

Ch 9 Test A

Name _____

1. A commercial for a breakfast cereal is shown during a certain television program. The manufacturer of the cereal wants to estimate the percent of television viewers who watch the program. The manufacturer wants the estimate to have a margin of error of at most 0.02 at a level of 95 percent confidence. Of the following, which is the smallest sample size that will satisfy the manufacturer's requirements?

(A) 40

(B) 50

(C) 100

(D) 1,700

(E) 2,500

2. A company produces millions of 1-pound packages of bacon every week. Company specifications allow for no more than 3 percent of the 1-pound packages to be underweight. To investigate compliance with the specifications, the company's quality control manager selected a random sample of 1,000 packages produced in one week and found 40 packages, or 4 percent, to be underweight. Assuming all conditions for inference are met, do the data provide convincing statistical evidence at the significance level of $\alpha = 0.05$ that more than 3 percent of all the packages produced in one week are underweight?



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- (A) Yes, because the sample estimate of 0.04 is greater than the company specification of 0.03.
- (B) Yes, because the p -value of 0.032 is less than the significance level of 0.05.
- (C) Yes, because the p -value of 0.064 is greater than the significance level of 0.05.
- (D) No, because the p -value of 0.032 is less than the significance level of 0.05.
- (E) No, because the p -value of 0.064 is greater than the significance level of 0.05.
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3. A department store manager wants to know if a greater proportion of customers on the store's mailing list would redeem a coupon for \$5 off the price of an item than would redeem a coupon for 10 percent off the price of an item. The manager mails a \$5 off coupon to a random sample of 500 customers and mails a 10 percent off coupon to an independent random sample of 500 customers. The number of coupons of each type that were redeemed was recorded. Assuming that the conditions for inference are met, what test procedure should be used to answer the manager's question?

- (A) A one-sample t -test for a mean
- (B) A one-sample z -test for a proportion
- (C) A t -test for the slope of a regression line
- (D) A matched-pairs t -test for a mean difference
- (E) A two-sample z -test for a difference between two proportions
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4. A doctor uses a new diagnostic test to indicate whether a patient has a certain disease. The doctor will prescribe medication for the patient if the doctor believes the patient has the disease, as indicated by the diagnostic test. The situation is similar to using a null hypothesis and an alternative hypothesis to decide whether to prescribe the medication. The hypotheses can be stated as follows.

H_0 : The patient does not have the disease.

H_a : The patient has the disease.

Which of the following best describes the power of the test?

- (A) The probability that the new test is better than an older test to indicate whether a patient has the disease
- (B) The probability that the new test indicates the disease in a patient who has the disease
- (C) The probability that the new test indicates the disease in a patient who does not have the disease
- (D) The probability that the new test does not indicate the disease in a patient who has the disease
- (E) The probability that the new test does not indicate the disease in a patient who does not have the disease
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5. A large number of randomized experiments were conducted to determine whether taking a particular drug regularly would decrease the chance of getting a certain disease. For each of the experiments, the drug effect is the difference between the proportion of people taking the drug who got the disease and the proportion of people taking a placebo who got the disease. If the drug had no effect whatsoever, which of the following experimental results would be anticipated?

1.

p -values will be greater than 0.05 for about 95 percent of the experiments.

2.

There will be about an equal number of experiments showing positive and negative values of drug effect.

3.

When 95 percent confidence intervals for the population drug effect are constructed, those confidence intervals include 0 about 95 percent of the time.



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- (A) I only
 - (B) II only
 - (C) III only
 - (D) I and II only
 - (E) I, II and III
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6. A national health study reported that the proportion of students with elevated blood pressure is 0.15. The principal of a local high school believes that the proportion of students in the school with elevated blood pressure is greater than 0.15. If a large random sample is used, which of the following is the most appropriate test to investigate the principal's belief?

- (A) A z-test for a proportion
 - (B) A z-test for a difference between two proportions
 - (C) A chi-square test for homogeneity of proportions
 - (D) A t -test for a mean
 - (E) A matched-pairs t -test
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7. A survey of a random sample of 1,045 young adults found that 60 percent do not have a landline telephone number. A hypothesis test will be used to determine whether the data provide convincing statistical evidence that more than 50 percent of all young adults do not have a landline telephone number. Which of the following is the test statistic for the appropriate test?



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(A) $\frac{0.50-0.60}{\sqrt{\frac{(0.50)(0.50)}{1,045}}}$

(B) $\frac{0.50-0.60}{\sqrt{\frac{(0.40)(0.60)}{1,045}}}$

(C) $\frac{0.60-0.50}{\sqrt{\frac{(0.50)(0.50)}{1,045}}}$

(D) $\frac{0.60-0.50}{\sqrt{\frac{(0.40)(0.60)}{1,045}}}$

(E) $\frac{0.60-0.50}{\sqrt{\frac{(0.40)(0.60)}{\sqrt{1,045}}}}$

8. A survey was conducted in a large city to investigate public opinion on banning the use of trans fats in restaurant cooking. A random sample of 230 city residents with school-age children was selected, and another random sample of 341 city residents without school-age children was also selected. Of those with school-age children, 94 opposed the banning of trans fats, and of those without school-age children, 147 opposed the banning of trans fats. An appropriate hypothesis test was conducted to investigate whether there was a difference between the two groups of residents in their opposition to the banning of trans fats. Is there convincing statistical evidence of a difference between the two population proportions at the significance level of 0.05 ?

