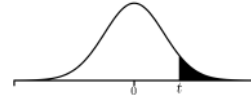


Critical Values for Student's  $t$ -Distribution.

| df       | Upper Tail Probability: $\Pr(T > t)$ |       |       |       |        |        |        |        |        |         |
|----------|--------------------------------------|-------|-------|-------|--------|--------|--------|--------|--------|---------|
|          | 0.2                                  | 0.1   | 0.05  | 0.04  | 0.03   | 0.025  | 0.02   | 0.01   | 0.005  | 0.0005  |
| 1        | 1.376                                | 3.078 | 6.314 | 7.916 | 10.579 | 12.706 | 15.895 | 31.821 | 63.657 | 636.619 |
| 2        | 1.061                                | 1.886 | 2.920 | 3.320 | 3.896  | 4.303  | 4.849  | 6.965  | 9.925  | 31.599  |
| 3        | 0.978                                | 1.638 | 2.353 | 2.605 | 2.951  | 3.182  | 3.482  | 4.541  | 5.841  | 12.924  |
| 4        | 0.941                                | 1.533 | 2.132 | 2.333 | 2.601  | 2.776  | 2.999  | 3.747  | 4.604  | 8.610   |
| 5        | 0.920                                | 1.476 | 2.015 | 2.191 | 2.422  | 2.571  | 2.757  | 3.365  | 4.032  | 6.869   |
| 6        | 0.906                                | 1.440 | 1.943 | 2.104 | 2.313  | 2.447  | 2.612  | 3.143  | 3.707  | 5.959   |
| 7        | 0.896                                | 1.415 | 1.895 | 2.046 | 2.241  | 2.365  | 2.517  | 2.998  | 3.499  | 5.408   |
| 8        | 0.889                                | 1.397 | 1.860 | 2.004 | 2.189  | 2.306  | 2.449  | 2.896  | 3.355  | 5.041   |
| 9        | 0.883                                | 1.383 | 1.833 | 1.973 | 2.150  | 2.262  | 2.398  | 2.821  | 3.250  | 4.781   |
| 10       | 0.879                                | 1.372 | 1.812 | 1.948 | 2.120  | 2.228  | 2.359  | 2.764  | 3.169  | 4.587   |
| 11       | 0.876                                | 1.363 | 1.796 | 1.928 | 2.096  | 2.201  | 2.328  | 2.718  | 3.106  | 4.437   |
| 12       | 0.873                                | 1.356 | 1.782 | 1.912 | 2.076  | 2.179  | 2.303  | 2.681  | 3.055  | 4.318   |
| 13       | 0.870                                | 1.350 | 1.771 | 1.899 | 2.060  | 2.160  | 2.282  | 2.650  | 3.012  | 4.221   |
| 14       | 0.868                                | 1.345 | 1.761 | 1.887 | 2.046  | 2.145  | 2.264  | 2.624  | 2.977  | 4.140   |
| 15       | 0.866                                | 1.341 | 1.753 | 1.878 | 2.034  | 2.131  | 2.249  | 2.602  | 2.947  | 4.073   |
| 16       | 0.865                                | 1.337 | 1.746 | 1.869 | 2.024  | 2.120  | 2.235  | 2.583  | 2.921  | 4.015   |
| 17       | 0.863                                | 1.333 | 1.740 | 1.862 | 2.015  | 2.110  | 2.224  | 2.567  | 2.898  | 3.965   |
| 18       | 0.862                                | 1.330 | 1.734 | 1.855 | 2.007  | 2.101  | 2.214  | 2.552  | 2.878  | 3.922   |
| 19       | 0.861                                | 1.328 | 1.729 | 1.850 | 2.000  | 2.093  | 2.205  | 2.539  | 2.861  | 3.883   |
| 20       | 0.860                                | 1.325 | 1.725 | 1.844 | 1.994  | 2.086  | 2.197  | 2.528  | 2.845  | 3.850   |
| 21       | 0.859                                | 1.323 | 1.721 | 1.840 | 1.988  | 2.080  | 2.189  | 2.518  | 2.831  | 3.819   |
| 22       | 0.858                                | 1.321 | 1.717 | 1.835 | 1.983  | 2.074  | 2.183  | 2.508  | 2.819  | 3.792   |
| 23       | 0.858                                | 1.319 | 1.714 | 1.832 | 1.978  | 2.069  | 2.177  | 2.500  | 2.807  | 3.768   |
| 24       | 0.857                                | 1.318 | 1.711 | 1.828 | 1.974  | 2.064  | 2.172  | 2.492  | 2.797  | 3.745   |
| 25       | 0.856                                | 1.316 | 1.708 | 1.825 | 1.970  | 2.060  | 2.167  | 2.485  | 2.787  | 3.725   |
| 26       | 0.856                                | 1.315 | 1.706 | 1.822 | 1.967  | 2.056  | 2.162  | 2.479  | 2.779  | 3.707   |
| 27       | 0.855                                | 1.314 | 1.703 | 1.819 | 1.963  | 2.052  | 2.158  | 2.473  | 2.771  | 3.690   |
| 28       | 0.855                                | 1.313 | 1.701 | 1.817 | 1.960  | 2.048  | 2.154  | 2.467  | 2.763  | 3.674   |
| 29       | 0.854                                | 1.311 | 1.699 | 1.814 | 1.957  | 2.045  | 2.150  | 2.462  | 2.756  | 3.659   |
| 30       | 0.854                                | 1.310 | 1.697 | 1.812 | 1.955  | 2.042  | 2.147  | 2.457  | 2.750  | 3.646   |
