The city of Savannah wants to know if its citizens are in favor of building a toll bridge across the Savannah River. A research company was hired to survey a sample of local residents to determine their views on the construction of a toll bridge. The mayor would like to know if the majority of the residents are in favor of the bridge before calling a formal referendum on the topic. Test at the $\alpha = 0.01$ level.

Of the 420 residents that were randomly selected, 228 favored the new bridge.

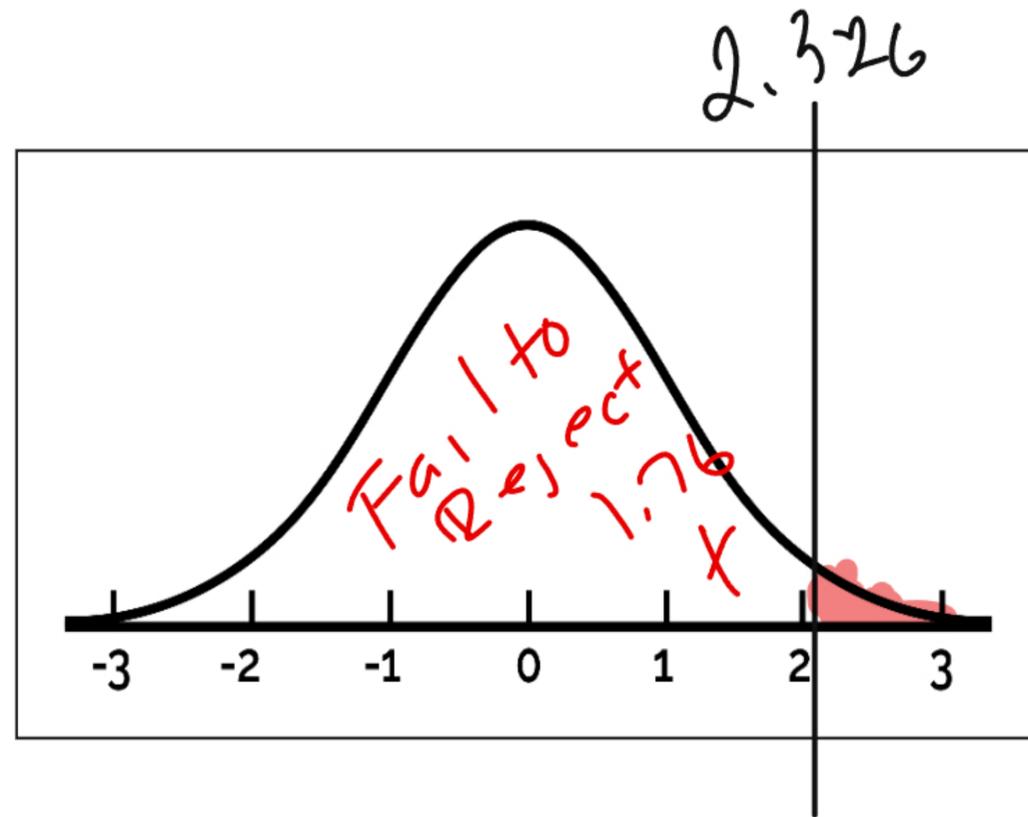$$\sigma_{\hat{p}} = \sqrt{\frac{p_0(1-p_0)}{n}},$$

