

Normal Distribution Calculations Using Technology

All of the calculations that we will do in Math 180A involving the normal distribution can be done using tables. A normal distribution table will be provided on exams. However, it is recommended that you also learn how to make these calculations using either a graphing calculator or Microsoft Excel.

Below are some instructions. On the TI-83, you can follow these instructions as soon as you turn on your calculator. On the TI-89, you first have to press APPS, then select FlashApps, then scroll to Stats/List Editor, then press Enter twice. You should then see options ranging from F1-Tools to F7-Ints, and you are ready to follow the instructions below.

It will often be necessary to calculate probabilities of the form $P(Z \leq z)$, $P(Z \geq z)$, or $P(a \leq Z \leq b)$, where Z has a standard normal distribution.

Microsoft Excel: Using Microsoft Excel, you can find probabilities of the form $P(Z \leq z)$. For example, to find $P(Z \leq 1.26)$, type “=normsdist(1.26)” into a cell, and you should get .8962. To find other probabilities, you can convert them into the form $P(Z \leq z)$. For example, to find $P(Z \geq -0.37)$, observe that this is $1 - P(Z \leq -0.37)$, so you can type “1 - normsdist(-0.37)” to get the answer of .6443. To find $P(-0.37 \leq Z \leq 1.26)$, you can calculate $P(Z \leq 1.26) - P(Z \leq -0.37)$ by typing “=normsdist(1.26) - normsdist(-0.37)” to get the answer of .5405.

TI-83: Press DISTR (that is, 2nd and VARS), and choose 2:normalcdf. To calculate $P(-0.37 \leq Z \leq 1.26)$, type “-0.37, 1.26, 0, 1)” to finish the command, then press ENTER. The numbers 0 and 1 that are entered correspond to the mean and standard deviation of Z respectively. You should obtain an answer of .5405. The TI-83 only calculates probabilities of the form $P(a \leq Z \leq b)$ and not of the form $P(Z \leq z)$ or $P(Z \geq z)$. However, to find $P(Z \leq 1.26)$, you can type a number such as -100 for the lower endpoint, so the full command becomes normcdf(-100, 1.26, 0, 1). To find $P(Z \geq -0.37)$, use 100 for the upper endpoint.

TI-89: Press F5, then scroll down to 4:normal Cdf. Then input the four numbers requested, moving from each number to the next one using the down arrow. To find $P(-0.37 \leq Z \leq 1.26)$, enter -0.37 for the Lower Value, 1.26 for the Upper Value, 0 for the mean μ , and 1 for the standard deviation σ . To find $P(Z \leq 1.26)$, use a number such as -100 for the Lower Value and 1.26 for the Upper Value. To find $P(Z \geq -0.37)$, use -0.37 for the Lower Value and 100 for the Upper Value.

In some problems, it will be necessary, for a given value y , to find the value of z such that $P(Z \leq z) = y$. These are known as inverse normal calculations and can be carried out using the instructions below.

Microsoft Excel: To find the value of z such that $P(Z \leq z) = .95$, type “=normsinv(.95)” into a cell to get the answer of 1.645. That is, 95 percent of the area under the normal curve is to the left of 1.645.

TI-83: Press DISTR (that is, 2nd and VARS), and choose 3:invnorm. The command “invNorm(” should appear. To finish the command, type “.95, 0, 1)” to get the answer of 1.645. This means that $P(Z \leq 1.645) \approx .95$.

TI-89: Press F5, then scroll down to 2:Inverse, then select 1:Inverse Normal. Type .95 for Area, 0 for μ , and 1 for σ to get the answer of 1.645. This means that $P(Z \leq 1.645) \approx .95$.