

Standard normal distribution¹

Standard normal cumulative distribution function $\Phi(z) = \int_{-\infty}^z \frac{1}{\sqrt{2\pi}} \exp\left(-\frac{t^2}{2}\right) dt$ and $100 \times \gamma$ th percentiles z_γ . Example: $\mathbb{P}(Z \leq 0.36) = 0.6406$.

| z | 0.00 | 0.01 | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 | 0.09 |
|-----|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| 0.0 | 0.5000 | 0.5040 | 0.5080 | 0.5120 | 0.5160 | 0.5199 | 0.5239 | 0.5279 | 0.5319 | 0.5359 |
| 0.1 | 0.5398 | 0.5438 | 0.5478 | 0.5517 | 0.5557 | 0.5596 | 0.5636 | 0.5675 | 0.5714 | 0.5753 |
| 0.2 | 0.5793 | 0.5832 | 0.5871 | 0.5910 | 0.5948 | 0.5987 | 0.6026 | 0.6064 | 0.6103 | 0.6141 |
| 0.3 | 0.6179 | 0.6217 | 0.6255 | 0.6293 | 0.6331 | 0.6368 | 0.6406 | 0.6443 | 0.6480 | 0.6517 |
| 0.4 | 0.6554 | 0.6591 | 0.6628 | 0.6664 | 0.6700 | 0.6736 | 0.6772 | 0.6808 | 0.6844 | 0.6879 |
| 0.5 | 0.6915 | 0.6950 | 0.6985 | 0.7019 | 0.7054 | 0.7088 | 0.7123 | 0.7157 | 0.7190 | 0.7224 |
| 0.6 | 0.7257 | 0.7291 | 0.7324 | 0.7357 | 0.7389 | 0.7422 | 0.7454 | 0.7486 | 0.7517 | 0.7549 |
| 0.7 | 0.7580 | 0.7611 | 0.7642 | 0.7673 | 0.7704 | 0.7734 | 0.7764 | 0.7794 | 0.7823 | 0.7852 |
| 0.8 | 0.7881 | 0.7910 | 0.7939 | 0.7967 | 0.7995 | 0.8023 | 0.8051 | 0.8078 | 0.8106 | 0.8133 |
| 0.9 | 0.8159 | 0.8186 | 0.8212 | 0.8238 | 0.8264 | 0.8289 | 0.8315 | 0.8340 | 0.8365 | 0.8389 |
| 1.0 | 0.8413 | 0.8438 | 0.8461 | 0.8485 | 0.8508 | 0.8531 | 0.8554 | 0.8577 | 0.8599 | 0.8621 |
| 1.1 | 0.8643 | 0.8665 | 0.8686 | 0.8708 | 0.8729 | 0.8749 | 0.8770 | 0.8790 | 0.8810 | 0.8830 |
| 1.2 | 0.8849 | 0.8869 | 0.8888 | 0.8907 | 0.8925 | 0.8944 | 0.8962 | 0.8980 | 0.8997 | 0.9015 |
| 1.3 | 0.9032 | 0.9049 | 0.9066 | 0.9082 | 0.9099 | 0.9115 | 0.9131 | 0.9147 | 0.9162 | 0.9177 |
| 1.4 | 0.9192 | 0.9207 | 0.9222 | 0.9236 | 0.9251 | 0.9265 | 0.9279 | 0.9292 | 0.9306 | 0.9319 |
