## Question #1 of 86

Question ID: 1456649

An analyst is testing the hypothesis that the mean excess return from a trading strategy is less than or equal to zero. The analyst reports that this hypothesis test produces a *p*-value of 0.034. This result *most likely* suggests that the:

**A)** best estimate of the mean excess return produced by the strategy is 3.4%.

**B)** null hypothesis can be rejected at the 5% significance level.

**C)** smallest significance level at which the null hypothesis can be rejected is 6.8%.

**Explanation**

A p-value of 0.035 means the hypothesis can be rejected at a significance level of 3.5% or higher. Thus, the hypothesis can be rejected at the 10% or 5% significance level, but cannot be rejected at the 1% significance level.

(Module 6.2, LOS 6.e)

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## Question #2 of 86

Question ID: 1456618

Which of the following statements about hypothesis testing is *most accurate*?

**A)** A Type I error is rejecting the null hypothesis when it is true, and a Type II error is rejecting the alternative hypothesis when it is true.

**B)** A hypothesis that the population mean is less than or equal to 5 should be rejected when the critical Z-statistic is greater than the sample Z-statistic.

**C)** A hypothesized mean of 3, a sample mean of 6, and a standard error of the sampling means of 2 give a sample Z-statistic of 1.5.

**Explanation**

Z = (6 - 3)/2 = 1.5. A Type II error is failing to reject the null hypothesis when it is false. The null hypothesis that the population mean is less than or equal to 5 should be rejected when the sample Z-statistic is greater than the critical Z-statistic.

(Module 6.1, LOS 6.c)

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## Question #3 of 86

Question ID: 1456607

Which of the following is an accurate formulation of null and alternative hypotheses?

**A)** Less than for the null and greater than for the alternative.

**B)** Equal to for the null and not equal to for the alternative.

**C)** Greater than for the null and less than or equal to for the alternative.

**Explanation**

A correctly formulated set of hypotheses will have the "equal to" condition in the null hypothesis.

(Module 6.1, LOS 6.a)

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## Question #4 of 86

Question ID: 1456642

An analyst calculates that the mean of a sample of 200 observations is 5. The analyst wants to determine whether the calculated mean, which has a standard error of the sample statistic of 1, is significantly different from 7 at the 5% level of significance. Which of the following statements is *least* accurate?:

**A)** The alternative hypothesis would be $H_a$: mean > 7.

**B)** The null hypothesis would be: $H_0$: mean = 7.

**C)** The mean observation is significantly different from 7, because the calculated Z-statistic is less than the critical Z-statistic.

**Explanation**

The way the question is worded, this is a two tailed test. The alternative hypothesis is not $H_a$: M > 7 because in a two-tailed test the alternative is =, while < and > indicate one-tailed tests. A test statistic is calculated by subtracting the hypothesized parameter from the parameter that has been estimated and dividing the difference by the standard error of the sample statistic. Here, the test statistic = (sample mean – hypothesized mean) / (standard error of the sample statistic) = (5 - 7) / (1) = -2. The calculated Z is -2, while the critical value is -1.96. The calculated test statistic of -2 falls to the left of the critical Z-statistic of -1.96, and is in the rejection region. Thus, the null hypothesis is rejected and the conclusion is that the sample mean of 5 is significantly different than 7. What the negative sign shows is that the mean is less than 7; a positive sign would indicate that the mean is more than 7. The way the null hypothesis is written, it makes no difference whether the mean is more or less than 7, just that it is not 7.

(Module 6.1, LOS 6.c)

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## Question #5 of 86

Question ID: 1456669

An analyst wants to determine whether the mean returns on two stocks over the last year were the same or not. What test should she use, assuming returns are normally distributed?

**A)** Chi-square test.

**B)** Difference in means test.

**C)** Paired comparisons test.

**Explanation**

Portfolio theory teaches us that returns on two stocks over the same time period are unlikely to be independent since both have some systematic risk. Because the samples are not independent, a paired comparisons test is appropriate to test whether the means of the two stocks' returns distributions are equal. A difference in means test is not appropriate because it requires that the samples be independent. A chi-square test compares the variance of a sample to a hypothesized variance.

(Module 6.3, LOS 6.i)

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## Question #6 of 86

Question ID: 1456622

A survey is taken to determine whether the average starting salaries of CFA charterholders is equal to or greater than $57,000 per year. Assuming a normal distribution, what is the test statistic given a sample of 115 newly acquired CFA charterholders with a mean starting salary of $65,000 and a standard deviation of $4,500?

**A)** 19.06.

**B)** 1.78.

**C)** -19.06.

**Explanation**

With a large sample size (115) the z-statistic is used. The z-statistic is calculated by subtracting the hypothesized parameter from the parameter that has been estimated and dividing the difference by the standard error of the sample statistic. Here, the test statistic = (sample mean – hypothesized mean) / (population standard deviation / (sample size)$^{1/2}$ = $(X - \mu) / (\sigma / n^{1/2})$ = (65,000 – 57,000) / (4,500 / 115$^{1/2}$) = (8,000) / (4,500 / 10.72) = 19.06.

(Module 6.1, LOS 6.c)

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## Question #7 of 86

Question ID: 1456637

If a two-tailed hypothesis test has a 5% probability of rejecting the null hypothesis when the null is true, it is *most likely* that:

**A)** the confidence level of the test is 95%.

**B)** the power of the test is 95%.

**C)** the probability of a Type I error is 2.5%.

**Explanation**

Rejecting the null hypothesis when it is true is a Type I error. The probability of a Type I error is the significance level of the test and one minus the significance level is the confidence level. The power of a test is one minus the probability of a Type II error, which cannot be calculated from the information given. (Module 6.1, LOS 6.c)

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## Question #8 of 86

Question ID: 1456670

Joe Sutton is evaluating the effects of the 1987 market decline on the volume of trading. Specifically, he wants to test whether the decline affected trading volume. He selected a sample of 500 companies and collected data on the total annual volume for one year prior to the decline and for one year following the decline. What is the set of hypotheses that Sutton is testing?

**A)** $H_0$: $\mu_d = \mu_{d0}$ versus $H_a$: $\mu_d > \mu_{d0}$.

**B)** $H_0$: $\mu_d = \mu_{d0}$ versus $H_a$: $\mu_d \neq \mu_{d0}$.

**C)** $H_0$: $\mu_d \neq \mu_{d0}$ versus $H_a$: $\mu_d = \mu_{d0}$.

**Explanation**

This is a paired comparison because the sample cases are not independent (i.e., there is a before and an after for each stock). Note that the test is two-tailed, t-test.

