Multiple Choice Questions on Inference for Proportions:

1. While visiting a major city, a travel agent reads a pamphlet about the hotels in the city. The pamphlet states that there are the same proportion of non-smoking hotel rooms as smoking hotel rooms in the city. The travel agent does not believe this claim and decides to test it when she returns to her office. Which of the following would be an appropriate set of hypothesis for this test?

(A) $H_O : p_{non-smoke} = p_{smoke} \quad H_A : p_{non-smoke} \neq p_{smoke}$

(B) $H_O : \hat{p}_{non-smoke} = \hat{p}_{smoke} \quad H_A : \hat{p}_{non-smoke} \neq \hat{p}_{smoke}$

(C) $H_O : p_{non-smoke} = p_{smoke} \quad H_A : p_{non-smoke} > p_{smoke}$

(D) $H_O : \hat{p}_{non-smoke} = \hat{p}_{smoke} \quad H_A : \hat{p}_{non-smoke} > \hat{p}_{smoke}$

(E) $H_O : p_{non-smoke} \neq p_{smoke} \quad H_A : p_{non-smoke} = p_{smoke}$

2. Greyhound dogs are used at dog race tracks for people to make wagers on which dog will win the race. After the dogs get old or are injured, they are retired from racing. Rescue organizations find homes for these greyhounds. One rescue organization claims that 45% of all retired greyhounds never find a home. A pet store owner and pet advocate believes that even more retired racing greyhounds never find a home and decides to run a test. The pet store owner checks the status (found home or not found home) of a random sample of 150 registered retired greyhounds and finds that 71 have been placed in a new home. At an alpha level of 0.05, what should the pet store owner conclude?

(A) Because the p-value is greater than the alpha level, the pet store owner has evidence that 45% of retired greyhounds have been placed in homes.
(B) Because the p-value is greater than the alpha level, the pet store owner has evidence that more than 45% of retired greyhounds have been placed in homes.
(C) Because the p-value is greater than the alpha level, the pet store owner has insufficient evidence that the proportion of retired greyhounds is more than 45%.
(D) Because the p-value is less than the alpha level, the pet store owner has sufficient evidence that more than 45% of retired greyhounds have been placed in homes.
(E) Because the p-value is less than the alpha level, the pet store owner has insufficient evidence that more then 45% of the retired greyhounds have been placed in homes.

3. A popular lakeside resort on the Great Lakes promotes in their brochure that you have an 85% chance of seeing a bald eagle while you are staying at their resort. A local businessman believes that this claim is outrageous. He has lived in the area for years and seen very few bald eagles. He decides to conduct a test to disprove the resorts claim of 85%. Over the following month, he asks every visitor to his store if they are staying at the resort and if they have seen a bald eagle while staying there. He finds that 35 people have stayed at the resort and only 15 of them have seen a bald eagle. Which of the following is true about this data?

(A) The p-value is essentially zero, so at any reasonable alpha level he has disproven the resorts claim.
(B) The p-value is essentially zero, so there is no proof that the resorts claim is false.
(C) The p-value is essentially zero, which means that no inference can be made.
(D) The sample size is too small, so not inference can be made.
(E) The sample data does not come from a simple random sample and therefore cannot be used to conduct this hypothesis test.

4. A random sample of 100 individuals are polled to determine the number that own a pet. The poll returns a result of 62 individuals owning a pet. The researcher is interested in determining if the number of individuals owning a pet has decreased from the previous believed proportion of 70%. Which of the following is true at the 5% level of significance?

(A) The p-value is 0.04 which indicates that the proportion of individuals owning a pet may have decreased.
(B) The p-value is 0.04 which indicates that the proportion of individuals owning a pet has not changed.
(C) The p-value is 0.08 which indicates that the proportion of individuals owning a pet may have changed.
(D) The p-value is 0.08 which indicates that there is no evidence that the proportion of individuals owning a pet has decreased.
(E) The sample size is too small to make an inference on this proportion.

5. A production line that makes digital cameras has a very high proportion of defective cameras that are being produced, 34%. After redesigning the production process and improving employee training, the production line is restarted. A random sample of 30 cameras is tested to see if they are defective. After testing these 30 cameras, only 8 were found to be defective. Is this good evidence that the improvements to the production line have decreased the proportion of defective cameras produced?
(A) yes, the new proportion, 27%, is much lower than the previous proportion.
(B) yes, the redesign and training have improved camera production.
(C) yes, there is significant evidence that the proportion of cameras that are defective has reduced.
(D) no, this data does show a reduction in the proportion of defective cameras, but a proportion this extreme could occur simply by chance 19.8% of the time.
(E) no, the redesign and training produced a p-value that was lower than a reasonable alpha level. Therefore we believe that the proportion of cameras that are defective is still 34%.

