Can domestic dogs understand human body cues such as leaning? The experimenter leaned toward one of two objects and recorded whether or not the dog being tested correctly chose the object indicated. A four-year-old male beagle named Augie participated in this study. He chose the correct object 42 out of 70 times when the experimenter leaned towards the correct object.

(a) Let the parameter of interest, π, represent the probability that the long-run probability that Augie chooses correctly. Researches are interested to see if Augie understands human body cues (better than gussing).
Fill in the blanks for the null and alternative hypotheses.
H_0 : H_a :

(b) Based on the above context, conduct a test of significance to determine the p-value to investigate if domestic dogs understand human body cues. What conclusion will you draw with significance level of 10%? (If you use an applet, please specify which applet you use, and the inputs.)

(c) Based on the above context, conduct a test of significance to determine the p-value to investigate if domestic dogs understand human body cues. What conclusion will you draw with significance level of 5%? (If you use an applet, please specify which applet you use, and the inputs.)

(d) Are your conclusions from part (b) and (c) the same? If they are different, please provide an explanation.

(e) Shown below is a dotplot from a simulation of 100 sample proportions under the assump- tion that the long-run probability that Augie chooses correct is 0.50. Based on this dotplot, would a 90% confidence interval for π contain the value 0.5? Explain your answer.

(f) Compute the standard error of the sample proportion of times that Augie chose the object correctly.

(g) Construct an approximate 95% confidence interval for π using the 2SD method

(h) What is the margin of error of the confidence interval that you found in the previous question

(i)How would you interpret the confidence interval that you found in part (g)?

(j)Which of the following is a correct interpretation of the 95% confidence level?

a) If Augie repeats this process many times, then about 95% of the intervals produced will capture the true proportion of times of choosing the correct objective.
b) About 95% times Augie chooses the correct objective.
c) If Augie repeats this process and constructs 20 intervals from separate independent samples, we can expect about 19 of those intervals to contain the true proportion Augie chooses the correct objective.

(h) Suppose that we repeated the same study with auggie, and this time he chose the correct object 21 out of 35 times. Conjecture how, if at all, the center and the width of a 99% confidence interval would

change with these data, compared to the original 2SD 95% confidence interval.

The center of the confidence interval would _____

The width of the confidence interval would _____

Suppose that we repeated the same study with auggie, and this time he chose the correct object 17 out of 35 times, and we also change the confidence level from 95% to 99%. Conjecture how, if at all, the center and the width of a 99% confidence interval would change with these data, compared to the original 2SD 95% confidence interval.

The center of the confidence interval would _____

The width of the confidence interval would _____

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2. Adult male polar bears are expected to weigh, on average, 370 kg. A polar bear's primary source of food are seals and other marine animals, which they hunt from a platform of sea ice. Scientists are concerned that global warming is melting these platforms earlier in the year, reducing the time polar bears are able to hunt and forcing them inland without the necessary fat reserves built up to survive summer and fall. The US Geological Survey (USGS) conducted a study in the Southern Beaufort Sea to investigate whether climate change has appeared to negatively impact the weight of polar bears, on average. Eighty-three adult male polar bears were captured between March and May of the years 1990 and 2006 and their weights were recorded. The sample mean weight was 324.6 kg and the sample standard deviation was 88.3 kg. A histogram of the 83 polar bear weights in the sample is shown below.

(a) What are the observational units in this study?
(b) What is the variable of interest? Is it quantitative or categorical?
(c)) Are validity conditions met in order to use theory-based methods? Explain your answer.
(d) What is the parameter of interest?

a. The proportion of adult male polar bears in the Southern Beaufort Sea that weigh less than 370 kg.
b. The number of adult male polar bears that have lost weight in the Southern Beaufort Sea.
c. The true mean weight of adult male polar bears in the Southern Beaufort Sea.
d. The mean weight of the 83 adult male polar bears in the sample.

(e) What are the appropriate null and alternative hypotheses to investigate whether cli- mate change has appeared to negatively impact the weight of polar bears?

H_0 :

H_a :

(f) Use the sample results to estimate the standard error of the sampling distribution of sample mean weight.

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7. (g) Calculate the standardized statistic (z).
8. (h) Interpret the standardized statistic (z) you found in the previous part.
9. (i) Based on this standardized statistic (z), does this result provide evidence that the true mean weight of polar bears is less than 370 kg?
10. (j) Use the 2SD method to find a 95% confidence interval for parameter of interest.
11. (k) How would you interpret the interval you found in part(j)?
12. (l) Does the confidence interval in part (j) provide statistically significant evidence that the true mean weight of adult male polar bears in the Southern Beaufort Sea is less than 370 kg?
    a. No, since we only sampled 83 captured adult male polar bears and not the entire popu- lation.
    b. No, since the entire confidence interval lies above zero.
    c. Yes, since the sample mean of 324.6 kg is less than 370 kg.
    d. Yes, since the entire confidence interval lies below 370 kg.
13. (m) To which population can we generalize these results?
    a. All polar bears.
    b. All adult male polar bears.
    c. All adult male polar bears in the Southern Beaufort Sea.
    d. Adult male polar bears that are similar to those captured for the sample.