(Module 6.3, LOS 6.i)

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## Question #9 of 86

Question ID: 1456639

Kyra Mosby, M.D., has a patient who is complaining of severe abdominal pain. Based on an examination and the results from laboratory tests, Mosby states the following diagnosis hypothesis: $H_0$: Appendicitis, $H_A$: Not Appendicitis. Dr. Mosby removes the patient's appendix and the patient still complains of pain. Subsequent tests show that the gall bladder was causing the problem. By taking out the patient's appendix, Dr. Mosby:

**A)** made a Type II error.

**B)** made a Type I error.

**C)** is correct.

**Explanation**

This statement is an example of a Type II error, which occurs when you fail to reject a hypothesis when it is actually false.

The other statements are incorrect. A Type I error is the rejection of a hypothesis when it is actually true.

(Module 6.1, LOS 6.c)

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## Question #10 of 86

Question ID: 1456624

A survey is taken to determine whether the average starting salaries of CFA charterholders is equal to or greater than $58,500 per year. What is the test statistic given a sample of 175 CFA charterholders with a mean starting salary of $67,000 and a standard deviation of $5,200?

**A)** 1.63.

**B)** –1.63.

**C)** 21.62.

**Explanation**

With a large sample size (175) the *z*-statistic is used. The *z*-statistic is calculated by subtracting the hypothesized parameter from the parameter that has been estimated and dividing the difference by the standard error of the sample statistic. Here, the test statistic = (sample mean – hypothesized mean) / (population standard deviation / (sample size)$^{1/2}$ = $(X - \mu) / (\sigma / n^{1/2})$ = (67,000 – 58,500) / (5,200 / 175$^{1/2}$) = (8,500) / (5,200 / 13.22) = 21.62.

(Module 6.1, LOS 6.c)

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## Question #11 of 86

Question ID: 1456677

The use of the F-distributed test statistic, $F = s_1^2 / s_2^2$, to compare the variances of two populations *least likely* requires which of the following?

**A)** samples are independent of one another.

**B)** populations are normally distributed.

**C)** two samples are of the same size.

**Explanation**

The F-statistic can be computed using samples of different sizes. That is, $n_1$ need not be equal to $n_2$.

(Module 6.4, LOS 6.j)

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## Question #12 of 86

Question ID: 1456602

Which one of the following *best* characterizes the alternative hypothesis? The alternative hypothesis is usually the:

**A)** hypothesis that is accepted after a statistical test is conducted.

**B)** hypothesis to be proved through statistical testing.

**C)** hoped-for outcome.

**Explanation**

The alternative hypothesis is typically the hypothesis that a researcher hopes to support after a statistical test is carried out. We can reject or fail to reject the null, not 'prove' a hypothesis.

(Module 6.1, LOS 6.a)

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## Question #13 of 86

Question ID: 1456619

If the probability of a Type I error decreases, then the probability of:

**A)** a Type II error increases.

**B)** incorrectly accepting the null decreases.

**C)** incorrectly rejecting the null increases.

**Explanation**

If P(Type I error) decreases, then P(Type II error) increases. A null hypothesis is never accepted. We can only fail to reject the null.

(Module 6.1, LOS 6.c)

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## Question #14 of 86

Question ID: 1456636

If a one-tailed *z*-test uses a 5% significance level, the test will reject a:

**A)** false null hypothesis 95% of the time.

**B)** true null hypothesis 95% of the time.

**C)** true null hypothesis 5% of the time.

**Explanation**

The level of significance is the probability of rejecting the null hypothesis when it is true. The probability of rejecting the null when it is false is the power of a test. (Module 6.1, LOS 6.c)

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## Question #15 of 86

Question ID: 1456611

George Appleton believes that the average return on equity in the amusement industry, μ, is greater than 10%. What is the null ($H_0$) and alternative ($H_a$) hypothesis for his study?

**A)** $H_0$: ≤ 0.10 versus $H_a$: > 0.10.

**B)** $H_0$: > 0.10 versus $H_a$: < 0.10.

**C)** $H_0$: > 0.10 versus $H_a$: ≤ 0.10.

**Explanation**

The alternative hypothesis is determined by the theory or the belief. The researcher specifies the null as the hypothesis that he wishes to reject (in favor of the alternative). Note that this is a one-sided alternative because of the "greater than" belief.

(Module 6.1, LOS 6.b)

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## Question #16 of 86

Question ID: 1456666

For a test of the equality of the means of two normally distributed independent populations, the appropriate test statistic follows a:

**A)** chi-square distribution.

**B)** *F*-distribution.

**C)** *t*-distribution.

**Explanation**

The test statistic for the equality of the means of two normally distributed independent populations is a t-statistic and equality is rejected if it lies outside the upper and lower critical values.

(Module 6.3, LOS 6.h)

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## Question #17 of 86

Question ID: 1456617

A researcher is testing whether the average age of employees in a large firm is statistically different from 35 years (either above or below). A sample is drawn of 250 employees and the researcher determines that the appropriate critical value for the test statistic is 1.96. The value of the computed test statistic is 4.35. Given this information, which of the following statements is *least* accurate? The test:

**A)** has a significance level of 95%.

**B)** indicates that the researcher will reject the null hypothesis.

**C)** indicates that the researcher is 95% confident that the average employee age is different than 35 years.

**Explanation**

This test has a *significance level of 5%.* The relationship between confidence and significance is: significance level = 1 – confidence level. We know that the significance level is 5% because the sample size is large and the critical value of the test statistic is 1.96 (2.5% of probability is in both the upper and lower tails).

(Module 6.1, LOS 6.c)

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## Question #18 of 86

Question ID: 1456654

Which of the following statements about testing a hypothesis using a Z-test is *least* accurate?

**A)** The confidence interval for a two-tailed test of a population mean at the 5% level of significance is that the sample mean falls between ±1.96 $\sigma/\sqrt{n}$ of the null hypothesis value.

**B)** If the calculated Z-statistic lies outside the critical Z-statistic range, the null hypothesis can be rejected.

**C)** The calculated Z-statistic determines the appropriate significance level to use.

**Explanation**

The significance level is chosen before the test so the calculated Z-statistic can be compared to an appropriate critical value.

(Module 6.2, LOS 6.g)

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## Question #19 of 86

Question ID: 1456668

For a test of the equality of the mean returns of two non-independent populations based on a sample, the numerator of the appropriate test statistic is the:

**A)** average difference between pairs of returns.

**B)** difference between the sample means for each population.

**C)** larger of the two sample means.

**Explanation**

A hypothesis test of the equality of the means of two normally distributed non-independent populations (hypothesized mean difference = 0) is a t-test and the numerator is the average difference between the sample returns over the sample period.