6. Are women better at face recognition than men? A psychology student wanted to test the idea that women can recognize a face that they have seen before better than men. A random sample of 50 women and 60 men are shown 20 black-and-white pictures of faces. After exactly one minute, they are shown a grid of 50 faces and asked to mark each of the 20 faces they were shown before. The women scored 78% recognition while the men scored only 70% recognition. Which of the following is true?
(A) p-value = 0.0858
(B) p-value = 0.1715
(C) p-value = 0.3430
(D) p-value = 0.7364
(E) p-value = 0.9861

7. A one proportion z-test is performed using a left tailed test. After further researching the population in question, it is determined that a two tailed test would be more appropriate. Which of the following would be true?
(A) The p-value from the original test should be halved for the two-tailed test.
(B) The alpha level from the original test should be doubled for the two-tailed test.
(C) The p-value from the original test should be doubled for the two-tailed test.
(D) The z-statistic from the original test should be doubled for the two-tailed test.
(E) A new random sample must be taken to run the two tailed test.

8. A lumber company requires that 68% of the trees in an area to be logged have usable wood for them to make a profit. They are offer a plot of land to log. The lumber company takes a random sample of 40 trees and finds that 25 of the trees have usable wood. Should the timber company agree to log this plot of land?
(A) yes, because the sample proportion produces a p-value that is very large
(B) yes, because the sample proportion is very close to the required 68%
(C) no, because the sample proportion is lower than the required 68%
(D) no, because the sample proportion produces a p-value that is very small
(E) no, there is too much error associated with this sample proportion.

9. Which of the following true about a one-proportion z-test?
(A) There is no restriction on the sample size.
(B) This test works even if the sampling process is not random.
(C) This test works when using a census.
(D) The population should be large compared to the sample size.
(E) For this test to be affective, the alpha level must be set at 5%

10. The owner of a large, vacant downtown building has agreed to tear down the building to make way for a new parking garage if at least 51% of the city's population agrees with the building's destruction. Because a poll of every citizen of the city would be too expensive, a random sample of 135 city residents is polled. The building owner has agreed to use a left tailed one proportion z test at an alpha level of 5% to determine if the actual proportion of residents is lower than 51%. Which of the following would be the minimum number of agreeing city residents required to make the owner decide to tear down the building?
(A) 69
(B) 67
(C) 60
(D) 55
(E) 51

Free Response Questions on Inference for Proportions

Free Response 1.

A major toy company has started production of a new building block toy system that uses blocks that snap together. Each day the production line uses one batch of melted plastic to produce millions of blocks. As production progresses through the day, there is less and less liquid plastic left in the batch. The quality control engineer suspects that the amount of liquid plastic left in the batch effects the quality of the fit of the blocks. To test this, a random sample of 100 blocks is taken at the beginning of the batch and another random sample of 100 blocks at the end of the batch. The quality control engineer plans to run a test that will determine if there is a difference in the proportion of blocks that fit together at the beginning of the batch as compared to the end of the batch. The proportion of blocks that fit together at the beginning of the batch is 88% and the proportion that fit together at the end of the batch are 79%. Is there a significant difference in the proportion of blocks that fit together from the beginning of the batch to the end of the batch?

Free Response 2.

A cookie making company ships hundreds of thousands of their cookies to costumers all over the United States. One of the largest complaints the cookie company has had is the number of individually -wrapped cookies that arrive broken after shipping. In an effort to reduce the proportion of broken cookies, the cookie company has implemented a new packing procedure. Before the new procedure was implemented, the cookie company had 13% of their individually-wrapped cookies broken in shipping. The cookie company wanted to test the results of their new packing procedure. To do this, they placed a postage-paid survey in with the new packing materials for the costumers to return. The customer simply wrote down the number of cookies that were broken and dropped the survey in the mail. Of the 450 individually-wrapped cookies represented by the surveys returned, there were 68 that were reported broken.

(a) Using a test of significance, is there evidence that the new packing procedure reduced the proportion of cookies broken?

(b) Does the method of collecting this data introduce bias into the sample? If so, discuss this bias and how it would affect the results of the test.

Key to Inference for Proportions Multiple Choice

1. A appropriate hypotheses for a 2-prop-z-test
2. C p-value = 0.2828
3. E conditions of 1-prop-z-test
4. A 1-prop-z-test p-value and conclusion
5. D definition of p-value
6. B 2-prop-z-test
7. C one-tailed test vs two-tailed test
8. A conclusion based on 1-prop-z-test
9. D conditions of a 1-prop-z-test
10. C find x which results in the rejection of the null hypothesis