| 31       | 0.853                                | 1.309 | 1.696 | 1.810 | 1.952  | 2.040  | 2.144  | 2.453  | 2.744  | 3.633   |
| 32       | 0.853                                | 1.309 | 1.694 | 1.808 | 1.950  | 2.037  | 2.141  | 2.449  | 2.738  | 3.622   |
| 33       | 0.853                                | 1.308 | 1.692 | 1.806 | 1.948  | 2.035  | 2.138  | 2.445  | 2.733  | 3.611   |
| 34       | 0.852                                | 1.307 | 1.691 | 1.805 | 1.946  | 2.032  | 2.136  | 2.441  | 2.728  | 3.601   |
| 35       | 0.852                                | 1.306 | 1.690 | 1.803 | 1.944  | 2.030  | 2.133  | 2.438  | 2.724  | 3.591   |
| 36       | 0.852                                | 1.306 | 1.688 | 1.802 | 1.942  | 2.028  | 2.131  | 2.434  | 2.719  | 3.582   |
| 37       | 0.851                                | 1.305 | 1.687 | 1.800 | 1.940  | 2.026  | 2.129  | 2.431  | 2.715  | 3.574   |
| 38       | 0.851                                | 1.304 | 1.686 | 1.799 | 1.939  | 2.024  | 2.127  | 2.429  | 2.712  | 3.566   |
| 39       | 0.851                                | 1.304 | 1.685 | 1.798 | 1.937  | 2.023  | 2.125  | 2.426  | 2.708  | 3.558   |
| 40       | 0.851                                | 1.303 | 1.684 | 1.796 | 1.936  | 2.021  | 2.123  | 2.423  | 2.704  | 3.551   |
| 41       | 0.850                                | 1.303 | 1.683 | 1.795 | 1.934  | 2.020  | 2.121  | 2.421  | 2.701  | 3.544   |
| 42       | 0.850                                | 1.302 | 1.682 | 1.794 | 1.933  | 2.018  | 2.120  | 2.418  | 2.698  | 3.538   |
| 43       | 0.850                                | 1.302 | 1.681 | 1.793 | 1.932  | 2.017  | 2.118  | 2.416  | 2.695  | 3.532   |
| 44       | 0.850                                | 1.301 | 1.680 | 1.792 | 1.931  | 2.015  | 2.116  | 2.414  | 2.692  | 3.526   |
| 45       | 0.850                                | 1.301 | 1.679 | 1.791 | 1.929  | 2.014  | 2.115  | 2.412  | 2.690  | 3.520   |
| 46       | 0.850                                | 1.300 | 1.679 | 1.790 | 1.928  | 2.013  | 2.114  | 2.410  | 2.687  | 3.515   |
| 47       | 0.849                                | 1.300 | 1.678 | 1.789 | 1.927  | 2.012  | 2.112  | 2.408  | 2.685  | 3.510   |
| 48       | 0.849                                | 1.299 | 1.677 | 1.789 | 1.926  | 2.011  | 2.111  | 2.407  | 2.682  | 3.505   |
| 49       | 0.849                                | 1.299 | 1.677 | 1.788 | 1.925  | 2.010  | 2.110  | 2.405  | 2.680  | 3.500   |
| 50       | 0.849                                | 1.299 | 1.676 | 1.787 | 1.924  | 2.009  | 2.109  | 2.403  | 2.678  | 3.496   |
| 60       | 0.848                                | 1.296 | 1.671 | 1.781 | 1.917  | 2.000  | 2.099  | 2.390  | 2.660  | 3.460   |
| 70       | 0.847                                | 1.294 | 1.667 | 1.776 | 1.912  | 1.994  | 2.093  | 2.381  | 2.648  | 3.435   |
| 80       | 0.846                                | 1.292 | 1.664 | 1.773 | 1.908  | 1.990  | 2.088  | 2.374  | 2.639  | 3.416   |
| 90       | 0.846                                | 1.291 | 1.662 | 1.771 | 1.905  | 1.987  | 2.084  | 2.368  | 2.632  | 3.402   |
| 100      | 0.845                                | 1.290 | 1.660 | 1.769 | 1.902  | 1.984  | 2.081  | 2.364  | 2.626  | 3.390   |
| 120      | 0.845                                | 1.289 | 1.658 | 1.766 | 1.899  | 1.980  | 2.076  | 2.358  | 2.617  | 3.373   |
| 140      | 0.844                                | 1.288 | 1.656 | 1.763 | 1.896  | 1.977  | 2.073  | 2.353  | 2.611  | 3.361   |
| 180      | 0.844                                | 1.286 | 1.653 | 1.761 | 1.893  | 1.973  | 2.069  | 2.347  | 2.603  | 3.345   |
| 200      | 0.843                                | 1.286 | 1.653 | 1.760 | 1.892  | 1.972  | 2.067  | 2.345  | 2.601  | 3.340   |
| 500      | 0.842                                | 1.283 | 1.648 | 1.754 | 1.885  | 1.965  | 2.059  | 2.334  | 2.586  | 3.310   |
| 1000     | 0.842                                | 1.282 | 1.646 | 1.752 | 1.883  | 1.962  | 2.056  | 2.330  | 2.581  | 3.300   |
| $\infty$ | 0.842                                | 1.282 | 1.645 | 1.751 | 1.881  | 1.960  | 2.054  | 2.326  | 2.576  | 3.291   |
|          | 60%                                  | 80%   | 90%   | 92%   | 94%    | 95%    | 96%    | 98%    | 99%    | 99.9%   |
|          | Confidence Level                     |       |       |       |        |        |        |        |        |         |

Note:  $t(\infty)_{\alpha/2} = Z_{\alpha/2}$  in our notation.