

H_0 is true, $H_0 = \mu = \mu_0$, known or unknown $n \geq 30$

$$P(-Z_{\frac{\alpha}{2}} < Z_{\text{calc}} < Z_{\frac{\alpha}{2}}) = 1 - \alpha \quad \& \quad P(Z_{\text{calc}} > Z_{\frac{\alpha}{2}}) = \alpha$$

$$P(|Z| > |Z_{\text{calc}}|) = 2[1 - F(|Z_{\text{calc}}|)]$$

10.21 $\mu = 3.5$ $\sigma = 0.5$ $N = 32$ $\bar{X} = 3.4$
 $\alpha = 0.05$

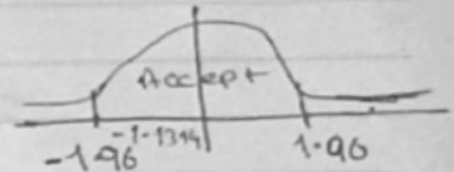
$H_0 = \mu = 3.5$ $H_1 = \mu \neq 3.5$

$$Z_{\alpha} = Z_{\frac{0.05}{2}} = 1.96$$

$$Z_{\text{calc}} = \frac{\bar{X} - \mu}{\frac{\sigma}{\sqrt{n}}} = \frac{3.4 - 3.5}{\frac{0.5}{\sqrt{32}}} = -1.01$$

Accept H_0

~~Reject H_0~~



$$P\text{-value} = 2[1 - Z(|Z_{\text{calc}}|)] = 2(1 - 0.87076)$$

$$P\text{-value} = 0.25848 > \alpha = 0.05$$

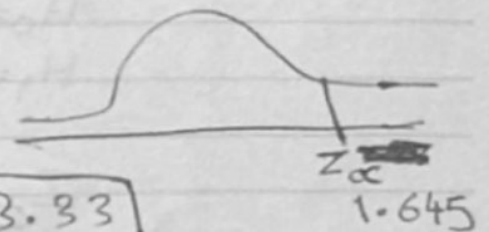
Accept H_0

10.22 $\sigma = 2.25$ $N = 225$ $\mu = 8$ $\bar{X} = 8.5$
Normal $\alpha = 0.05$

$$H_0 = \mu = 8$$

$$H_1 = \mu > 8$$

$$Z_{\text{calc}} = \frac{\bar{X} - \mu}{\frac{\sigma}{\sqrt{n}}} = \frac{8.5 - 8}{\frac{2.25}{\sqrt{225}}} = 3.33$$



$$Z_{\text{calc}} > Z$$

$$1 - 0.99957 = 0.00043$$

$$0.00043 < 0.05$$

reject H_0

Normal

10.26

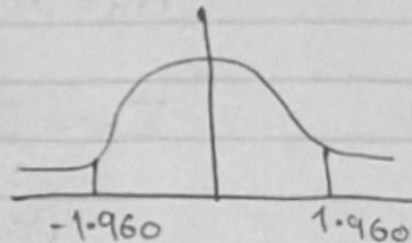
$$n = 20 \quad \bar{X} = 244 \quad \sigma = 24.5$$

$$\alpha = 0.05$$

$$H_0 = \mu = 200$$

$$H_1 = \mu \neq 200$$

$$Z_{\frac{\alpha}{2}} = Z_{\frac{0.05}{2}} = 1.960$$



$$Z_{\text{calc}} = \frac{244 - 200}{\frac{24.5}{\sqrt{20}}} = 8.036$$

$$Z_{\text{calc}} > Z_{\frac{\alpha}{2}}$$

reject H_0

10.24

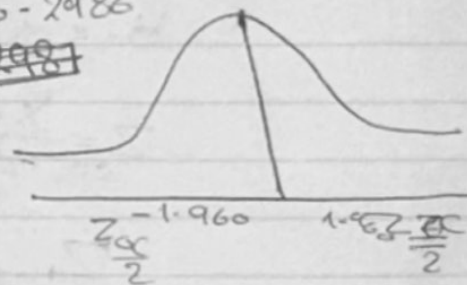
$$N = 54 \quad \mu = 8.4 \quad \sigma = 1.4$$

