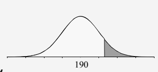
Sample Problem 1

A football coach is boasting that high school football teams in Nebraska are better at offense than the national average. A Sports Illustrated survey of 25 Nebraska teams indicates that on the average Nebraska football teams rushed and passed for 195 yards per game (with a sample standard deviation of 10 yards) whereas the national average was 190 yards. Is the data sufficient to justify the coaches boasting? Assume a normal distribution.

Let $\alpha = 0.05$

1. $H_o: \mu \leq 190$ $\quad H_a: \mu > 190$
2. $t = \dfrac{\bar{x} - \mu_0}{s / \sqrt{n}}$
3. $\alpha = 0.05$
4. Rejection Rule:



Reject H_0 if P-value<α and $\bar{x} > 190$

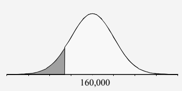
5. $t = \dfrac{\bar{x} - \mu_0}{s / \sqrt{n}} = \dfrac{195 - 190}{10 / \sqrt{25}}$ = **2.5**
6. .005<P-value<.01
   Reject Ho and Accept Ha
7. We are 95% confident that high school football teams in Nebraska are better at offense than the national average.

Sample Problem 2

You select a large simple random sample of houses from the Kearney city limits. You determine the appraised value of each house in your sample. You wish to know whether the sample data provide sufficient evidence to indicate that the mean appraisal value of the population of houses is less than \$160,000. Write the correct hypothesis and rejection rule.

1. $H_o: \mu \geq 160{,}000$ $\quad H_a: \mu < 160{,}000$

4.



Reject H_0 if P-value $< \alpha$ and $\bar{x} < 160000$

Sample Problem 3

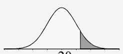
The head accountant of a company is concerned over the clerical errors on outgoing invoices, and believes that more than 20% of these invoices contain at least one error. In a random sample of 400 invoices, 100 are found to contain at least one error. Do these data support the accountant's belief? Let $\alpha = 0.05$

1. $H_o : \rho \le .20$ $\quad H_a : \rho > .20$

2. $z = \dfrac{\bar{\rho} - \rho_0}{\sqrt{\dfrac{\rho_0(1-\rho_0)}{n}}}$

3. $\alpha = 0.05$

4. Rejection Rule:



.20

Reject H_0 if P-value $< \alpha$ and $\bar{\rho} > .20$

5. $\bar{\rho} = \dfrac{100}{400} = .25$

$$z = \frac{\bar{\rho} - \rho_0}{\sqrt{\dfrac{\rho_0(1-\rho_0)}{n}}} = \frac{.25 - .20}{\sqrt{\dfrac{.20 \times .80}{400}}} = \mathbf{2.5}$$

6. P-value = .0062
Reject H_0 and Accept H_A

7. We are 95% confident that more than 20% of these invoices contain at least one error.

Sample Problem 4

The U.S. Department of Interior believes that the average age of people in coastal areas is not the same as in non-coastal areas. Is this belief substantiated with 95% confidence? (research hypothesis)

Coastal Areas	**Non-Coastal Areas**
$\bar{x}_1 = 39.3\,years$	$\bar{x}_2 = 35.4\,years$
$s_1 = 16.8\,years$	$s_2 = 15.2\,years$
$n_1 = 150$	$n_2 = 175$

1. $H_o: \mu_1 - \mu_2 = 0$ $\qquad H_a: \mu_1 - \mu_2 \neq 0$

2. $$z = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)_0}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

3. $\alpha = 0.05$

4. Rejection Rule:

Reject H_0 if P-value $< \alpha$

5. $$z = \frac{(39.3 - 35.4) - 0}{\sqrt{\frac{16.8^2}{150} + \frac{15.2^2}{175}}} = \mathbf{2.18}$$

6. P-value=.0292
   Reject H_0 and Accept H_A

7. We are 95% confident that the average age of people in coastal areas is not the same as in non-coastal areas

Sample Problem 5

Wall Street Journal, Nov 26, 2010 Scientists have partially reversed age-related degeneration in mice, an achievement that suggests a new approach for tackling similar disorders in people. By tweaking a gene, the researchers reversed brain disease and restored the sense of smell and fertility in prematurely aged mice.

Harvard Medical School (HMS) has started an ethics panel to investigate society's view of performing "telomerase experiments" on humans. In particular, HMS believes that a higher proportion of men favor such experiments than women. Is HMS justified in its belief at a .05 significance level?

HMS Survey Information

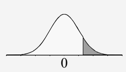
Of the 100 men surveyed, 64 indicated that it is good for medical research to perform “telomerase experiments” on humans. Similarly, 75 of the 125 women surveyed have this belief.

Men	Women
$n_1 = 100$	$n_1 = 125$
$\bar{p}_1 = .64$	$\bar{p}_1 = .60$

1. $H_o: \rho_1 - \rho_2 \leq 0$ $H_a: \rho_1 - \rho_2 > 0$

3. $\alpha = 0.05$

4. Rejection Rule:



Reject H_0 if P-value$<\alpha$ and $\bar{p}_1 - \bar{p}_2 > 0$

5. $\bar{p} = \frac{100 \times .64 + 125 \times .60}{100 + 125} = \mathbf{0.618}$

$$s_{\bar{p}_1 - \bar{p}_2} = \sqrt{.618 \times .382 \left(\frac{1}{100} + \frac{1}{125}\right)} = \mathbf{0.0652}$$

$$z = \frac{(.64 - .60) - 0}{.0652} = \mathbf{0.61}$$

6. P-value=.2709
Fail to Reject H_0

7. The data is not sufficient to prove that a higher proportion of men favor “telomerase experiments” on humans than women.

Sample Problem 6

You wish to estimate the Occupancy Rate based on the Average Room Rate.

Market	Occupancy (Y) Rate (%)	Average Room (X) Rate ($)
Los Angeles-Long Beach	67.9	75.91
Chicago	72	92.04
Washington	68.4	94.42
Atlanta	67.7	81.69
Dallas	69.5	74.76
San Diego	68.7	80.86
Anaheim-Santa Ana	69.5	70.04
San Francisco	78.7	106.47
Houston	62	66.11
Miami-Hialeah	71.2	85.83
Oahu Island	80.7	107.11
Phoenix	71.4	95.34
Boston	73.5	105.51
Tampa-St. Petersburg	63.4	67.45
Detroit	68.7	64.79
Philadelphia	70.1	83.56
Nashville	67.1	70.12
Seattle	73.4	82.6
Minneapolis-St. Paul	69.8	73.64
New Orleans	70.6	99

Determine the regression equation.

	Coefficients	Standard Error	t Stat	P-value
Intercept	49.62575627	3.811275792	13.02077	1.34123E-10
Average Room(X) Rate ($)	0.245511924	0.044867139	5.471976	3.38208E-05

$$\hat{y} = 49.63 + .2455 x_i$$

Estimate the occupancy rate for a hotel with an average room rate of $80.

$49.63 + .2455(80)$ **= 69.3% occupancy rate**