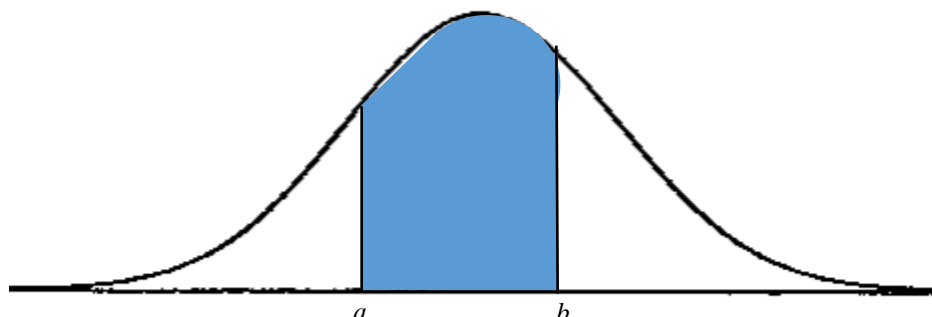


TI-83/84 Normal Distributions

You can use the TI-83/84 calculator to find the area (or probability) between points a and b under a normal distribution curve with mean μ and standard deviation σ .



2nd

VARs

Press **2nd** and **DISTR** (above the **VARs** button). Scroll 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)

ENTER

separated by commas and then press **ENTER** and the TI-83/84 will calculate the area under the normal curve between these two values. If the lower bound is $-\infty$ then use $-E99$. If the upper bound is $+\infty$ then use $E99$ (E is above the comma key and stands for a power of 10, so $E99$ is the same as 10^{99} ; this is the largest

number the TI can work with).

Example 1: Calculate $P(z < 1.35)$

Since z is given we know this is a standard normal distribution with $\mu=0$ and $\sigma=1$.

2nd

VARs

Press **2nd** **VARs** (for the **DISTR**ibutions menu) and select 2: normalcdf(lower bound, upper bound, mean, and standard deviation).

If you have an older calculator or the Stat Wizard is off, you will see a screen like what is on the left, type in the necessary values, separated by commas as shown. If you have a newer calculator with the Stat Wizard, you may see a screen like the one on the right. Enter each value where it belongs in the table, and then select Paste. Your

ENTER

screen will then appear like the left screen with the correct syntax. Press **ENTER** to execute.

```
normalcdf(-E99,1
.35,0,1)
.9114919484
```

normalcdf

```
lower: -1E99
upper: 1.35
μ: 0
σ: 1
Paste
```

Example 2: The age of employees at a manufacturing plant are normally distributed, with mean 45 years and standard deviation 12 years. An employee is stopped at random and asked to fill out a questionnaire. What is the probability that the employee is between 35 and 55 years old?

We want the area under the normal curve between 35 and 55 with $\mu = 45$, $\sigma = 12$.

```
normalcdf(35, 55,
45, 12)
.5953433508
```

```
normalcdf
lower: 35
upper: 55
μ: 45
σ: 12
Paste
```

Example 3: The weight of 3rd graders is normally distributed with a mean of 60 lbs. and a standard deviation of 4 lbs. What is the probability that a 3rd grader weighs more than 55 lbs.?

We want the area under the normal curve to the right of 55 with $\mu = 60$, $\sigma = 4$.

```
normalcdf(55, E99
, 60, 4)
.894350161
```

```
normalcdf
lower: 55
upper: E99
μ: 60
σ: 4
Paste
```

You can also use the TI-83/84 to calculate probabilities that the sample mean, \bar{x} will fall in a given interval of the sampling distribution. First calculate the standard error of the mean, $\frac{\sigma}{\sqrt{n}}$, and enter this value as your standard deviation in normalcdf(lower bound, upper bound, mean, standard deviation).

Example 4: The weight of 3rd graders is normally distributed with a mean of 60 lbs and a standard deviation of 4 lbs. What is the probability that a sample of 40 3rd grader will have a mean weight less than 58 lbs?

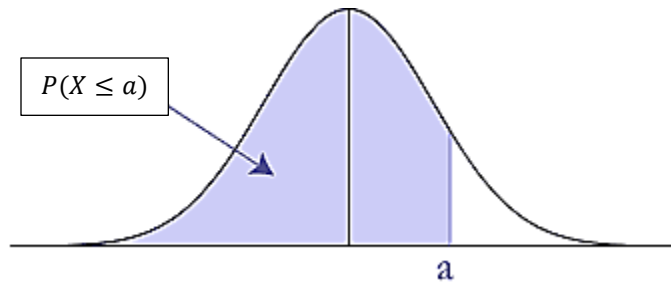
We want the area under the normal curve to the left of 58 with $\mu = 60$, $\sigma = 4/\sqrt{40}$.

```
normalcdf(-E99, 5
8, 60, 4/√(40))
7.827669991E-4
```

```
normalcdf
lower: -E99
upper: 58
μ: 60
σ: 4/√(40)
Paste
```

This answer is in scientific notation: $7.828 \times 10^{-4} = 0.0007828 = 0.001$ when rounded to the thousandths place.

Suppose that we instead want to find the value (x or z) knowing the probability or percentile of the value.



The TI-83/84 will calculate a specific x-value or raw score associated with a given cumulative area (probability) under the normal curve (the inverse normal problem).

Press **2nd** and DISTR (above the **VARs** button). Scroll down and select 3: invNorm(which stands for inverse normal distribution.

```

0:Stat DRAW
1:normalpdf(
2:normalcdf(
3:invNorm(
4:tpdf(
5:tcdf(
6:χ²pdf(
7:χ²cdf(

```

Enter the cumulative area (area left of z), μ (mean), and σ (standard deviation) separated by commas and then press **ENTER** and the TI-83/84 will calculate the x-value or raw score.

Example 5: Calculate z for P_{90}
 We want the z that has 90% of the normal distribution below it, with $\mu = 0$, and $\sigma = 1$. As before, without the Stat Wizard, you will have to recall this syntax.

Enter the percent below as a decimal.

```

invNorm(.9,0,1)
1.281551567

```

```

invNorm
area: .9
μ: 0
σ: 1
Paste

```

So $z = 1.282$.

Example 6: 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?

Here $\mu = 4$, $\sigma = 1.2$ and the cumulative area (or probability) is 5% (since they do not want to replace more than 5% of the fans, it's the lowest 5% of the normal curve). This is the same as calculating P_5 (5th percentile).

```

invNorm(.05,4,1.2)
2.026175649

```

```

invNorm
area: .05
μ: 4
σ: 1.2
Paste

```

So GE would guarantee the fan for 2.026 years (or 24 months)