AP Statistics
Ch. 6 Supplement for TI Calculations

The Normal Probability Distribution

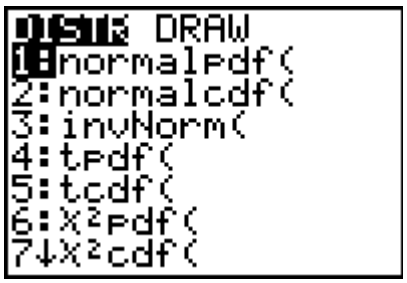
The Probability Distribution menu for the TI-83+/84+ is found under **DISTR (2nd VARS).**

NOTE: A mean of zero and a standard deviation of one are considered to be the default values for a normal distribution on the calculator.

Computing Normal Probabilities

1) Go the standard screen
2) Select DISTR
3) Select Normalcdf((#2 not pdf)
4) Normalcdf(lower #, upper #, mean, stdev)
5) Example: Normalcdf(600,700,504,111) computes the percentage that the variable lies between 600 and 700, for a normal distribution with mean = 504 and stdev = 111.
6) This method is only for variables with a normal distribution
7) This method can be used instead of the method, which uses table A and the z-score. You must still know how to take z-scores and use table A, however.

The Normal Distribution functions:



#1:normalpdf returns the probability of a single value of the random variable *x*

normalpdf(x, mean, standard deviation)

#2:normalcdf returns the cumulative probability from zero up to some input value of the random variable *x*.

normalcdf(lower bound, upper bound, mean, standard deviation)

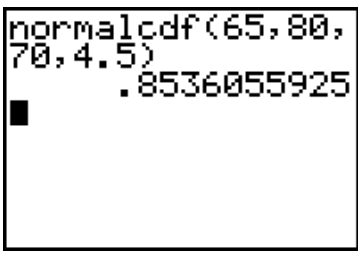
#3:invNorm(returns the x-value given the probability region to the left of the x-value. $0 \leq \text{area} \leq 1$ must be true.

invNorm(probability, mean, standard deviation)

Finding Probabilities

Situation: Given a normal distribution of values for which the mean is 70 and the standard deviation is 4.5.

Example 1a: Determine the probability that a value is between 65 and 80, inclusive. (This is accomplished by finding the probability of the interval from 65 to 80.)



Answer: The probability is **85.361%.**

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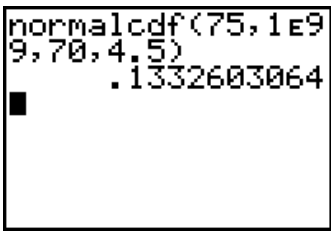
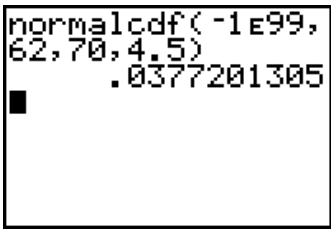
Example 1b: Determine the probability that a value is greater than or equal to 75.
(The upper boundary in this problem will be positive infinity. The largest value the calculator can handle is 1 x 10^{99}. Type 1 EE 99. Enter the EE by pressing 2nd, comma – only one E will show on the screen.)

Answer: The probability is **13.326%.**



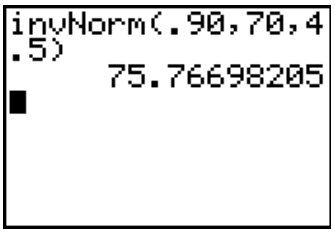
Example 1c: Determine the probability that a value is less than 62.
(The lower boundary in this problem will be negative infinity. The smallest value the calculator can handle is -1 x 10^{99}. Type -1 EE 99. Enter the EE by pressing 2nd, comma – only one E will show on the screen.)

Answer: The probability is **3.772%.**



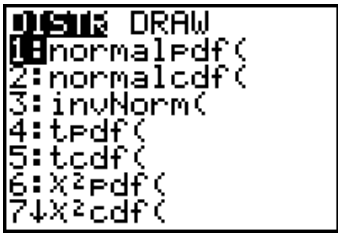
Example 1d: Determine the 90th percentile for this distribution.
(Given a probability region to the left of a value (i.e., a percentile), determine the value using invNorm.)

Answer: The x-value is **75.767**.

