 | 130 | 135 | 139 | 144 |
| 7 | | | 21 | 26 | 32 | 37 | 43 | 48 | 53 | 59 | 64 | 69 | 75 | 80 | 85 | 91 | 96 | 101 | 106 | 112 | 117 | 122 | 128 | 133 | 138 | 143 | 149 | 154 | 159 | 164 |
| 8 | | | 23 | 30 | 36 | 42 | 48 | 54 | 60 | 66 | 72 | 78 | 84 | 90 | 96 | 102 | 108 | 114 | 120 | 125 | 131 | 137 | 143 | 149 | 155 | 161 | 167 | 173 | 178 | 184 |
| 9 | | 18 | 26 | 33 | 40 | 47 | 53 | 60 | 67 | 73 | 80 | 87 | 93 | 100 | 106 | 113 | 119 | 126 | 133 | 139 | 146 | 152 | 159 | 165 | 172 | 178 | 185 | 191 | 198 | 204 |
| 10 | | 20 | 29 | 36 | 44 | 51 | 59 | 66 | 73 | 81 | 88 | 95 | 102 | 110 | 117 | 124 | 131 | 138 | 145 | 153 | 160 | 167 | 174 | 181 | 188 | 195 | 203 | 210 | 217 | 224 |
| 11 | | 22 | 31 | 40 | 48 | 56 | 64 | 72 | 80 | 88 | 96 | 104 | 112 | 119 | 127 | 135 | 143 | 151 | 158 | 166 | 174 | 182 | 189 | 197 | 205 | 213 | 220 | 228 | 236 | 244 |
| 12 | | 24 | 34 | 43 | 52 | 61 | 69 | 78 | 87 | 95 | 104 | 112 | 121 | 129 | 138 | 146 | 154 | 163 | 171 | 180 | 188 | 196 | 205 | 213 | 221 | 230 | 238 | 246 | 255 | 263 |
| 13 | | 26 | 36 | 46 | 56 | 65 | 75 | 84 | 93 | 102 | 112 | 121 | 130 | 139 | 148 | 157 | 166 | 175 | 184 | 193 | 202 | 211 | 220 | 229 | 238 | 247 | 256 | 265 | 274 | 283 |
| 14 | | 28 | 39 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 119 | 129 | 139 | 148 | 158 | 168 | 177 | 187 | 197 | 206 | 216 | 225 | 235 | 245 | 254 | 264 | 273 | 283 | 292 | 302 |
| 15 | | 30 | 42 | 53 | 64 | 75 | 85 | 96 | 106 | 117 | 127 | 138 | 148 | 158 | 168 | 179 | 189 | 199 | 209 | 220 | 230 | 240 | 250 | 260 | 270 | 281 | 291 | 301 | 311 | 321 |
| 16 | | 31 | 44 | 56 | 68 | 79 | 91 | 102 | 113 | 124 | 135 | 146 | 157 | 168 | 179 | 190 | 200 | 211 | 222 | 233 | 244 | 254 | 265 | 276 | 287 | 297 | 308 | 319 | 330 | 340 |
| 17 | | 33 | 47 | 60 | 72 | 84 | 96 | 108 | 119 | 131 | 143 | 154 | 166 | 177 | 189 | 200 | 212 | 223 | 235 | 246 | 257 | 269 | 280 | 292 | 303 | 314 | 326 | 337 | 348 | 360 |
| 18 | | 35 | 50 | 63 | 76 | 89 | 101 | 114 | 126 | 138 | 151 | 163 | 175 | 187 | 199 | 211 | 223 | 235 | 247 | 259 | 271 | 283 | 295 | 307 | 319 | 331 | 343 | 355 | 367 | 379 |
| 19 | | 37 | 52 | 66 | 80 | 93 | 106 | 120 | 133 | 145 | 158 | 171 | 184 | 197 | 209 | 222 | 235 | 247 | 260 | 273 | 285 | 298 | 310 | 323 | 335 | 348 | 360 | 373 | 385 | 398 |
| 20 | | 39 | 55 | 70 | 84 | 98 | 112 | 125 | 139 | 153 | 166 | 180 | 193 | 206 | 220 | 233 | 246 | 259 | 273 | 286 | 299 | 312 | 325 | 338 | 351 | 365 | 378 | 391 | 404 | 417 |
| 21 | | 41 | 57 | 73 | 88 | 102 | 117 | 131 | 146 | 160 | 174 | 188 | 202 | 216 | 230 | 244 | 257 | 271 | 285 | 299 | 313 | 326 | 340 | 354 | 368 | 381 | 395 | 409 | 422 | 436 |
| 22 | | 43 | 60 | 76 | 92 | 107 | 122 | 137 | 152 | 167 | 182 | 196 | 211 | 225 | 240 | 254 | 269 | 283 | 298 | 312 | 326 | 341 | 355 | 369 | 384 | 398 | 412 | 427 | 441 | 455 |
| 23 | | 44 | 63 | 79 | 96 | 112 | 128 | 143 | 159 | 174 | 189 | 205 | 220 | 235 | 250 | 265 | 280 | 295 | 310 | 325 | 340 | 355 | 370 | 385 | 400 | 415 | 430 | 444 | 459 | 474 |
| 24 | | 46 | 65 | 83 | 100 | 116 | 133 | 149 | 165 | 181 | 197 | 213 | 229 | 245 | 260 | 276 | 292 | 307 | 323 | 338 | 354 | 369 | 385 | 400 | 416 | 431 | 447 | 462 | 478 | 493 |
| 25 | | 48 | 68 | 86 | 104 | 121 | 138 | 155 | 172 | 188 | 205 | 221 | 238 | 254 | 270 | 287 | 303 | 319 | 335 | 351 | 368 | 384 | 400 | 416 | 432 | 448 | 464 | 480 | 496 | 512 |
| 26 | | 50 | 70 | 89 | 108 | 126 | 143 | 161 | 178 | 195 | 213 | 230 | 247 | 264 | 281 | 297 | 314 | 331 | 348 | 365 | 381 | 398 | 415 | 431 | 448 | 465 | 481 | 498 | 515 | 531 |
| 27 | | 52 | 73 | 93 | 112 | 130 | 149 | 167 | 185 | 203 | 220 | 238 | 256 | 273 | 291 | 308 | 326 | 343 | 360 | 378 | 395 | 412 | 430 | 447 | 464 | 481 | 499 | 516 | 533 | 550 |
| 28 | | 54 | 76 | 96 | 116 | 135 | 154 | 173 | 191 | 210 | 228 | 246 | 265 | 283 | 301 | 319 | 337 | 355 | 373 | 391 | 409 | 427 | 444 | 462 | 480 | 498 | 516 | 534 | 551 | 569 |
| 29 | | 56 | 78 | 99 | 120 | 139 | 159 | 178 | 198 | 217 | 236 | 255 | 274 | 292 | 311 | 330 | 348 | 367 | 385 | 404 | 422 | 441 | 459 | 478 | 496 | 515 | 533 | 551 | 570 | 588 |
| 30 | | 58 | 81 | 103 | 124 | 144 | 164 | 184 | 204 | 224 | 244 | 263 | 283 | 302 | 321 | 340 | 360 | 379 | 398 | 417 | 436 | 455 | 474 | 493 | 512 | 531 | 550 | 569 | 588 | 607 |

