Carrying Out a Test for the Slope of a Regression Model Quiz

1. An agronomist is an expert in soil management and crop production. A certain state hires an agronomist to investigate whether there is a linear relationship between a wheat stalk's height and the yield of wheat. The agronomist collected data and used the data to test the claim that there is a linear relationship at a significance level of $\alpha = 0.05$. The agronomist tested the following hypotheses.

$$\mathrm{H}_0 : \beta_1 = 0$$
$$\mathrm{H}_\mathrm{a} : \beta_1 \neq 0$$

The test yielded a p-value of 0.25. Which of the following is a correct conclusion about the claim?

(A) The null hypothesis is rejected because $0.25 > 0.05$. There is sufficient evidence to suggest that there is a linear relationship between a wheat stalk's height and its yield.

(B) The null hypothesis is not rejected because $0.25 > 0.05$. There is sufficient evidence to suggest that there is a linear relationship between a wheat stalk's height and its yield.

(C) The null hypothesis is rejected because $0.25 > 0.05$. There is not sufficient evidence to suggest that there is a linear relationship between a wheat stalk's height and its yield.

(D) The null hypothesis is not rejected because $0.25 > 0.05$. There is not sufficient evidence to suggest that there is a linear relationship between a wheat stalk's height and its yield.

(E) The null hypothesis is accepted because $0.25 > 0.05$. There is sufficient evidence to suggest that there is not a linear relationship between a wheat stalk's height and its yield.

2. A baseball enthusiast carried out a simple linear regression to investigate whether there is a linear relationship between the number of runs scored by a player and the number of times the player was intentionally walked. Computer output from the regression analysis is shown.

Variable	**DF**	**Estimate**	**SE**
Intercept	1	16	2.073
Intentional Walks	1	0.50	0.037
		$\mathrm{R\text{-}sq} = 0.63$	

Let β_1 represent the slope of the population regression line used to predict the number of runs scored from the number of intentional walks in the population of baseball players. A t-test for a slope of a regression line was conducted for the following hypotheses.

$$\mathrm{H}_0 : \beta_1 = 0$$
$$\mathrm{H}_\mathrm{a} : \beta_1 \neq 0$$

What is the appropriate test statistic for the test?

(A) $t = \frac{16}{2.073}$

(B) $t = \frac{16}{0.63}$

(C) $t = \frac{16}{0.50}$

(D) $t = \frac{0.50}{0.63}$

(E) $t = \frac{0.50}{0.037}$

Carrying Out a Test for the Slope of a Regression Model Quiz

3. A car retailer wanted to see if there is a linear relationship between overall mileage and the suggested retail price of a car. The retailer collected data on 18 cars of a similar type selected at random and used the data to test the claim that there is a linear relationship. The following hypotheses were used to test the claim.

$\mathrm{H}_0 : \beta_1 = 0$
$\mathrm{H}_a : \beta_1 \neq 0$

The test yielded a t-value of 2.186 with a corresponding p-value of 0.044. Which of the following is the correct interpretation of the p-value?

(A) If there is a linear relationship between overall mileage and the suggested retail price of a car, the probability of observing a test statistic at least as extreme as 2.186 is 0.044.

(B) If there is not a linear relationship between overall mileage and the suggested retail price of a car, the probability of observing a test statistic at least as extreme as 2.186 is 0.044.

(C) If there is not a linear relationship between overall mileage and the suggested retail price of a car, the probability of observing a test statistic of 2.186 or greater is 0.044.

(D) If there is not a linear relationship between overall mileage and the suggested retail price of a car, the probability of observing a test statistic of 2.186 is 0.044.

(E) If there is a linear relationship between overall mileage and the suggested retail price of a car, the probability of observing a test statistic of 2.186 or greater is 0.044.

4. The yield of a certain chemical reaction is believed to be related to temperature. A study collected the yield from 15 such reactions selected at random to test the belief and produced the following results.

Variable		**Estimate**	
Intercept	1	15.5	2.96
Temp	1	0.05	0.017
		R-sq $= 0.73$	

Let β_1 represent the slope of the population regression line used to predict the yield of the reaction from the temperature. A t-test for a slope of a regression line was conducted for the following hypotheses.
$\mathrm{H}_0 : \beta_1 = 0$
$\mathrm{H}_a : \beta_1 \neq 0$

Which of the following is the appropriate test statistic for the test?

(A) $t = \frac{15.5}{0.05}$

(B) $t = \frac{15.5}{0.73}$

(C) $t = \frac{0.05}{15.5}$

(D) $t = \frac{0.05}{0.73}$

(E) $t = \frac{0.05}{0.017}$

Carrying Out a Test for the Slope of a Regression Model Quiz

5. A researcher collected data on the cholesterol level, C, and the age, A, of 24 people selected at random. Using the data, the researcher calculated the least-squares regression line to be $\widehat{C} = 182 + 2.2A$ and the standard error of the slope to be 0.38. If the conditions for inference are met, which of the following is closest to the value of the test statistic to test the hypotheses $\mathrm{H_0} : \beta = 0$ versus $\mathrm{H_a} : \beta \neq 0$?