$H_0 \rightarrow P_0 = .50$

$H_a \rightarrow P_0 > .50$

$P_0 = .50$

$6 = 0.024$

$n = 420$

$\hat{p} = \frac{228}{420}$

1

2.326

Fail to
Reject 1.76
x

$\alpha = 0.01$

$Z = \dfrac{x - \mu}{\sigma/\sqrt{n}}$ mean

$Z = \dfrac{\hat{P} - P_0}{\sigma}$ Proportion

$Z = 1.76$

A commercial airline is concerned about the increase in usage of carry-on luggage. For years, the percentage of passengers with one or more pieces of carry-on luggage has been stable at approximately 68%. The airline recently selected 300 passengers at random and determined that 237 possessed carry-on luggage. Is there overwhelming evidence of an increase in carry-on luggage at a significance level of 0.01?
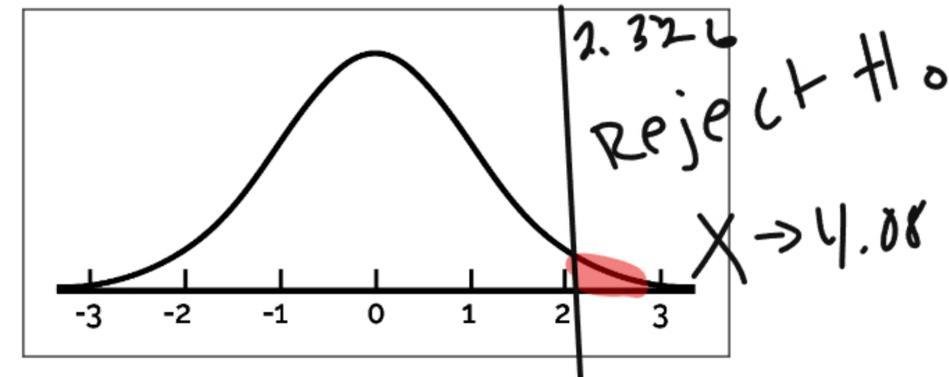
$H_0 \Rightarrow P_0 = .68 \qquad H_a \Rightarrow P_0 > .68$

$\hat{P} = \dfrac{237}{300}$

$\sigma = 0.027$

$Z = 4.08$

$\alpha = 0.01$

2.326

Reject H_0

$X \rightarrow 4.08$

Paper International, Inc. has a large staff of salespeople nationwide. Top officials of the company believe that 75% of their salespeople have met their monthly sales goals by the end of the third week of each month. To investigate this, they randomly select 250 salespeople and examine their sales records at the end of the third week of the current month. One-hundred seventy-five of the 250 salespeople surveyed had already met their monthly sales goals.
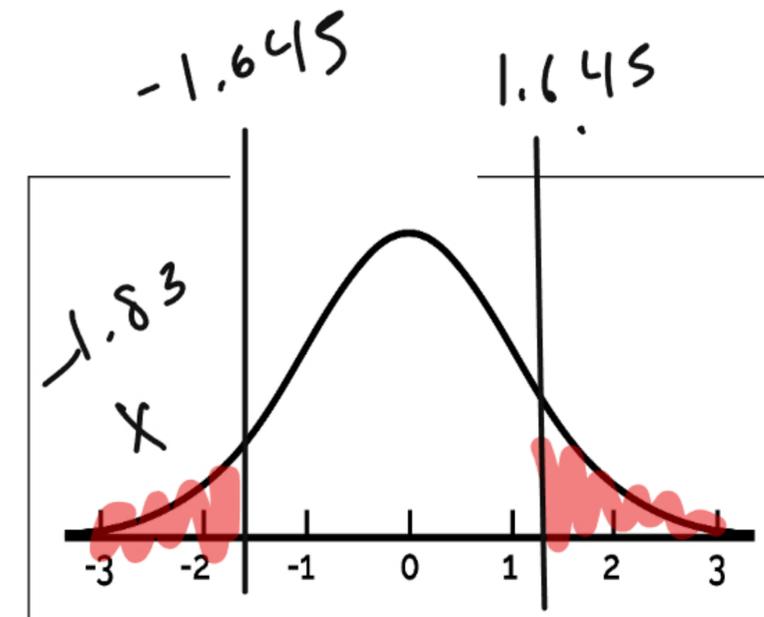
a. Does this sample support the belief of the top officials at the company at $\alpha = 0.10$?