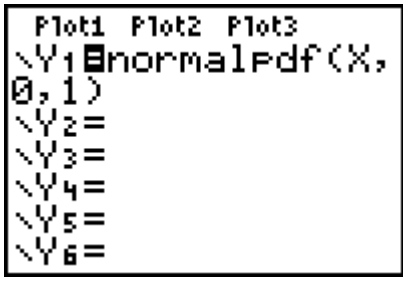


Graphing/investigating the standard normal distribution curve where the mean is 0 and the standard deviation is 1

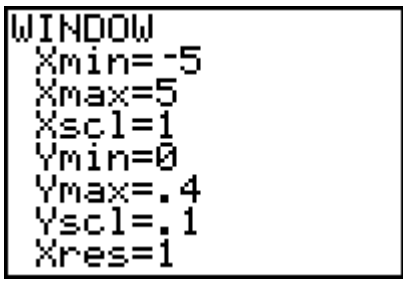
The **normalpdf** (normal probability distribution function) is found under DISTR (2nd VARS) #1normalpdf(.



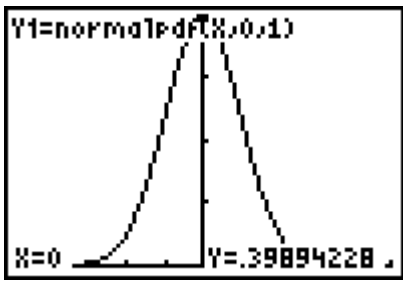
Go to the Y = menu. The parameters will be ***(variable, mean, standard deviation).***



Adjust the **WINDOW**.
One possible set up for the window is shown below. Allow enough room on the *x*-axis for at least the mean plus/minus 3 * standard deviation. Set the *y*-axis very small and adjust as needed or use ZoomFit.



GRAPH. Using **TRACE**, simply type the desired *x*-value and the point will be plotted. The *y*-values (heights) are in percentages and should be multiplied by 100.



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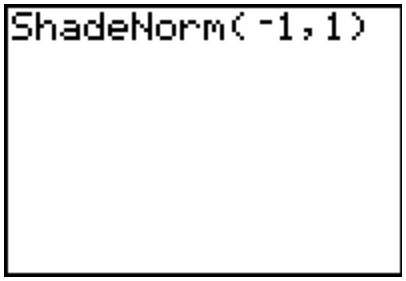
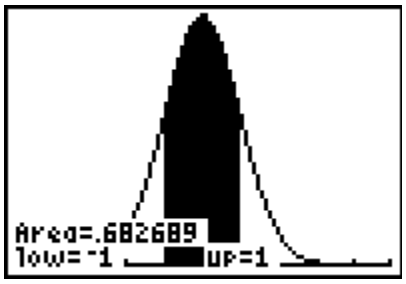
Now, the ***area under the curve*** between particular values represents the probabilities of events occurring within that specific range. This area can be seen using the command ShadeNorm(.

To find ShadeNorm(, go to DISTR and right arrow to DRAW. Choose #1:ShadeNorm(.

ShadeNorm(lower bound, upperbound, mean, standard deviation)

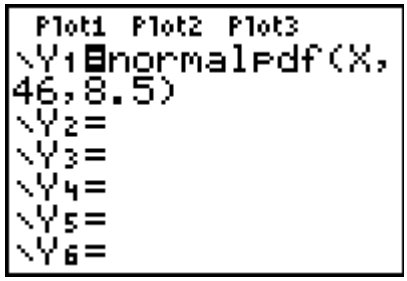
By entering parameters -1,1 you will see the area, indicating approximately 68% probability of a score falling within 1 standard deviation from the mean in a normally distributed set of values. Since the calculator defaults to a mean of 0 and standard deviation of 1, it was not necessary to enter these values in this example.



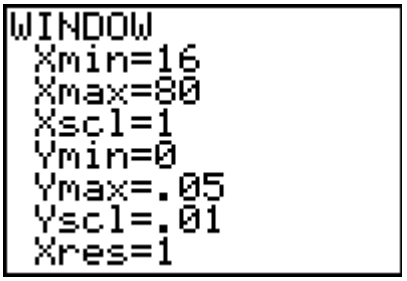


Example: Graph/examine a situation where the mean score is 46 and the standard deviation is 8.5.

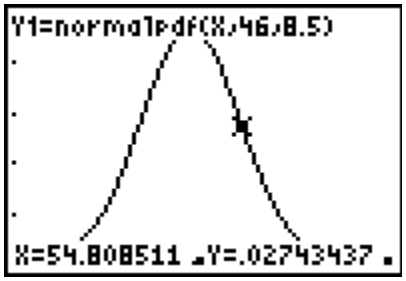
Go to WINDOW.



Adjust the window.



GRAPH.



What is the probability of a value falling between the mean and the first standard deviation to the right?