Section 8 – 4, #4:

a) n=15 → d.f.=14 → 0.01 < P-value < 0.025;
b) n=28 → d.f.=27 → 0.05 < P-value < 0.10;
c) n=8 → d.f.=7 → 0.10 < P-value < 0.25;

You may use Minitab for the above: CALC → Probability Distributions → t … → check Cumulative Probability. You may need to adjust result, based on one vs two tail test. For example, for problem a) you will get the answer 0.982, which you must subtract from 1 in order to get the right tail p-value of 0.018

Section 8 – 4, #6:

Calculate mean and standard deviation of sample:

\[
\bar{X} = \text{AVERAGE}(959, 1187, 493, 6249, 541) = 1885.8
\]
\[
s = \text{STDEV}(959, 1187, 493, 6249, 541) = 2456.3
\]

a. \( H_0: \mu = 2000 \) \( H_1: \mu < 2000 \) Claim: \( H_1 \)
b. \( \sigma \) not known and \( n < 30 \) → Use t-distributions with d.f. = 4 and \( \alpha = 0.01 \), left-tailed test
c. Test Value:

\[
t = \frac{\bar{X} - \mu}{s/\sqrt{n}} = \frac{(1885.8 - 2000) \cdot \sqrt{5}}{2456.3} = -0.104
\]

d. C.V.: \( t = -3.747 \) (Use table F: row for d.f. = 4 and column for “One tail”, \( \alpha = 0.01 \), or use Minitab checking this time the “Inverse Cumulative Distribution” radio button); use negative value because it is a left-tailed test.

CR: \( t < -3.747 \)

e. Do not Reject \( H_0 \). (Test Value lies Outside the Critical Region)
f. There is not enough evidence to support the claim that the average number of acres is less than 2000.
**Sect. 8 – 4, #8:**

a. $H_0: \mu = 25.4 \quad H_1: \mu < 25.4$  \hspace{1cm} Claim: $H_1$

b. $n = 25, \, s = 5.3, \, \bar{X} = 22.1, \, \sigma$ not known and $n < 30 \Rightarrow$ Use t-distributions with d.f. = 24 and $\alpha = 0.1$, left-tailed test.

c. Test Value: $t = \frac{\bar{X} - \mu}{s/\sqrt{n}} = \frac{(22.1 - 25.4) \cdot \sqrt{24}}{5.3} = -3.11$


d. C.V. = -1.318  \hspace{1cm} (Use table F: row for d.f. =24 and column for “One tail”, $\alpha = 0.10$, or use Minitab). Use negative value because it is a left-tailed test.

CR: $t < -3.11$

e. Reject $H_0$. (Test Value lies in Critical Region).

f. There is enough evidence to support the claim that the average commute time is less than 25.4 minutes.

**Sect. 8 – 4, #10:**

a. $H_0: \mu = 17.63 \quad H_1: \mu \neq 17.63$  \hspace{1cm} Claim: $H_0$

b. $n = 15, \, s = 3.64, \, \bar{X} = 18.72, \, \sigma$ not known and $n < 30 \Rightarrow$ Use t-distributions with d.f. = 14 and $\alpha = 0.05$, two-tailed test.

c. Test Value: $t = \frac{\bar{X} - \mu}{s/\sqrt{n}} = \frac{(18.72 - 17.63) \cdot \sqrt{15}}{3.64} = 1.16$
d. C.V. = ± 2.145 (Use table F: row for d.f. = 14 and column for “Two tails”, α = 0.05, or use Minitab).

CR: t < -2.145 or t > 2.145

e. Do not Reject $H_0$. (Test Value lies Outside the Critical Region)

f. There is not enough evidence to reject the claim that there is no difference in the rates.

**Sect. 8 – 5, #16:**

a. $H_0: p = 0.83 \quad H_1: p < 0.83$ \quad Claim: $H_1$

b. $n = 50, \hat{p} = \frac{40}{50} = 0.8, \hat{q} = 0.2, \quad p = 0.83, \quad q = 0.17$, Left-tailed test with $\alpha = 0.04$, z-Distr.

c. Test Value:

\[
z = \frac{\hat{p} - p}{\sqrt{pq/n}} = \frac{0.8 - 0.83}{\sqrt{(0.83)(0.17)/50}} = -0.56
\]

d. CV = -1.75 (Use Table E and look for z corresponding to area 0.50-0.04 = 0.46.).

CR: $z < -1.75$

e. Do not Reject $H_0$. (Test Value lies Outside the Critical Region)

f. There is not enough evidence to support the claim that the percentage is less than 83.

