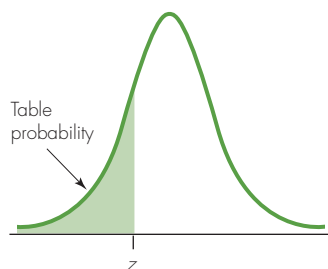


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- Table A.1 Standard Normal Probabilities
- Table A.2 t^* Multipliers for Confidence Intervals and Rejection Region Critical Values
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Table A.1 Standard Normal Probabilities (for $z < 0$)



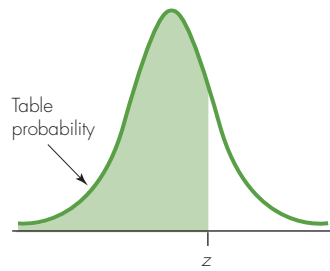
| <i>z</i> | .00 | .01 | .02 | .03 | .04 | .05 | .06 | .07 | .08 | .09 |
|----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| -3.4 | .0003 | .0003 | .0003 | .0003 | .0003 | .0003 | .0003 | .0003 | .0003 | .0002 |
| -3.3 | .0005 | .0005 | .0005 | .0004 | .0004 | .0004 | .0004 | .0004 | .0004 | .0003 |
| -3.2 | .0007 | .0007 | .0006 | .0006 | .0006 | .0006 | .0006 | .0005 | .0005 | .0005 |
| -3.1 | .0010 | .0009 | .0009 | .0009 | .0008 | .0008 | .0008 | .0008 | .0007 | .0007 |
| -3.0 | .0013 | .0013 | .0013 | .0012 | .0012 | .0011 | .0011 | .0011 | .0010 | .0010 |
| -2.9 | .0019 | .0018 | .0018 | .0017 | .0016 | .0016 | .0015 | .0015 | .0014 | .0014 |
| -2.8 | .0026 | .0025 | .0024 | .0023 | .0023 | .0022 | .0021 | .0021 | .0020 | .0019 |
| -2.7 | .0035 | .0034 | .0033 | .0032 | .0031 | .0030 | .0029 | .0028 | .0027 | .0026 |
| -2.6 | .0047 | .0045 | .0044 | .0043 | .0041 | .0040 | .0039 | .0038 | .0037 | .0036 |
| -2.5 | .0062 | .0060 | .0059 | .0057 | .0055 | .0054 | .0052 | .0051 | .0049 | .0048 |
| -2.4 | .0082 | .0080 | .0078 | .0075 | .0073 | .0071 | .0069 | .0068 | .0066 | .0064 |
| -2.3 | .0107 | .0104 | .0102 | .0099 | .0096 | .0094 | .0091 | .0089 | .0087 | .0084 |
| -2.2 | .0139 | .0136 | .0132 | .0129 | .0125 | .0122 | .0119 | .0116 | .0113 | .0110 |
| -2.1 | .0179 | .0174 | .0170 | .0166 | .0162 | .0158 | .0154 | .0150 | .0146 | .0143 |
| -2.0 | .0228 | .0222 | .0217 | .0212 | .0207 | .0202 | .0197 | .0192 | .0188 | .0183 |
| -1.9 | .0287 | .0281 | .0274 | .0268 | .0262 | .0256 | .0250 | .0244 | .0239 | .0233 |
| -1.8 | .0359 | .0351 | .0344 | .0336 | .0329 | .0322 | .0314 | .0307 | .0301 | .0294 |
| -1.7 | .0446 | .0436 | .0427 | .0418 | .0409 | .0401 | .0392 | .0384 | .0375 | .0367 |
| -1.6 | .0548 | .0537 | .0526 | .0516 | .0505 | .0495 | .0485 | .0475 | .0465 | .0455 |
| -1.5 | .0668 | .0655 | .0643 | .0630 | .0618 | .0606 | .0594 | .0582 | .0571 | .0559 |
| -1.4 | .0808 | .0793 | .0778 | .0764 | .0749 | .0735 | .0721 | .0708 | .0694 | .0681 |
| -1.3 | .0968 | .0951 | .0934 | .0918 | .0901 | .0885 | .0869 | .0853 | .0838 | .0823 |
| -1.2 | .1151 | .1131 | .1112 | .1093 | .1075 | .1056 | .1038 | .1020 | .1003 | .0985 |
| -1.1 | .1357 | .1335 | .1314 | .1292 | .1271 | .1251 | .1230 | .1210 | .1190 | .1170 |
| -1.0 | .1587 | .1562 | .1539 | .1515 | .1492 | .1469 | .1446 | .1423 | .1401 | .1379 |
| -0.9 | .1841 | .1814 | .1788 | .1762 | .1736 | .1711 | .1685 | .1660 | .1635 | .1611 |
| -0.8 | .2119 | .2090 | .2061 | .2033 | .2005 | .1977 | .1949 | .1922 | .1894 | .1867 |
| -0.7 | .2420 | .2389 | .2358 | .2327 | .2296 | .2266 | .2236 | .2206 | .2177 | .2148 |
| -0.6 | .2743 | .2709 | .2676 | .2643 | .2611 | .2578 | .2546 | .2514 | .2483 | .2451 |
| -0.5 | .3085 | .3050 | .3015 | .2981 | .2946 | .2912 | .2877 | .2843 | .2810 | .2776 |
| -0.4 | .3446 | .3409 | .3372 | .3336 | .3300 | .3264 | .3228 | .3192 | .3156 | .3121 |
| -0.3 | .3821 | .3783 | .3745 | .3707 | .3669 | .3632 | .3594 | .3557 | .3520 | .3483 |
| -0.2 | .4207 | .4168 | .4129 | .4090 | .4052 | .4013 | .3974 | .3936 | .3897 | .3859 |
| -0.1 | .4602 | .4562 | .4522 | .4483 | .4443 | .4404 | .4364 | .4325 | .4286 | .4247 |
| -0.0 | .5000 | .4960 | .4920 | .4880 | .4840 | .4801 | .4761 | .4721 | .4681 | .4641 |

