Setting Up a Test for a Population Mean Quiz

1. Last year the mean cost μ for a one-bedroom rental in a certain city was \$1,200 per month. Eli is looking for a one-bedroom apartment and is investigating whether the mean cost is less now than what it was last year. A random sample of apartments had a sample mean $\bar{x}$ of \$1,180 per month. Assuming all conditions for inference are met, Eli will conduct a hypothesis test as part of his investigation.

Which of the following is the correct set of hypotheses?

(A) $H_0 : \mu = 1{,}200$
$H_a : \mu > 1{,}200$

(B) $H_0 : \mu = 1{,}200$
$H_a : \mu < 1{,}200$

(C) $H_0 : \bar{x} = 1{,}200$
$H_a : \bar{x} < 1{,}200$

(D) $H_0 : \bar{x} = 1{,}180$
$H_a : \bar{x} \neq 1{,}180$

(E) $H_0 : \bar{x} = 1{,}180$
$H_a : \bar{x} < 1{,}180$

2. Researchers for a company that manufactures batteries want to test the hypothesis that the mean battery life of their new battery is greater than the known mean battery life of their older version. The researchers selected random samples of 32 of the new batteries, subjected the batteries to continuous use, and determined the mean and standard deviation of the battery lives in the sample.

Which of the following is an appropriate test for the researchers' hypothesis?

(A) A one-sample z-test for a population mean

(B) A one-sample t-test for a population mean

(C) A one-sample z-test for a population proportion

(D) A matched-pairs t-test for a mean difference

(E) A two-sample t-test for a difference between means

3. To test the effectiveness of an exercise program in reducing high blood pressure, 15 participants had their blood pressures recorded before beginning the program and again after completing the program. The difference (after minus before) in blood pressure was recorded for each participant, and the sample mean difference $\bar{x}_D$ was calculated. A hypothesis test will be conducted to investigate whether there is convincing statistical evidence for a reduction in blood pressure for all who complete the program.

Which of the following is the correct set of hypotheses?

Setting Up a Test for a Population Mean Quiz

(A) $H_0 : \bar{x}_D = 0$
$H_a : \bar{x}_D \neq 0$

(B) $H_0 : \bar{x}_D = 0$
$H_a : \bar{x}_D < 0$

(C) $H_0 : \mu_D = 0$
$H_a : \mu_D \neq 0$

(D) $H_0 : \mu_D = 0$
$H_a : \mu_D > 0$

(E) $H_0 : \mu_D = 0$
$H_a : \mu_D < 0$

4. The mean length μ of male geckos is 9.5 inches. A researcher studying a population of geckos in a certain region will conduct a hypothesis test to investigate whether there is evidence that the mean length is greater than 9.5 inches. A random sample of geckos was selected, and the sample mean $\bar{x}$ was calculated as 10 inches.

Which of the following is the correct set of hypotheses?

(A) $H_0 : \bar{x} = 10$
$H_a : \bar{x} \neq 10$

(B) $H_0 : \bar{x} = 10$
$H_a : \bar{x} < 10$

(C) $H_0 : \mu = 9.5$
$H_a : \mu > 9.5$

(D) $H_0 : \mu = 9.5$
$H_a : \mu < 9.5$

(E) $H_0 : \mu = 9.5$
$H_a : \mu \neq 9.5$

5. A recent study reported the mean body mass index (BMI) for adults in the United States was 26.8. A researcher believes the mean BMI of marathon runners is less than 26.8. A random sample of 35 marathon runners had a mean BMI of 22.7 with a standard deviation of 3.1. The researcher will conduct a one-sample t-test for a population mean.

Have the conditions for inference been met?

(A) Yes, all conditions have been met.

(B) No, because the sample was not selected using a random method.

(C) No, because marathon runners are not a representative sample of all adults in the United States.

(D) No, because the shape of the distribution of the sample is not known.

(E) No, because the sample size is not large enough to assume normality of the sampling distribution of the sample mean.

Setting Up a Test for a Population Mean Quiz

6. A business analyst is investigating whether the mean amount of purchases made by customers at an online department store is greater than \$100. The analyst obtained a random sample of 56 orders and calculated a sample mean of \$102.30 and a sample standard deviation of \$5.30.

Which of the following is an appropriate test for the investigation?

(A) A one-sample t-test for a population mean

(B) A one-sample t-test for a sample mean

(C) A one-sample z-test for a population proportion

(D) A two-sample t-test for a difference between population means

(E) A matched-pairs t-test for a mean difference

7. A researcher's hypothesis is that the average length of salmon returning to spawn from an Alaskan river is less than the historical average length of 24 inches. The researcher collects a random sample of 45 salmon, measures the length of each fish, and computes an average length of 22 inches, with a standard deviation of 3.1 inches.

Which of the following is the appropriate test for the researcher's hypothesis?

(A) A matched-pairs t-test for a mean difference

(B) A two-sample t-test for a difference between means

(C) A one-sample z-test for a population mean

(D) A one-sample t-test for a population mean

(E) A one-sample z-test for a population proportion

8. A software company provides specialized resort reservation software that can be tailored to the needs of its customers. The company's 120 customers pay yearly subscription costs that can vary from customer to customer. The company knows that to be profitable, it needs each customer to be spending at least \$23,000 per year, on average. The company selects a random sample of 33 customers and computes a mean of \$27,871 and a standard deviation of \$309.10. It performs a hypothesis test and computes a very small p-value. The software company concludes that the mean is greater than \$23,000.

Was it appropriate for the software company to perform the hypothesis test and make the conclusion that was made?

(A) Yes, because the p-value is very small, so the company has sufficient evidence to reject the null hypothesis and conclude that its customers are spending more, on average, than \$23,000 per year.

(B) Yes, because the sample size is large enough to perform the hypothesis test.

(C) No, because the sample is more than 10 percent of the population, so one of the conditions for conducting a hypothesis test has not been met.

(D) No, because the sample size is not large enough to perform the hypothesis test.

(E) No, because the distribution of the sample data is skewed.

Setting Up a Test for a Population Mean Quiz

9. A six-week fitness program was designed to decrease the time it takes retired individuals to walk one mile. At the beginning of the program, 20 randomly selected retired individuals were invited to participate, and their times to walk a mile were recorded. After the six-week program, their times to walk a mile were again recorded. Most participants saw little to no improvement in their times to walk one mile; however, a few participants saw drastic improvements in their times to walk one mile. The program director would like to perform a hypothesis test to determine if the program reduces the mean time for retired individuals to walk a mile.

Which of the following statements is true?

(A) Because there are 40 observations in total, the sample size is large enough to assume that the sampling distribution of the sample mean differences is approximately normal.

(B) Because the walk times before and after the program are paired, a hypothesis test is not appropriate.

(C) The sampling distribution of sample means can be assumed to be approximately normal because the distribution of the sample data is not skewed.

(D) Because the sample size of 20 is less than 30 and the improvements in walk times in the sample data appear to be skewed, the distribution of sample means should not be assumed to be approximately normal.

(E) Because the program recruited only retired individuals, the distribution of sample means should not be assumed to be approximately normal.