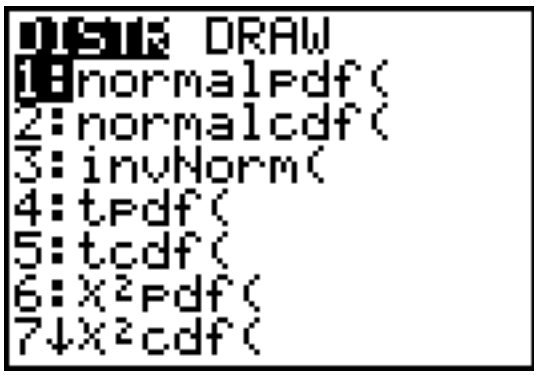
Chapter 5: Statistics

5.5 - Normal Distribution on the Calculator

The Normal 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, if you choose not to set these values.



The Normal Distribution functions:

#1: normalpdf *pdf = Probability Density Function*

This function returns the probability of a single value of the random variable x. Use this to graph a normal curve. Using this function returns the y-coordinates of the normal curve.

Syntax: *normalpdf (x, mean, standard deviation)*

#2: normalcdf *cdf = Cumulative Distribution Function*

This function returns the cumulative probability from zero up to some input value of the random variable x. Technically, it returns the percentage of area under a continuous distribution curve from negative infinity to the x. You can, however, set the lower bound.

Syntax: *normalcdf (lower bound, upper bound, mean, standard deviation)*

#3: invNorm(*inv = Inverse Normal Probability Distribution Function*

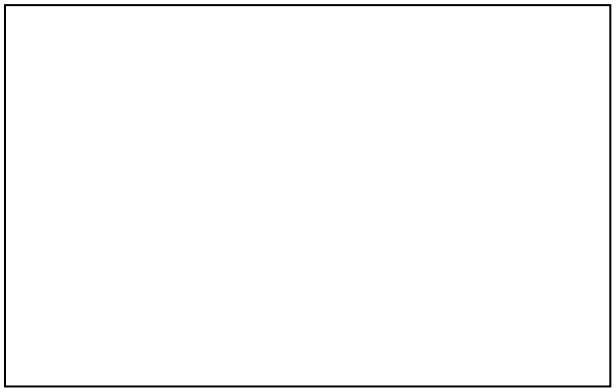
This function returns the x-value given the probability region to the left of the x-value.

($0 \leq$ area ≤ 1 must be true.) The inverse normal probability distribution function will find the precise value at a given percent based upon the mean and standard deviation.

Syntax: *invNorm (probability, mean, standard deviation)*

Example #1: Given a normal distribution of values for which the mean is 70 and the standard deviation is 4.5.

First, use your calculator to display the distribution graph.



Xmin =
Xmax =

Ymin =
Ymax =

Then, use your calculator to find the following values:

a) the probability that a value is between 65 and 80, inclusive.

b) the probability that a value is greater than or equal to 75.

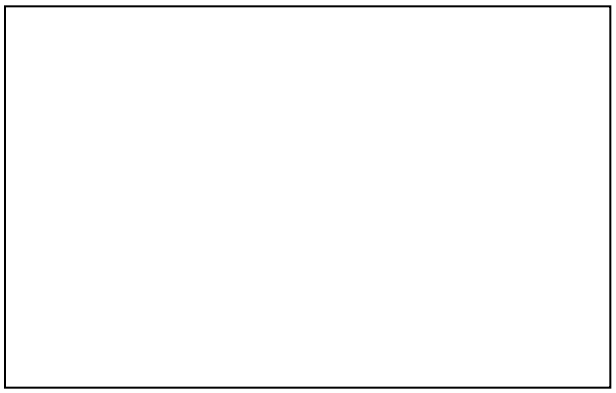
c) the probability that a value is less than 62.

d) What score would you need to get in order to be higher than 80% of the data?

e) What score would you need in order to be in the top 30%?

Example #2: Suppose scores on an IQ test are normally distributed. The test has a mean of 100 and a standard deviation of 10.

First, use your calculator to display the distribution graph.



Xmin =
Xmax =

Ymin =
Ymax =

a) What is the probability that a person who takes the test will score between 90 and 110?

b) the probability of having a score less than 75?

c) the probability of having a score greater than 120?

d) The score you would need in order to avoid being in the bottom 25%?

e) the score you would need to get in order to be in the top 10%?