In the Extreme (for $z < 0$)

| <i>z</i> | -3.09 | -3.72 | -4.26 | -4.75 | -5.20 | -5.61 | -6.00 |
|--------------------|-------|-------|--------|---------|----------|-----------|------------|
| <i>Probability</i> | .001 | .0001 | .00001 | .000001 | .0000001 | .00000001 | .000000001 |

S-PLUS was used to determine information for the "In the Extreme" portion of the table.

Table A.1 Standard Normal Probabilities (for $z > 0$)



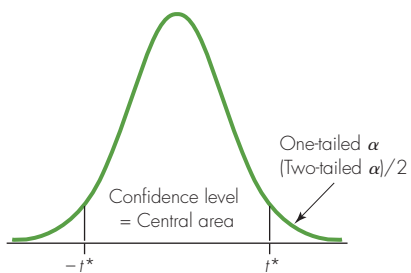
| <i>z</i> | .00 | .01 | .02 | .03 | .04 | .05 | .06 | .07 | .08 | .09 |
|----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.0 | .5000 | .5040 | .5080 | .5120 | .5160 | .5199 | .5239 | .5279 | .5319 | .5359 |
| 0.1 | .5398 | .5438 | .5478 | .5517 | .5557 | .5596 | .5636 | .5675 | .5714 | .5753 |
| 0.2 | .5793 | .5832 | .5871 | .5910 | .5948 | .5987 | .6026 | .6064 | .6103 | .6141 |
| 0.3 | .6179 | .6217 | .6255 | .6293 | .6331 | .6368 | .6406 | .6443 | .6480 | .6517 |
| 0.4 | .6554 | .6591 | .6628 | .6664 | .6700 | .6736 | .6772 | .6808 | .6844 | .6879 |
| 0.5 | .6915 | .6950 | .6985 | .7019 | .7054 | .7088 | .7123 | .7157 | .7190 | .7224 |
| 0.6 | .7257 | .7291 | .7324 | .7357 | .7389 | .7422 | .7454 | .7486 | .7517 | .7549 |
| 0.7 | .7580 | .7611 | .7642 | .7673 | .7704 | .7734 | .7764 | .7794 | .7823 | .7852 |
| 0.8 | .7881 | .7910 | .7939 | .7967 | .7995 | .8023 | .8051 | .8078 | .8106 | .8133 |
| 0.9 | .8159 | .8186 | .8212 | .8238 | .8264 | .8289 | .8315 | .8340 | .8365 | .8389 |
| 1.0 | .8413 | .8438 | .8461 | .8485 | .8508 | .8531 | .8554 | .8577 | .8599 | .8621 |
| 1.1 | .8643 | .8665 | .8686 | .8708 | .8729 | .8749 | .8770 | .8790 | .8810 | .8830 |
| 1.2 | .8849 | .8869 | .8888 | .8907 | .8925 | .8944 | .8962 | .8980 | .8997 | .9015 |
| 1.3 | .9032 | .9049 | .9066 | .9082 | .9099 | .9115 | .9131 | .9147 | .9162 | .9177 |
| 1.4 | .9192 | .9207 | .9222 | .9236 | .9251 | .9265 | .9279 | .9292 | .9306 | .9319 |
| 1.5 | .9332 | .9345 | .9357 | .9370 | .9382 | .9394 | .9406 | .9418 | .9429 | .9441 |
| 1.6 | .9452 | .9463 | .9474 | .9484 | .9495 | .9505 | .9515 | .9525 | .9535 | .9545 |
| 1.7 | .9554 | .9564 | .9573 | .9582 | .9591 | .9599 | .9608 | .9616 | .9625 | .9633 |
| 1.8 | .9641 | .9649 | .9656 | .9664 | .9671 | .9678 | .9686 | .9693 | .9699 | .9706 |
| 1.9 | .9713 | .9719 | .9726 | .9732 | .9738 | .9744 | .9750 | .9756 | .9761 | .9767 |
| 2.0 | .9772 | .9778 | .9783 | .9788 | .9793 | .9798 | .9803 | .9808 | .9812 | .9817 |
| 2.1 | .9821 | .9826 | .9830 | .9834 | .9838 | .9842 | .9846 | .9850 | .9854 | .9857 |
| 2.2 | .9861 | .9864 | .9868 | .9871 | .9875 | .9878 | .9881 | .9884 | .9887 | .9890 |
| 2.3 | .9893 | .9896 | .9898 | .9901 | .9904 | .9906 | .9909 | .9911 | .9913 | .9916 |
| 2.4 | .9918 | .9920 | .9922 | .9925 | .9927 | .9929 | .9931 | .9932 | .9934 | .9936 |
| 2.5 | .9938 | .9940 | .9941 | .9943 | .9945 | .9946 | .9948 | .9949 | .9951 | .9952 |
| 2.6 | .9953 | .9955 | .9956 | .9957 | .9959 | .9960 | .9961 | .9962 | .9963 | .9964 |
| 2.7 | .9965 | .9966 | .9967 | .9968 | .9969 | .9970 | .9971 | .9972 | .9973 | .9974 |
| 2.8 | .9974 | .9975 | .9976 | .9977 | .9977 | .9978 | .9979 | .9979 | .9980 | .9981 |
| 2.9 | .9981 | .9982 | .9982 | .9983 | .9984 | .9984 | .9985 | .9985 | .9986 | .9986 |
| 3.0 | .9987 | .9987 | .9987 | .9988 | .9988 | .9989 | .9989 | .9989 | .9990 | .9990 |
| 3.1 | .9990 | .9991 | .9991 | .9991 | .9992 | .9992 | .9992 | .9992 | .9993 | .9993 |
| 3.2 | .9993 | .9993 | .9994 | .9994 | .9994 | .9994 | .9994 | .9995 | .9995 | .9995 |
| 3.3 | .9995 | .9995 | .9995 | .9996 | .9996 | .9996 | .9996 | .9996 | .9996 | .9997 |
| 3.4 | .9997 | .9997 | .9997 | .9997 | .9997 | .9997 | .9997 | .9997 | .9997 | .9998 |

