Canvas Quiz: Chapter 10

Stating Hypotheses **In exercises 1–5, the statement represents a claim. Write down the H_0 and the H_a for each question.**

1. $p \neq 0.55$

2. $p < 0.07$

3. $p \geq 0.29$

4. $p > 0.45$

5. $\mu > 158$

6. Which of the following are legitimate hypotheses?
   - (a) $\bar{x} = 25$ (a) _____
   - (b) $\hat{p} = 0.20$ (b) _____
   - (c) $p > 15$ (c) _____
   - (d) $p > 3.4$ (d) _____
   - (e) $\mu = 400$ (e) _____

7. Which of the following specify legitimate pairs of null and alternative hypotheses? If you find a pair that is illegitimate, then explain why it is not legitimate.
   - (a) $H_0 : p = 0.34$ $H_a : p > 0.36$ (a) _____
   - (b) $H_0 : \hat{p} = 0.60$ $H_a : \hat{p} > 0.60$ (b) _____
   - (c) $H_0 : \bar{x} > 0.45$ $H_a : \bar{x} = 0.45$ (c) _____
   - (d) $H_0 : p = 4.65$ $H_a : p =< 4.65$ (d) _____
   - (e) $H_0 : p = 0.58$ $H_a : p \neq 0.58$ (e) _____

Stating the Hypotheses In Exercises 8–12, write the claim as a mathematical statement. State the null and alternative hypotheses, and identify which represents the claim.

8. A research center claims that at least 46% of U.S. adults think that the IRS is not aggressive enough in pursuing people who cheat on their taxes. In a random sample of 600 U.S. adults, 246 say that the IRS is not aggressive enough in pursuing people who cheat on their taxes. At $\alpha = 0.01$, is there enough evidence to reject the center's claim?

9. DUI The U.S. Department of Transportation, National Highway Traffic Safety Administration, reported that 77% of all fatally injured automobile drivers were intoxicated. A random sample of 27 records of automobile driver fatalities in Kit Carson County, Colorado, showed that 15 involved an intoxicated driver. Do these data indicate that the population proportion of driver fatalities related to alcohol is less than 77% in Kit Carson County? Use $\alpha = 0.01$.

10. The following is based on information from The Wolf in the Southwest: The Making of an Endangered Species by David E. Brown (University of Arizona Press). Before 1918, the proportion of female wolves in the general population of all southwestern wolves was about 50%. However, after 1918, southwestern cattle ranchers began a widespread effort to destroy wolves. In a recent sample of 34 wolves, there were only 10 females. One theory is that male wolves tend to return sooner than females to their old territories where their predecessors were exterminated. Do these data indicate that the population proportion of female wolves is now less than 50% in the region? Use $\alpha = 0.01$.

11. Athabasca Fishing Lodge is located on Lake Athabasca in northern Canada. In one of its recent brochures, the lodge advertises that 75% of its guests catch northern pike over 20 pounds. Suppose that last summer 64 out of a random sample of 83 guests did, in fact, catch northern pike weighing over 20 pounds. Does this indicate that the population proportion of guests who catch pike over 20 pounds is different from 75% (either higher or lower)? Use $\alpha = 0.05$.

12. What is your favorite color? A large survey of countries, including the United States, China, Russia, France, Turkey, Kenya, and others, indicated that most people prefer the color blue. In fact, about 24% of the population claim blue as their favorite color (Reference: Study by J. Bunge and A. Freeman-Gallant, Statistics Center, Cornell University). Suppose a random sample of n = 56 college students were surveyed and x = 12 of them said that blue is their favorite color. Does this information imply that the color preference of all college students is different (either way) from that of the general population? Use $\alpha = 0.05$.

Interpreting a Decision **In Exercises 13 and 14, write down the null hypothesis or the alternative hypothesis. If a hypothesis test is performed, how should you interpret a decision that**
(a) rejects the null hypothesis?
(b) fails to reject the null hypothesis?

13. A media outlet claims that more than two-thirds of Americans favor legislation that has them lose even more privacy rights in the future, in order to 'safely open the country.'