(Module 6.3, LOS 6.i)

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## Question #20 of 86

Question ID: 1456646

A researcher determines that the mean annual return over the last 10 years for an investment strategy was greater than that of an index portfolio of equal risk with a statistical significance level of 1%. To determine whether the abnormal portfolio returns to the strategy are economically meaningful, it would be *most appropriate* to additionally account for:

**A)** only the transaction costs and tax effects of the strategy.

**B)** only the transaction costs of the strategy.

**C)** the transaction costs, tax effects, and risk of the strategy.

**Explanation**

A statistically significant excess of mean strategy return over the return of an index or benchmark portfolio may not be economically meaningful because of 1) the transaction costs of implementing the strategy, 2) the increase in taxes incurred by using the strategy, 3) the risk of the strategy. Although the market risk of the strategy portfolios is matched to that of the index portfolio, variability in the annual strategy returns introduces additional risk that must be considered before we can determine whether the results of the analysis are economically meaningful, that is, whether we should invest according to the strategy.

(Module 6.1, LOS 6.d)

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## Question #21 of 86

Question ID: 1456659

**Student's *t*-Distribution**

| Level of Significance for One-Tailed Test | | | | | | |
|---|---|---|---|---|---|---|
| **df** | **0.100** | **0.050** | **0.025** | **0.01** | **0.005** | **0.0005** |
| **Level of Significance for Two-Tailed Test** | | | | | | |
| **df** | **0.20** | **0.10** | **0.05** | **0.02** | **0.01** | **0.001** |
| **28** | 1.313 | 1.701 | 2.048 | 2.467 | 2.763 | 3.674 |
| **29** | 1.311 | 1.699 | 2.045 | 2.462 | 2.756 | 3.659 |
| **30** | 1.310 | 1.697 | 2.042 | 2.457 | 2.750 | 3.646 |

In order to test whether the mean IQ of employees in an organization is greater than 100, a sample of 30 employees is taken and the sample value of the computed test statistic, $t_{n-1}$ = 3.4. If you choose a 5% significance level you should:

**A)** reject the null hypothesis and conclude that the population mean is greater than 100.

**B)** fail to reject the null hypothesis and conclude that the population mean is greater than 100.

**C)** fail to reject the null hypothesis and conclude that the population mean is less than or equal to 100.

**Explanation**

At a 5% significance level, the critical t-statistic using the Student's t distribution table for a one-tailed test and 29 degrees of freedom (sample size of 30 less 1) is 1.699 (with a large sample size the critical z-statistic of 1.645 may be used). Because the calculated t-statistic of 3.4 is greater than the critical t-statistic of 1.699, meaning that the calculated t-statistic is in the rejection range, we reject the null hypothesis and we conclude that the population mean is greater than 100.

(Module 6.2, LOS 6.g)

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## Question #22 of 86

Question ID: 1456604

Which of the following statements *least accurately* describes the procedure for testing a hypothesis?

**A)** Develop a hypothesis, compute the test statistic, and make a decision.

**B)** Select the level of significance, formulate the decision rule, and make a decision.

**C)** Compute the sample value of the test statistic, set up a rejection (critical) region, and make a decision.

**Explanation**

Depending upon the author there can be as many as seven steps in hypothesis testing which are:

1. Stating the hypotheses.
2. Identifying the test statistic and its probability distribution.
3. Specifying the significance level.
4. Stating the decision rule.
5. Collecting the data and performing the calculations.
6. Making the statistical decision.
7. Making the economic or investment decision.

(Module 6.1, LOS 6.a)

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## Question #23 of 86

Question ID: 1456667

Brandon Ratliff is investigating whether the mean of abnormal returns earned by portfolio managers with an MBA degree significantly differs from mean abnormal returns earned by managers without an MBA. Ratliff's null hypothesis is that the means are equal. If Ratliff's critical t-value is 1.98 and his computed t-statistic is 2.05, he should:

**A)** reject the null hypothesis and conclude that the population means are equal.

**B)** reject the null hypothesis and conclude that the population means are not equal.

**C)** fail to reject the null hypothesis and conclude that the population means are equal.

**Explanation**

The hypothesis test is a two-tailed test of equality of the population means. The t-statistic is greater than the critical t-value. Therefore, Ratliff can reject the null hypothesis that the population means are equal.

(Module 6.3, LOS 6.h)

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## Question #24 of 86

Question ID: 1456656

**Student's *t*-Distribution**

| Level of Significance for One-Tailed Test | | | | | | |
|---|---|---|---|---|---|---|
| **df** | **0.100** | **0.050** | **0.025** | **0.01** | **0.005** | **0.0005** |
| **Level of Significance for Two-Tailed Test** | | | | | | |
| **df** | **0.20** | **0.10** | **0.05** | **0.02** | **0.01** | **0.001** |
| **40** | 1.303 | 1.684 | 2.021 | 2.423 | 2.704 | 3.551 |

Ken Wallace is interested in testing whether the average price to earnings (P/E) of firms in the retail industry is 25. Using a *t*-distributed test statistic and a 5% level of significance, the critical values for a sample of 41 firms is (are):

**A)** -1.685 and 1.685.

**B)** -1.96 and 1.96.

**C)** -2.021 and 2.021.

**Explanation**

There are 41 − 1 = 40 degrees of freedom and the test is two-tailed. Therefore, the critical *t*-values are ± 2.021. The value 2.021 is the critical value for a one-tailed probability of 2.5%.

(Module 6.2, LOS 6.g)

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## Question #25 of 86

Question ID: 1456629

A Type II error:

**A)** fails to reject a false null hypothesis.

**B)** fails to reject a true null hypothesis.

**C)** rejects a true null hypothesis.

**Explanation**

A Type II error is defined as accepting the null hypothesis when it is actually false. The chance of making a Type II error is called beta risk.

(Module 6.1, LOS 6.c)

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## Question #26 of 86

Question ID: 1456655

Segment of the table of critical values for Student's t-distribution:

| Level of Significance for a One-Tailed Test | | |
|---|---|---|
| **df** | **0.050** | **0.025** |
| **Level of Significance for a Two-Tailed Test** | | |
| **df** | **0.10** | **0.05** |
| 18 | 1.734 | 2.101 |
| 19 | 1.729 | 2.093 |

Simone Mak is a television network advertising executive. One of her responsibilities is selling commercial spots for a successful weekly sitcom. If the average share of viewers for this season exceeds 8.5%, she can raise the advertising rates by 50% for the next season. The population of viewer shares is normally distributed. A sample of the past 19 episodes results in a mean share of 9.6% with a standard deviation of 10.0%. If Mak is willing to make a Type 1 error with a 5% probability, which of the following statements is *most* accurate?

**A)** Mak cannot charge a higher rate next season for advertising spots based on this sample.

**B)** The null hypothesis Mak needs to test is that the mean share of viewers is greater than 8.5%.

**C)** With an unknown population variance and a small sample size, Mak cannot test a hypothesis based on her sample data.

