STAT 100 Formula Sheet and Tables

# Descriptive Statistics

* *X* *= Variable of interest*
* + *where n = sample size*
* **First quartile** *= Q1 =* the data value that divides the lower 25% of the ordered data set from the upper 75% of the ordered data set
* **Third Quartile** *= Q3 =* the data value that divides the lower 75% of the ordered data set from the upper 25% of the ordered data set
* **Range** *=* maximum – minimum
* **Interquartile Range** *= Q3 – Q1*

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# Normal Curves

* *where* 
  + ***µ* is the mean of the model or population mean**and
  + ***σ* is the standard deviation of the model or the population standard** **deviation**
* Re-converting back to x-values
* signifies that the random variable x is normally distributed with a mean, µ and a standard deviation, σ.

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# Correlation and Regression (Linear Models)

* + Where
* *= a =*
* **Residual *=***

# Probability

* **Complement Rule**
* **Addition Rule**

*P(A or B) =*

* **Multiplication Rule** *–* if events A and B are independent, then *P(A and B) = P(A)P(B)*

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# Sampling Distributions

* **Sampling Distribution of the Sample Mean*,*** 
  + Mean *=*
  + Standard Deviation *= =*
  + Z-score of sample mean *=*
* **Sampling Distribution of the Sampling Proportion,** 
  + Sample proportion *= where* 
    - *x =* number of successes
    - *n =* sample size
  + Mean
  + Standard Deviation *=*
  + Z-score of sample proportion *=*

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# Confidence Intervals

* **Confidence Interval for Population Mean,** 
  + Population is normal
  + Population standard deviation, σ, is known.
  + *where*
  + *where = Critical Value*
* **Margin of Error for Population Proportion *= m*** *=* 
  + *n =*
  + If there is no guess for the sample proportion*,*

# Test Statistics

* **Test Statistic for Population Proportion**
* **Test Statistic for population Mean** *t =* 
  + **with degrees of freedom** *= df=n-1*



Table entry for *z* is the area under the

standard Normal curve to the left of *z.*

**Table A** Standard normal cumulative proportions

***z* .00 .01 .02 .03 .04 .05 .06 .07 .08 .09**

*−***3***.***4** 0.0003 0.0003 0.0003 0.0003 0.0003 0.0003 0.0003 0.0003 0.0003 0.0002

*−***3***.***3** 0.0005 0.0005 0.0005 0.0004 0.0004 0.0004 0.0004 0.0004 0.0004 0.0003

*−***3***.***2** 0.0007 0.0007 0.0006 0.0006 0.0006 0.0006 0.0006 0.0005 0.0005 0.0005

*−***3***.***1** 0.0010 0.0009 0.0009 0.0009 0.0008 0.0008 0.0008 0.0008 0.0007 0.0007

*−***3***.***0** 0.0013 0.0013 0.0013 0.0012 0.0012 0.0011 0.0011 0.0011 0.0010 0.0010

*−***2***.***9** 0.0019 0.0018 0.0018 0.0017 0.0016 0.0016 0.0015 0.0015 0.0014 0.0014

*−***2***.***8** 0.0026 0.0025 0.0024 0.0023 0.0023 0.0022 0.0021 0.0021 0.0020 0.0019

*−***2***.***7** 0.0035 0.0034 0.0033 0.0032 0.0031 0.0030 0.0029 0.0028 0.0027 0.0026

*−***2***.***6** 0.0047 0.0045 0.0044 0.0043 0.0041 0.0040 0.0039 0.0038 0.0037 0.0036

*−***2***.***5** 0.0062 0.0060 0.0059 0.0057 0.0055 0.0054 0.0052 0.0051 0.0049 0.0048

*−***2***.***4** 0.0082 0.0080 0.0078 0.0075 0.0073 0.0071 0.0069 0.0068 0.0066 0.0064

*−***2***.***3** 0.0107 0.0104 0.0102 0.0099 0.0096 0.0094 0.0091 0.0089 0.0087 0.0084

*−***2***.***2** 0.0139 0.0136 0.0132 0.0129 0.0125 0.0122 0.0119 0.0116 0.0113 0.0110

