

Using The TI-83 to Find Normal Probabilities

You can use the TI-83 calculator to find the area (or probability) between points a and b under a normal distribution curve with mean μ and standard deviation σ .

Hit 2ND and DISTR (above the VARS button) buttons. Arrow down and select 2: normalcdf(which stands for normal cumulative density function).

```
0:QUIT DRAW
1:normalpdf(
2:normalcdf(
3:invNorm(
4:tpdf(
5:tcdf(
6:X2pdf(
7↓X2cdf(
```

Enter a (lower bound), b (upper bound), μ (mean), and σ (standard deviation) separated by commas and then hit ENTER and the TI-83 will give you the correct probability. Note: you may have to enter an arbitrarily small or large lower bound or upper bound if you are computing areas that are not between two values.

Example: The ages of workers at a manufacturing plant are normally distributed, with mean 45 years and standard deviation 12 years. A worker is stopped at random and asked to fill out a questionnaire.

- What is the probability that the worker is less than 30 years old?
- What is the probability that the worker is between 35 and 55 years old?
- What is the probability that the worker is more than 63 years old?

For this problem $\mu = 45$, $\sigma = 12$ and X = the age of workers at the plant.

- (a) We want $P(X < 30) = .1056$

```
normalcdf(-100,30,45,12)
.1056
```

Notice for this example, that I made the lower bound (a) an arbitrarily small value (-100).

- (b) We want $P(35 < X < 55) = .5953$

```
normalcdf(35,55,45,12)
.5953
```

Note: this value will be slightly different than the result you would get using the standard normal table, because the calculator uses the actual z-scores ($\pm .8333\dots$) instead of a rounded value ($\pm .83$).

(c) We want $P(X > 63) = .0668$

```
normalcdf(63,100
,45,12)
.0668
```

Again, notice for this example that I made the upper bound (b) an arbitrarily large value (100).

The TI-83 will also calculate a specific x -value or raw score associated with a given cumulative area (probability) under the normal curve (the “backwards” normal problem).

Hit 2ND and DISTR (above the VARS button) buttons. Arrow down and select 3: invNorm(which stands for inverse normal distribution).

```
DISTR DRAW
1:normalpdf(
2:normalcdf(
3:invNorm(
4:tpdf(
5:tcdf(
6:X²pdf(
7↓X²cdf(
```

Enter the cumulative area (probability), μ (mean), and σ (standard deviation) separated by commas and then hit ENTER and the TI-83 will give you the correct x -value or raw score.

Example: The life of a GE electric fan is normally distributed with mean 4 years and standard deviation 1.2 years. The manufacturer will replace any fan free of charge while it is under guarantee. For how many years should a GE fan be guaranteed if the manufacturer does not want to replace more than 5% of them? (Give the answer to the nearest month).

For this problem $\mu = 4$, $\sigma = 1.2$ and the cumulative area or probability is 5% (does not want to replace more than 5% of the fans).

```
invNorm(.05,4,1.
2)
2.0262
```

Therefore we would guarantee the fan for 2.0262 years or 24 months.

Note: You can also use the TI-83 to calculate probabilities that the sample mean, \bar{X} , will fall in a given interval of the \bar{X} sampling distribution. You need only to calculate the standard error of the mean $\frac{\sigma}{\sqrt{n}}$ (and use this value as your standard deviation) before using the procedures above.