$$\bar{X} = 7.2$$

$$H_0 = \mu = 8.4$$

$$H_1 = \mu \neq 8.4$$

$$Z_{\text{calc}} = \frac{7.2 - 8.4}{\frac{1.4}{\sqrt{54}}} = -6.2986$$



$$Z_{\frac{\alpha}{2}} = 1.960$$

$$Z_{\text{calc}} < -Z_{\frac{\alpha}{2}}$$

reject H_0

10.27

$$n_1 = 30$$

$$\sigma_1 = 10.5$$

\bar{x} unknown

$$n_2 = 30$$

$$\sigma_2 = 10.2$$

$$\bar{x}_2 = \bar{x}_1 - 34$$

$$H_0: \mu_1 = \mu_2$$

$$H_1: \mu_1 > \mu_2$$

$$s_p^2 = \frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2} = \frac{29 \times 10.5^2 + 29 \times 10.2^2}{58}$$

$$= 107.145, 0.01$$

$$+ \frac{0.05}{\sqrt{0.01 + \frac{0.01}{30}}} (30 + 30 - 2) = T_{0.05, 58} = 1.671$$

$$T_{calc} = \frac{0.34 - 0}{\sqrt{\frac{0.01}{30} + \frac{0.01}{30}}} = 12.72$$

∴ reject H_0

$$p \text{ value} = 1 - F(12.72)$$

10.28

$$n_1 = 25$$

$$n_2 = 25$$

$$x_1 = 20$$

$$x_2 = 12$$

$$s_1 = 1.5$$

$$s_2 = 1.25$$

$$H_0: \mu_1 - \mu_2 = \mu_0 = 0$$

$$H_1: \mu_1 - \mu_2 > \mu_0$$

$$\alpha = 0.05$$

$$t_{0.05}(48) = 1.67$$

$$s_p^2 = \frac{24 \times 1.5^2 + 24 \times 1.25^2}{48} = 1.91$$

$$t_{cal} = \frac{(20 - 12) - 0}{\sqrt{\frac{1.91}{25} + \frac{1.91}{25}}} = 20.48$$

reject H_0

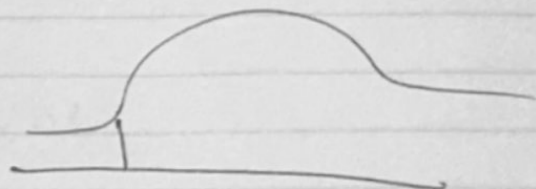
10.29

$$\mu = 2.3$$

$$n = 20$$

$$\bar{x} = 2.15$$

$$s = 0.34$$



$$H_0: \mu = 2.3$$

$$H_1: \mu < 2.3$$

$$t_{\alpha}(n-1) = t_{0.05}(19) = -1.729$$

$$t_{cal} = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{2.15 - 2.3}{0.34/\sqrt{20}} = -1.97$$

reject H_0

10.31

$$n_1 = 50$$

$$\bar{X}_1 = 85$$

$$s_1 = 8$$

$$n_2 = 50$$

$$\bar{X}_2 = 78$$

$$s_2 = 8$$

(A) test σ_1^2, σ_2^2

$$H_0: \sigma_1^2 = \sigma_2^2$$

$$H_1: \sigma_1^2 \neq \sigma_2^2$$

$$\alpha = 0.05$$

$$F_{\frac{\alpha}{2}}(49, 49) = F_{0.05}(49, 49) = 1.76$$

$$F_{1-\frac{\alpha}{2}}(49, 49) = \frac{1}{1.76} = 0.56$$

(B) $F_{cal} = \frac{s_1^2}{s_2^2} = 2.56$

reject H_0

$$\sigma_1^2 \neq \sigma_2^2$$

~~scribble~~ $H_0: \mu_1 - \mu_2 \neq 0$

$$H_1: \mu_1 - \mu_2 > 10$$

$$Z_{0.05} = 1.65$$

$$Z_{cal} = \frac{(85 - 78) - 10}{\sqrt{\frac{s_1^2}{50} + \frac{s_2^2}{50}}} = -2.24$$