*−***2***.***1** 0.0179 0.0174 0.0170 0.0166 0.0162 0.0158 0.0154 0.0150 0.0146 0.0143

*−***2***.***0** 0.0228 0.0222 0.0217 0.0212 0.0207 0.0202 0.0197 0.0192 0.0188 0.0183

*−***1***.***9** 0.0287 0.0281 0.0274 0.0268 0.0262 0.0256 0.0250 0.0244 0.0239 0.0233

*−***1***.***8** 0.0359 0.0351 0.0344 0.0336 0.0329 0.0322 0.0314 0.0307 0.0301 0.0294

*−***1***.***7** 0.0446 0.0436 0.0427 0.0418 0.0409 0.0401 0.0392 0.0384 0.0375 0.0367

*−***1***.***6** 0.0548 0.0537 0.0526 0.0516 0.0505 0.0495 0.0485 0.0475 0.0465 0.0455

*−***1***.***5** 0.0668 0.0655 0.0643 0.0630 0.0618 0.0606 0.0594 0.0582 0.0571 0.0559

*−***1***.***4** 0.0808 0.0793 0.0778 0.0764 0.0749 0.0735 0.0721 0.0708 0.0694 0.0681

*−***1***.***3** 0.0968 0.0951 0.0934 0.0918 0.0901 0.0885 0.0869 0.0853 0.0838 0.0823

*−***1***.***2** 0.1151 0.1131 0.1112 0.1093 0.1075 0.1056 0.1038 0.1020 0.1003 0.0985

*−***1***.***1** 0.1357 0.1335 0.1314 0.1292 0.1271 0.1251 0.1230 0.1210 0.1190 0.1170

*−***1***.***0** 0.1587 0.1562 0.1539 0.1515 0.1492 0.1469 0.1446 0.1423 0.1401 0.1379

*−***0***.***9** 0.1841 0.1814 0.1788 0.1762 0.1736 0.1711 0.1685 0.1660 0.1635 0.1611

*−***0***.***8** 0.2119 0.2090 0.2061 0.2033 0.2005 0.1977 0.1949 0.1922 0.1894 0.1867

*−***0***.***7** 0.2420 0.2389 0.2358 0.2327 0.2296 0.2266 0.2236 0.2206 0.2177 0.2148

*−***0***.***6** 0.2743 0.2709 0.2676 0.2643 0.2611 0.2578 0.2546 0.2514 0.2483 0.2451

*−***0***.***5** 0.3085 0.3050 0.3015 0.2981 0.2946 0.2912 0.2877 0.2843 0.2810 0.2776

*−***0***.***4** 0.3446 0.3409 0.3372 0.3336 0.3300 0.3264 0.3228 0.3192 0.3156 0.3121

*−***0***.***3** 0.3821 0.3783 0.3745 0.3707 0.3669 0.3632 0.3594 0.3557 0.3520 0.3483

*−***0***.***2** 0.4207 0.4168 0.4129 0.4090 0.4052 0.4013 0.3974 0.3936 0.3897 0.3859

*−***0***.***1** 0.4602 0.4562 0.4522 0.4483 0.4443 0.4404 0.4364 0.4325 0.4286 0.4247

*−***0***.***0** 0.5000 0.4960 0.4920 0.4880 0.4840 0.4801 0.4761 0.4721 0.4681 0.4641

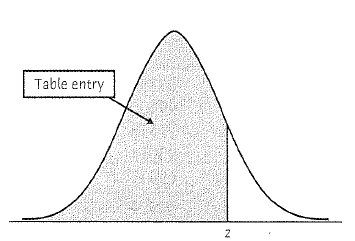


Table entry for *z* is the area under the

standard Normal curve to the left of *z.*

**Table A** (continued) Standard normal cumulative proportions

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***z*** | **.00** | **.01** | **.02** | **.03** | **.04** | **.05** | **.06** | **.07** | **.08** | **.09** |
| **0.0** | 0.50003333330 | 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 |

