

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%...

```
invNorm(.96
```

DIST

3:invNorm

```
invNorm(.96  
1.750686071
```

1.75 is the z^* critical value for 92%.

NOW...

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

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

But how do we find the (t_{df}^*) 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...

```
0:QUIT DRAW
1:normalPdf(
2:normalcdf(
3:invNorm(
4:invT(
5:tPdf(
6:tcdf(
7:χ²Pdf(
```

DIST

4:invT(

```
invT(.975,14
```

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

```
invT(.975,14
      2.144786681
```

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

IF YOU HAVE A TI-83...

```
EDIT CALC TESTS  
2:T-Test...  
3:2-SampZTest...  
4:2-SampTTest...  
5:1-PropZTest...  
6:2-PropZTest...  
7:ZInterval...  
8:TInterval...
```

STAT, TEST

8:TInterval

```
TInterval  
Inpt:Data Stats  
X:0  
Sx:√(15  
n:15  
C-Level:.95  
Calculate
```

Stats

```
TInterval  
(-2.145,2.1448)  
X=0  
Sx=3.872983346  
n=15
```

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

NOW SOLVE THE QUESTION...

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

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

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

```
T-Test  
μ>300  
t=.7386612798  
P=.2377892274  
x=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?