TABLE 14 CRITICAL VALUES OF THE MANN-WHITNEY STATISTIC (CONTINUED)

Since U is discrete, exact significance levels cannot in general be achieved.

The critical values given are those whose significance levels are nearest to those stated.

TABLE 14 CRITICAL VALUES OF THE MANN-WHITNEY STATISTIC (CONTINUED)

| | | One tail 2.5% | | | | | | | | | | | | | Two tail 5% | | | | | | | | | | | | | | | |
|-------|----|---------------|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| m \ n | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 1 | | | | | | | | | | | | | | | | | | | | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 2 | | | | | 10 | 12 | 14 | 16 | 18 | 19 | 21 | 23 | 25 | 26 | 28 | 30 | 32 | 34 | 35 | 37 | 39 | 41 | 42 | 44 | 46 | 48 | 50 | 51 | 53 | 55 |
| 3 | | | | 12 | 15 | 17 | 19 | 22 | 24 | 27 | 29 | 32 | 34 | 37 | 39 | 42 | 44 | 47 | 49 | 52 | 54 | 57 | 59 | 62 | 64 | 67 | 69 | 72 | 74 | 76 |
| 4 | | | 12 | 15 | 18 | 22 | 25 | 28 | 31 | 34 | 37 | 40 | 44 | 47 | 50 | 53 | 56 | 59 | 62 | 66 | 69 | 72 | 75 | 78 | 81 | 84 | 87 | 91 | 94 | 97 |
| 5 | | 10 | 15 | 18 | 22 | 26 | 30 | 34 | 38 | 41 | 45 | 49 | 53 | 56 | 60 | 64 | 68 | 72 | 75 | 79 | 83 | 87 | 90 | 94 | 98 | 102 | 105 | 109 | 113 | 117 |
| 6 | | 12 | 17 | 22 | 26 | 31 | 35 | 40 | 44 | 48 | 53 | 57 | 62 | 66 | 70 | 75 | 79 | 84 | 88 | 92 | 97 | 101 | 106 | 110 | 114 | 119 | 123 | 128 | 132 | 136 |
| 7 | | 14 | 19 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 66 | 71 | 76 | 81 | 86 | 91 | 96 | 101 | 106 | 111 | 116 | 121 | 126 | 131 | 136 | 141 | 146 | 151 | 156 |
| 8 | | 16 | 22 | 28 | 34 | 40 | 45 | 51 | 57 | 62 | 68 | 74 | 79 | 85 | 91 | 96 | 102 | 108 | 113 | 119 | 124 | 130 | 136 | 141 | 147 | 152 | 158 | 164 | 169 | 175 |
| 9 | | 18 | 24 | 31 | 38 | 44 | 50 | 57 | 63 | 69 | 76 | 82 | 88 | 94 | 101 | 107 | 113 | 119 | 126 | 132 | 138 | 144 | 151 | 157 | 163 | 169 | 175 | 182 | 188 | 194 |
| 10 | | 19 | 27 | 34 | 41 | 48 | 55 | 62 | 69 | 76 | 83 | 90 | 97 | 104 | 111 | 117 | 124 | 131 | 138 | 145 | 152 | 158 | 165 | 172 | 179 | 186 | 193 | 199 | 206 | 213 |
| 11 | | 21 | 29 | 37 | 45 | 53 | 60 | 68 | 76 | 83 | 91 | 98 | 106 | 113 | 121 | 128 | 135 | 143 | 150 | 158 | 165 | 173 | 180 | 187 | 195 | 202 | 210 | 217 | 224 | 232 |
| 12 | | 23 | 32 | 40 | 49 | 57 | 66 | 74 | 82 | 90 | 98 | 106 | 114 | 122 | 130 | 139 | 147 | 155 | 163 | 171 | 179 | 187 | 195 | 203 | 211 | 219 | 227 | 235 | 243 | 251 |
| 13 | | 25 | 34 | 44 | 53 | 62 | 71 | 79 | 88 | 97 | 106 | 114 | 123 | 132 | 140 | 149 | 158 | 166 | 175 | 183 | 192 | 201 | 209 | 218 | 226 | 235 | 244 | 252 | 261 | 269 |
| 14 | | 26 | 37 | 47 | 56 | 66 | 76 | 85 | 94 | 104 | 113 | 122 | 132 | 141 | 150 | 159 | 169 | 178 | 187 | 196 | 205 | 215 | 224 | 233 | 242 | 251 | 261 | 270 | 279 | 288 |