14. A new test for Covid-19 antibodies has a less than 1% rate of false positives.

Identifying Tests **In Exercises 15–17, determine whether the hypothesis test is left-tailed, right-tailed, or two-tailed.**

15. $H_0: \quad p = 0.36$
        $H_a: \quad p \neq 0.36$

16. $H_0: \quad p = 0.86$
        $H_a: \quad p > 0.86$

17. $H_0: \quad p = 0.56$
        $H_a: \quad p < 0.56$

18. A news article on Yahoo.com described a Covid-19 antibody test made by a particular manufacturer was used to test a random sample of 1000 adult Americans. Suppose that you want to use the sample results from the study cited in the news article to decide if there is evidence that the test is accurate in detecting coronavirus antibodies less than 75% of the time. Let p be the actual percentage of all tests from the manufacturer that accurately report the results.

   (a) Describe the shape, center, and spread of the sampling distribution of $\hat{p}$ for random samples of size 1000 if the null hypothesis $H_0 : p = 0.75$ is true.

   (b) Would you be surprised to observe a sample proportion of $\hat{p} = 0.73$ for a sample of size 1000 if the null hypothesis $H_0 : p = 0.75$ were true? Explain why or why not.

   (c) Would you be surprised to observe a sample proportion of $\hat{p} = 0.60$ for a sample of size 1000 if the null hypothesis $H_0 : p = 0.75$ were true? Explain why or why not.

Identifying Errors **In Exercises 18–19, describe type I and type II errors for a hypothesis test of the indicated claim.**

19. A manufacturer claims that the success rate of their new Covid-19 tests is more than 97%, and that the government should stop using their competitor's test which has been around longer and has a success rate of about 95%

20. A hospital advertises that the average cost of being treated for severe symptoms of Coronavirus is $72,000.

Hypothesis Testing

21. A recent survey found that 68.6% of the population own their homes. In a random sample of 150 heads of households, 92 responded that they owned their homes. At the a $\alpha = 0.01$ level of significance, does that suggest a difference from the national proportion?

(a) (2 points)   Write the null and alternative hypotheses.

(b) (2 points)   What conditions should you check first before you conduct the hypothesis test?

(c) (1 point)   What formula should be used for the test statistic?

(d) (1 point)   What number is the test statistic equal to?

(e) (1 point)   What p-value do you obtain? Round to the ten-thousandths.

(f) (1 point)   Do you reject the null hypothesis or fail to reject the null hypothesis? Explain.

(g) (2 points)   Please write a conclusion sentence in the context of the problem.

22. A research center claims that more than 68% of U.S. adults support using surveillance cameras in public places. In a random sample of 300 U.S. adults, 70% say that they support using surveillance cameras in public places. At $\alpha = 0.05$, is there enough evidence to reject the research center's claim?

   (a) (2 points) Write the null and alternative hypotheses.

   (b) (2 points) What conditions should you check first before you conduct the hypothesis test?

   (c) (1 point) What formula should be used for the test statistic?

   (d) (1 point) What number is the test statistic equal to?

   (e) (1 point) What p-value do you obtain? Round to the ten-thousandths.

   (f) (1 point) Do you reject the null hypothesis or fail to reject the null hypothesis? Explain.

   (g) (2 points) Please write a conclusion sentence in the context of the problem.

23. A polling agency reports that over 60% of U.S. adults think that the federal govern-ment's bank bailouts were bad for the United States. In a random sample of 298 U.S. adults, 167 said that the federal government's bank bailouts were bad for the United States. Is there enough evidence to support the agency's claim?

(a) (2 points) Write the null and alternative hypotheses.

(b) (2 points) What conditions should you check first before you conduct the hy-pothesis test?

(c) (1 point) What formula should be used for the test statistic?

(d) (1 point) What number is the test statistic equal to?

(e) (1 point) What p-value do you obtain? Round to the ten-thousandths.

(f) (1 point) Do you reject the null hypothesis or fail to reject the null hypothesis? Explain.

(g) (2 points) Please write a conclusion sentence in the context of the problem.

24. The Western blot assay is a blood test for the presence of HIV. It has been found that this test sometimes gives false positive results for HIV. A medical researcher claims that the rate of false positives is less than 2%. A recent study of 500 randomly selected U.S. blood donors who do not have HIV found that 6 received a false positive test result. Is there enough evidence to reject the researcher's claim?

   (a) (2 points)   Write the null and alternative hypotheses.

   (b) (2 points)   What conditions should you check first before you conduct the hypothesis test?

   (c) (1 point)   What formula should be used for the test statistic?

   (d) (1 point)   What number is the test statistic equal to?

   (e) (1 point)   What p-value do you obtain? Round to the ten-thousandths.

   (f) (1 point)   Do you reject the null hypothesis or fail to reject the null hypothesis? Explain.

   (g) (2 points)   Please write a conclusion sentence in the context of the problem.