§8.1 #17

$\mu_1 \rightarrow$ Region A, $\mu_2 \rightarrow$ Region B

$$\begin{cases} H_0 : \mu_1 \geq \mu_2 \\ \text{claim} \rightarrow H_a : \mu_1 < \mu_2 \end{cases}$$

$\alpha = 0.05$
$\bar{x}_1 = 14.0$
$\bar{x}_2 = 15.1$
$\sigma_1 = 2.9$
$\sigma_2 = 3.3$
$n_1 = 60$
$n_2 = 60$

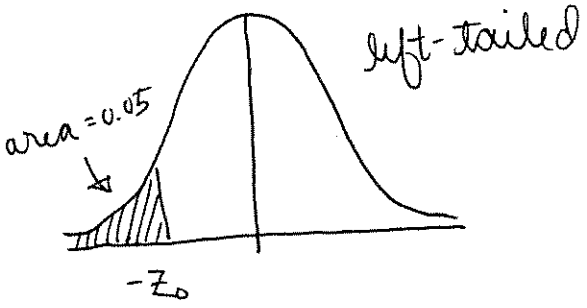


table $\rightarrow z_0 = -1.645$

Rejection Region:
$z < -1.645$

Test-statistic

$$z = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sigma_{\bar{x}_1 - \bar{x}_2}}$$

$$\sigma_{\bar{x}_1 - \bar{x}_2} = \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$$

$$\sigma_{\bar{x}_1 - \bar{x}_2} = \sqrt{\frac{(2.9)^2}{60} + \frac{(3.3)^2}{60}} = 0.5672$$

$$\rightarrow z = \frac{(14.0 - 15.1) - 0}{0.5672} = \boxed{-1.9395}$$

$\rightarrow$ Reject H_0

$\rightarrow$ "There is sufficient evidence to support the claim."

§8.1 #21 | $\mu_1 \rightarrow$ Spring, TX $\quad \mu_2 \rightarrow$ Austin, TX

claim $\rightarrow$ $H_0: \mu_1 = \mu_2$

$H_a: \mu_1 \neq \mu_2$

$\alpha = 0.01$

$\bar{x}_1 = 127,414$

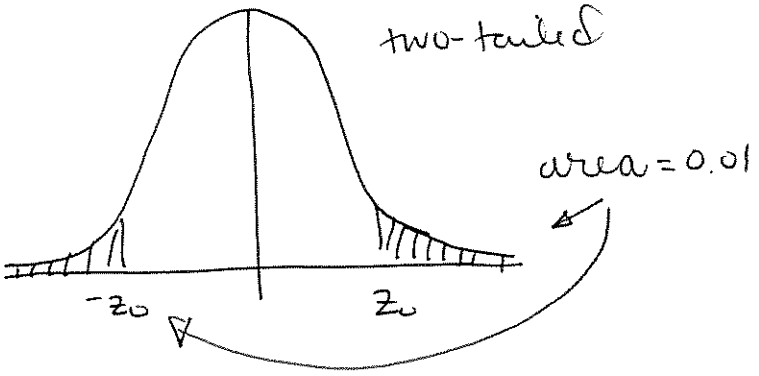
$\bar{x}_2 = 112,301$

$\sigma_1 = 25,875$

$\sigma_2 = 27,110$

$n_1 = 25$

$n_2 = 25$



total area = 0.01

area of each = 0.005

$\rightarrow$ table $\rightarrow$ $-z_0 = -2.575$

$z_0 = 2.575$

Rejection Region:

$z > 2.575$ or $z < -2.575$

Test-Statistic

$$z = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sigma_{\bar{x}_1 - \bar{x}_2}}$$

$$\sigma_{\bar{x}_1 - \bar{x}_2} = \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$$

$$\sigma_{\bar{x}_1 - \bar{x}_2} = \sqrt{\frac{(25,875)^2}{25} + \frac{(27,110)^2}{25}} = 7495.2458$$

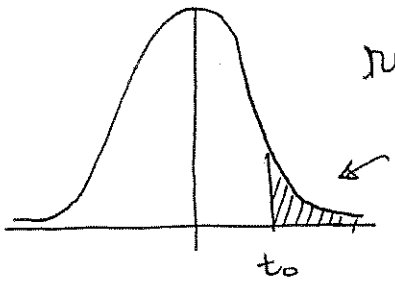
$$z = \frac{(127,414 - 112,301) - 0}{7495.2458} = \boxed{2.0163}$$

$\rightarrow$ fail to reject H_0

$\rightarrow$ "There is not sufficient evidence to reject the claim."