In the Extreme (for $z > 0$)

| <i>z</i> | 3.09 | 3.72 | 4.26 | 4.75 | 5.20 | 5.61 | 6.00 |
|--------------------|------|-------|--------|---------|----------|-----------|------------|
| <i>Probability</i> | .999 | .9999 | .99999 | .999999 | .9999999 | .99999999 | .999999999 |

S-PLUS was used to determine information for the "In the Extreme" portion of the table.

Table A.2 *t** Multipliers for Confidence Intervals and Rejection Region Critical Values



| df | Confidence Level | | | | | | |
|----------------------------|------------------|-------|-------|-------|-------|--------|--------|
| | .80 | .90 | .95 | .98 | .99 | .998 | .999 |
| 1 | 3.08 | 6.31 | 12.71 | 31.82 | 63.66 | 318.31 | 636.62 |
| 2 | 1.89 | 2.92 | 4.30 | 6.96 | 9.92 | 22.33 | 31.60 |
| 3 | 1.64 | 2.35 | 3.18 | 4.54 | 5.84 | 10.21 | 12.92 |
| 4 | 1.53 | 2.13 | 2.78 | 3.75 | 4.60 | 7.17 | 8.61 |
| 5 | 1.48 | 2.02 | 2.57 | 3.36 | 4.03 | 5.89 | 6.87 |
| 6 | 1.44 | 1.94 | 2.45 | 3.14 | 3.71 | 5.21 | 5.96 |
| 7 | 1.41 | 1.89 | 2.36 | 3.00 | 3.50 | 4.79 | 5.41 |
| 8 | 1.40 | 1.86 | 2.31 | 2.90 | 3.36 | 4.50 | 5.04 |
| 9 | 1.38 | 1.83 | 2.26 | 2.82 | 3.25 | 4.30 | 4.78 |
| 10 | 1.37 | 1.81 | 2.23 | 2.76 | 3.17 | 4.14 | 4.59 |
| 11 | 1.36 | 1.80 | 2.20 | 2.72 | 3.11 | 4.02 | 4.44 |
| 12 | 1.36 | 1.78 | 2.18 | 2.68 | 3.05 | 3.93 | 4.32 |
| 13 | 1.35 | 1.77 | 2.16 | 2.65 | 3.01 | 3.85 | 4.22 |
| 14 | 1.35 | 1.76 | 2.14 | 2.62 | 2.98 | 3.79 | 4.14 |
| 15 | 1.34 | 1.75 | 2.13 | 2.60 | 2.95 | 3.73 | 4.07 |
| 16 | 1.34 | 1.75 | 2.12 | 2.58 | 2.92 | 3.69 | 4.01 |
| 17 | 1.33 | 1.74 | 2.11 | 2.57 | 2.90 | 3.65 | 3.97 |
| 18 | 1.33 | 1.73 | 2.10 | 2.55 | 2.88 | 3.61 | 3.92 |
| 19 | 1.33 | 1.73 | 2.09 | 2.54 | 2.86 | 3.58 | 3.88 |
| 20 | 1.33 | 1.72 | 2.09 | 2.53 | 2.85 | 3.55 | 3.85 |
| 21 | 1.32 | 1.72 | 2.08 | 2.52 | 2.83 | 3.53 | 3.82 |
| 22 | 1.32 | 1.72 | 2.07 | 2.51 | 2.82 | 3.50 | 3.79 |
| 23 | 1.32 | 1.71 | 2.07 | 2.50 | 2.81 | 3.48 | 3.77 |
| 24 | 1.32 | 1.71 | 2.06 | 2.49 | 2.80 | 3.47 | 3.75 |
| 25 | 1.32 | 1.71 | 2.06 | 2.49 | 2.79 | 3.45 | 3.73 |
| 26 | 1.31 | 1.71 | 2.06 | 2.48 | 2.78 | 3.43 | 3.71 |
| 27 | 1.31 | 1.70 | 2.05 | 2.47 | 2.77 | 3.42 | 3.69 |
| 28 | 1.31 | 1.70 | 2.05 | 2.47 | 2.76 | 3.41 | 3.67 |
| 29 | 1.31 | 1.70 | 2.05 | 2.46 | 2.76 | 3.40 | 3.66 |
| 30 | 1.31 | 1.70 | 2.04 | 2.46 | 2.75 | 3.39 | 3.65 |
| 40 | 1.30 | 1.68 | 2.02 | 2.42 | 2.70 | 3.31 | 3.55 |
| 50 | 1.30 | 1.68 | 2.01 | 2.40 | 2.68 | 3.26 | 3.50 |
| 60 | 1.30 | 1.67 | 2.00 | 2.39 | 2.66 | 3.23 | 3.46 |
| 70 | 1.29 | 1.67 | 1.99 | 2.38 | 2.65 | 3.21 | 3.44 |
| 80 | 1.29 | 1.66 | 1.99 | 2.37 | 2.64 | 3.20 | 3.42 |
| 90 | 1.29 | 1.66 | 1.99 | 2.37 | 2.63 | 3.18 | 3.40 |
| 100 | 1.29 | 1.66 | 1.98 | 2.36 | 2.63 | 3.17 | 3.39 |
| 1000 | 1.282 | 1.646 | 1.962 | 2.330 | 2.581 | 3.098 | 3.300 |
| Infinite | 1.281 | 1.645 | 1.960 | 2.326 | 2.576 | 3.090 | 3.291 |
| <i>Two-tailed</i> α | .20 | .10 | .05 | .02 | .01 | .002 | .001 |
| <i>One-tailed</i> α | .10 | .05 | .025 | .01 | .005 | .001 | .0005 |