Table entry for *C* is the critical value *t*∗ required for confidence level *C*. To approximate one- and two-sided *P*-values, compare the value of the t statistic with the critical values that match the *P*-values given at the bottom of the table.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table C *t* distribution critical values | | | | | | | | | | | | | | |
| Degrees of freedom | Confidence level *C* | | | | | | |  | |  | | | | |
| 50% | 60% | 70% | 80% | 90% | 95% | 96% | | 98% | | 99% | 99.5% | 99.8% | 99.9% |
| 1 | 1.000 | 1.376 | 1.963 | 3.078 | 6.314 | 12.71 | 15.89 | | 31.82 | | 63.66 | 127.3 | 318.3 | 636.6 |
| 2 | 0.816 | 1.061 | 1.386 | 1.886 | 2.920 | 4.303 | 4.849 | | 6.965 | | 9.925 | 14.09 | 22.33 | 31.60 |
| 3 | 0.765 | 0.978 | 1.250 | 1.638 | 2.353 | 3.182 | 3.482 | | 4.541 | | 5.841 | 7.453 | 10.21 | 12.92 |
| 4 | 0.741 | 0.941 | 1.190 | 1.533 | 2.132 | 2.776 | 2.999 | | 3.747 | | 4.604 | 5.598 | 7.173 | 8.610 |
| 5 | 0.727 | 0.920 | 1.156 | 1.476 | 2.015 | 2.571 | 2.757 | | 3.365 | | 4.032 | 4.773 | 5.893 | 6.869 |
| 6 | 0.718 | 0.906 | 1.134 | 1.440 | 1.943 | 2.447 | 2.612 | | 3.143 | | 3.707 | 4.317 | 5.208 | 5.959 |
| 7 | 0.711 | 0.896 | 1.119 | 1.415 | 1.895 | 2.365 | 2.517 | | 2.998 | | 3.499 | 4.029 | 4.785 | 5.408 |
| 8 | 0.706 | 0.889 | 1.108 | 1.397 | 1.860 | 2.306 | 2.449 | | 2.896 | | 3.355 | 3.833 | 4.501 | 5.041 |
| 9 | 0.703 | 0.883 | 1.100 | 1.383 | 1.833 | 2.262 | 2.398 | | 2.821 | | 3.250 | 3.690 | 4.297 | 4.781 |
| 10 | 0.700 | 0.879 | 1.093 | 1.372 | 1.812 | 2.228 | 2.359 | | 2.764 | | 3.169 | 3.581 | 4.144 | 4.587 |
| 11 | 0.697 | 0.876 | 1.088 | 1.363 | 1.796 | 2.201 | 2.328 | | 2.718 | | 3.106 | 3.497 | 4.025 | 4.437 |
| 12 | 0.695 | 0.873 | 1.083 | 1.356 | 1.782 | 2.179 | 2.303 | | 2.681 | | 3.055 | 3.428 | 3.930 | 4.318 |
| 13 | 0.694 | 0.870 | 1.079 | 1.350 | 1.771 | 2.160 | 2.282 | | 2.650 | | 3.012 | 3.372 | 3.852 | 4.221 |
| 14 | 0.692 | 0.868 | 1.076 | 1.345 | 1.761 | 2.145 | 2.264 | | 2.624 | | 2.977 | 3.326 | 3.787 | 4.140 |
| 15 | 0.691 | 0.866 | 1.074 | 1.341 | 1.753 | 2.131 | 2.249 | | 2.602 | | 2.947 | 3.286 | 3.733 | 4.073 |
| 16 | 0.690 | 0.865 | 1.071 | 1.337 | 1.746 | 2.120 | 2.235 | | 2.583 | | 2.921 | 3.252 | 3.686 | 4.015 |
| 17 | 0.689 | 0.863 | 1.069 | 1.333 | 1.740 | 2.110 | 2.224 | | 2.567 | | 2.898 | 3.222 | 3.646 | 3.965 |