| 1.5 | 0.9332 | 0.9345 | 0.9357 | 0.9370 | 0.9382 | 0.9394 | 0.9406 | 0.9418 | 0.9429 | 0.9441 |
| 1.6 | 0.9452 | 0.9463 | 0.9474 | 0.9484 | 0.9495 | 0.9505 | 0.9515 | 0.9525 | 0.9535 | 0.9545 |
| 1.7 | 0.9554 | 0.9564 | 0.9573 | 0.9582 | 0.9591 | 0.9599 | 0.9608 | 0.9616 | 0.9625 | 0.9633 |
| 1.8 | 0.9641 | 0.9649 | 0.9656 | 0.9664 | 0.9671 | 0.9678 | 0.9686 | 0.9693 | 0.9699 | 0.9706 |
| 1.9 | 0.9713 | 0.9719 | 0.9726 | 0.9732 | 0.9738 | 0.9744 | 0.9750 | 0.9756 | 0.9761 | 0.9767 |
| 2.0 | 0.9772 | 0.9778 | 0.9783 | 0.9788 | 0.9793 | 0.9798 | 0.9803 | 0.9808 | 0.9812 | 0.9817 |
| 2.1 | 0.9821 | 0.9826 | 0.9830 | 0.9834 | 0.9838 | 0.9842 | 0.9846 | 0.9850 | 0.9854 | 0.9857 |
| 2.2 | 0.9861 | 0.9864 | 0.9868 | 0.9871 | 0.9875 | 0.9878 | 0.9881 | 0.9884 | 0.9887 | 0.9890 |
| 2.3 | 0.9893 | 0.9896 | 0.9898 | 0.9901 | 0.9904 | 0.9906 | 0.9909 | 0.9911 | 0.9913 | 0.9916 |
| 2.4 | 0.9918 | 0.9920 | 0.9922 | 0.9925 | 0.9927 | 0.9929 | 0.9931 | 0.9932 | 0.9934 | 0.9936 |
| 2.5 | 0.9938 | 0.9940 | 0.9941 | 0.9943 | 0.9945 | 0.9946 | 0.9948 | 0.9949 | 0.9951 | 0.9952 |
| 2.6 | 0.9953 | 0.9955 | 0.9956 | 0.9957 | 0.9959 | 0.9960 | 0.9961 | 0.9962 | 0.9963 | 0.9964 |
| 2.7 | 0.9965 | 0.9966 | 0.9967 | 0.9968 | 0.9969 | 0.9970 | 0.9971 | 0.9972 | 0.9973 | 0.9974 |
| 2.8 | 0.9974 | 0.9975 | 0.9976 | 0.9977 | 0.9977 | 0.9978 | 0.9979 | 0.9979 | 0.9980 | 0.9981 |
| 2.9 | 0.9981 | 0.9982 | 0.9982 | 0.9983 | 0.9984 | 0.9984 | 0.9985 | 0.9985 | 0.9986 | 0.9986 |
| 3.0 | 0.9987 | 0.9987 | 0.9987 | 0.9988 | 0.9988 | 0.9989 | 0.9989 | 0.9989 | 0.9990 | 0.9990 |
| 3.1 | 0.9990 | 0.9991 | 0.9991 | 0.9991 | 0.9992 | 0.9992 | 0.9992 | 0.9992 | 0.9993 | 0.9993 |
| 3.2 | 0.9993 | 0.9993 | 0.9994 | 0.9994 | 0.9994 | 0.9994 | 0.9994 | 0.9995 | 0.9995 | 0.9995 |
| 3.3 | 0.9995 | 0.9995 | 0.9995 | 0.9996 | 0.9996 | 0.9996 | 0.9996 | 0.9996 | 0.9996 | 0.9997 |
| 3.4 | 0.9997 | 0.9997 | 0.9997 | 0.9997 | 0.9997 | 0.9997 | 0.9997 | 0.9997 | 0.9997 | 0.9998 |

