AP Stats – Chap 22
(the fun "algebra" part)

FLASHBACK…

When we were using a Normal Model (z-scores) and we were looking for the sample size, we knew the Margin of Error, the z* value, and the $\hat{p}$ and $\hat{q}$, we used the formula:

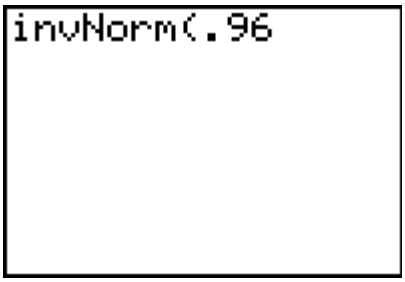
$$ME = (z^*)\left(\sqrt{\frac{\hat{p}\hat{q}}{n}}\right)$$

The **critical values** that we used for z* were…

90% = 1.645
95% = 1.96
98% = 2.326
99% = 2.58

What if we had wanted to know a critical value for a different confidence percentage?

Say, 92%...



DIST

3:invNorm

1.75 is the z* critical value for 92%.

NOW…

We're using a t-model, so the formula will be:

$$ME = \left(t^*_{df}\right)\left(\frac{s}{\sqrt{n}}\right)$$

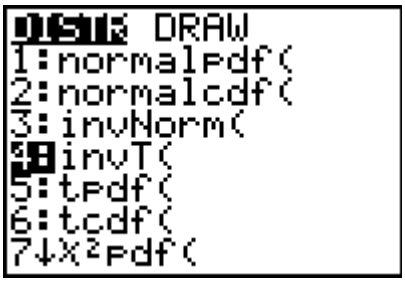
But how do we find the $\left(t^*_{df}\right)$ value?

It depends on the confidence percentage we want and the **degrees of freedom** in the question.

The **degrees of freedom** value is 1 less than the interval we're looking for.

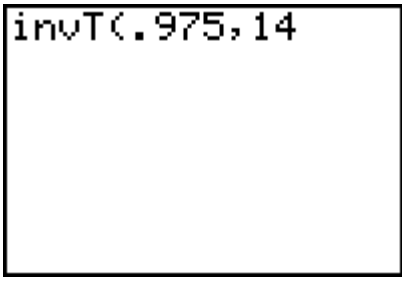
If we wish to conduct another trial, how many batteries must we test to be 95% sure of estimating the mean lifespan to within 15 minutes?

IF YOU HAVE A TI-84...

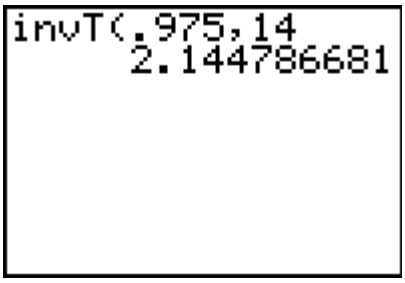


DIST

4:invT(

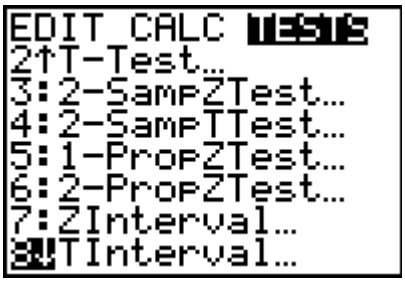


4:invT(cut-off point on curve, df)



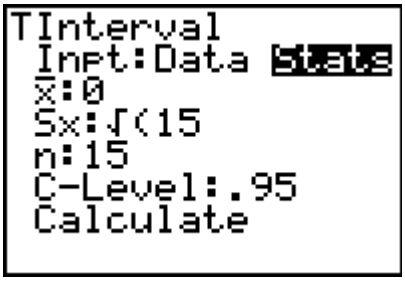
2.14 is the t^*_{df} critical value we need.

IF YOU HAVE A TI-83...

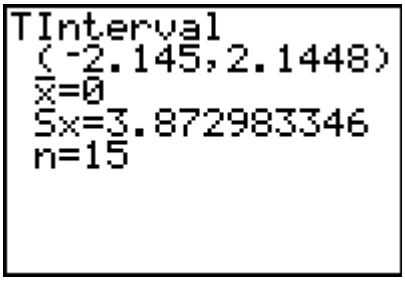


STAT, TEST

8:TInterval



Stats



2.14 is the t^*_{df} critical value we need.

NOW SOLVE THE QUESTION...

$$ME = \left(t^*_{df}\right)\left(\frac{s}{\sqrt{n}}\right)$$

this is the SD calculated from the original data (in the Mechanics section)

$$15 = (2.14)\left(\frac{29.31}{\sqrt{n}}\right)$$

T-Test
μ>300
t=.7386612798
p=.2377892274
x̄=306.25
Sx=29.31064033
n=12

$$7.01 = \left(\frac{29.31}{\sqrt{n}}\right)$$

$$\sqrt{n} = \left(\frac{29.31}{7.01}\right)$$

$$\sqrt{n} = 4.18$$

$$n = 17.47$$

Approximately 18 batteries are needed.

If we wish to conduct another trial, how many batteries must we test to be 95% sure of estimating the mean lifespan to within 5 minutes?