Note that the *t*-distribution with infinite df is the standard normal distribution.

Table A.3 One-Sided p -Values for Significance Tests Based on a t -Statistic

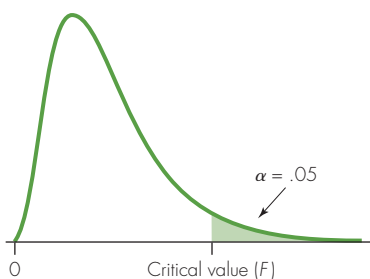
- A p -value in the table is the area to the right of t .
- Double the value if the alternative hypothesis is two-sided (not equal).

| <i>df</i> | Absolute Value of t -Statistic | | | | | | | |
|-----------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|
| | 1.28 | 1.50 | 1.65 | 1.80 | 2.00 | 2.33 | 2.58 | 3.00 |
| 1 | .211 | .187 | .173 | .161 | .148 | .129 | .118 | .102 |
| 2 | .164 | .136 | .120 | .107 | .092 | .073 | .062 | .048 |
| 3 | .145 | .115 | .099 | .085 | .070 | .051 | .041 | .029 |
| 4 | .135 | .104 | .087 | .073 | .058 | .040 | .031 | .020 |
| 5 | .128 | .097 | .080 | .066 | .051 | .034 | .025 | .015 |
| 6 | .124 | .092 | .075 | .061 | .046 | .029 | .021 | .012 |
| 7 | .121 | .089 | .071 | .057 | .043 | .026 | .018 | .010 |
| 8 | .118 | .086 | .069 | .055 | .040 | .024 | .016 | .009 |
| 9 | .116 | .084 | .067 | .053 | .038 | .022 | .015 | .007 |
| 10 | .115 | .082 | .065 | .051 | .037 | .021 | .014 | .007 |
| 11 | .113 | .081 | .064 | .050 | .035 | .020 | .013 | .006 |
| 12 | .112 | .080 | .062 | .049 | .034 | .019 | .012 | .006 |
| 13 | .111 | .079 | .061 | .048 | .033 | .018 | .011 | .005 |
| 14 | .111 | .078 | .061 | .047 | .033 | .018 | .011 | .005 |
| 15 | .110 | .077 | .060 | .046 | .032 | .017 | .010 | .004 |
| 16 | .109 | .077 | .059 | .045 | .031 | .017 | .010 | .004 |
| 17 | .109 | .076 | .059 | .045 | .031 | .016 | .010 | .004 |
| 18 | .108 | .075 | .058 | .044 | .030 | .016 | .009 | .004 |
| 19 | .108 | .075 | .058 | .044 | .030 | .015 | .009 | .004 |
| 20 | .108 | .075 | .057 | .043 | .030 | .015 | .009 | .004 |
| 21 | .107 | .074 | .057 | .043 | .029 | .015 | .009 | .003 |
| 22 | .107 | .074 | .057 | .043 | .029 | .015 | .009 | .003 |
| 23 | .107 | .074 | .056 | .042 | .029 | .014 | .008 | .003 |
| 24 | .106 | .073 | .056 | .042 | .028 | .014 | .008 | .003 |
| 25 | .106 | .073 | .056 | .042 | .028 | .014 | .008 | .003 |
| 26 | .106 | .073 | .055 | .042 | .028 | .014 | .008 | .003 |
| 27 | .106 | .073 | .055 | .042 | .028 | .014 | .008 | .003 |
| 28 | .106 | .072 | .055 | .041 | .028 | .014 | .008 | .003 |
| 29 | .105 | .072 | .055 | .041 | .027 | .013 | .008 | .003 |
| 30 | .105 | .072 | .055 | .041 | .027 | .013 | .008 | .003 |
| 40 | .104 | .071 | .053 | .040 | .026 | .012 | .007 | .002 |
| 50 | .103 | .070 | .053 | .039 | .025 | .012 | .006 | .002 |
| 60 | .103 | .069 | .052 | .038 | .025 | .012 | .006 | .002 |
| 70 | .102 | .069 | .052 | .038 | .025 | .011 | .006 | .002 |
| 80 | .102 | .069 | .051 | .038 | .024 | .011 | .006 | .002 |
| 90 | .102 | .069 | .051 | .038 | .024 | .011 | .006 | .002 |
| 100 | .102 | .068 | .051 | .037 | .024 | .011 | .006 | .002 |
| 1000 | .100 | .067 | .050 | .036 | .023 | .010 | .005 | .001 |
| Infinite | .1003 | .0668 | .0495 | .0359 | .0228 | .0099 | .0049 | .0013 |

