Practice Quiz 9

Statistics 90-707 Fall 2021 Dr. Nancy Pfenning

1. (3 pts.) Amount spent in 2010 by a sample of 400 "Black Friday" weekend shoppers had a mean of 365 dollars. Assume a population standard deviation of 240 dollars.

   (a) Set up a 95% confidence interval for population mean amount spent.

   (b) Based on your confidence interval, is 343 dollars a plausible value for population mean amount spent? (i) yes (ii) no (iii) borderline

   (c) Suppose someone wants to test a claim that the overall mean amount spent in 2010 differs from the mean for 2009, 343 dollars. What is the correct formulation of the alternative hypothesis in this case?
   (i) $H_a : \mu > 365$ (ii) $H_a : \mu \neq 365$ (iii) $H_a : \bar{x} > 365$ (iv) $H_a : \bar{x} \neq 365$
   (v) $H_a : \mu > 343$ (vi) $H_a : \mu \neq 343$ (vii) $H_a : \bar{x} > 343$ (viii) $H_a : \bar{x} \neq 343$

   (d) Calculate the standardized test statistic for the test in (c). _____

   (e) The absolute value of our test statistic is (i) not large (ii) large (iii) borderline.

   (f) The P-value is (i) not small (ii) small (iii) borderline.

   (g) Which of these should we believe? (i) H_0 (ii) H_a (iii) inconclusive

   (h) If a researcher wants to claim that the population mean amount spent in 2010 is *greater than* 343 dollars, the P-value would be
   (i) half (ii) twice (iii) the same as the one for the test described above.

2. (3 pts.) Number of calves sired by a sample of 10 captive Beluga whales had mean 1.5. Assume population standard deviation to be 1.4.

   (a) Set up a 95% confidence interval for the mean number of calves sired by all captive Belugas.

   (b) Based on your confidence interval, is 3 a plausible value for mean number of calves sired?

   (c) Suppose someone wants to test a claim that the mean number of calves sired is less than 3. State the appropriate null and alternative hypotheses.

   (d) Calculate the standardized test statistic. _____

   (e) Our test statistic is
   (i) not large (ii) large (iii) borderline.

   (f) The p-value is (i) not small (ii) small (iii) borderline.

   (g) Which one of these is the correct conclusion?

      i. Population mean number of calves sired is proven to be 3.
      ii. Population mean number of calves sired is proven to be 1.5.
      iii. Population mean number of calves sired may be 3.
      iv. We have proven that population mean number of calves sired is less than 3.
      v. We have compelling evidence that population mean number of calves sired is less than 3.
      vi. Results are inconclusive.

   (h) If the data were used to test a claim that mean number of calves sired *differs* from 3, the p-value would be
   (i) half (ii) twice (iii) the same as the one for the test described above.

   (i) Now suppose that 1.4 is the *sample* standard deviation; use the fact that the t multiplier for 9 degrees of freedom and 95% confidence is 2.26 to set up a confidence interval for population mean number of calves sired.

   (j) The interval is narrower when we use the (i) z (ii) t multiplier.

3. (2 pts.) *Domestic goats follow gaze direction and use social cues in an object choice task*, published online in Animal Behavior in January of 2005, included information on goats' performance in a bucket-selection task. Based on the data obtained, we want to determine if a sample of 13 adult goats tended to be more successful in picking the bucket with food when cued by the experimenter pointing at it with a finger, compared to control conditions where no cue was given.

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Point      13    10.923     2.691     0.746
Control    13     9.308     1.437     0.398
Difference 13     1.615     3.477     0.964
T-Test of mean difference = 0 (vs > 0): T-value = XXXXX  P-Value = 0.060
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(a) The data arise from a (i) two-sample (ii) paired design.

(b) The t-statistic has been X-ed out. Based on the size of the P-value, the t-statistic must be (i) large (ii) not large (iii) borderline

(c) Are you convinced that in general goats respond to the pointing cue?
(Answer yes or no or inconclusive.)

(d) Based on your conclusion in (c), would a confidence interval for population mean of differences contain zero?
(Answer yes or no or borderline.)

(e) What would the P-value have been if a two-sided alternative had been used?

(f) Would the sample difference have been more convincing if the sample size were much larger?

4. (2 pts.) *Domestic goats follow gaze direction and use social cues in an object choice task*, published online in Animal Behavior in January of 2005, included information on goats' performance in a bucket-selection task. Based on the data obtained, we want to determine if adult and juvenile goats may be equally successful in general when it comes to picking the bucket with food when cued by the experimenter pointing at it with a finger.

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            N      Mean     StDev   SE Mean
Adults     13     10.92      2.69      0.75
Juveniles  10     12.10      2.38      0.75
Difference = mu Adults - mu Juveniles
Estimate for difference:  -1.18
95% CI for difference: (-3.39, 1.03)
T-Test of difference = 0 (vs not =): T-Value = -1.11  P-Value = XXXXX  DF = 20
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(a) This was a (i) paired (ii) two-sample study.

(b) Does the confidence interval contain zero? (i) No, not even close. (ii) No, not quite. (iii) Yes, just barely. (iv) Yes, clearly.

(c) The test statistic is best described as (i) large (ii) not large (iii) borderline.

(d) The P-value has been X-ed out; based on the size of the test statistic, the P-value is best described as (i) small (ii) not small (iii) borderline.

(e) Is there compelling evidence of a difference in mean scores for all adult and juvenile goats performing this bucket selection task?