| γ | 0.90 | 0.95 | 0.975 | 0.99 | 0.995 | 0.999 |
|------------|-------------|-------------|--------------|-------------|--------------|--------------|
| z_γ | 1.282 | 1.645 | 1.960 | 2.326 | 2.576 | 3.090 |

¹I sincerely thank my colleagues from the Econometric Institute for sharing a template with tables of these critical values.

Student's t distribution with ν degrees of freedom

The $100 \times \gamma$ th percentiles $t_\gamma(\nu)$ of Students's t distribution with ν degrees of freedom. Example: If T denotes a t -distributed random variable with 2 degrees of freedom, then $\mathbb{P}(T \leq 2.920) = 0.95$.

| ν | γ | | | |
|----------|----------|-------|--------|--------|
| | 0.90 | 0.95 | 0.975 | 0.99 |
| 1 | 3.078 | 6.314 | 12.706 | 31.821 |
| 2 | 1.886 | 2.920 | 4.303 | 6.965 |
| 3 | 1.638 | 2.353 | 3.182 | 4.541 |
| 4 | 1.533 | 2.132 | 2.776 | 3.747 |
| 5 | 1.476 | 2.015 | 2.571 | 3.365 |
| 6 | 1.440 | 1.943 | 2.447 | 3.143 |
| 7 | 1.415 | 1.895 | 2.365 | 2.998 |
| 8 | 1.397 | 1.860 | 2.306 | 2.896 |
| 9 | 1.383 | 1.833 | 2.262 | 2.821 |
| 10 | 1.372 | 1.812 | 2.228 | 2.764 |
| 11 | 1.363 | 1.796 | 2.201 | 2.718 |
| 12 | 1.356 | 1.782 | 2.179 | 2.681 |
| 13 | 1.350 | 1.771 | 2.160 | 2.650 |
| 14 | 1.345 | 1.761 | 2.145 | 2.624 |
| 15 | 1.341 | 1.753 | 2.131 | 2.602 |
| 16 | 1.337 | 1.746 | 2.120 | 2.583 |
| 17 | 1.333 | 1.740 | 2.110 | 2.567 |
| 18 | 1.330 | 1.734 | 2.101 | 2.552 |
| 19 | 1.328 | 1.729 | 2.093 | 2.539 |
| 20 | 1.325 | 1.725 | 2.086 | 2.528 |
| 21 | 1.323 | 1.721 | 2.080 | 2.518 |
| 22 | 1.321 | 1.717 | 2.074 | 2.508 |
| 23 | 1.319 | 1.714 | 2.069 | 2.500 |
| 24 | 1.318 | 1.711 | 2.064 | 2.492 |
| 25 | 1.316 | 1.708 | 2.060 | 2.485 |
| 26 | 1.315 | 1.706 | 2.056 | 2.479 |
| 27 | 1.314 | 1.703 | 2.052 | 2.473 |
| 28 | 1.313 | 1.701 | 2.048 | 2.467 |
| 29 | 1.311 | 1.699 | 2.045 | 2.462 |
| 30 | 1.310 | 1.697 | 2.042 | 2.457 |
| 32 | 1.309 | 1.694 | 2.037 | 2.449 |
| 34 | 1.307 | 1.691 | 2.032 | 2.441 |
| 36 | 1.306 | 1.688 | 2.028 | 2.434 |
| 38 | 1.304 | 1.686 | 2.024 | 2.429 |
| 40 | 1.303 | 1.684 | 2.021 | 2.423 |
| 45 | 1.301 | 1.679 | 2.014 | 2.412 |
| 50 | 1.299 | 1.676 | 2.009 | 2.403 |
| 55 | 1.297 | 1.673 | 2.004 | 2.396 |
| 60 | 1.296 | 1.671 | 2.000 | 2.390 |
| 65 | 1.295 | 1.669 | 1.997 | 2.385 |
| 70 | 1.294 | 1.667 | 1.994 | 2.381 |
| 75 | 1.293 | 1.665 | 1.992 | 2.377 |
| 80 | 1.292 | 1.664 | 1.990 | 2.374 |
| 85 | 1.292 | 1.663 | 1.988 | 2.371 |
| 90 | 1.291 | 1.662 | 1.987 | 2.369 |
| 95 | 1.291 | 1.661 | 1.985 | 2.366 |
| 100 | 1.290 | 1.660 | 1.984 | 2.364 |
| 110 | 1.289 | 1.659 | 1.982 | 2.361 |
| 120 | 1.289 | 1.658 | 1.980 | 2.358 |
| 130 | 1.288 | 1.657 | 1.978 | 2.355 |
| 140 | 1.288 | 1.656 | 1.977 | 2.353 |
| 160 | 1.287 | 1.654 | 1.975 | 2.350 |
| 180 | 1.286 | 1.653 | 1.973 | 2.347 |
| 200 | 1.286 | 1.653 | 1.972 | 2.345 |
| 250 | 1.285 | 1.651 | 1.969 | 2.341 |
| ∞ | 1.282 | 1.645 | 1.960 | 2.326 |

