

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Write the null and alternative hypotheses you would use to test the following situation.

- 1) 5% of trucks of a certain model have needed new engines after being driven between 0 and 100 miles. The manufacturer hopes that the redesign of one of the engine's components has solved this problem. 1) _____
- A) $H_0: p > 0.05$
 $H_A: p = 0.05$
- B) $H_0: p < 0.05$
 $H_A: p > 0.05$
- C) $H_0: p = 0.05$
 $H_A: p < 0.05$
- D) $H_0: p < 0.05$
 $H_A: p = 0.05$
- E) $H_0: p = 0.05$
 $H_A: p > 0.05$
- 2) The federal guideline for smog is 12% pollutants per 10,000 volume of air. A metropolitan city is trying to bring its smog level into federal guidelines. The city comes up with a new policy where city employees are to use of city transportation to and from work. A local environmental group does not think the city is doing enough and no real change will occur. An independent agency, hired by the city, runs a test on the air. What are the null and alternative hypotheses? 2) _____
- A) $H_0: p = 0.12$
 $H_A: p < 0.12$
- B) $H_0: p = 0.12$
 $H_A: p > 0.12$
- C) $H_0: p = 0.12$
 $H_A: p \neq 0.12$
- D) $H_0: p \neq 0.12$
 $H_A: p = 0.12$
- E) $H_0: p < 0.12$
 $H_A: p > 0.12$

- 3) A weight loss center provided a loss for 72% of its participants. The center's leader decides to test a new weight loss strategy to see if it's better. What are the null and alternative hypotheses? 3) _____
- A) $H_0: p = 0.72$
 $H_A: p < 0.72$
- B) $H_0: p = 0.72$
 $H_A: p > 0.72$
- C) $H_0: p > 0.72$
 $H_A: p < 0.72$
- D) $H_0: p = 0.72$
 $H_A: p \neq 0.72$
- E) $H_0: p > 0.72$
 $H_A: p = 0.72$

Find the P-value for the indicated hypothesis test.

- 4) In a sample of 88 children selected randomly from one town, it is found that 8 of them suffer from asthma. Find the P-value for a test of the claim that the proportion of all children in the town who suffer from asthma is equal to 11%. 4) _____
- A) -0.2843 B) 0.5686 C) 0.2843 D) 0.2157
- 5) In a sample of 47 adults selected randomly from one town, it is found that 9 of them have been exposed to a particular strain of the flu. Find the P-value for a test of the claim that the proportion of all adults in the town that have been exposed to this strain of the flu is 8%. 5) _____
- A) 0.0524 B) 0.0048 C) 0.0024 D) 0.0262
- 6) An article in a journal reports that 34% of American fathers take no responsibility for child care. A researcher claims that the figure is higher for fathers in the town of Littleton. A random sample of 225 fathers from Littleton, yielded 97 who did not help with child care. Find the P-value for a test of the researcher's claim. 6) _____
- A) 0.0015 B) 0.0019 C) 0.0038 D) 0.0529

Explain what the P-value means in the given context.

- 7) A new manager, hired at a large warehouse, was told to reduce the 26% employee sick leave. The manager introduced a new incentive program for employees with perfect attendance. The manager decides to test the new program to see if it's better and receives a P-value of 0.06. What is reasonable to conclude about the new strategy using $\alpha = 0.05$? 7) _____
- A) There's only a 6% chance of seeing the new program having no effect on employee attendance in the results we observed from natural sampling variation. We conclude the new program is more effective.
- B) There is a 94% chance of the new program having no effect on employee attendance.
- C) There is a 6% chance of the new program having no effect on employee attendance.
- D) We can say there is a 6% chance of seeing the new program having an effect on employee attendance in the results we observed from natural sampling variation. We conclude the new program is more effective.
- E) We can say there is a 6% chance of seeing the new program having no effect on employee attendance in the results we observed from natural sampling variation. There is no evidence the new program is more effective, but we cannot conclude the program has no effect on employee attendance.

- 8) A weight loss center provided a loss for 72% of its participants. The center's leader decides to test a new weight loss strategy to see if it's better and receives a P-value of 0.23. What is reasonable to conclude about the new strategy using $\alpha = 0.1$? 8) _____
- A) We can say there is a 23% chance of seeing the strategies being equally effective in the results we observed from natural sampling variation. There is no evidence the new strategy is more effective, but we cannot conclude the strategies are equally effective.
 - B) We can say there is a 23% chance of not seeing the strategies being equally effective in the results we observed from natural sampling variation. We conclude the new strategy is more effective.
 - C) There's only a 23% chance of seeing the strategies being equally effective in the results we observed from natural sampling variation. We conclude the new strategy is more effective.
 - D) There is a 77% chance of the strategies being equally effective.
 - E) There is a 23% chance of the strategies being equally effective.

Provide an appropriate response.

