**1.** Work in groups of about 5. Assume you form a random sample from some population and use your heights to test $H_0 : \mu = 66$ against $H_1 : \mu \neq 66$. Calculate the $P$-value for your test.

**2.** Use your height data to calculate a 90% confidence interval for the true population variance (using a chi-square distribution).

**3.** Work with another group to test $H_0 : \mu_1 - \mu_2 = 0$ against $H_1 : \mu_1 - \mu_2 \neq 0$. 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. Calculate the $P$-value for the test.

**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 test $H_0 : \sigma_1 = \sigma_2$ against $H_1 : \sigma_1 \neq \sigma_2$. Calculate the $P$-value for the test.

**5.** If the population is normally distributed, then the mean height should also be the median height. Pool all the data for the class together and test $H_0 : \theta = 0.5$ against $H_1 : \theta \neq 0.5$, where $\theta$ is the proportion of the population less than $66$ inches tall. Calculate the $P$-value.