(A) $t = 0.17$

(B) $t = 0.38$

(C) $t = 0.836$

(D) $t = 2.2$

(E) $t = 5.79$

6. A major credit card company is interested in whether there is a linear relationship between its internal rating of a customer's credit risk and that of an independent rating agency. The company collected a random sample of 200 customers and used the data to test the claim that there is a linear relationship. The following hypotheses were used to test the claim.

$\mathrm{H_0} : \beta_1 = 0$

$\mathrm{H_a} : \beta_1 \neq 0$

The test yielded a t-value of 3.34 with a corresponding p-value of 0.001. Which of the following is the correct interpretation of the p-value?

(A) If the alternative hypothesis is true, the probability of observing a test statistic at least as extreme as 3.34 is 0.001.

(B) If the alternative hypothesis is true, the probability of observing a test statistic of 3.34 or greater is 0.001.

(C) If the null hypothesis is true, the probability of observing a test statistic of 3.34 or greater is 0.001.

(D) If the null hypothesis is true, the probability of observing a test statistic of 3.34 is 0.001.

(E) If the null hypothesis is true, the probability of observing a test statistic at least as extreme as 3.34 is 0.001.

7. A scientist claims that there is a linear relationship between a lake's flow rate and its runoff factor. The scientist collected data and used the data to test the claim that there is a linear relationship at a significance level of $\alpha = 0.05$. The scientist tested the following hypotheses.

$\mathrm{H_0} : \beta_1 = 0$

$\mathrm{H_a} : \beta_1 \neq 0$

The scientist found a p-value of 0.02 for the test. Which of the following is a correct conclusion about the scientist's claim?

Carrying Out a Test for the Slope of a Regression Model Quiz

(A) The null hypothesis is rejected since $0.02 < 0.05$. There is sufficient statistical evidence to suggest that there is a linear relationship between a lake's flow rate and runoff factor.

(B) The null hypothesis is not rejected since $0.02 < 0.05$. There is sufficient evidence to suggest that there is a linear relationship between a lake's flow rate and runoff factor.

(C) The null hypothesis is rejected since $0.02 < 0.05$. There is not sufficient evidence to suggest that there is a linear relationship between a lake's flow rate and runoff factor.

(D) The null hypothesis is not rejected since $0.02 < 0.05$. There is not sufficient evidence to suggest that there is a linear relationship between a lake's flow rate and runoff factor.

(E) The null hypothesis is accepted since $0.02 < 0.05$. There is sufficient evidence to suggest that there is not a linear relationship between a lake's flow rate and runoff factor.

8. A popular musician believes an increase in the number of times songs are listened to via a streaming service leads to an increase in recording sales. The musician's recording company selected 50 songs at random and used the data to test the claim that there is a positive linear relationship between the number of times a song is listened to and recording sales. The following hypotheses were used to test the claim.

$\mathrm{H_0} : \beta_1 = 0$

$\mathrm{H_a} : \beta_1 > 0$

The test yielded a t-value of 1.592 with a corresponding p-value of 0.059. Which of the following is the correct interpretation of the p-value?

(A) If the alternative hypothesis is true, the probability of observing a test statistic of 1.592 or smaller is 0.059.

(B) If the alternative hypothesis is true, the probability of observing a test statistic of 1.592 or greater is 0.059.

(C) If the null hypothesis is true, the probability of observing a test statistic of 1.592 or greater is 0.059.

(D) If the null hypothesis is true, the probability of observing a test statistic of 1.592 is 0.059.

(E) If the null hypothesis is true, the probability of observing a test statistic of 1.592 or smaller is 0.059.

9. A car magazine claims that there is a linear relationship between a car's weight, in pounds, and the car's fuel efficiency, in miles per gallon. The magazine collected data and used the data to test the claim at a significance level of $\alpha = 0.05$. The magazine tested the following hypotheses.

$\mathrm{H_0} : \beta_1 = 0$

$\mathrm{H_a} : \beta_1 \neq 0$

The test yielded a t-value of 1.95 and a p-value of 0.08. Which of the following is a correct conclusion about the magazine's claim?

Carrying Out a Test for the Slope of a Regression Model Quiz

(A) The null hypothesis is rejected because $0.08 > 0.05$. There is sufficient evidence to suggest that there is a linear relationship between a car's weight and its fuel efficiency.

(B) The null hypothesis is not rejected because $0.08 > 0.05$. There is sufficient evidence to suggest that there is a linear relationship between a car's weight and its fuel efficiency.

(C) The null hypothesis is rejected because $0.08 > 0.05$. There is not sufficient evidence to suggest that there is a linear relationship between a car's weight and its fuel efficiency.

(D) The null hypothesis is not rejected because $0.08 > 0.05$. There is not sufficient evidence to suggest that there is a linear relationship between a car's weight and its fuel efficiency.

(E) The null hypothesis is accepted because $0.08 > 0.05$. There is sufficient evidence to suggest that there is not a linear relationship between a car's weight and its fuel efficiency.