| 15 | | 28 | 39 | 50 | 60 | 70 | 81 | 91 | 101 | 111 | 121 | 130 | 140 | 150 | 160 | 170 | 180 | 189 | 199 | 209 | 219 | 229 | 238 | 248 | 258 | 268 | 277 | 287 | 297 | 307 |
| 16 | | 30 | 42 | 53 | 64 | 75 | 86 | 96 | 107 | 117 | 128 | 139 | 149 | 159 | 170 | 180 | 191 | 201 | 211 | 222 | 232 | 243 | 253 | 263 | 274 | 284 | 294 | 305 | 315 | 325 |
| 17 | | 32 | 44 | 56 | 68 | 79 | 91 | 102 | 113 | 124 | 135 | 147 | 158 | 169 | 180 | 191 | 202 | 213 | 224 | 235 | 246 | 256 | 267 | 278 | 289 | 300 | 311 | 322 | 333 | 344 |
| 18 | | 34 | 47 | 59 | 72 | 84 | 96 | 108 | 119 | 131 | 143 | 155 | 166 | 178 | 189 | 201 | 213 | 224 | 236 | 247 | 259 | 270 | 282 | 293 | 305 | 316 | 328 | 339 | 351 | 362 |
| 19 | | 35 | 49 | 62 | 75 | 88 | 101 | 113 | 126 | 138 | 150 | 163 | 175 | 187 | 199 | 211 | 224 | 236 | 248 | 260 | 272 | 284 | 296 | 308 | 320 | 333 | 345 | 357 | 369 | 381 |
| 20 | 20 | 37 | 52 | 66 | 79 | 92 | 106 | 119 | 132 | 145 | 158 | 171 | 183 | 196 | 209 | 222 | 235 | 247 | 260 | 273 | 285 | 298 | 311 | 323 | 336 | 349 | 361 | 374 | 387 | 399 |
| 21 | 21 | 39 | 54 | 69 | 83 | 97 | 111 | 124 | 138 | 152 | 165 | 179 | 192 | 205 | 219 | 232 | 246 | 259 | 272 | 285 | 299 | 312 | 325 | 338 | 352 | 365 | 378 | 391 | 404 | 418 |
| 22 | 22 | 41 | 57 | 72 | 87 | 101 | 116 | 130 | 144 | 158 | 173 | 187 | 201 | 215 | 229 | 243 | 256 | 270 | 284 | 298 | 312 | 326 | 340 | 353 | 367 | 381 | 395 | 409 | 422 | 436 |
| 23 | 23 | 42 | 59 | 75 | 90 | 106 | 121 | 136 | 151 | 165 | 180 | 195 | 209 | 224 | 238 | 253 | 267 | 282 | 296 | 311 | 325 | 340 | 354 | 368 | 383 | 397 | 411 | 426 | 440 | 454 |
| 24 | 24 | 44 | 62 | 78 | 94 | 110 | 126 | 141 | 157 | 172 | 187 | 203 | 218 | 233 | 248 | 263 | 278 | 293 | 308 | 323 | 338 | 353 | 368 | 383 | 398 | 413 | 428 | 443 | 458 | 473 |
| 25 | 25 | 46 | 64 | 81 | 98 | 114 | 131 | 147 | 163 | 179 | 195 | 211 | 226 | 242 | 258 | 274 | 289 | 305 | 320 | 336 | 352 | 367 | 383 | 398 | 414 | 429 | 445 | 460 | 476 | 491 |
| 26 | 26 | 48 | 67 | 84 | 102 | 119 | 136 | 152 | 169 | 186 | 202 | 219 | 235 | 251 | 268 | 284 | 300 | 316 | 333 | 349 | 365 | 381 | 397 | 413 | 429 | 445 | 461 | 477 | 493 | 510 |
| 27 | 27 | 50 | 69 | 87 | 105 | 123 | 141 | 158 | 175 | 193 | 210 | 227 | 244 | 261 | 277 | 294 | 311 | 328 | 345 | 361 | 378 | 395 | 411 | 428 | 445 | 461 | 478 | 495 | 511 | 528 |
| 28 | 28 | 51 | 72 | 91 | 109 | 128 | 146 | 164 | 182 | 199 | 217 | 235 | 252 | 270 | 287 | 305 | 322 | 339 | 357 | 374 | 391 | 409 | 426 | 443 | 460 | 477 | 495 | 512 | 529 | 546 |
| 29 | 29 | 53 | 74 | 94 | 113 | 132 | 151 | 169 | 188 | 206 | 224 | 243 | 261 | 279 | 297 | 315 | 333 | 351 | 369 | 387 | 404 | 422 | 440 | 458 | 476 | 493 | 511 | 529 | 547 | 564 |
| 30 | 30 | 55 | 76 | 97 | 117 | 136 | 156 | 175 | 194 | 213 | 232 | 251 | 269 | 288 | 307 | 325 | 344 | 362 | 381 | 399 | 418 | 436 | 454 | 473 | 491 | 510 | 528 | 546 | 564 | 583 |