Note that the t -distribution with infinite df is the standard normal distribution.

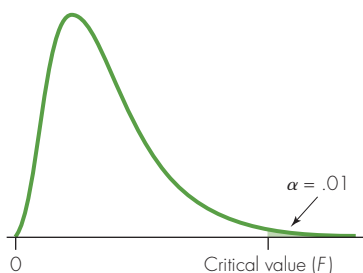
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Table A.4 Critical Values for F-Test ($\alpha = .05$)



| Denom df | Numerator df | | | | | | | | | |
|----------|--------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 1 | 161.45 | 199.50 | 215.71 | 224.58 | 230.16 | 233.99 | 236.77 | 238.88 | 240.54 | 241.88 |
| 2 | 18.51 | 19.00 | 19.16 | 19.25 | 19.30 | 19.33 | 19.35 | 19.37 | 19.38 | 19.40 |
| 3 | 10.13 | 9.55 | 9.28 | 9.12 | 9.01 | 8.94 | 8.89 | 8.85 | 8.81 | 8.79 |
| 4 | 7.71 | 6.94 | 6.59 | 6.39 | 6.26 | 6.16 | 6.09 | 6.04 | 6.00 | 5.96 |
| 5 | 6.61 | 5.79 | 5.41 | 5.19 | 5.05 | 4.95 | 4.88 | 4.82 | 4.77 | 4.74 |
| 6 | 5.99 | 5.14 | 4.76 | 4.53 | 4.39 | 4.28 | 4.21 | 4.15 | 4.10 | 4.06 |
| 7 | 5.59 | 4.74 | 4.35 | 4.12 | 3.97 | 3.87 | 3.79 | 3.73 | 3.68 | 3.64 |
| 8 | 5.32 | 4.46 | 4.07 | 3.84 | 3.69 | 3.58 | 3.50 | 3.44 | 3.39 | 3.35 |
| 9 | 5.12 | 4.26 | 3.86 | 3.63 | 3.48 | 3.37 | 3.29 | 3.23 | 3.18 | 3.14 |
| 10 | 4.96 | 4.10 | 3.71 | 3.48 | 3.33 | 3.22 | 3.14 | 3.07 | 3.02 | 2.98 |
| 11 | 4.84 | 3.98 | 3.59 | 3.36 | 3.20 | 3.09 | 3.01 | 2.95 | 2.90 | 2.85 |
| 12 | 4.75 | 3.89 | 3.49 | 3.26 | 3.11 | 3.00 | 2.91 | 2.85 | 2.80 | 2.75 |
| 13 | 4.67 | 3.81 | 3.41 | 3.18 | 3.03 | 2.92 | 2.83 | 2.77 | 2.71 | 2.67 |
| 14 | 4.60 | 3.74 | 3.34 | 3.11 | 2.96 | 2.85 | 2.76 | 2.70 | 2.65 | 2.60 |
| 15 | 4.54 | 3.68 | 3.29 | 3.06 | 2.90 | 2.79 | 2.71 | 2.64 | 2.59 | 2.54 |
| 16 | 4.49 | 3.63 | 3.24 | 3.01 | 2.85 | 2.74 | 2.66 | 2.59 | 2.54 | 2.49 |
| 17 | 4.45 | 3.59 | 3.20 | 2.96 | 2.81 | 2.70 | 2.61 | 2.55 | 2.49 | 2.45 |
| 18 | 4.41 | 3.55 | 3.16 | 2.93 | 2.77 | 2.66 | 2.58 | 2.51 | 2.46 | 2.41 |