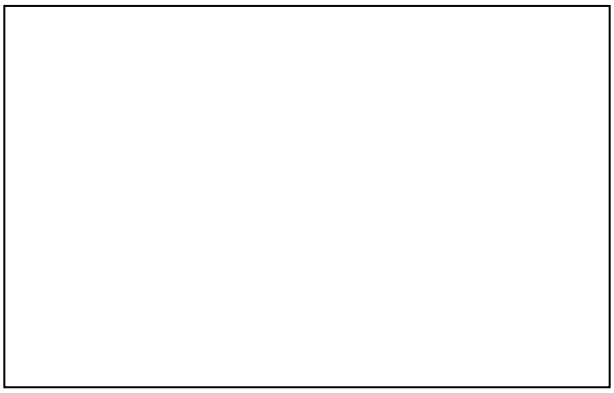
How to graph the area under a distribution:

ShadeNorm(

To find ShadeNorm(, go to DISTR and right arrow to DRAW. Choose #1:ShadeNorm(.The *area under the curve* between particular values represents the probabilities of events occurring within that specific range.

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

Example #1: The average (mean) score on a test is 63% and the standard deviation is 15. The teacher is marking on the "bell curve".



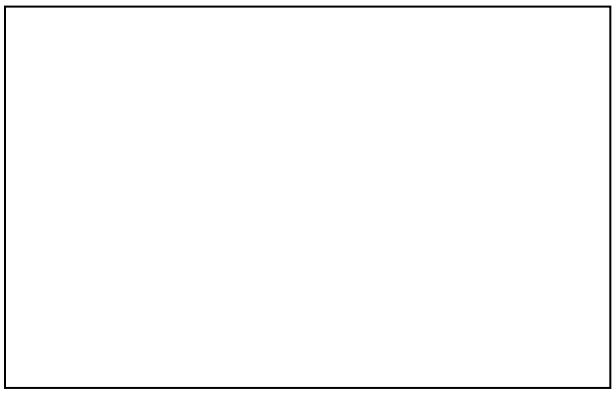
Xmin =
Xmax =

Ymin =
Ymax =

What is the probability of getting an 'A' (show shading on your graph):

Check answer with normalcdf(

Example #2: The lifetime of a battery is normally distributed with a mean life of 40 hours and a standard deviation of 1.2 hours.



Xmin =
Xmax =

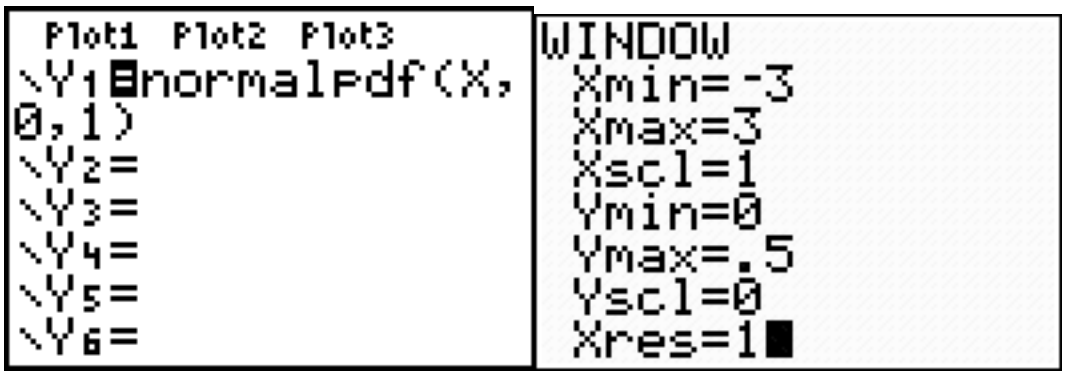
Ymin =
Ymax =

Find the probability that a randomly selected battery lasts longer than 42 hours. (show shading on your graph)

Check answer with normalcdf(

Assignment

1) Use your calculator to verify the 68/95/99.7 rule. Graph a normal distribution (mean = 0, standard deviation = 1)



The parameters will be (*variable, mean, standard deviation*).