TABLE 14 CRITICAL VALUES OF THE MANN-WHITNEY STATISTIC (CONTINUED)

One tail 5% Two tail 10%

| n \ m | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
|--------------|-----------|-----------|-----------|-----------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| 1 | | | | | | | | | | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 28 | 29 |
| 2 | | | 6 | 8 | 10 | 12 | 13 | 15 | 17 | 18 | 20 | 22 | 23 | 25 | 27 | 28 | 30 | 32 | 33 | 35 | 37 | 39 | 40 | 42 | 44 | 45 | 47 | 49 | 50 | 52 |
| 3 | | 6 | 9 | 11 | 14 | 16 | 18 | 21 | 23 | 25 | 28 | 30 | 32 | 35 | 37 | 39 | 42 | 44 | 46 | 49 | 51 | 53 | 56 | 58 | 60 | 63 | 65 | 67 | 70 | 72 |
| 4 | | 8 | 11 | 14 | 17 | 20 | 23 | 26 | 29 | 32 | 35 | 38 | 41 | 44 | 47 | 50 | 53 | 56 | 59 | 62 | 65 | 68 | 71 | 74 | 77 | 80 | 83 | 85 | 88 | 91 |
| 5 | | 10 | 14 | 17 | 21 | 25 | 28 | 32 | 35 | 39 | 43 | 46 | 50 | 53 | 57 | 61 | 64 | 68 | 71 | 75 | 78 | 82 | 86 | 89 | 93 | 96 | 100 | 103 | 107 | 111 |
| 6 | | 12 | 16 | 20 | 25 | 29 | 33 | 37 | 42 | 46 | 50 | 54 | 58 | 63 | 67 | 71 | 75 | 79 | 83 | 88 | 92 | 96 | 100 | 104 | 109 | 113 | 117 | 121 | 125 | 129 |
| 7 | | 13 | 18 | 23 | 28 | 33 | 38 | 43 | 48 | 52 | 57 | 62 | 67 | 72 | 76 | 81 | 86 | 91 | 96 | 100 | 105 | 110 | 115 | 119 | 124 | 129 | 134 | 138 | 143 | 148 |
| 8 | | 15 | 21 | 26 | 32 | 37 | 43 | 48 | 54 | 59 | 64 | 70 | 75 | 81 | 86 | 91 | 97 | 102 | 108 | 113 | 118 | 124 | 129 | 134 | 140 | 145 | 150 | 156 | 161 | 167 |
| 9 | | 17 | 23 | 29 | 35 | 42 | 48 | 54 | 60 | 66 | 72 | 78 | 84 | 90 | 96 | 102 | 108 | 114 | 120 | 125 | 131 | 137 | 143 | 149 | 155 | 161 | 167 | 173 | 179 | 185 |
| 10 | 10 | 18 | 25 | 32 | 39 | 46 | 52 | 59 | 66 | 72 | 79 | 86 | 92 | 99 | 105 | 112 | 118 | 125 | 131 | 138 | 145 | 151 | 158 | 164 | 171 | 177 | 184 | 190 | 197 | 203 |
| 11 | 11 | 20 | 28 | 35 | 43 | 50 | 57 | 64 | 72 | 79 | 86 | 93 | 100 | 108 | 115 | 122 | 129 | 136 | 143 | 150 | 158 | 165 | 172 | 179 | 186 | 193 | 200 | 207 | 214 | 221 |
| 12 | 12 | 22 | 30 | 38 | 46 | 54 | 62 | 70 | 78 | 86 | 93 | 101 | 109 | 117 | 124 | 132 | 140 | 147 | 155 | 163 | 171 | 178 | 186 | 194 | 201 | 209 | 217 | 224 | 232 | 240 |
| 13 | 13 | 23 | 32 | 41 | 50 | 58 | 67 | 75 | 84 | 92 | 100 | 109 | 117 | 125 | 134 | 142 | 150 | 159 | 167 | 175 | 183 | 192 | 200 | 208 | 217 | 225 | 233 | 241 | 250 | 258 |
| 14 | 14 | 25 | 35 | 44 | 53 | 63 | 72 | 81 | 90 | 99 | 108 | 117 | 125 | 134 | 143 | 152 | 161 | 170 | 179 | 188 | 196 | 205 | 214 | 223 | 232 | 241 | 249 | 258 | 267 | 276 |
| 15 | 15 | 27 | 37 | 47 | 57 | 67 | 76 | 86 | 96 | 105 | 115 | 124 | 134 | 143 | 153 | 162 | 172 | 181 | 190 | 200 | 209 | 219 | 228 | 238 | 247 | 256 | 266 | 275 | 285 | 294 |
| 16 | 16 | 28 | 39 | 50 | 61 | 71 | 81 | 91 | 102 | 112 | 122 | 132 | 142 | 152 | 162 | 172 | 182 | 192 | 202 | 212 | 222 | 232 | 242 | 252 | 262 | 272 | 282 | 292 | 302 | 312 |
| 17 | 17 | 30 | 42 | 53 | 64 | 75 | 86 | 97 | 108 | 118 | 129 | 140 | 150 | 161 | 172 | 182 | 193 | 203 | 214 | 225 | 235 | 246 | 256 | 267 | 277 | 288 | 298 | 309 | 319 | 330 |
| 18 | 18 | 32 | 44 | 56 | 68 | 79 | 91 | 102 | 114 | 125 | 136 | 147 | 159 | 170 | 181 | 192 | 203 | 215 | 226 | 237 | 248 | 259 | 270 | 281 | 292 | 303 | 315 | 326 | 337 | 348 |
| 19 | 19 | 33 | 46 | 59 | 71 | 83 | 96 | 108 | 120 | 131 | 143 | 155 | 167 | 179 | 190 | 202 | 214 | 226 | 237 | 249 | 261 | 272 | 284 | 296 | 307 | 319 | 331 | 342 | 354 | 366 |
| 20 | 20 | 35 | 49 | 62 | 75 | 88 | 100 | 113 | 125 | 138 | 150 | 163 | 175 | 188 | 200 | 212 | 225 | 237 | 249 | 261 | 274 | 286 | 298 | 310 | 323 | 335 | 347 | 359 | 371 | 384 |
| 21 | 21 | 37 | 51 | 65 | 78 | 92 | 105 | 118 | 131 | 145 | 158 | 171 | 183 | 196 | 209 | 222 | 235 | 248 | 261 | 274 | 286 | 299 | 312 | 325 | 338 | 350 | 363 | 376 | 389 | 402 |
| 22 | 22 | 39 | 53 | 68 | 82 | 96 | 110 | 124 | 137 | 151 | 165 | 178 | 192 | 205 | 219 | 232 | 246 | 259 | 272 | 286 | 299 | 313 | 326 | 339 | 353 | 366 | 379 | 393 | 406 | 419 |
| 23 | 23 | 40 | 56 | 71 | 86 | 100 | 115 | 129 | 143 | 158 | 172 | 186 | 200 | 214 | 228 | 242 | 256 | 270 | 284 | 298 | 312 | 326 | 340 | 354 | 368 | 382 | 396 | 409 | 423 | 437 |
| 24 | 24 | 42 | 58 | 74 | 89 | 104 | 119 | 134 | 149 | 164 | 179 | 194 | 208 | 223 | 238 | 252 | 267 | 281 | 296 | 310 | 325 | 339 | 354 | 368 | 383 | 397 | 412 | 426 | 441 | 455 |
| 25 | 25 | 44 | 60 | 77 | 93 | 109 | 124 | 140 | 155 | 171 | 186 | 201 | 217 | 232 | 247 | 262 | 277 | 292 | 307 | 323 | 338 | 353 | 368 | 383 | 398 | 413 | 428 | 443 | 458 | 473 |
| 26 | 26 | 45 | 63 | 80 | 96 | 113 | 129 | 145 | 161 | 177 | 193 | 209 | 225 | 241 | 256 | 272 | 288 | 303 | 319 | 335 | 350 | 366 | 382 | 397 | 413 | 428 | 444 | 460 | 475 | 491 |
| 27 | 27 | 47 | 65 | 83 | 100 | 117 | 134 | 150 | 167 | 184 | 200 | 217 | 233 | 249 | 266 | 282 | 298 | 315 | 331 | 347 | 363 | 379 | 396 | 412 | 428 | 444 | 460 | 476 | 492 | 509 |
| 28 | 28 | 49 | 67 | 85 | 103 | 121 | 138 | 156 | 173 | 190 | 207 | 224 | 241 | 258 | 275 | 292 | 309 | 326 | 342 | 359 | 376 | 393 | 409 | 426 | 443 | 460 | 476 | 493 | 510 | 526 |
| 29 | 28 | 50 | 70 | 88 | 107 | 125 | 143 | 161 | 179 | 197 | 214 | 232 | 250 | 267 | 285 | 302 | 319 | 337 | 354 | 371 | 389 | 406 | 423 | 441 | 458 | 475 | 492 | 510 | 527 | 544 |
| 30 | 29 | 52 | 72 | 91 | 111 | 129 | 148 | 167 | 185 | 203 | 221 | 240 | 258 | 276 | 294 | 312 | 330 | 348 | 366 | 384 | 402 | 419 | 437 | 455 | 473 | 491 | 509 | 526 | 544 | 562 |