**Explanation**

Mak cannot conclude with 95% confidence that the average share of viewers for the show this season exceeds 8.5 and thus she cannot charge a higher advertising rate next season.

Hypothesis testing process:

*Step 1: State the hypothesis.* Null hypothesis: mean ≤ 8.5%; Alternative hypothesis: mean > 8.5%

*Step 2: Select the appropriate test statistic.* Use a *t* statistic because we have a normally distributed population with an unknown variance (we are given only the sample variance) and a small sample size (less than 30). If the population were not normally distributed, no test would be available to use with a small sample size.

*Step 3: Specify the level of significance.* The significance level is the probability of a Type I error, or 0.05.

*Step 4: State the decision rule.* This is a one-tailed test. The critical value for this question will be the *t*-statistic that corresponds to a significance level of 0.05 and n-1 or 18 degrees of freedom. Using the *t*-table, we determine that we will reject the null hypothesis if the calculated test statistic is greater than the critical value of **1.734.**

*Step 5: Calculate the sample (test) statistic.* The test statistic = $t = (9.6 – 8.5) / (10.0 / \sqrt{19})$ = **0.4795**. (*Note:* Remember to use standard error in the denominator because we are testing a hypothesis about the population mean based on the mean of 18 observations.)

*Step 6: Make a decision.* The calculated statistic is less than the critical value. Mak cannot conclude with 95% confidence that the mean share of viewers exceeds 8.5% and thus she cannot charge higher rates.

*Note:* By eliminating the two incorrect choices, you can select the correct response to this question without performing the calculations.

(Module 6.2, LOS 6.g)

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## Question #27 of 86

Question ID: 1456615

In order to test whether the mean IQ of employees in an organization is greater than 100, a sample of 30 employees is taken and the sample value of the computed test statistic, $t_{n-1}$ = 3.4. The null and alternative hypotheses are:

**A)** $H_0$: μ ≤ 100; $H_a$: μ > 100.

**B)** $H_0$: X ≤ 100; $H_a$: X > 100.

**C)** $H_0$: μ = 100; $H_a$: μ ≠ 100.

**Explanation**

The null hypothesis is that the population mean is less than or equal to from 100. The alternative hypothesis is that the population mean is greater than 100.

(Module 6.1, LOS 6.b)

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## Question #28 of 86

Question ID: 1456634

Ron Jacobi, manager with the Toulee Department of Natural Resources, is responsible for setting catch-and-release limits for Lake Norby, a large and popular fishing lake. He takes a sample to determine whether the mean length of Northern Pike in the lake exceeds 18 inches. If the sample t-statistic indicates that the mean length of the fish is significantly greater than 18 inches, when the population mean is actually 17.8 inches, the t-test resulted in:

**A)** both a Type I and a Type II error. ✗

**B)** a Type I error only. ✓

**C)** a Type II error only. ✗

**Explanation**

Rejection of a null hypothesis when it is actually true is a Type I error. Here, $H_o$: $\mu \leq 18$ inches and $H_a$: $\mu > 18$ inches. Type II error is failing to reject a null hypothesis when it is actually false.

Because a Type I error can only occur if the null hypothesis is true, and a Type II error can only occur if the null hypothesis is false, it is logically impossible for a test to result in both types of error at the same time.

(Module 6.1, LOS 6.c)

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## Question #29 of 86

Question ID: 1456625

A survey is taken to determine whether the average starting salaries of CFA charterholders is equal to or greater than $59,000 per year. What is the test statistic given a sample of 135 newly acquired CFA charterholders with a mean starting salary of $64,000 and a standard deviation of $5,500?

**A)** -10.56. ✗

**B)** 0.91. ✗

**C)** 10.56. ✓

**Explanation**

With a large sample size (135) the *z*-statistic is used. The *z*-statistic is calculated by subtracting the hypothesized parameter from the parameter that has been estimated and dividing the difference by the standard error of the sample statistic. Here, the test statistic = (sample mean – hypothesized mean) / (population standard deviation / (sample size)$^{1/2}$) = $(X − \mu) / (\sigma / n^{1/2})$ = (64,000 – 59,000) / (5,500 / 135$^{1/2}$) = (5,000) / (5,500 / 11.62) = 10.56.

(Module 6.1, LOS 6.c)

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## Question #30 of 86

Question ID: 1456676

The variance of 100 daily stock returns for Stock A is 0.0078. The variance of 90 daily stock returns for Stock B is 0.0083. Using a 5% level of significance, the critical value for this test is 1.61. The *most appropriate* conclusion regarding whether the variance of Stock A is different from the variance of Stock B is that the:

**A)** variance of Stock B is significantly greater than the variance of Stock A.

**B)** variances are equal.

**C)** variances are not equal.

**Explanation**

A test of the equality of variances requires an F-statistic. The calculated F-statistic is 0.0083/0.0078 = 1.064. Since the calculated F value of 1.064 is less than the critical F value of 1.61, we cannot reject the null hypothesis that the variances of the 2 stocks are equal.

(Module 6.4, LOS 6.j)

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## Question #31 of 86

Question ID: 1456650

Given the following hypothesis:

- The null hypothesis is $H_0 : \mu = 5$
- The alternative is $H_1 : \mu \neq 5$
- The mean of a sample of 17 is 7
- The population standard deviation is 2.0

What is the calculated z-statistic?

**A)** 8.00.

**B)** 4.00.

**C)** 4.12.

**Explanation**

The z-statistic is calculated by subtracting the hypothesized parameter from the parameter that has been estimated and dividing the difference by the standard error of the sample statistic. Here, the test statistic = (sample mean − hypothesized mean) / (population standard deviation / (sample size)$^{1/2}$ = (X − μ) / (σ / $n^{1/2}$) = (7 − 5) / (2 / $17^{1/2}$) = (2) / (2 / 4.1231) = 4.12.

(Module 6.2, LOS 6.g)

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## Question #32 of 86

Question ID: 1456628

Which of the following statements regarding hypothesis testing is *least* accurate?

**A)** A type I error is acceptance of a hypothesis that is actually false.

**B)** The significance level is the risk of making a type I error.

**C)** A type II error is the acceptance of a hypothesis that is actually false.

**Explanation**

A type I error is the rejection of a hypothesis that is actually true.

