

⚠ Lagunita is retiring and will shut down at 12 noon Pacific Time on March 31, 2020. A few courses may be open for self-enrollment for a limited time. We will continue to offer courses on other online learning platforms; visit <http://online.stanford.edu>.

Course > Inference: Hypothesis Testing for the Population Proportion > z-test for the Population Proportion > Learn By Doing Activity

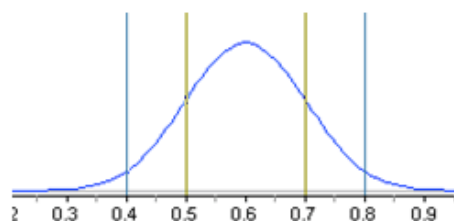
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Learn By Doing Activity

Scenario: Part-Time College Students by Gender

Consider the population of part-time college students. Suppose that 60% of this population is female.

Here is the sampling distribution for the proportion of females in random samples of n students. The standard deviation is approximately 0.10. Lines indicate a distance of 1 and 2 standard deviations above and below the mean.



Learn By Doing

1/1 point (graded)

Use the graph to approximate the test statistic if $\hat{p} = 0.75$:



1.5

Answer

Correct:

The test statistic is the number of standard deviations $\hat{p} = 0.75$ is from $p_o = 0.60$. Since \hat{p} halfway between the line indicating 1 standard deviation and the line indicating 2 standard deviations, that makes \hat{p} 1.5 standard deviations above p_o .

Learn By Doing

1/1 point (graded)

Use the graph to approximate the test statistic if $\hat{p} = 0.40$:



Answer

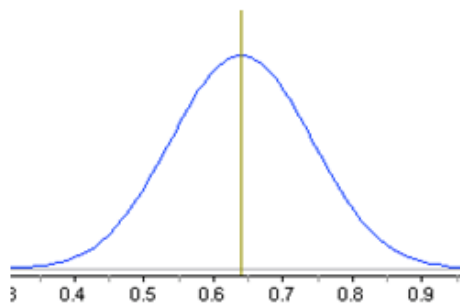
Correct:

The test statistic is the number of standard deviations $\hat{p} = 0.40$ is from $p_o = 0.60$. Now \hat{p} is at the line that is 2 standard deviations below p_o . Since \hat{p} is below p_o , the test statistic is negative.

Scenario: Support of Death Penalty

In this series of problems we will investigate how the sample size impacts the test statistic. Let's return to the context of example 3. The population is U.S. adults and we are investigating whether the proportion supporting the death penalty is still 0.64 (as it was in 2003).

Here is the sampling distribution for the proportion of supporters in random samples of 25 adults. The standard deviation is approximately 0.10.



Learn By Doing

1/1 point (graded)

What is the approximate test statistic for $\hat{p} = 0.74$?

1



1

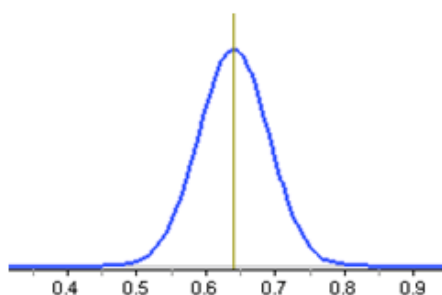
Answer

Correct:

The test statistic is about 1, since $\hat{p} = 0.74$ is 0.10 above $p_0 = 0.64$ and 0.10 is 1 standard deviation.

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If we increase the sample size to 100, the standard deviation decreases to approximately 0.05, as shown.

**Learn By Doing**

1/1 point (graded)

How is the test statistic affected if $\hat{p} = 0.74$ as before?

- ☐ The test statistic is still about 1 since the distance between \hat{p} and p_0 is the same as before.
- ☒ The test statistic increases to about 2 since $\hat{p} = 0.74$ is about 2 standard deviations above $p_0 = 0.64$. ✓
- ☐ The test statistic decreases to about 0.5 since the standard deviation decreased to half of its previous size.

Answer

Correct: Since the standard deviation is now 0.05, the distance of 0.10 is now 2 standard deviations.

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1/1 point (graded)

For which sample size does $\hat{p} = 0.74$ provide stronger evidence against a null hypothesis of $p = 0.60$?☐ $n = 25$ ☐ $n = 100$ ☒ $n = 500$ ✓**Answer**

Correct:

Sampling distributions for large samples have less variability. So $\hat{p} = 0.74$ will be more standard deviations from $p = 0.60$, giving a larger test statistic and stronger evidence against H_0 .

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1/1 point (graded)

In general, when the test statistic is farther from 0, that means the evidence against the null hypothesis is:

☒ stronger ✓☐ weaker**Answer**

Correct:

The further the test statistic is from zero, the more standard deviations \hat{p} is from p_0 . The larger the discrepancy between the data and the claim about p in H_0 the stronger the evidence against H_0 .

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