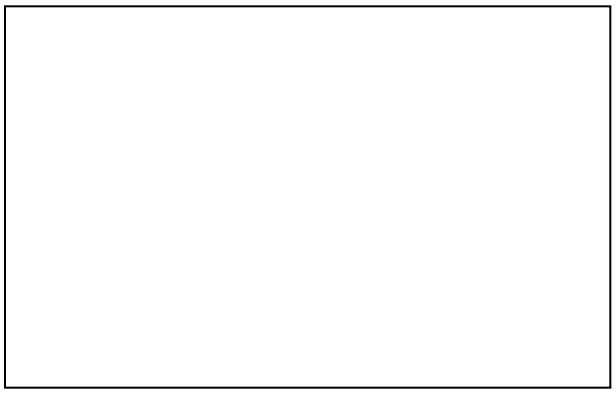
a) Shade the graph from -1 to 1 and record the area:

b) Shade the graph from -2 to 2 and record the area:

c) Shade the graph from -3 to 3 and record the area:

2) A teacher is marking on "the curve" and wants a class average of 67% with a standard deviation of 10. In this class, what percentage of students will receive each letter grade?

First, use your calculator to display the distribution graph.



Xmin =
Xmax =

Ymin =
Ymax =

Then, use your calculator to find the following values:

a) the probability that a student will fail (less than 50%)?

b) the probability that a student will get a C- (50% to 60%)?

c) The probability that a student will get a C (60% to 67%)?

d) The probability that a student will get a C+ (67% to 73%)?

e) The probability that a student will get a B (73% to 86%)?

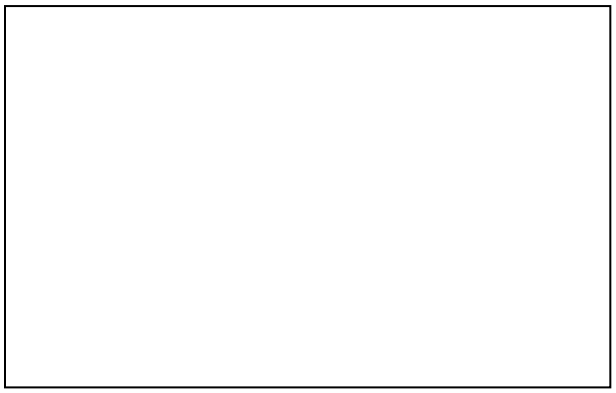
f) The probability that a student will get a B (86% to 100%)?

g) What score would be required to beat 40% of the class?

h) What score would be required to be in the top 10% of the class?

3) A manufacturer of TV's wants to know how long to make a warranty. The TV's last an average of 4.75 years with a standard deviation of 0.75

First, use your calculator to display the distribution graph.



Xmin =
Xmax =

Ymin =
Ymax =

Then, use your calculator to find the following values:

a) the probability that a TV will last less than 3 years?

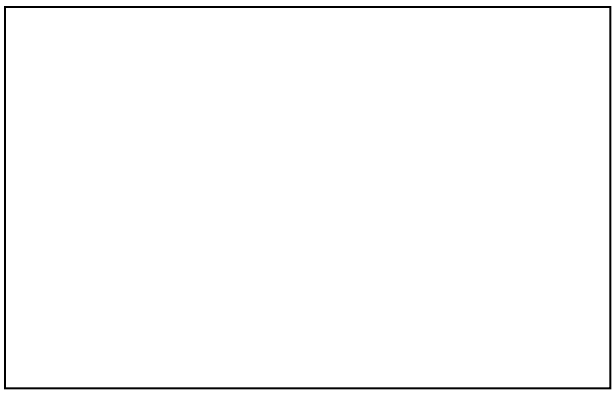
b) the probability that a TV will break before 5 years?

c) If he is willing to fix 5% of the TV's under warranty, then how many years should he make the warranty for?

d) After how many years can he be confident that 90% of the TV's are no longer being used?

4) A game of chance has an average score of 50 with a standard deviation of 20. Anytime you score over 60, you get your money back. If you get a score of 100, then you win the jackpot (10 times whatever you put in).

First, use your calculator to display the distribution graph.



Xmin =
Xmax =

Ymin =
Ymax =

Then, use your calculator to find the following values:

a) the probability that you will score over 60?

b) the probability that you will score less than 60?

d) the probability that you will score between 50 and 60?

c) the probability of winning the jackpot?