TABLE 15 RANDOM DIGITS

The table gives 2500 random digits, from 0 to 9, arranged for convenience in blocks of 5.

| | | | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 87024 | 74221 | 69721 | 44518 | 58804 | 04860 | 18127 | 16855 | 61558 | 15430 |
| 04852 | 03436 | 72753 | 99836 | 37513 | 91341 | 53517 | 92094 | 54386 | 44563 |
| 33592 | 45845 | 52015 | 72030 | 23071 | 92933 | 84219 | 39455 | 57792 | 14216 |
| 68121 | 53688 | 56812 | 34869 | 28573 | 51079 | 94677 | 23993 | 88241 | 97735 |
| 25062 | 10428 | 43930 | 69033 | 73395 | 83469 | 25990 | 12971 | 73728 | 03856 |
| 78183 | 44396 | 11064 | 92153 | 96293 | 00825 | 21079 | 78337 | 19739 | 13684 |
| 70209 | 23316 | 32828 | 00927 | 61841 | 64754 | 91125 | 01206 | 06691 | 50868 |
| 94342 | 91040 | 94035 | 02650 | 36284 | 91162 | 07950 | 36178 | 42536 | 49869 |
| 92503 | 29854 | 24116 | 61149 | 49266 | 82303 | 54924 | 58251 | 23928 | 20703 |
| 71646 | 57503 | 82416 | 22657 | 72359 | 30085 | 13037 | 39608 | 77439 | 49318 |
| 51809 | 70780 | 41544 | 27828 | 84321 | 07714 | 25865 | 97896 | 01924 | 62028 |
| 88504 | 21620 | 07292 | 71021 | 80929 | 45042 | 08703 | 45894 | 24521 | 49942 |
| 33186 | 49273 | 87542 | 41086 | 29615 | 81101 | 43707 | 87031 | 36101 | 15137 |
| 40068 | 35043 | 05280 | 62921 | 30122 | 65119 | 40512 | 26855 | 40842 | 83244 |
| 76401 | 68461 | 20711 | 12007 | 19209 | 28259 | 49820 | 76415 | 51534 | 63574 |
| 47014 | 93729 | 74235 | 47808 | 52473 | 03145 | 92563 | 05837 | 70023 | 33169 |
| 67147 | 48017 | 90741 | 53647 | 55007 | 36607 | 29360 | 83163 | 79024 | 26155 |
| 86987 | 62924 | 93157 | 70947 | 07336 | 49541 | 81386 | 26968 | 38311 | 99885 |
| 58973 | 47026 | 78574 | 08804 | 22960 | 32850 | 67944 | 92303 | 61216 | 72948 |
| 71635 | 86749 | 40369 | 94639 | 40731 | 54012 | 03972 | 98581 | 45604 | 34885 |
| 60971 | 54212 | 32596 | 03052 | 84150 | 36798 | 62635 | 26210 | 95685 | 87089 |
| 06599 | 60910 | 66315 | 96690 | 19039 | 39878 | 44688 | 65146 | 02482 | 73130 |
| 89960 | 27162 | 66264 | 71024 | 18708 | 77974 | 40473 | 87155 | 35834 | 03114 |
| 03930 | 56898 | 61900 | 44036 | 90012 | 17673 | 54167 | 82396 | 39468 | 49566 |

