1. Work in groups of 6 to 8. Assume you form a random sample from some population and use your heights to calculate 90%, 95%, and 99% confidence intervals for the true population mean...

a) ... using the (correct) t distribution;

b) ... using the (incorrect) standard normal distribution.

Compare your confidence intervals.

2. Use your height data to calculate a 90% confidence interval for the true population variance.

3. Work with another group to form a 90% confidence interval for the difference between population means. Assume the 2 groups are random samples from 2 populations with the same variance and use the pooled estimator

$$S_p^2 = \frac{(n_1 - 1)S_1^2 + (n_2 - 1)S_2^2}{n_1 + n_1 - 2}$$

and the test statistic

$$T = \frac{\overline{X}_1 - \overline{X}_2 - (\mu_1 - \mu_2)}{S_p\sqrt{\frac{1}{n_1} - \frac{1}{n_2}}}$$

which has a t distribution with $n_1 + n_2 - 2$ degrees of freedom.

4. Using the pooled estimator for the common variance of 2 populations is only justified if those populations actually have the same variance. Check to see if this is reasonable using $F = \frac{\sigma_2^2 S_1^2}{\sigma_1^2 S_2^2}$, which has an F distribution with parameters $n_1 - 1$ and $n_2 - 1$ (order of these parameters matters), to find a 90% confidence interval for $\frac{\sigma_1^2}{\sigma_2^2}$.