- 9) A weight loss center provided a loss for 72% of its participants. The center's leader decides to test a new weight loss strategy on a random sample size of 140 and found 109 participants lost weight. Should the center continue its new strategy? Test an appropriate hypothesis using $\alpha = 0.02$ and state your conclusion. Be sure the appropriate assumptions and conditions are satisfied before you proceed. 9) _____
- A) $z = 1.54$; P-value = 0.1236. The change is statistically significant. A 95% confidence interval is (70.4%, 85.3%). This is clearly lower than 72%. The chance of observing 109 or more participants of 140 is only 11.42% if the weight loss is really 72%.
 - B) $z = -1.54$; P-value = 0.9382. The center should continue with the new strategy. There is a 94.29% chance of having 109 or more of 140 participants in a random sample weigh less if in fact 72% do.
 - C) $z = -1.54$; P-value = 0.0618. The change is statistically significant. A 90% confidence interval is (71.6%, 84.1%). This is clearly higher than 72%. The chance of observing 109 or more participants of 140 is only 5.71% if the weight loss is really 72%.
 - D) $z = 1.54$; P-value = 0.9382. The change is statistically significant. A 98% confidence interval is (69.0%, 86.7%). This is clearly higher than 72%. The chance of observing 109 or more participants of 140 is only 94.29% if the weight loss is really 72%.
 - E) $z = 1.54$; P-value = 0.0618. The center should not continue with the new strategy. There is a 6.18% chance of having 109 or more of 140 participants in a random sample weigh less if in fact 72% do. The P-value of 0.0618 is greater than the alpha level of 0.02.

- 10) The U.S. Department of Labor and Statistics released the current unemployment rate of 5.3% for the month in the U.S. and claims the unemployment has not changed in the last two months. However, the states statistics reveal that there is a decrease in the U.S. unemployment rate. A test on unemployment was done on a random sample size of 1000 and found 38 people were unemployed. Should the state continue with its assumption of no change? Test an appropriate hypothesis using $\alpha = 0.05$ and state your conclusion. Be sure the appropriate assumptions and conditions are satisfied before you proceed.
- A) $z = -2.12$; P-value = 0.983. The state should continue with its assumption. There is a 98.3% chance of having 38 or less of 1000 people in a random sample be unemployed if in fact 5.3% do.
- B) $z = 2.12$; P-value = 0.983. The change is statistically significant. A 98% confidence interval is (2.2%, 5.4%). This is clearly lower than 5.3%. The chance of observing 38 or less unemployed people of 1000 is 1.7% if the unemployment is really 5.3%.
- C) $z = 2.12$; P-value = 0.017. The state should continue with its assumption. There is a 1.7% chance of having 38 or less of 1000 people in a random sample be unemployed if in fact 5.3% do.
- D) $z = -2.12$; P-value = 0.017. The change is statistically significant. A 90% confidence interval is (2.8%, 4.8%). This is clearly lower than 5.3%. The chance of observing 38 or less unemployed people of 1000 is 1.7% if the unemployment is really 5.3%. The P-value is less than the alpha level of 0.05.
- E) $z = -2.12$; P-value = 0.034. The change is statistically significant. A 90% confidence interval is (2.7%, 5.0%). This is clearly lower than 5.3%. The chance of observing 38 or less unemployed people of 1000 is 1.7% if the unemployment is really 5.3%.

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Identify the null hypothesis, alternative hypothesis, test statistic, P-value, conclusion about the null hypothesis, and final conclusion that addresses the original claim.

- 11) A supplier of 3.5" disks claims that no more than 1% of the disks are defective. In a random sample of 600 disks, it is found that 3% are defective, but the supplier claims that this is only a sample fluctuation. At the 0.01 level of significance, test the supplier's claim that no more than 1% are defective. 11) _____
- 12) A poll of 1,068 adult Americans reveals that 48% of the voters surveyed prefer the Democratic candidate for the presidency. At the 0.05 level of significance, test the claim that at least half of all voters prefer the Democrat. 12) _____
- 13) A manufacturer considers his production process to be out of control when defects exceed 3%. In a random sample of 85 items, the defect rate is 5.9% but the manager claims that this is only a sample fluctuation and production is not really out of control. At the 0.01 level of significance, test the manager's claim. 13) _____

Answer Key

Testname: HYPOTHESIS TESTING PROPORTIONS EXERCISES

- 1) C
- 2) C
- 3) B
- 4) B
- 5) B
- 6) B
- 7) E
- 8) A
- 9) E
- 10) D

11) $H_0: p = 0.01$. $H_1: p > 0.01$. Test statistic: $z = 4.92$. P-value: $p = 0.001$.

Critical value: $z = 2.33$. Reject null hypothesis. There is sufficient evidence to warrant rejection of the claim that no more than 1% are defective.

12) $H_0: p = 0.5$. $H_1: p < 0.5$. Test statistic: $z = -1.31$. P-value: $p = 0.0951$.

Critical value: $z = -1.645$. Fail to reject null hypothesis. There is not sufficient evidence to warrant rejection of the claim that at least half of all voters prefer the Democrat.

13) $H_0: p = 0.03$. $H_1: p > 0.03$. Test statistic: $z = 1.57$. P-value: $p = 0.0582$.

Critical value: $z = 2.33$. Fail to reject null hypothesis. There is not sufficient evidence to warrant rejection of the manager's claim that production is not really out of control.