| 19 | 4.38 | 3.52 | 3.13 | 2.90 | 2.74 | 2.63 | 2.54 | 2.48 | 2.42 | 2.38 |
| 20 | 4.35 | 3.49 | 3.10 | 2.87 | 2.71 | 2.60 | 2.51 | 2.45 | 2.39 | 2.35 |
| 21 | 4.32 | 3.47 | 3.07 | 2.84 | 2.68 | 2.57 | 2.49 | 2.42 | 2.37 | 2.32 |
| 22 | 4.30 | 3.44 | 3.05 | 2.82 | 2.66 | 2.55 | 2.46 | 2.40 | 2.34 | 2.30 |
| 23 | 4.28 | 3.42 | 3.03 | 2.80 | 2.64 | 2.53 | 2.44 | 2.37 | 2.32 | 2.27 |
| 24 | 4.26 | 3.40 | 3.01 | 2.78 | 2.62 | 2.51 | 2.42 | 2.36 | 2.30 | 2.25 |
| 25 | 4.24 | 3.39 | 2.99 | 2.76 | 2.60 | 2.49 | 2.40 | 2.34 | 2.28 | 2.24 |
| 26 | 4.23 | 3.37 | 2.98 | 2.74 | 2.59 | 2.47 | 2.39 | 2.32 | 2.27 | 2.22 |
| 27 | 4.21 | 3.35 | 2.96 | 2.73 | 2.57 | 2.46 | 2.37 | 2.31 | 2.25 | 2.20 |
| 28 | 4.20 | 3.34 | 2.95 | 2.71 | 2.56 | 2.45 | 2.36 | 2.29 | 2.24 | 2.19 |
| 29 | 4.18 | 3.33 | 2.93 | 2.70 | 2.55 | 2.43 | 2.35 | 2.28 | 2.22 | 2.18 |
| 30 | 4.17 | 3.32 | 2.92 | 2.69 | 2.53 | 2.42 | 2.33 | 2.27 | 2.21 | 2.16 |
| 40 | 4.08 | 3.23 | 2.84 | 2.61 | 2.45 | 2.34 | 2.25 | 2.18 | 2.12 | 2.08 |
| 50 | 4.03 | 3.18 | 2.79 | 2.56 | 2.40 | 2.29 | 2.20 | 2.13 | 2.07 | 2.03 |
| 60 | 4.00 | 3.15 | 2.76 | 2.53 | 2.37 | 2.25 | 2.17 | 2.10 | 2.04 | 1.99 |
| 70 | 3.98 | 3.13 | 2.74 | 2.50 | 2.35 | 2.23 | 2.14 | 2.07 | 2.02 | 1.97 |
| 80 | 3.96 | 3.11 | 2.72 | 2.49 | 2.33 | 2.21 | 2.13 | 2.06 | 2.00 | 1.95 |
| 90 | 3.95 | 3.10 | 2.71 | 2.47 | 2.32 | 2.20 | 2.11 | 2.04 | 1.99 | 1.94 |
| 100 | 3.94 | 3.09 | 2.70 | 2.46 | 2.31 | 2.19 | 2.10 | 2.03 | 1.97 | 1.93 |
| 200 | 3.89 | 3.04 | 2.65 | 2.42 | 2.26 | 2.14 | 2.06 | 1.98 | 1.93 | 1.88 |
| 500 | 3.86 | 3.01 | 2.62 | 2.39 | 2.23 | 2.12 | 2.03 | 1.96 | 1.90 | 1.85 |
| 1000 | 3.85 | 3.00 | 2.61 | 2.38 | 2.22 | 2.11 | 2.02 | 1.95 | 1.89 | 1.84 |

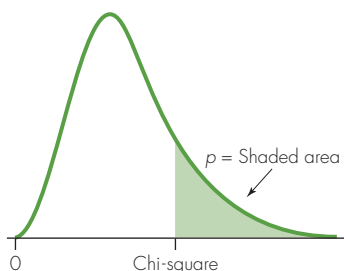
Table A.4 Critical Values for F-Test ($\alpha = .01$)