Chi-square distribution with ν degrees of freedom

The $100 \times \gamma$ th percentiles $\chi^2_\gamma(\nu)$ of the chi-square distribution with ν degrees of freedom. Example: If χ^2 denotes a chi-square distributed random variable with 2 degrees of freedom, then $\mathbb{P}(\chi^2 \leq 5.991) = 0.95$.

| ν | γ | | | | | | | | | |
|-------|----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| | 0.005 | 0.01 | 0.025 | 0.05 | 0.1 | 0.9 | 0.95 | 0.975 | 0.99 | 0.995 |
| 1 | 0.000 | 0.000 | 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 |
| 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 |

| ν | γ | | | | | | | | | |
|-------|----------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| | 0.005 | 0.01 | 0.025 | 0.05 | 0.1 | 0.9 | 0.95 | 0.975 | 0.99 | 0.995 |
| 30 | 13.787 | 14.953 | 16.791 | 18.493 | 20.599 | 40.256 | 43.773 | 46.979 | 50.892 | 53.672 |
| 32 | 15.134 | 16.362 | 18.291 | 20.072 | 22.271 | 42.585 | 46.194 | 49.480 | 53.486 | 56.328 |
| 34 | 16.501 | 17.789 | 19.806 | 21.664 | 23.952 | 44.903 | 48.602 | 51.966 | 56.061 | 58.964 |
| 36 | 17.887 | 19.233 | 21.336 | 23.269 | 25.643 | 47.212 | 50.998 | 54.437 | 58.619 | 61.581 |
| 38 | 19.289 | 20.691 | 22.878 | 24.884 | 27.343 | 49.513 | 53.384 | 56.896 | 61.162 | 64.181 |
| 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 |
| 110 | 75.550 | 78.458 | 82.867 | 86.792 | 91.471 | 129.385 | 135.480 | 140.917 | 147.414 | 151.948 |
| 120 | 83.852 | 86.923 | 91.573 | 95.705 | 100.624 | 140.233 | 146.567 | 152.211 | 158.950 | 163.648 |
| 130 | 92.222 | 95.451 | 100.331 | 104.662 | 109.811 | 151.045 | 157.610 | 163.453 | 170.423 | 175.278 |
| 140 | 100.655 | 104.034 | 109.137 | 113.659 | 119.029 | 161.827 | 168.613 | 174.648 | 181.840 | 186.847 |
| 160 | 117.679 | 121.346 | 126.870 | 131.756 | 137.546 | 183.311 | 190.516 | 196.915 | 204.530 | 209.824 |
| 180 | 134.884 | 138.820 | 144.741 | 149.969 | 156.153 | 204.704 | 212.304 | 219.044 | 227.056 | 232.620 |
| 200 | 152.241 | 156.432 | 162.728 | 168.279 | 174.835 | 226.021 | 233.994 | 241.058 | 249.445 | 255.264 |
| 225 | 174.116 | 178.609 | 185.348 | 191.281 | 198.278 | 252.578 | 260.992 | 268.438 | 277.269 | 283.390 |
| 250 | 196.161 | 200.939 | 208.098 | 214.392 | 221.806 | 279.050 | 287.882 | 295.689 | 304.940 | 311.346 |