**Sect. 8 – 5, #18:**

a. $H_0: p = 0.6 \quad H_1: p < 0.6$ \quad Claim: $H_1$

b. $n = 50, \hat{p} = \frac{26}{50} = 0.52, \quad \hat{q} = 0.48, \quad p = 0.6, \quad q = 0.4$, Left-tailed test with $\alpha = 0.05$, z-Distr,

c. Test Value:

\[
z = \frac{\hat{p} - p}{\sqrt{pq/n}} = \frac{0.52 - 0.6}{\sqrt{(0.6)(0.4)/50}} = -1.15
\]
d. CV = - 1.65 (Use Table E and look for z corresponding to area 0.50 - 0.05 = 0.45.)
   CR: z < - 1.65

e. Do not Reject $H_0$. (Test Value lies Outside the Critical Region)

f. There is not enough evidence to support the claim that the proportion is less than 0.60.

**Sect. 8 – 6, #2:**

a. $0.01 < P-value < 0.025$

b. $0.005 < P-value < 0.01$

c. $0.005 < P-value < 0.01$

d. $0.01 < P-value < 0.02$

You may use Minitab for the above: CALC $\rightarrow$ Probability Distributions $\rightarrow$ Chi Square $\rightarrow$ Check Cumulative Probability. You may need to adjust result, based on Left / Right tail test. For example, for problem a) you will get the answer 0.985, which you must subtract from 1 in order to get the right tail p-value of 0.015.

**Sect. 8 – Rev, #6:**

a. $H_0: \mu = 32 \quad H_1: \mu < 32 \quad$ Claim: $H_0$

b. $n = 18, \bar{X} = 31.3, s = 2.8, \alpha = 0.05$, Left-tailed test, $\sigma$ not known and $n < 30 \Rightarrow$ Use t-distributions with d.f. = 17 and $\alpha = 0.05$

c. Test Value: $t = \frac{\bar{X} - \mu}{s/\sqrt{n}} = \frac{(31.3 - 32) \cdot \sqrt{18}}{2.8} = -1.06$

d. Find P-value:
   Table F: Row for d.f. = 17, value of 1.06 is between 0.689 and 1.33 $\Rightarrow 0.1 < P-value < 0.25$

e. Do not Reject $H_0$ ($P-value > \alpha$, lowest $P-value$ is 0.1)

f. There is not enough evidence to reject the claim that the average age is 32 years.

**Sect. 8 – Rev, #8:**

a. $H_0: p = 0.585 \quad H_1: p > 0.585 \quad$ Claim: $H_1$

b. $n = 1000, \hat{p} = \frac{622}{1000} = 0.622, \hat{q} = 0.378, p = 0.585, q = 0.415$, Right-tail test with $\alpha = 0.05$

c. Test Value: $z = \frac{\hat{p} - p}{\sqrt{pq/n}} = \frac{0.622 - 0.585}{\sqrt{(0.585)(0.415)/1000}} = 2.37$
d. CV = 1.65 (Use Table E and look for z corresponding to area 0.50 - 0.05 = 0.45.)
   CR: \( z > 1.65 \)

   e. Reject \( H_0 \); (Test value lies in critical region: 2.37 > 1.65)

   f. There is enough evidence to support the claim that the proportion of women who work is greater than 0.585.

**Sect. 8 – Rev, #12:**

a. \( H_0: \mu = 225 \quad H_1: \mu \neq 225 \quad \text{Claim: } H_0 \)

b. \( n = 50, \quad \bar{X} = 230, \quad s = 15, \quad \alpha = 0.01 \), Two-tail test, Since \( n \geq 30 \), use z-distributions, approximating \( \sigma \) with \( s \)

c. Test value: \( z = \frac{\bar{X} - \mu}{\sigma/\sqrt{n}} = \frac{230 - 225}{15/\sqrt{50}} = 2.36 \)

d. Find P-value:
   Table E: for \( z = 2.36 \), \( A(2.36) = 0.4909 \rightarrow \)
   \( P-value = 2 \cdot (0.5000 - 0.4909) = 0.0182 \)

   e. Do not Reject \( H_0 \) (\( P-value > \alpha: 0.0182 > 0.01 \))

   f. There is not enough evidence to reject the claim that the average weight is 225 lbs.

**Sect. 8 – Rev, #18:**

a. \( H_0: \mu = 35 \quad H_1: \mu \neq 35 \quad \text{Claim: } H_0 \)

b. \( n = 36, \quad \bar{X} = 33.5, \quad s = 3, \quad \alpha = 0.10 \), Two-tail test, since \( n \geq 30 \), use z-distributions, approximating \( \sigma \) with \( s \)

   Since we have a two tailed test we can use the CI method.

c. \( z_{0.10/2} = 1.645, \quad E = 1.645 \cdot \frac{\sigma}{\sqrt{n}} = 1.645 \cdot \frac{3}{\sqrt{36}} = 0.8 \)

d. CI: 33.5 - 0.8 < \mu < 33.5 + 0.8 \rightarrow 32.7 < \mu < 34.3 \)

   e. Reject \( H_0 \) (Hypothesized mean of 35 is not contained in the CI)

   f. There is enough evidence to reject the claim that people keep tires inflated at 35 psi.