Suppose you're a 315 Stats professor who has recently introduced 'tutorials' on the course website. You want to know if these tutorials are helping students learn. You do this by comparing Exam 2 scores from course taught in 2021 with tutorials to the course taught in 2020 without tutorials.

In 2021, the 81 Exam 2 scores had a mean of 81.72 and a standard deviation of 28.2834. The 81 Exam 2 scores in 2020 had a mean of 71.68 and a standard deviation of 33.3654. Let's run a hypothesis test to determine of the mean Exam 2 scores from 2021 is significantly greater than from 2020. Use $\alpha = 0.05$.

$x$: 2021 $n_x = 81$ $\bar{x} = 81.72$ $s_x = 28.2834$ 1 tailed test, $\alpha = .05$

$y$: 2020 $n_y = 81$ $\bar{y} = 71.68$ $s_y = 33.3654$

$$s_p = \sqrt{\frac{(n_x - 1)s_x^2 + (n_y - 1)s_y^2}{(n_x - 1) + (n_y - 1)}}$$

if $n = n_x = n_y$ $s_p = \sqrt{\frac{s_x^2 + s_y^2}{2}}$

$$s_{\bar{x}-\bar{y}} = s_p \sqrt{\frac{1}{n_x} + \frac{1}{n_y}}$$

if $n = n_x = n_y$ $s_{\bar{x}-\bar{y}} = \sqrt{\frac{s_x^2 + s_y^2}{n}}$

$$s_{\bar{x}-\bar{y}} = \sqrt{\frac{(28.2834)^2 + (33.3654)^2}{81}} = 4.86$$

$$t = \frac{\bar{x} - \bar{y}}{s_{\bar{x}-\bar{y}}} = \frac{81.72 - 71.68}{4.86} = 2.07$$

$df = n_x + n_y - 2 = 160$

$t_{crit}$ for $\alpha = .05$ 1 tailed $= 1.654$

Reject $H_0$: Tutorials had a significant improvement on Exam 2 scores. The exam scores from 2021 ($M = 81.72$, $SD = 28.2834$) were signisnifantly greater than from 2020 ($M = 71.68$, $SD = 33.3654$), $t(180) = 2.07$, $p < .05$

$p = .040$)

Suppose you want to test the hypothesis that women with tall mothers are taller than women with less tall mothers. We'll use our class for our sample and divide the students into women with mothers that are taller and shorter than the median of of 64 inches (5 feet 4 inches). For our class, the heights of the 55 women with tall mothers has a mean of 65.9 inches and a standard deviation of 2.6 inches. The heights of the 63 women with less tall mothers has a mean of 63.6 inches and a standard deviation of 2.55 inches. Are these heights significantly different? Use alpha = 0.01.