| 18 | 0.688 | 0.862 | 1.067 | 1.330 | 1.734 | 2.101 | 2.214 | | 2.552 | | 2.878 | 3.197 | 3.611 | 3.922 |
| 19 | 0.688 | 0.861 | 1.066 | 1.328 | 1.729 | 2.093 | 2.205 | | 2.539 | | 2.861 | 3.174 | 3.579 | 3.883 |
| 20 | 0.687 | 0.860 | 1.064 | 1.325 | 1.725 | 2.086 | 2.197 | | 2.528 | | 2.845 | 3.153 | 3.552 | 3.850 |
| 21 | 0.686 | 0.859 | 1.063 | 1.323 | 1.721 | 2.080 | 2.189 | | 2.518 | | 2.831 | 3.135 | 3.527 | 3.819 |
| 22 | 0.686 | 0.858 | 1.061 | 1.321 | 1.717 | 2.074 | 2.183 | | 2.508 | | 2.819 | 3.119 | 3.505 | 3.792 |
| 23 | 0.685 | 0.858 | 1.060 | 1.319 | 1.714 | 2.069 | 2.177 | | 2.500 | | 2.807 | 3.104 | 3.485 | 3.768 |
| 24 | 0.685 | 0.857 | 1.059 | 1.318 | 1.711 | 2.064 | 2.172 | | 2.492 | | 2.797 | 3.091 | 3.467 | 3.745 |
| 25 | 0.684 | 0.856 | 1.058 | 1.316 | 1.708 | 2.060 | 2.167 | | 2.485 | | 2.787 | 3.078 | 3.450 | 3.725 |
| 26 | 0.684 | 0.856 | 1.058 | 1.315 | 1.706 | 2.056 | 2.162 | | 2.479 | | 2.779 | 3.067 | 3.435 | 3.707 |
| 27 | 0.684 | 0.855 | 1.057 | 1.314 | 1.703 | 2.052 | 2.158 | | 2.473 | | 2.771 | 3.057 | 3.421 | 3.690 |
| 28 | 0.683 | 0.855 | 1.056 | 1.313 | 1.701 | 2.048 | 2.154 | | 2.467 | | 2.763 | 3.047 | 3.408 | 3.674 |
| 29 | 0.683 | 0.854 | 1.055 | 1.311 | 1.699 | 2.045 | 2.150 | | 2.462 | | 2.756 | 3.038 | 3.396 | 3.659 |
| 30 | 0.683 | 0.854 | 1.055 | 1.310 | 1.697 | 2.042 | 2.147 | | 2.457 | | 2.750 | 3.030 | 3.385 | 3.646 |
| 40 | 0.681 | 0.851 | 1.050 | 1.303 | 1.684 | 2.021 | 2.123 | | 2.423 | | 2.704 | 2.971 | 3.307 | 3.551 |
| 50 | 0.679 | 0.849 | 1.047 | 1.299 | 1.676 | 2.009 | 2.109 | | 2.403 | | 2.678 | 2.937 | 3.261 | 3.496 |
| 60 | 0.679 | 0.848 | 1.045 | 1.296 | 1.671 | 2.000 | 2.099 | | 2.390 | | 2.660 | 2.915 | 3.232 | 3.460 |
| 80 | 0.678 | 0.846 | 1.043 | 1.292 | 1.664 | 1.990 | 2.088 | | 2.374 | | 2.639 | 2.887 | 3.195 | 3.416 |
| 100 | 0.677 | 0.845 | 1.042 | 1.290 | 1.660 | 1.984 | 2.081 | | 2.364 | | 2.626 | 2.871 | 3.174 | 3.390 |
| 1000 | 0.675 | 0.842 | 1.037 | 1.282 | 1.646 | 1.962 | 2.056 | | 2.330 | | 2.581 | 2.813 | 3.098 | 3.300 |
| *z*∗ | 0.674 | 0.841 | 1.036 | 1.282 | 1.645 | 1.960 | 2.054 | | 2.326 | | 2.576 | 2.807 | 3.091 | 3.291 |
| One-sided P | .25 | .20 | .15 | .10 | .05 | .025 | .02 | | .01 | | .005 | .0025 | .001 | .0005 |
| Two-sided P | .50 | .40 | .30 | .20 | .10 | .05 | .04 | | .02 | | .01 | .005 | .002 | .001 |