- (A) Yes, because the sample proportions are different.
- (B) Yes, because the probability of observing a difference at least as large as the sample difference is greater than 0.05.
- (C) Yes, because the probability of observing a difference at least as large as the sample difference, if the two population proportions are the same, is less than 0.05.
- (D) No, because the probability of observing a difference at least as large as the sample difference, if the two population proportions are the same, is greater than 0.05.
- (E) No, because the probability of observing a difference at least as large as the sample difference is less than 0.05.
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9. There are 1,000 golden delicious and 1,000 red delicious apples in a cooler. In a random sample of 75 of the golden delicious apples, 48 had blemishes. In a random sample of 75 of the red delicious apples, 42 had blemishes. Assume all conditions for inference have been met. Which of the following is closest to the interval estimate of the difference in the numbers of apples with blemishes (golden delicious minus red delicious) at a 98 percent level of confidence?
- (A) $(-0.076, 0.236)$
- (B) $(-0.105, 0.265)$
- (C) $(-10.5, 26.5)$
- (D) $(-76, 236)$
- (E) $(-105, 265)$
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10. A local arts council has 200 members. The council president wanted to estimate the percent of its members who have had experience in writing grants. The president randomly selected 30 members and surveyed the selected members on their grant-writing experience. Of the 30 selected members, 12 indicated that they did have the experience. Have the conditions for inference with a one-sample z -interval been met?
- (A) Yes, all conditions for inference have been met.
- (B) No, because the sample size is not large enough to satisfy the conditions for normality.
- (C) No, because the sample was not selected at random.
- (D) No, because the sample size is not less than 10 percent of the population size.
- (E) No, because the sample is not representative of the population.
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11. Two large containers, X and Y, contain many colored beads. From a random sample of beads taken from container X, the proportion of blue beads in the sample was recorded as $\hat{p}_X = 0.35$. From a random sample of beads taken from container Y, the proportion of blue beads in the sample was recorded as $\hat{p}_Y = 0.39$. Assuming all conditions for inference are met, which of the following procedures is the most appropriate for estimating the difference between the proportions of all blue beads in the containers?
- (A) A two-sample z -interval for a difference in population proportions
- (B) A two-sample z -interval for a difference in sample proportions
- (C) A one-sample z -interval for a population proportion
- (D) A one-sample z -interval for a sample proportion
- (E) A one-sample z -interval for a difference in population proportions
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12. Consider the results of a hypothesis test, which indicate there is not enough evidence to reject the null hypothesis. Which of the following statements about error is correct?
- (A) A Type I error could have been made, but not a Type II error.
- (B) A Type II error could have been made, but not a Type I error.
- (C) Both types of error could have been made, but the probability of a Type I error is greater than the probability of a Type II error.
- (D) Both types of error could have been made, but the probability of a Type I error is less than the probability of a Type II error.
- (E) The type of error that could have been made is not possible to determine without knowing the statement of the null hypothesis.
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13. A random sample of 415 potential voters was interviewed 3 weeks before the start of a state-wide campaign for governor; 223 of the 415 said they favored the new candidate over the



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incumbent. However, the new candidate made several unfortunate remarks one week before the election. Subsequently, a new random sample of 630 potential voters showed that 317 voters favored the new candidate.

Do these data support the conclusion that there was a decrease in voter support for the new candidate after the unfortunate remarks were made? Give appropriate statistical evidence to support your answer.



Please respond on separate paper, following directions from your teacher.

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- 14.** A recent report stated that less than 35 percent of the adult residents in a certain city will be able to pass a physical fitness test. Consequently, the city's Recreation Department is trying to convince the City Council to fund more physical fitness programs. The council is facing budget constraints and is skeptical of the report. The council will fund more physical fitness programs only if the Recreation Department can provide convincing evidence that the report is true.

The Recreation Department plans to collect data from a sample of 185 adult residents in the city. A test of significance will be conducted at a significance level of $\alpha = 0.05$ for the following hypotheses.

$$H_0 : p = 0.35$$

$$H_a : p$$

where p is the proportion of adult residents in the city who are able to pass the physical fitness test.

- (a) Describe what a Type II error would be in the context of the study, and also describe a consequence of making this type of error.
- (b) The Recreation Department recruits 185 adult residents who volunteer to take the physical fitness test. The test is passed by 77 of the 185 volunteers, resulting in a p -value of 0.97 for the hypotheses stated above. If it was reasonable to conduct a test of significance for the hypotheses stated above using the data collected from the 185 volunteers, what would the p -value of 0.97 lead you to conclude?
- (c) Describe the primary flaw in the study described in part (b), and explain why it is a concern.



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