Using The TI-83/84 Plus
Chapter 6: Normal Distributions

The following pages give detailed instructions and links to instructional videos for the two main tasks found in Chapter 6. Each topic has its own page or you can go directly to the videos.

- **Probabilities with the `normalcdf` Function** 2

  For example, if *IQ's* are normally distributed with a mean of 100 and a standard deviation of 15, what percentage of people have an *IQ* between 110 and 125?

  Play Video ▷

- **Percentiles from a Normal Distribution with the `invNorm` Function** 3

  For example, if *IQ's* are normally distributed with a mean of 100 and a standard deviation of 15, what *IQ* separates the top 10% from the rest? That is, find P_{90}.

  Play Video ▷

Finding Probabilities with the `normalcdf` Function

Play Video ▷

- **Getting to the `normalcdf` function**

  1. Hit [2nd] button then the [VARS] button to access the `DISTR` (distributions) menu.

  2. Highlight the `DISTR` option and scroll down (using the down arrow [↓] button) to highlight the `normalcdf` option then hit [ENTER]. The screen then shows

     `normalcdf(`

     and you can put in the variables from here.

- **Usage for any normal distribution with mean μ and standard deviation σ**

  If x is a normally distributed random variable, with mean $= \mu$ and standard deviation $= \sigma$, then

$$P(x_{\text{min}} < x < x_{\text{max}}) = \texttt{normalcdf(}x_{\text{min}}\texttt{, }x_{\text{max}}\texttt{, }\mu\texttt{, }\sigma\texttt{)}$$

$$P(x < x_{\text{max}}) \approx \texttt{normalcdf(very low x-value, }x_{\text{max}}\texttt{, }\mu\texttt{, }\sigma\texttt{)}$$

$$P(x > x_{\text{min}}) \approx \texttt{normalcdf(}x_{\text{min}}\texttt{, very high x-value, }\mu\texttt{, }\sigma\texttt{)}$$

  Examples:
  Suppose IQ's are normally distributed with a mean of 100 and a standard deviation of 15.

  1. What percentage of people have an IQ between 110 and 125?

     `normalcdf`(110 , 125 , 100 , 15) = **0.2047** or about 20%

  2. What percentage of people have an IQ less than 125?

     `normalcdf`(−1000 , 125 , 100 , 15) = **.9522** or about 95%

  3. What percentage of people have an IQ greater than 110?

     `normalcdf`(110 , 1000 , 100 , 15) = **.2525** or about 25%

- **Usage for the standard normal (z) distribution ($\mu = 0$ and $\sigma = 1$).**

  In the text we first convert x scores to z scores using the formula $z = (x-\mu)/\sigma$ and then find probabilities from the z-table. These probabilities can be found with the `normalcdf` function as well. The usage is the same, just be sure to set $\mu = 0$ and $\sigma = 1$.

$$P(z_{\text{min}} < z < z_{\text{max}}) = \texttt{normalcdf(}z_{\text{min}}\texttt{, }z_{\text{max}}\texttt{, 0, 1)}$$

$$P(z < z_{\text{max}}) \approx \texttt{normalcdf(-100, }z_{\text{max}}\texttt{, 0, 1)}$$

$$P(z > z_{\text{min}}) \approx \texttt{normalcdf(}z_{\text{min}}\texttt{, 100, 0, 1)}$$

Finding percentiles from a Normal Distribution with the `invNorm` Function

.

Play Video ▷

- **Getting to the `invNorm` function**

  1. Hit $\boxed{2^{\text{nd}}}$ button then the $\boxed{\text{VARS}}$ button to access the `DISTR` (distributions) menu.

  2. Highlight the `DISTR` option and scroll down (using the down arrow $\boxed{\downarrow}$ button) to highlight the `invNorm` option then hit $\boxed{\text{ENTER}}$. The screen then shows

     `invNorm(`

     and you can put in the variables from here.

- **Usage for any normal distribution with mean μ and standard deviation σ**

  Suppose you want to find the x-value that separates the bottom $k\%$ of the values from a distribution with mean μ and standard deviation σ. We denote this value in the text as P_k.

  $P_k =$ `invNorm(k (in decimal form),` μ, σ`)`

  $P_{25} =$ `invNorm(0.25,` μ, σ`)`

  $P_{90} =$ `invNorm(0.90,` μ, σ`)`

  Examples:
  Suppose IQ's are normally distributed with a mean of 100 and a standard deviation of 15.

  1. What IQ separates the lower 25% from the others? (Find P_{25}.)

     $P_{25} =$ `invNorm`(.25 , 100 , 15) = **89.88**

  2. What IQ separates the top 10% from the others? (Find P_{90}.)

     $P_{90} =$ `invNorm`(.9 , 100 , 15) = **119.22**

- **Usage for the standard normal (z) distribution ($\mu = 0$ and $\sigma = 1$).**

  In the text we found the z-scores for a given percentile from the z-table and then converted these to x-values using the formula $x = \mu + z\,\sigma$. These percentiles can be found with the `normInv` function as well. The usage is the same, just be sure to set $\mu = 0$ and $\sigma = 1$.

  $P_k =$ `invNorm(k (in decimal form), 0, 1)`

  $P_{25} =$ `invNorm(0.25, 0, 1) = -0.67449` $\rightarrow$ `-0.67`

  $P_{90} =$ `invNorm(0.90, 0, 1) = 1.28155` $\rightarrow$ `1.28`