TABLE 15 RANDOM DIGITS (CONTINUED)

| | | | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 31338 | 28729 | 02095 | 07429 | 35718 | 86882 | 37513 | 51560 | 08872 | 33717 |
| 29782 | 33287 | 27400 | 42915 | 49914 | 68221 | 56088 | 06112 | 95481 | 30094 |
| 68493 | 88796 | 94771 | 89418 | 62045 | 40681 | 15941 | 05962 | 44378 | 64349 |
| 42534 | 31925 | 94158 | 90197 | 62874 | 53659 | 33433 | 48610 | 14698 | 54761 |
| 76126 | 41049 | 43363 | 52461 | 00552 | 93352 | 58497 | 16347 | 87145 | 73668 |
| 80434 | 73037 | 69008 | 36801 | 25520 | 14161 | 32300 | 04187 | 80668 | 07499 |
| 81301 | 39731 | 53857 | 19690 | 39998 | 49829 | 12399 | 70867 | 44498 | 17385 |
| 54521 | 42350 | 82908 | 51212 | 70208 | 39891 | 64871 | 67448 | 42988 | 32600 |
| 82530 | 22869 | 87276 | 06678 | 36873 | 61198 | 87748 | 07531 | 29592 | 39612 |
| 81338 | 64309 | 45798 | 42954 | 95565 | 02789 | 83017 | 82936 | 67117 | 17709 |
| 58264 | 60374 | 32610 | 17879 | 96900 | 68029 | 06993 | 84288 | 35401 | 56317 |
| 77023 | 46829 | 21332 | 77383 | 15547 | 29332 | 77698 | 89878 | 20489 | 71800 |
| 29750 | 59902 | 78110 | 59018 | 87548 | 10225 | 15774 | 70778 | 56086 | 08117 |
| 08288 | 38411 | 69886 | 64918 | 29055 | 87607 | 37452 | 38174 | 31431 | 46173 |
| 93908 | 94810 | 22057 | 94240 | 89918 | 16561 | 92716 | 66461 | 22337 | 64718 |
| 06341 | 25883 | 42574 | 80202 | 57287 | 95120 | 69332 | 19036 | 43326 | 98697 |
| 23240 | 94741 | 55622 | 79479 | 34606 | 51079 | 09476 | 10695 | 49618 | 63037 |
| 96370 | 19171 | 40441 | 05002 | 33165 | 28693 | 45027 | 73791 | 23047 | 32976 |
| 97050 | 16194 | 61095 | 26533 | 81738 | 77032 | 60551 | 31605 | 95212 | 81078 |
| 40833 | 12169 | 10712 | 78345 | 48236 | 45086 | 61654 | 94929 | 69169 | 70561 |
| 95676 | 13582 | 25664 | 60838 | 88071 | 50052 | 63188 | 50346 | 65618 | 17517 |
| 28030 | 14185 | 13226 | 99566 | 45483 | 10079 | 22945 | 23903 | 11695 | 10694 |
| 60202 | 32586 | 87466 | 83357 | 95516 | 31258 | 66309 | 40615 | 30572 | 60842 |
| 46530 | 48755 | 02308 | 79508 | 53422 | 50805 | 08896 | 06963 | 93922 | 99423 |
| 53151 | 95839 | 01745 | 46462 | 81463 | 28669 | 60179 | 17880 | 75875 | 34562 |
| 80272 | 64398 | 88249 | 06792 | 98424 | 66842 | 49129 | 98939 | 34173 | 49883 |

TABLE 16 NEGATIVE EXPONENTIAL FUNCTION

The table gives the values of the function $f(x) = e^{-x}$.

