Student's t Distribution

Today we are learning...

What Student's t Distribution is and where it is used.

I will know if I have been successful if...

I know where the t distribution comes from.

I can use the t distribution table.

I can construct a confidence interval for the population mean when the variance is unknown.

A Confidence Interval for the Population Mean

A 95% CI for the Population Mean is given by

$$\left(\overline{X} - 1.96 \frac{\sigma}{\sqrt{n}} \quad \overline{X} + 1.96 \frac{\sigma}{\sqrt{n}} \right)$$

For 90% use z = 1.64

For 95% use z = 1.96

For 99% use z = 2.58

When σ is known!

If σ is Unknown

A 100(1 - α)% confidence interval for the population mean is given by....

$$\bar{x} \pm t_{n-1,\,1-\alpha/2}\,\frac{s}{\sqrt{n}}$$

Degrees of Freedom

Point Estimate for the Variance s^2

Sums of Squares and Products

$$S_{xx} = \Sigma(x_i - \bar{x})^2 = \boxed{\Sigma x_i^2 - \frac{(\Sigma x_i)^2}{n}}$$

Sample Standard Deviation

$$s = \sqrt{\frac{S_{xx}}{n-1}}$$

Can also calculate this on the TI84's

t - Distribution for Hypothesis Testing

Today we are learning...

How to use the t distribution to hypothesis test.

I will know if I have been successful if...

I can use the t distribution tables and find values on the TI84.

I can find a critical value or critical region.

I can conclude my hypothesis test correctly.

t - Distribution for Hypothesis Testing

Previously for Hypothesis Testing when we are given the variance we calculate our test statistics as follows:

$$Z = \frac{\overline{X} - \mu_0}{\sigma/\sqrt{n}} \sim N(0, 1)$$

However if we are not given the variance in a similar way to confidence intervals we must use the t distribution instead.

t - Distribution for Hypothesis Testing

We set up our hypothesis as normal. We then calculate the test statistics as usual using the following:

$$t_{n-1} = \frac{\bar{x} - \mu_o}{s/\sqrt{n}}$$

(using n - 1 degrees of freedom)