(Module 6.1, LOS 6.c)

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## Question #33 of 86

Question ID: 1456673

**F-Table, Critical Values, 5 Percent in Upper Tail**

Degrees of freedom for the numerator along top row

Degrees of freedom for the denominator along side row

| | **10** | **12** | **15** | **20** | **24** | **30** |
|---|---|---|---|---|---|---|
| **25** | 2.24 | 2.16 | 2.09 | 2.01 | 1.96 | 1.92 |
| **30** | 2.16 | 2.09 | 2.01 | 1.93 | 1.89 | 1.84 |
| **40** | 2.08 | 2.00 | 1.92 | 1.84 | 1.79 | 1.74 |

Abby Ness is an analyst for a firm that specializes in evaluating firms involved in mineral extraction. Ness believes that the earnings of copper extracting firms are more volatile than those of bauxite extraction firms. In order to test this, Ness examines the volatility of returns for 31 copper firms and 25 bauxite firms. The standard deviation of earnings for copper firms was $2.69, while the standard deviation of earnings for bauxite firms was $2.92. Ness's Null Hypothesis is $\sigma_1^2 = \sigma_2^2$. Based on the samples, can we reject the null hypothesis at a 90% confidence level using an F-statistic? Null is:

**A)** rejected. The F-value exceeds the critical value by 0.71.

**B)** not rejected.

**C)** rejected. The F-value exceeds the critical value by 0.849.

**Explanation**

$F = s_1^2 / s_2^2 = \$2.92^2 / \$2.69^2 = 1.18$

From an F table, the critical value with numerator df = 24 and denominator df = 30 is 1.89. We cannot reject the null hypothesis.

(Module 6.4, LOS 6.j)

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## Question #34 of 86

Question ID: 1456610

Which one of the following is the *most* appropriate set of hypotheses to use when a researcher is trying to demonstrate that a return is greater than the risk-free rate? The null hypothesis is framed as a:

**A)** greater than statement and the alternative hypothesis is framed as a less than or equal to statement.

**B)** less than or equal to statement and the alternative hypothesis is framed as a greater than statement.

**C)** less than statement and the alternative hypothesis is framed as a greater than or equal to statement.

**Explanation**

If a researcher is trying to show that a return is greater than the risk-free rate then this should be the alternative hypothesis. The null hypothesis would then take the form of a less than or equal to statement.

(Module 6.1, LOS 6.b)

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## Question #35 of 86

Question ID: 1456640

The power of the test is:

**A)** the probability of rejecting a false null hypothesis.

**B)** equal to the level of confidence.

**C)** the probability of rejecting a true null hypothesis.

**Explanation**

This is the definition of the power of the test: the probability of correctly rejecting the null hypothesis (rejecting the null hypothesis when it is false).

(Module 6.1, LOS 6.c)

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## Question #36 of 86

Question ID: 1456626

A Type I error is made when the researcher:

**A)** rejects the null hypothesis when it is actually true.

**B)** rejects the alternative hypothesis when it is actually true.

**C)** fails to reject the null hypothesis when it is actually false.

**Explanation**

A Type I error is defined as rejecting the null hypothesis when it is actually true. It can be thought of as a false positive.

A Type II error occurs when a researching fails to reject the null hypothesis when it is false. It can be thought of as a false negative.

(Module 6.1, LOS 6.c)

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## Question #37 of 86

Question ID: 1456632

Which of the following statements about hypothesis testing is *most* accurate? A Type I error is the probability of:

**A)** rejecting a true null hypothesis. ✓

**B)** rejecting a true alternative hypothesis. ✗

**C)** failing to reject a false hypothesis. ✗

**Explanation**

The Type I error is the error of rejecting the null hypothesis when, in fact, the null is true.

(Module 6.1, LOS 6.c)

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## Question #38 of 86

Question ID: 1456621

If a two-tailed hypothesis test has a 5% probability of rejecting the null hypothesis when the null is true, it is *most likely* that the:

**A)** probability of a Type I error is 2.5%. ✗

**B)** power of the test is 95%. ✗

**C)** significance level of the test is 5%. ✓

**Explanation**

Rejecting the null hypothesis when it is true is a Type I error. The probability of a Type I error is the significance level of the test. The power of a test is one minus the probability of a Type II error, which cannot be calculated from the information given.

(Module 6.1, LOS 6.c)

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## Question #39 of 86

Question ID: 1456620

Which of the following statements about hypothesis testing is *most* accurate? A Type II error is the probability of:

**A)** failing to reject a false null hypothesis.

**B)** rejecting a true alternative hypothesis.

**C)** rejecting a true null hypothesis.

**Explanation**

The Type II error is the error of failing to reject a null hypothesis that is not true.

(Module 6.1, LOS 6.c)

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## Question #40 of 86

Question ID: 1456612

Brian Ci believes that the average return on equity in the airline industry, μ, is less than 5%. What are the appropriate null ($H_0$) and alternative ($H_a$) hypotheses to test this belief?

**A)** $H_0$: $\mu < 0.05$ versus $H_a$: $\mu > 0.05$.

**B)** $H_0$: $\mu < 0.05$ versus $H_a$: $\mu \geq 0.05$.

**C)** $H_0$: $\mu \geq 0.05$ versus $H_a$: $\mu < 0.05$.

**Explanation**

The null must be either equal to, less than or equal to, or greater than or equal to.

(Module 6.1, LOS 6.b)

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## Question #41 of 86

Question ID: 1456616

Susan Bellows is comparing the return on equity for two industries. She is convinced that the return on equity for the discount retail industry (DR) is greater than that of the luxury retail (LR) industry. What are the hypotheses for a test of her comparison of return on equity?

**A)** $H_0$: $\mu_{DR} > \mu_{LR}$ versus $H_a$: $\mu_{DR} \leq \mu_{LR}$.

**B)** $H_0$: $\mu_{DR} \leq \mu_{LR}$ versus $H_a$: $\mu_{DR} > \mu_{LR}$.

**C)** $H_0$: $\mu_{DR} < \mu_{LR}$ versus $H_a$: $\mu_{DR} \geq \mu_{LR}$.

**Explanation**

The alternative hypothesis is determined by the theory or the belief. It is essentially what the analyst is trying to support, in this case that $H_a$: $\mu_{DR} > \mu_{LR}$

The opposite of the alternative will be the null hypothesis, in this case $H_0$: $\mu_{DR} \leq \mu_{LR}$

Remember that the null hypothesis can only have one of the following signs: ≥, ≤, =.

The alternative hypothesis, on the other hand, can only have one of these signs: <, >, ≠.

(Module 6.1, LOS 6.b)

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## Question #42 of 86

Question ID: 1456630

John Jenkins, CFA, is performing a study on the behavior of the mean P/E ratio for a sample of small-cap companies. Which of the following statements is *most* accurate?

**A)** A Type I error represents the failure to reject the null hypothesis when it is, in fact, false.

**B)** One minus the confidence level of the test represents the probability of making a Type II error.

**C)** The significance level of the test represents the probability of making a Type I error.

**Explanation**

A Type I error is the rejection of the null when the null is actually true. The significance level of the test (alpha) (which is one minus the confidence level) is the probability of making a Type I error. A Type II error is the failure to reject the null when it is actually false.