Reject

$H_0 \rightarrow P_0 = .75$ $H_a \rightarrow P_0 \neq .75$

$\alpha = 0.10$ $\sigma = 0.027$

$\hat{P} = 175/250$ $Z = -1.83$

$n = 250$

-1.645   1.645

-1.83

X

A socially conscious corporation wants to relocate their headquarters to another part of town. One concern expressed by workers is that their commuting distance will increase. The corporation has decided that if more than 50% of the employees will have to drive farther to the proposed new location, they will cancel the move. In a random sample of 398 employees, 201 indicated that their commuting distance to the new office will be longer. Based on the sample data, should the corporation cancel the move? Use a significance level of 0.01.

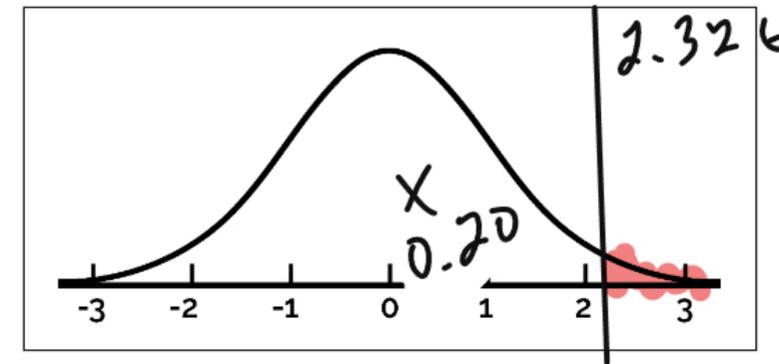$H_0 \Rightarrow P_0 = .50 \qquad H_a \Rightarrow P_0 > .50$

$\hat{P} = 201/398$

$6 = 0.025$

$\alpha = 0.01$

$Z = 0.20$

Fail to Reject

2.326

$\times 0.20$

Suppose a dog food manufacturer wants to know if the proper amount of dog food is being placed in the 25 pound bags. The hypothesis would be:
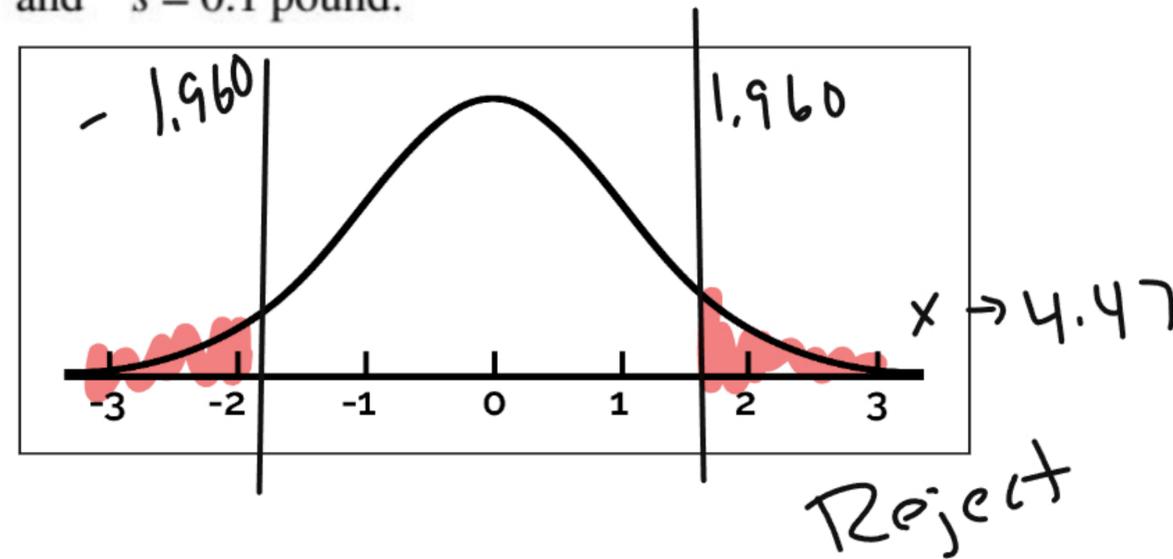
$$H_0: \mu = 25 \text{ lb}$$
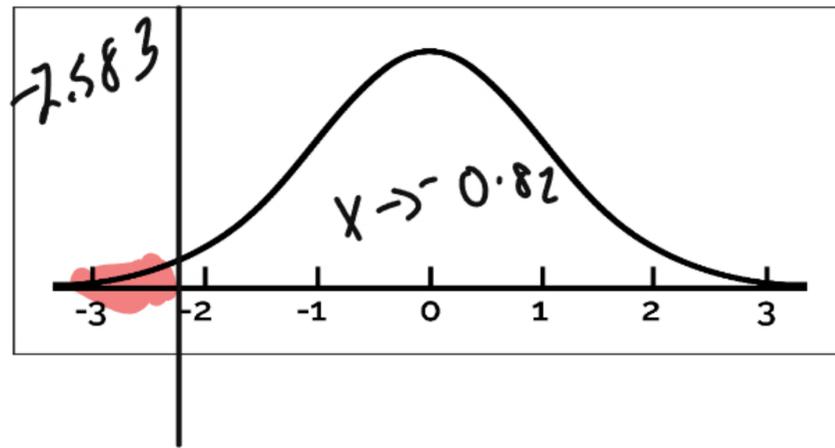
$$H_a: \mu \neq 25 \text{ lb}$$