accept H_0

10.38

$$n_1 = 10$$

$$\bar{x}_1 = 32.1$$

$$s_1 = 3.2$$

$$n_2 = 15 \quad \alpha = 0.05$$

$$\bar{x}_2 = 37.6$$

$$s_2 = 2.8$$

$$H_0: \mu_1 - \mu_2 = 3$$

$$H_1: \mu_1 - \mu_2 < 3$$

$$\alpha = 0.05$$

$$t_{0.05}(23) = -1.708$$

$$sp^2 = 3.78, t_{cal} = -3.766$$

reject H_0 .

10.32

$n_1 = 200$

$n_2 = 200$

$\bar{x}_1 = 70,750$

$\bar{x}_2 = 65,200$

$\alpha = 0.01$

$s_1 = 6000$

$s_2 = 5000$

A σ_1^2, σ_2^2

$H_0 = \sigma_1^2 = \sigma_2^2$

$H_1 = \sigma_1^2 \neq \sigma_2^2$

$F_{0.005}(199, 199) = 1.44$

$F_{0.995}(199, 199) = 0.69$

$F = \frac{s_1^2}{s_2^2} = 1.44 \text{ reject } \sigma_1^2 = \sigma_2^2$

$H_0: \mu_1 - \mu_2 = 2000$

$H_1: \mu_1 - \mu_2 > 2000$

$Z_{0.01} = 2.33$

$Z_{cal} = 6.42$

reject H_0

10.34

$n_1 = 11$

$n_2 = 17$

$\bar{x}_1 = 85$

$\bar{x}_2 = 79$

$s_1 = 4.7$

$s_2 = 6.1$

$H_0: \mu_2 - \mu_1 = 3$

$H_1: \mu_1 - \mu_2 > 3$

$\alpha = 0.05$

$t_{0.05}(26) = 1.706$

$sp^2 = 31.39$

$t_{cal} = 0.922$

accept H_0

$$10.33 - n_1 = 15$$

$$n_2 = 12$$

$$x_1 = 7.5$$

$$x_2 = 8.8$$

$$\alpha = 0.01$$

$$s_1 = 1.5$$

$$s_2 = 1.2$$

$$H_0 = \mu_2 - \mu_1 = 0.5$$

$$H_1 = \mu_2 - \mu_1 > 0.5$$

$$\alpha = 0.01$$

$$t_{\alpha}(n_1+n_2-2) = t_{0.01}^{25} = 2.485$$

$$s_p^2 = \frac{14 \times 1.5^2 + 11 \times 1.2^2}{25} = 1.89$$

$$t_{cal} = -3.38$$

Accept H_0

$$10.37$$

$$n_1 = 12$$

$$n_2 = 10$$

$$x_1 = 16$$

$$x_2 = 11$$

$$\alpha = 0.1$$

$$s_1 = 1$$

$$s_2 = 0.8$$

$$H_0 = \mu_2 - \mu_1 = 0$$

$$H_1 = \mu_1 - \mu_2 > 0$$

$$t_{0.1}^{20} = 1.325$$

$$s_p^2 = 0.833$$

$$t_{cal} = 12.75$$

Reject H_0



10.39

$$n_1 = 5$$

$$n_2 = 7$$

$$\bar{x}_1 = 97.4$$

$$\bar{y}_2 = 110$$

$$s_1 = 8.876$$

$$s_2 = 30.22$$

[A] test σ_1^2, σ_2^2

$$H_0 = \sigma_1^2 = \sigma_2^2$$

$$H_1 = \sigma_1^2 \neq \sigma_2^2$$

$$\alpha = 0.1$$

$$F_{0.05}(4, 6) = 4.53$$

$$F_{cal} = \frac{s_1^2}{s_2^2} = 0.08$$

Accept H_0