(Module 6.1, LOS 6.c)

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## Question #43 of 86

Question ID: 1456658

**Student's *t*-Distribution**

| Level of Significance for One-Tailed Test | | | | | | |
|---|---|---|---|---|---|---|
| **df** | **0.100** | **0.050** | **0.025** | **0.01** | **0.005** | **0.0005** |
| **Level of Significance for Two-Tailed Test** | | | | | | |
| **df** | **0.20** | **0.10** | **0.05** | **0.02** | **0.01** | **0.001** |
| **18** | 1.330 | 1.734 | 2.101 | 2.552 | 2.878 | 3.922 |
| **19** | 1.328 | 1.729 | 2.093 | 2.539 | 2.861 | 3.883 |
| **20** | 1.325 | 1.725 | 2.086 | 2.528 | 2.845 | 3.850 |
| **21** | 1.323 | 1.721 | 2.080 | 2.518 | 2.831 | 3.819 |

In a test of whether a population mean is equal to zero, a researcher calculates a t-statistic of –2.090 based on a sample of 20 observations. If you choose a 5% significance level, you should:

**A)** fail to reject the null hypothesis that the population mean is equal to zero.

**B)** reject the null hypothesis and conclude that the population mean is not significantly different from zero.

**C)** reject the null hypothesis and conclude that the population mean is significantly different from zero.

**Explanation**

At a 5% significance level, the critical t-statistic using the Student's t distribution table for a two-tailed test and 19 degrees of freedom (sample size of 20 less 1) is ± 2.093. Because the critical t-statistic of -2.093 is to the left of the calculated t-statistic of –2.090, meaning that the calculated t-statistic is not in the rejection range, we fail to reject the null hypothesis that the population mean is not significantly different from zero.

(Module 6.2, LOS 6.g)

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## Question #44 of 86

Question ID: 1456652

**Student's *t*-Distribution**

| Level of Significance for One-Tailed Test | | | | | | |
|---|---|---|---|---|---|---|
| **df** | **0.100** | **0.050** | **0.025** | **0.01** | **0.005** | **0.0005** |
| **Level of Significance for Two-Tailed Test** | | | | | | |
| **df** | **0.20** | **0.10** | **0.05** | **0.02** | **0.01** | **0.001** |
| **28** | 1.313 | 1.701 | 2.048 | 2.467 | 2.763 | 3.674 |
| **29** | 1.311 | 1.699 | 2.045 | 2.462 | 2.756 | 3.659 |
| **30** | 1.310 | 1.697 | 2.042 | 2.457 | 2.750 | 3.646 |

In order to test if the mean IQ of employees in an organization is greater than 100, a sample of 30 employees is taken and the sample value of the computed test statistic, $t_{n-1} = 1.2$. If you choose a 5% significance level you should:

**A)** reject the null hypothesis and conclude that the population mean is greater than 100.

**B)** fail to reject the null hypothesis and conclude that the population mean is not greater than 100.

**C)** fail to reject the null hypothesis and conclude that the population mean is greater than 100.

**Explanation**

At a 5% significance level, the critical *t*-statistic using the Student's *t* distribution table for a one-tailed test and 29 degrees of freedom (sample size of 30 less 1) is 1.699 (with a large sample size the critical *z*-statistic of 1.645 may be used). Because the critical *t*-statistic is greater than the calculated *t*-statistic, meaning that the calculated *t*-statistic is *not* in the rejection range, we fail to reject the null hypothesis and we conclude that the population mean is not significantly greater than 100.

(Module 6.2, LOS 6.g)

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## Question #45 of 86

Question ID: 1456609

Jill Woodall believes that the average return on equity in the retail industry, μ, is less than 15%. If Woodall wants to examine the data statistically, what are the appropriate null ($H_0$) and alternative ($H_a$) hypotheses for her study?

**A)** $H_0$: $\mu \geq 0.15$ versus $H_a$: $\mu < 0.15$.

**B)** $H_0$: μ < 0.15 versus $H_a$: μ > 0.15.

**C)** $H_0$: μ < 0.15 versus $H_a$: μ ≥ 0.15.

**Explanation**

The alternative hypothesis may be thought of as what the analyst is trying to establish with statistical evidence, in this case that μ < 0.15.

The opposite of the alternative will be the null hypothesis, in this case that μ ≥ 0.15.

Remember that the null hypothesis always includes the "equal to" condition: ≥, ≤, =.

The alternative hypothesis can only have one of these signs: <, >, ≠.

(Module 6.1, LOS 6.b)

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## Question #46 of 86

Question ID: 1456660

Which of the following statements about test statistics is *least* accurate?

**A)** In a test of the population mean, if the population variance is unknown, we should use a *t*-distributed test statistic.

**B)** In the case of a test of the difference in means of two independent samples, we use a *t*-distributed test statistic.

**C)** In a test of the population mean, if the population variance is unknown and the sample is small, we should use a *z*-distributed test statistic.

**Explanation**

If the population sampled has a known variance, the *z*-test is the correct test to use. In general, a *t*-test is used to test the mean of a population when the population is unknown. Note that in special cases when the sample is extremely large, the *z*-test may be used in place of the *t*-test, but the *t*-test is considered to be the test of choice when the population variance is unknown. A *t*-test is also used to test the difference between two population means while an F-test is used to compare differences between the variances of two populations.

(Module 6.2, LOS 6.g)

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## Question #47 of 86

Question ID: 1456672

In order to test if Stock A is more volatile than Stock B, prices of both stocks are observed to construct the sample variance of the two stocks. The appropriate test statistics to carry out the test is the:

**A)** Chi-square test.

**B)** t test.

**C)** F test.

**Explanation**

The F test is used to test the differences of variance between two samples.

(Module 6.4, LOS 6.j)

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## Question #48 of 86

Question ID: 1456661

**Cumulative Z-Table**

| z | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 | 0.09 |
|---|---|---|---|---|---|---|
| **1.2** | 0.8925 | 0.8944 | 0.8962 | 0.8980 | 0.8997 | 0.9015 |
| **1.3** | 0.9099 | 0.9115 | 0.9131 | 0.9147 | 0.9162 | 0.9177 |
| **1.4** | 0.9251 | 0.9265 | 0.9279 | 0.9292 | 0.9306 | 0.9319 |
| **1.5** | 0.9382 | 0.9394 | 0.9406 | 0.9418 | 0.9429 | 0.9441 |
| **1.6** | 0.9495 | 0.9505 | 0.9515 | 0.9525 | 0.9535 | 0.9545 |

Maria Huffman is the Vice President of Human Resources for a large regional car rental company. Last year, she hired Graham Brickley as Manager of Employee Retention. Part of the compensation package was the chance to earn one of the following two bonuses: if Brickley can reduce turnover to less than 30%, he will receive a 25% bonus. If he can reduce turnover to less than 25%, he will receive a 50% bonus (using a significance level of 10%). The population of turnover rates is normally distributed. The population standard deviation of turnover rates is 1.5%. A recent sample of 100 branch offices resulted in an average turnover rate of 24.2%. Which of the following statements is *most* accurate?