$$\alpha = 0.05$$

A sample of 2000 bags was selected with the following results:

$n = 2000$ $\bar{x} = 25.01$ pounds and $s = 0.1$ pound.

$$Z = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}} = 4.47$$

-1.960 1.960

$x = 4.47$

Reject

The managers of a large department store wish to test reactions of shoppers to a new in-store video screen which will broadcast continuous information about the store and the items currently on sale. The video production company claims that the average shopper will watch for five or more minutes. The managers randomly select 17 shoppers and determine how long they watch the video. The average time is 4.5 minutes with a standard deviation of 2.5 minutes. Perform a hypothesis test to determine whether there is overwhelming evidence to refute the claim of the video production company. Use $\alpha = 0.01$. Discuss the statistical and practical significance for this problem.

$H_0 \Rightarrow \mu = 5$

$H_a \Rightarrow \mu < 5$

$\alpha = 0.01$
one tail

$\mu = 5$

$\bar{x} = 4.5$

$S = 2.5$

$n = 17 \quad d.f. = 16$

-2.583

$x \rightarrow -0.82$

$t = -0.82$

Fail to Reject

7

You have decided to become a professional gambler specializing in roulette.

If the roulette wheel is fair (each number has a $\frac{1}{38}$ chance) then you will $H_0 \Rightarrow P_0 = \frac{1}{38}$

lose in the long run. However, you plan to locate wheels that are not balanced $H_a \Rightarrow P_a > \frac{1}{38}$
properly. An unbalanced wheel will produce some numbers more often than
expected. You believe that you have found such a wheel and have started
keeping track of the number 29. After 420 spins of the wheel, the number 29
has been observed 14 times. Is this overwhelming evidence at the $\alpha = 0.05$
level that you should start betting heavily on the number 29?

1.645

$\overset{x}{.90}$
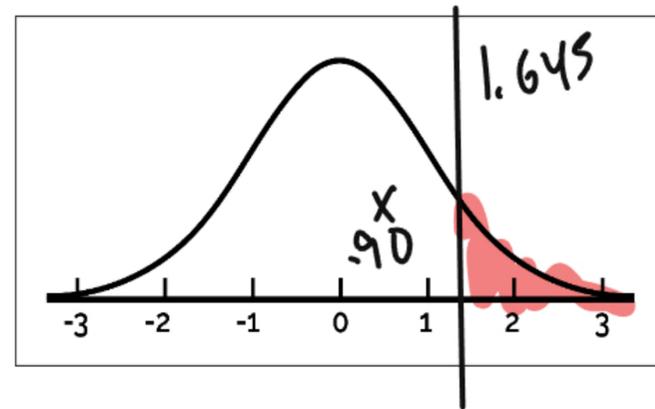
$P = \frac{1}{38}$ $n = 420$ $\hat{P} = \frac{14}{420}$

$\alpha = 0.05$

$S = .0078$ Fail to Reject

$Z = .90$