SUBTRACT

| X | .00 | .01 | .02 | .03 | .04 | .05 | .06 | .07 | .08 | .09 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|-----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0.0 | 1.0000 | .99005 | .98020 | .97045 | .96079 | .95123 | .94176 | .93239 | .92312 | .91393 | 95 | 190 | 286 | 381 | 476 | 571 | 666 | 760 | 855 |
| 0.1 | .90484 | .89583 | .88692 | .87810 | .86936 | .86071 | .85214 | .84366 | .83527 | .82696 | 86 | 172 | 258 | 344 | 431 | 516 | 602 | 688 | 774 |
| 0.2 | .81873 | .81058 | .80252 | .79453 | .78663 | .77880 | .77105 | .76338 | .75578 | .74826 | 78 | 156 | 234 | 312 | 389 | 467 | 545 | 623 | 700 |
| 0.3 | .74082 | .73345 | .72615 | .71892 | .71177 | .70469 | .69768 | .69073 | .68386 | .67706 | 70 | 141 | 211 | 282 | 352 | 423 | 493 | 563 | 633 |
| 0.4 | .67032 | .66365 | .65705 | .65051 | .64404 | .63763 | .63128 | .62500 | .61878 | .61263 | 63 | 127 | 191 | 255 | 319 | 382 | 446 | 510 | 573 |
| 0.5 | .60653 | .60050 | .59452 | .58860 | .58275 | .57695 | .57121 | .56553 | .55990 | .55433 | 57 | 115 | 173 | 231 | 288 | 346 | 404 | 461 | 518 |
| 0.6 | .54881 | .54335 | .53794 | .53259 | .52729 | .52205 | .51685 | .51171 | .50662 | .50158 | 52 | 104 | 157 | 209 | 261 | 313 | 365 | 417 | 469 |
| 0.7 | .49659 | .49164 | .48675 | .48191 | .47711 | .47237 | .46767 | .46301 | .45841 | .45384 | 47 | 94 | 142 | 189 | 236 | 283 | 330 | 377 | 424 |
| 0.8 | .44933 | .44486 | .44043 | .43605 | .43171 | .42741 | .42316 | .41895 | .41478 | .41066 | 42 | 85 | 128 | 171 | 214 | 256 | 299 | 341 | 384 |
| 0.9 | .40657 | .40252 | .39852 | .39455 | .39063 | .38674 | .38289 | .37908 | .37531 | .37158 | 38 | 77 | 116 | 155 | 193 | 232 | 270 | 309 | 347 |
| 1.0 | .36788 | .36422 | .36059 | .35701 | .35345 | .34994 | .34646 | .34301 | .33960 | .33622 | 35 | 70 | 105 | 140 | 175 | 210 | 245 | 279 | 314 |
| 1.1 | .33287 | .32956 | .32628 | .32303 | .31982 | .31664 | .31349 | .31037 | .30728 | .30422 | 31 | 63 | 95 | 126 | 158 | 190 | 221 | 253 | 284 |
| 1.2 | .30119 | .29820 | .29523 | .29229 | .28938 | .28650 | .28365 | .28083 | .27804 | .27527 | 28 | 57 | 86 | 114 | 143 | 172 | 200 | 229 | 257 |
| 1.3 | .27253 | .26982 | .26714 | .26448 | .26185 | .25924 | .25666 | .25411 | .25158 | .24908 | 26 | 52 | 77 | 103 | 129 | 155 | 181 | 207 | 233 |
| 1.4 | .24660 | .24414 | .24171 | .23931 | .23693 | .23457 | .23224 | .22993 | .22764 | .22537 | 23 | 47 | 70 | 94 | 117 | 140 | 164 | 187 | 211 |
| 1.5 | .22313 | .22091 | .21871 | .21654 | .21438 | .21225 | .21014 | .20805 | .20598 | .20393 | 21 | 42 | 63 | 85 | 106 | 127 | 148 | 169 | 190 |
| 1.6 | .20190 | .19989 | .19790 | .19593 | .19398 | .19205 | .19014 | .18825 | .18637 | .18452 | 19 | 38 | 57 | 76 | 96 | 115 | 134 | 153 | 172 |
| 1.7 | .18268 | .18087 | .17907 | .17728 | .17552 | .17377 | .17204 | .17033 | .16864 | .16696 | 17 | 34 | 52 | 69 | 87 | 104 | 121 | 139 | 156 |
| 1.8 | .16530 | .16365 | .16203 | .16041 | .15882 | .15724 | .15567 | .15412 | .15259 | .15107 | 15 | 31 | 47 | 63 | 78 | 94 | 110 | 125 | 141 |
| 1.9 | .14957 | .14808 | .14661 | .14515 | .14370 | .14227 | .14086 | .13946 | .13807 | .13670 | 14 | 28 | 42 | 57 | 71 | 85 | 99 | 113 | 127 |
| 2.0 | .13534 | .13399 | .13266 | .13134 | .13003 | .12873 | .12745 | .12619 | .12493 | .12369 | 12 | 25 | 38 | 51 | 64 | 77 | 90 | 102 | 115 |
| 2.1 | .12246 | .12124 | .12003 | .11884 | .11765 | .11648 | .11533 | .11418 | .11304 | .11192 | 11 | 23 | 35 | 46 | 58 | 69 | 81 | 93 | 104 |
| 2.2 | .11080 | .10970 | .10861 | .10753 | .10646 | .10540 | .10435 | .10331 | .10228 | .10127 | 10 | 21 | 31 | 42 | 52 | 63 | 73 | 84 | 94 |
| 2.3 | .10026 | .09926 | .09827 | .09730 | .09633 | .09537 | .09442 | .09348 | .09255 | .09163 | 9 | 19 | 28 | 38 | 47 | 57 | 66 | 76 | 85 |
| 2.4 | .09072 | .08982 | .08892 | .08804 | .08716 | .08629 | .08543 | .08458 | .08374 | .08291 | 8 | 17 | 25 | 34 | 43 | 51 | 60 | 69 | 77 |

TABLE 16 NEGATIVE EXPONENTIAL FUNCTION (CONTINUED)