**A)** Brickley should not receive either bonus.

**B)** For the 50% bonus level, the test statistic is -5.33 and Huffman should give Brickley a 50% bonus.

**C)** For the 50% bonus level, the critical value is -1.65 and Huffman should give Brickley a 50% bonus.

**Explanation**

Using the process of Hypothesis testing:

*Step 1: State the Hypothesis.* For 25% bonus level - $H_o$: m ≥ 30% $H_a$: m < 30%; For 50% bonus level - $H_o$: m ≥ 25% $H_a$: m < 25%.

*Step 2: Select Appropriate Test Statistic.* Here, we have a normally distributed population with a known variance (standard deviation is the square root of the variance) and a large sample size (greater than 30.) Thus, we will use the *z*-statistic.

*Step 3: Specify the Level of Significance.* α = 0.10.

*Step 4: State the Decision Rule.* This is a one-tailed test. The critical value for this question will be the *z*-statistic that corresponds to an α of 0.10, or an area to the left of the mean of 40% (with 50% to the right of the mean). Using the *z*-table (normal table), we determine that the appropriate critical value = -1.28 *(Remember that we highly recommend that you have the "common" z-statistics memorized!)* Thus, we will reject the null hypothesis if the calculated test statistic is less than -1.28.

*Step 5: Calculate sample (test) statistics*. Z (for 50% bonus) = (24.2 – 25) / (1.5 / √ 100) = **−5.333.** Z (for 25% bonus) = (24.2 – 30) / (1.5 / √ 100) = **−38.67.**

*Step 6: Make a decision.* Reject the null hypothesis for both the 25% and 50% bonus level because the test statistic is less than the critical value. Thus, Huffman should give Brickley a 50% bonus.

The other statements are false. The critical value of –1.28 is based on the significance level, and is thus the same for both the 50% and 25% bonus levels.

(Module 6.2, LOS 6.g)

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## Question #49 of 86

Question ID: 1456664

An analyst plans to use the following test statistic:

$$t_{n-1} = \frac{\bar{x} - \mu_0}{s/\sqrt{n}}$$

This test statistic is appropriate for a hypothesis about:

**A)** the population mean of a normal distribution with unknown variance.

**B)** the mean difference of two normal populations.

**C)** the equality of two population means of two normally distributed populations based on independent samples.

**Explanation**

When testing hypotheses about the population mean, the sample standard deviation must be used in the denominator of the test statistic when the population standard deviation is unknown, the population is normal, and/or the sample is large. The statistic is a *t*-stat with n − 1 degrees of freedom. The numerator is the sampling error for the population mean if the true mean is μ0 and the denominator is the standard error of the sample mean around the true mean. (Module 6.2, LOS 6.g)

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## Question #50 of 86

Question ID: 1456614

Jo Su believes that there should be a negative relation between returns and systematic risk. She intends to collect data on returns and systematic risk to test this theory. What is the appropriate alternative hypothesis?

**A)** $H_a$: $\rho < 0$.

**B)** $H_a$: $\rho > 0$.

**C)** $H_a$: $\rho \neq 0$.

**Explanation**

The alternative hypothesis is determined by the theory or the belief. The researcher specifies the null as the hypothesis that she wishes to reject (in favor of the alternative). The theory in this case is that the correlation is negative.

(Module 6.1, LOS 6.b)

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## Question #51 of 86

Question ID: 1456627

A Type I error:

**A)** rejects a false null hypothesis.

**B)** fails to reject a false null hypothesis.

**C)** rejects a true null hypothesis.

**Explanation**

A Type I Error is defined as rejecting the null hypothesis when it is actually true. The probability of committing a Type I error is the significance level or alpha risk.

(Module 6.1, LOS 6.c)

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## Question #52 of 86

Question ID: 1456645

Of the following explanations, which is *least likely* to be a valid explanation for divergence between statistical significance and economic significance?

**A)** Adjustment for risk.

**B)** Data errors.

**C)** Transactions costs.

### Explanation

While data errors would certainly come to bear on the analysis, in their presence we would not be able to assert either statistical or economic significance. In other words, data errors are not a valid explanation. The others are factors that can produce statistically significant results that are not economically significant.

(Module 6.1, LOS 6.d)

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## Question #53 of 86

Question ID: 1456631

Which of the following statements about hypothesis testing is *least* accurate?

**A)** A Type I error is the probability of rejecting the null hypothesis when the null hypothesis is false.

**B)** A Type II error is the probability of failing to reject a null hypothesis that is not true.

**C)** The significance level is the probability of making a Type I error.

### Explanation

A Type I error is the probability of rejecting the null hypothesis when the null hypothesis is true.

(Module 6.1, LOS 6.c)

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## Question #54 of 86

Question ID: 1456608

James Ambercrombie believes that the average return on equity in the utility industry, μ, is greater than 10%. What is null ($H_0$) and alternative ($H_a$) hypothesis for his study?

**A)** $H_0$: $\mu \geq 0.10$ versus $H_a$: $\mu < 0.10$.

**B)** $H_0$: $\mu = 0.10$ versus $H_a$: $\mu \neq 0.10$.

**C)** $H_0$: $\mu \leq 0.10$ versus $H_a$: $\mu > 0.10$.

**Explanation**

This is a one-sided alternative because of the "greater than" belief. We expect to reject the null.

(Module 6.1, LOS 6.b)

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## Question #55 of 86

Question ID: 1456606

Robert Patterson, an options trader, believes that the return on options trading is higher on Mondays than on other days. In order to test his theory, he formulates a null hypothesis. Which of the following would be an appropriate null hypothesis? Returns on Mondays are:

**A)** not greater than returns on other days.

**B)** greater than returns on other days.

**C)** less than returns on other days.

**Explanation**

An appropriate null hypothesis is one that the researcher wants to reject. If Patterson believes that the returns on Mondays are greater than on other days, he would like to reject the hypothesis that the opposite is true–that returns on Mondays are not greater than returns on other days.

(Module 6.1, LOS 6.a)

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## Question #56 of 86

Question ID: 1456684

To test a hypothesis that the population correlation coefficient of two variables is equal to zero, an analyst collects a sample of 24 observations and calculates a sample correlation coefficient of 0.37. Can the analyst test this hypothesis using only these two inputs?