| Denom df | Numerator df | | | | | | | | | |
|----------|--------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 1 | 4052 | 4999 | 5404 | 5624 | 5764 | 5859 | 5928 | 5981 | 6022 | 6056 |
| 2 | 98.50 | 99.00 | 99.16 | 99.25 | 99.30 | 99.33 | 99.36 | 99.38 | 99.39 | 99.40 |
| 3 | 34.12 | 30.82 | 29.46 | 28.71 | 28.24 | 27.91 | 27.67 | 27.49 | 27.34 | 27.23 |
| 4 | 21.20 | 18.00 | 16.69 | 15.98 | 15.52 | 15.21 | 14.98 | 14.80 | 14.66 | 14.55 |
| 5 | 16.26 | 13.27 | 12.06 | 11.39 | 10.97 | 10.67 | 10.46 | 10.29 | 10.16 | 10.05 |
| 6 | 13.75 | 10.92 | 9.78 | 9.15 | 8.75 | 8.47 | 8.26 | 8.10 | 7.98 | 7.87 |
| 7 | 12.25 | 9.55 | 8.45 | 7.85 | 7.46 | 7.19 | 6.99 | 6.84 | 6.72 | 6.62 |
| 8 | 11.26 | 8.65 | 7.59 | 7.01 | 6.63 | 6.37 | 6.18 | 6.03 | 5.91 | 5.81 |
| 9 | 10.56 | 8.02 | 6.99 | 6.42 | 6.06 | 5.80 | 5.61 | 5.47 | 5.35 | 5.26 |
| 10 | 10.04 | 7.56 | 6.55 | 5.99 | 5.64 | 5.39 | 5.20 | 5.06 | 4.94 | 4.85 |
| 11 | 9.65 | 7.21 | 6.22 | 5.67 | 5.32 | 5.07 | 4.89 | 4.74 | 4.63 | 4.54 |
| 12 | 9.33 | 6.93 | 5.95 | 5.41 | 5.06 | 4.82 | 4.64 | 4.50 | 4.39 | 4.30 |
| 13 | 9.07 | 6.70 | 5.74 | 5.21 | 4.86 | 4.62 | 4.44 | 4.30 | 4.19 | 4.10 |
| 14 | 8.86 | 6.51 | 5.56 | 5.04 | 4.69 | 4.46 | 4.28 | 4.14 | 4.03 | 3.94 |
| 15 | 8.68 | 6.36 | 5.42 | 4.89 | 4.56 | 4.32 | 4.14 | 4.00 | 3.89 | 3.80 |
| 16 | 8.53 | 6.23 | 5.29 | 4.77 | 4.44 | 4.20 | 4.03 | 3.89 | 3.78 | 3.69 |
| 17 | 8.40 | 6.11 | 5.19 | 4.67 | 4.34 | 4.10 | 3.93 | 3.79 | 3.68 | 3.59 |
| 18 | 8.29 | 6.01 | 5.09 | 4.58 | 4.25 | 4.01 | 3.84 | 3.71 | 3.60 | 3.51 |
| 19 | 8.18 | 5.93 | 5.01 | 4.50 | 4.17 | 3.94 | 3.77 | 3.63 | 3.52 | 3.43 |
| 20 | 8.10 | 5.85 | 4.94 | 4.43 | 4.10 | 3.87 | 3.70 | 3.56 | 3.46 | 3.37 |
| 21 | 8.02 | 5.78 | 4.87 | 4.37 | 4.04 | 3.81 | 3.64 | 3.51 | 3.40 | 3.31 |
| 22 | 7.95 | 5.72 | 4.82 | 4.31 | 3.99 | 3.76 | 3.59 | 3.45 | 3.35 | 3.26 |
| 23 | 7.88 | 5.66 | 4.76 | 4.26 | 3.94 | 3.71 | 3.54 | 3.41 | 3.30 | 3.21 |
| 24 | 7.82 | 5.61 | 4.72 | 4.22 | 3.90 | 3.67 | 3.50 | 3.36 | 3.26 | 3.17 |
| 25 | 7.77 | 5.57 | 4.68 | 4.18 | 3.85 | 3.63 | 3.46 | 3.32 | 3.22 | 3.13 |
| 26 | 7.72 | 5.53 | 4.64 | 4.14 | 3.82 | 3.59 | 3.42 | 3.29 | 3.18 | 3.09 |
| 27 | 7.68 | 5.49 | 4.60 | 4.11 | 3.78 | 3.56 | 3.39 | 3.26 | 3.15 | 3.06 |
| 28 | 7.64 | 5.45 | 4.57 | 4.07 | 3.75 | 3.53 | 3.36 | 3.23 | 3.12 | 3.03 |
| 29 | 7.60 | 5.42 | 4.54 | 4.04 | 3.73 | 3.50 | 3.33 | 3.20 | 3.09 | 3.00 |
| 30 | 7.56 | 5.39 | 4.51 | 4.02 | 3.70 | 3.47 | 3.30 | 3.17 | 3.07 | 2.98 |
| 40 | 7.31 | 5.18 | 4.31 | 3.83 | 3.51 | 3.29 | 3.12 | 2.99 | 2.89 | 2.80 |
| 50 | 7.17 | 5.06 | 4.20 | 3.72 | 3.41 | 3.19 | 3.02 | 2.89 | 2.78 | 2.70 |
| 60 | 7.08 | 4.98 | 4.13 | 3.65 | 3.34 | 3.12 | 2.95 | 2.82 | 2.72 | 2.63 |
| 70 | 7.01 | 4.92 | 4.07 | 3.60 | 3.29 | 3.07 | 2.91 | 2.78 | 2.67 | 2.59 |
| 80 | 6.96 | 4.88 | 4.04 | 3.56 | 3.26 | 3.04 | 2.87 | 2.74 | 2.64 | 2.55 |
| 90 | 6.93 | 4.85 | 4.01 | 3.53 | 3.23 | 3.01 | 2.84 | 2.72 | 2.61 | 2.52 |
| 100 | 6.90 | 4.82 | 3.98 | 3.51 | 3.21 | 2.99 | 2.82 | 2.69 | 2.59 | 2.50 |
| 200 | 6.76 | 4.71 | 3.88 | 3.41 | 3.11 | 2.89 | 2.73 | 2.60 | 2.50 | 2.41 |
| 500 | 6.69 | 4.65 | 3.82 | 3.36 | 3.05 | 2.84 | 2.68 | 2.55 | 2.44 | 2.36 |
| 1000 | 6.66 | 4.63 | 3.80 | 3.34 | 3.04 | 2.82 | 2.66 | 2.53 | 2.43 | 2.34 |