SUBTRACT

| X | .00 | .01 | .02 | .03 | .04 | .05 | .06 | .07 | .08 | .09 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|-----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---|----|----|----|----|----|----|----|----|
| 2.5 | .08208 | .08127 | .08046 | .07966 | .07887 | .07808 | .07730 | .07654 | .07577 | .07502 | 7 | 15 | 23 | 31 | 39 | 46 | 54 | 62 | 70 |
| 2.6 | .07427 | .07353 | .07280 | .07208 | .07136 | .07065 | .06995 | .06925 | .06856 | .06788 | 7 | 14 | 21 | 28 | 35 | 42 | 49 | 56 | 63 |
| 2.7 | .06721 | .06654 | .06587 | .06522 | .06457 | .06393 | .06329 | .06266 | .06204 | .06142 | 6 | 12 | 19 | 25 | 32 | 38 | 44 | 51 | 57 |
| 2.8 | .06081 | .06020 | .05961 | .05901 | .05843 | .05784 | .05727 | .05670 | .05613 | .05558 | 5 | 11 | 17 | 23 | 28 | 34 | 40 | 46 | 52 |
| 2.9 | .05502 | .05448 | .05393 | .05340 | .05287 | .05234 | .05182 | .05130 | .05079 | .05029 | 5 | 10 | 15 | 20 | 26 | 31 | 36 | 41 | 47 |
| 3.0 | .04979 | .04929 | .04880 | .04832 | .04783 | .04736 | .04689 | .04642 | .04596 | .04550 | 4 | 9 | 14 | 18 | 23 | 28 | 33 | 37 | 42 |
| 3.1 | .04505 | .04460 | .04416 | .04372 | .04328 | .04285 | .04243 | .04200 | .04159 | .04117 | 4 | 8 | 12 | 17 | 21 | 25 | 30 | 34 | 38 |
| 3.2 | .04076 | .04036 | .03996 | .03956 | .03916 | .03877 | .03839 | .03801 | .03763 | .03725 | 3 | 7 | 11 | 15 | 19 | 23 | 27 | 31 | 34 |
| 3.3 | .03688 | .03652 | .03615 | .03579 | .03544 | .03508 | .03474 | .03439 | .03405 | .03371 | 3 | 7 | 10 | 14 | 17 | 21 | 24 | 28 | 31 |
| 3.4 | .03337 | .03304 | .03271 | .03239 | .03206 | .03175 | .03143 | .03112 | .03081 | .03050 | 3 | 6 | 9 | 12 | 15 | 19 | 22 | 25 | 28 |
| 3.5 | .03020 | .02990 | .02960 | .02930 | .02901 | .02872 | .02844 | .02816 | .02788 | .02760 | 2 | 5 | 8 | 11 | 14 | 17 | 20 | 22 | 25 |
| 3.6 | .02732 | .02705 | .02678 | .02652 | .02625 | .02599 | .02573 | .02548 | .02522 | .02497 | 2 | 5 | 7 | 10 | 13 | 15 | 18 | 20 | 23 |
| 3.7 | .02472 | .02448 | .02423 | .02399 | .02375 | .02352 | .02328 | .02305 | .02282 | .02260 | 2 | 4 | 7 | 9 | 11 | 14 | 16 | 18 | 21 |
| 3.8 | .02237 | .02215 | .02193 | .02171 | .02149 | .02128 | .02107 | .02086 | .02065 | .02045 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 17 | 19 |
| 3.9 | .02024 | .02004 | .01984 | .01964 | .01945 | .01925 | .01906 | .01887 | .01869 | .01850 | 1 | 3 | 5 | 7 | 9 | 11 | 13 | 15 | 17 |
| 4.0 | .01832 | .01813 | .01795 | .01777 | .01760 | .01742 | .01725 | .01708 | .01691 | .01674 | 1 | 3 | 5 | 6 | 8 | 10 | 12 | 13 | 15 |
| 4.1 | .01657 | .01641 | .01624 | .01608 | .01592 | .01576 | .01561 | .01545 | .01530 | .01515 | 1 | 3 | 4 | 6 | 7 | 9 | 11 | 12 | 14 |
| 4.2 | .01500 | .01485 | .01470 | .01455 | .01441 | .01426 | .01412 | .01398 | .01384 | .01370 | 1 | 2 | 4 | 5 | 7 | 8 | 9 | 11 | 12 |
| 4.3 | .01357 | .01343 | .01330 | .01317 | .01304 | .01291 | .01278 | .01265 | .01253 | .01240 | 1 | 2 | 3 | 5 | 6 | 7 | 9 | 10 | 11 |
| 4.4 | .01228 | .01216 | .01203 | .01191 | .01180 | .01168 | .01156 | .01145 | .01133 | .01122 | 1 | 2 | 3 | 4 | 5 | 7 | 8 | 9 | 10 |
| 4.5 | .01111 | .01100 | .01089 | .01078 | .01067 | .01057 | .01046 | .01036 | .01025 | .01015 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 4.6 | .01005 | .00995 | .00985 | .00975 | .00966 | .00956 | .00947 | .00937 | .00928 | .00919 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 4.7 | .00910 | .00900 | .00892 | .00883 | .00874 | .00865 | .00857 | .00848 | .00840 | .00831 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 6 | 7 |
| 4.8 | .00823 | .00815 | .00807 | .00799 | .00791 | .00783 | .00775 | .00767 | .00760 | .00752 | 0 | 1 | 2 | 3 | 3 | 4 | 5 | 6 | 7 |
| 4.9 | .00745 | .00737 | .00730 | .00723 | .00715 | .00708 | .00701 | .00694 | .00687 | .00681 | 0 | 1 | 2 | 2 | 3 | 4 | 4 | 5 | 6 |