§8.2 #14 | $\mu_1 \rightarrow$ Burger Shop , $\mu_2 \rightarrow$ Fry World

$$\begin{cases} H_0 : \mu_1 \leq \mu_2 \\ H_a : \mu_1 > \mu_2 \end{cases} \quad \text{claim} \rightarrow H_a$$



right-tailed

area = 0.05

table $\rightarrow$ $t_0 = 1.676$

$$\begin{bmatrix} \alpha = 0.05 \\ \bar{x}_1 = 5.46 \\ s_1 = 0.89 \\ n_1 = 22 \\ \bar{x}_2 = 5.12 \\ s_2 = 0.79 \\ n_2 = 30 \end{bmatrix}$$

pop. variances are equal

$\rightarrow df = 22 + 30 - 2 = 50$

Rejection Region: $t > 1.676$

Test-statistic

Since pop. variances are equal

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{s_{\bar{x}_1 - \bar{x}_2}}$$

$$s_{\bar{x}_1 - \bar{x}_2} = \hat{\sigma}\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}$$

$$\hat{\sigma} = \sqrt{\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}}$$

$$\hat{\sigma} = \sqrt{\frac{(22-1)(0.89)^2 + (30-1)(0.79)^2}{22 + 30 - 2}}$$

$$= 0.8335$$

$$s_{\bar{x}_1 - \bar{x}_2} = (0.8335)\sqrt{\frac{1}{22} + \frac{1}{30}}$$

$$= 0.2339$$

$$t = \frac{(5.46 - 5.12) - 0}{0.2339}$$

$$t = 1.4533$$

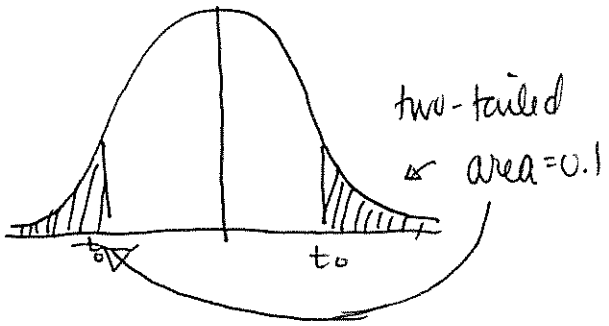
$\rightarrow$ fail to reject H_0

$\rightarrow$ "there is not sufficient evidence to support the claim."

§8.2 #18 | $\mu_1 \rightarrow$ Kauai Co., $\mu_2 \rightarrow$ Maui Co.

claim → $H_0 : \mu_1 = \mu_2$

$H_a : \mu_1 \neq \mu_2$



- $\alpha = 0.10$
- $\bar{x}_1 = 56{,}900$
- $s_1 = 12{,}100$
- $n_1 = 18$
- $\bar{x}_2 = 57{,}800$
- $s_2 = 8000$
- $n_2 = 20$

→ because pop. variances are not equal: → $df = 18 - 1 = 17$

total area = 0.1

→ area of each = 0.05

table → $t_0 = 1.740$

$-t_0 = -1.740$

→ **Rejection Region:** $t > 1.740$ or $t < -1.740$

Test-Statistic — Because pop. variances are not equal →

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{s_{\bar{x}_1 - \bar{x}_2}}$$

$$s_{\bar{x}_1 - \bar{x}_2} = \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$$

↓

$$s_{\bar{x}_1 - \bar{x}_2} = \sqrt{\frac{(12{,}100)^2}{18} + \frac{(8000)^2}{20}}$$

$$= 3366.5842$$

$$t = \frac{(56{,}900 - 57{,}800) - 0}{3366.5842}$$

$$t = -0.2673$$

→ Fail to reject H_0

→ "There is not enough evidence to reject the claim."