732 Appendix of Tables

Table A.5 Chi-Square Distribution



| p = Area to Right of Chi-Square Value | | | | | | | | | |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| <i>df</i> | .50 | .25 | .10 | .075 | .05 | .025 | .01 | .005 | .001 |
| 1 | 0.45 | 1.32 | 2.71 | 3.17 | 3.84 | 5.02 | 6.63 | 7.88 | 10.83 |
| 2 | 1.39 | 2.77 | 4.61 | 5.18 | 5.99 | 7.38 | 9.21 | 10.60 | 13.82 |
| 3 | 2.37 | 4.11 | 6.25 | 6.90 | 7.81 | 9.35 | 11.34 | 12.84 | 16.27 |
| 4 | 3.36 | 5.39 | 7.78 | 8.50 | 9.49 | 11.14 | 13.28 | 14.86 | 18.47 |
| 5 | 4.35 | 6.63 | 9.24 | 10.01 | 11.07 | 12.83 | 15.09 | 16.75 | 20.51 |
| 6 | 5.35 | 7.84 | 10.64 | 11.47 | 12.59 | 14.45 | 16.81 | 18.55 | 22.46 |
| 7 | 6.35 | 9.04 | 12.02 | 12.88 | 14.07 | 16.01 | 18.48 | 20.28 | 24.32 |
| 8 | 7.34 | 10.22 | 13.36 | 14.27 | 15.51 | 17.53 | 20.09 | 21.95 | 26.12 |
| 9 | 8.34 | 11.39 | 14.68 | 15.63 | 16.92 | 19.02 | 21.67 | 23.59 | 27.88 |
| 10 | 9.34 | 12.55 | 15.99 | 16.97 | 18.31 | 20.48 | 23.21 | 25.19 | 29.59 |
| 11 | 10.34 | 13.70 | 17.28 | 18.29 | 19.68 | 21.92 | 24.73 | 26.76 | 31.26 |
| 12 | 11.34 | 14.85 | 18.55 | 19.60 | 21.03 | 23.34 | 26.22 | 28.30 | 32.91 |
| 13 | 12.34 | 15.98 | 19.81 | 20.90 | 22.36 | 24.74 | 27.69 | 29.82 | 34.53 |
| 14 | 13.34 | 17.12 | 21.06 | 22.18 | 23.68 | 26.12 | 29.14 | 31.32 | 36.12 |
| 15 | 14.34 | 18.25 | 22.31 | 23.45 | 25.00 | 27.49 | 30.58 | 32.80 | 37.70 |
| 16 | 15.34 | 19.37 | 23.54 | 24.72 | 26.30 | 28.85 | 32.00 | 34.27 | 39.25 |
| 17 | 16.34 | 20.49 | 24.77 | 25.97 | 27.59 | 30.19 | 33.41 | 35.72 | 40.79 |
| 18 | 17.34 | 21.60 | 25.99 | 27.22 | 28.87 | 31.53 | 34.81 | 37.16 | 42.31 |
| 19 | 18.34 | 22.72 | 27.20 | 28.46 | 30.14 | 32.85 | 36.19 | 38.58 | 43.82 |
| 20 | 19.34 | 23.83 | 28.41 | 29.69 | 31.41 | 34.17 | 37.57 | 40.00 | 45.31 |
| 21 | 20.34 | 24.93 | 29.62 | 30.92 | 32.67 | 35.48 | 38.93 | 41.40 | 46.80 |
| 22 | 21.34 | 26.04 | 30.81 | 32.14 | 33.92 | 36.78 | 40.29 | 42.80 | 48.27 |
| 23 | 22.34 | 27.14 | 32.01 | 33.36 | 35.17 | 38.08 | 41.64 | 44.18 | 49.73 |
| 24 | 23.34 | 28.24 | 33.20 | 34.57 | 36.42 | 39.36 | 42.98 | 45.56 | 51.18 |
| 25 | 24.34 | 29.34 | 34.38 | 35.78 | 37.65 | 40.65 | 44.31 | 46.93 | 52.62 |
| 26 | 25.34 | 30.43 | 35.56 | 36.98 | 38.89 | 41.92 | 45.64 | 48.29 | 54.05 |
| 27 | 26.34 | 31.53 | 36.74 | 38.18 | 40.11 | 43.19 | 46.96 | 49.65 | 55.48 |
| 28 | 27.34 | 32.62 | 37.92 | 39.38 | 41.34 | 44.46 | 48.28 | 50.99 | 56.89 |
| 29 | 28.34 | 33.71 | 39.09 | 40.57 | 42.56 | 45.72 | 49.59 | 52.34 | 58.30 |
| 30 | 29.34 | 34.80 | 40.26 | 41.76 | 43.77 | 46.98 | 50.89 | 53.67 | 59.70 |