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5. From Z-Scores to Area, and Vice Versa

Finding areas: The NORMALD_CDF() command on the HP Prime can be used to find lower-tail areas under a Normal curve. The syntax is NORMALD_CDF(*mean, standard deviation, value*) and it returns the area to the left of *value* under a Normal cumulative density function with the given *mean* and *standard deviation*.

1. What proportion of observations from the standard Normal distribution are greater than –1.78? Recall that the standard Normal distribution has mean 0 and standard deviation 1. Since this calculation involves the area to the right of z=-1.78, we use 1-NORMAL_CDF(0,1,-1.78).

    -   Press ⌂ to go to Home view
    -   Type 1-, then press [Mem B], tap Math if not already selected, tap **Probability**, tap **Cumulative**, and tap **Normal** to select the Normal cumulative density function NORMALD_CDF(μ,σ,*x*)
    -   Press [0 Notes] [, Eval O] [1 Program Y] [, Eval O] [+/− M] [1 Program Y] [. List Q] [7 Q] [() R] [8 R]; then press [Enter ≈] to complete the formula

The mean and standard deviation are optional for the standard Normal curve, so 1-NORMAL_CDF(-1.78) returns the same result.

    -   Also, using -1.78 as the lower bound and 1E99 as the upper bound returns the same result without subtracting the normal calculation from 1

| Function	09:54
1−NORMALD_CDF(0,1,-1.78)	
	0.962462019652
1−NORMALD_CDF(-1.78)	0.962462019652
NORMALD_CDF(0,1,-1.78,1E99)	
	0.962462019652
Sto ▶	

2. What proportion of observations from the standard Normal distribution is between –1.25 and 0.81? In this case, we subtract two areas to find the area between the two values.

   -   Also, using -1.25 as the lower bound and .81 as the upper bound returns the same area

The screen shot below confirms the result of 0.6854 using Table A.

| Function	10:11
NORMALD_CDF(0.81)−NORMALD_CDF(-1.25)	
	0.685380138461
NORMALD_CDF(0,1,-1.25,0.81)	
	0.685380138461
Sto ▶	

Working backward: The HP Prime NORMALD_ICDF() function calculates the z-value corresponding to a given percentile in a Normal distribution. For this command, the syntax is NORMAL_ICDF (*mean, standard deviation, area to the left*).

3. What is the 90th percentile of the standard Normal distribution?

    - Press ⌨, if not already selected tap **Math**, tap **Probability**, tap **Inverse**, and tap **Normal** to select the Normal inverse cumulative density function NORMALD_ICDF(μ, σ, x)
    - Complete the formula NORMALD_ICDF(0, 1, 0.9) and press ⌈Enter⌉ .
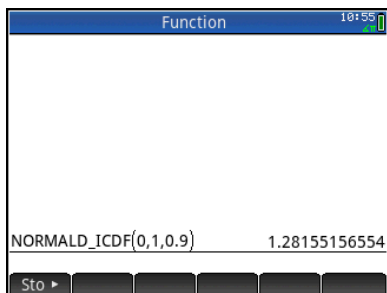
    - For the standard Normal distribution, you can omit the mean and standard deviation and just enter NORMALD_ICDF(0.9) as shown below.
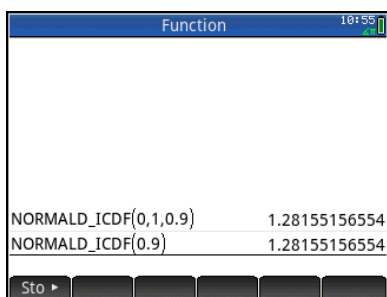
The results match what we got using Table A.