**A)** Yes.

**B)** No, because the sample means of the two variables are also required.

**C)** No, because the sample standard deviations of the two variables are also required.

**Explanation**

The t-statistic for a test of the population correlation coefficient is $\frac{r\sqrt{n-2}}{\sqrt{1-r^2}}$, where $r$ is the sample correlation coefficient and $n$ is the sample size.

(Module 6.4, LOS 6.l)

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## Question #57 of 86

Question ID: 1456686

A researcher wants to test whether the weekly returns on two stocks are correlated. The test statistic for the appropriate test follows a:

**A)** chi-square distribution.

**B)** t-distribution with n − 1 degrees of freedom.

**C)** t-distribution with n − 2 degrees of freedom.

**Explanation**

The test statistic for the significance of the correlation between two random variables follows a t-distribution with n − 2 degrees of freedom. (Module 6.4, LOS 6.l)

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## Question #58 of 86

Question ID: 1456647

A p-value of 0.02% means that a researcher:

**A)** can reject the null hypothesis at both the 5% and 1% significance levels.

**B)** can reject the null hypothesis at the 5% significance level but cannot reject at the 1% significance level.

**C)** cannot reject the null hypothesis at either the 5% or 1% significance levels.

**Explanation**

A p-value of 0.02% means that the smallest significance level at which the hypothesis can be rejected is 0.0002, which is smaller than 0.05 or 0.01. Therefore the null hypothesis can be rejected at both the 5% and 1% significance levels.

(Module 6.2, LOS 6.e)

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## Question #59 of 86

Question ID: 1456641

If the null hypothesis is innocence, then the statement "It is better that the guilty go free, than the innocent are punished" is an example of preferring a:

**A)** greater percentage of significance.

**B)** Type I error over a Type II error.

**C)** Type II error over a Type I error.

**Explanation**

The statement shows a preference for failing to reject the null hypothesis when it is false (a Type II error), over rejecting it when it is true (a Type I error).

(Module 6.1, LOS 6.c)

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## Question #60 of 86

Question ID: 1456644

For a hypothesis test regarding a population parameter, an analyst has determined that the probability of failing to reject a false null hypothesis is 18%, and the probability of rejecting a true null hypothesis is 5%. The power of the test is:

**A)** 0.82.

**B)** 0.18.

**C)** 0.95.

**Explanation**

The power of the test is 1 – the probability of failing to reject a false null (Type II error); 1 – 0.18 = 0.82.

(Module 6.1, LOS 6.c)

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## Question #61 of 86

Question ID: 1456662

In order to test if the mean IQ of employees in an organization is greater than 100, a sample of 30 employees is taken. The sample value of the computed *z*-statistic = 3.4. The appropriate decision at a 5% significance level is to:

**A)** reject the null hypotheses and conclude that the population mean is greater than 100.

**B)** reject the null hypothesis and conclude that the population mean is not equal to 100.

**C)** reject the null hypothesis and conclude that the population mean is equal to 100.

**Explanation**

$H_0: \mu \leq 100$; $H_a: \mu > 100$. Reject the null since $z = 3.4 > 1.65$ (critical value).

(Module 6.2, LOS 6.g)

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## Question #62 of 86

Question ID: 1456680

A researcher has random samples from two populations that are approximately normally distributed. He uses the ratio of the larger sample variance to the smaller sample variance to test the hypothesis that the true variances of the two populations are equal. The test statistic he has calculated will have what type of distribution?

**A)** The F-distribution.

**B)** The chi-squared distribution.

**C)** The *t*-distribution.

**Explanation**

The test statistic for this test of the equality of variances follows an F-distribution.

(Module 6.4, LOS 6.j)

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## Question #63 of 86

Question ID: 1456603

Which of the following is the correct sequence of events for testing a hypothesis?

**A)** State the hypothesis, select the level of significance, formulate the decision rule, compute the test statistic, and make a decision.

**B)** State the hypothesis, formulate the decision rule, select the level of significance, compute the test statistic, and make a decision.

**C)** State the hypothesis, select the level of significance, compute the test statistic, formulate the decision rule, and make a decision.

**Explanation**

Depending upon the author there can be as many as seven steps in hypothesis testing which are:

1. Stating the hypotheses.
2. Identifying the test statistic and its probability distribution.
3. Specifying the significance level.
4. Stating the decision rule.
5. Collecting the data and performing the calculations.
6. Making the statistical decision.
7. Making the economic or investment decision.

(Module 6.1, LOS 6.a)

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## Question #64 of 86

Question ID: 1456638

An analyst decides to select 10 stocks for her portfolio by placing the ticker symbols for all the stocks traded on the New York Stock Exchange in a large bowl. She randomly selects 20 stocks and will put every other one chosen into her 10-stock portfolio. The analyst used:

**A)** dual random sampling.

**B)** stratified random sampling.

**C)** simple random sampling.

**Explanation**

In simple random sampling, each item in the population has an equal chance of being selected. The analyst's method meets this criterion.

(Module 6.1, LOS 6.c)

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## Question #65 of 86

Question ID: 1456682

A test of whether a mutual fund's performance rank in one period provides information about the fund's performance rank in a subsequent period is *best* described as a:

**A)** mean-rank test.

**B)** nonparametric test.

**C)** parametric test.

**Explanation**

A rank correlation test is best described as a nonparametric test.

(Module 6.4, LOS 6.k)

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## Question #66 of 86

Question ID: 1456653

**Student's *t*-Distribution**

| Level of Significance for One-Tailed Test | | | | | | |
|---|---|---|---|---|---|---|
| **df** | **0.100** | **0.050** | **0.025** | **0.01** | **0.005** | **0.0005** |
| **Level of Significance for Two-Tailed Test** | | | | | | |
| **df** | **0.20** | **0.10** | **0.05** | **0.02** | **0.01** | **0.001** |
| **18** | 1.330 | 1.734 | 2.101 | 2.552 | 2.878 | 3.922 |
| **19** | 1.328 | 1.729 | 2.093 | 2.539 | 2.861 | 3.883 |
| **20** | 1.325 | 1.725 | 2.086 | 2.528 | 2.845 | 3.850 |
| **21** | 1.323 | 1.721 | 2.080 | 2.518 | 2.831 | 3.819 |

In a two-tailed test of a hypothesis concerning whether a population mean is zero, Jack Olson computes a *t*-statistic of 2.7 based on a sample of 20 observations where the distribution is normal. If a 5% significance level is chosen, Olson should:

**A)** fail to reject the null hypothesis that the population mean is not significantly different from zero.

**B)** reject the null hypothesis and conclude that the population mean is not significantly different from zero.

**C)** reject the null hypothesis and conclude that the population mean is significantly different from zero.

**Explanation**

At a 5% significance level, the critical *t*-statistic using the Student's *t*-distribution table for a two-tailed test and 19 degrees of freedom (sample size of 20 less 1) is ± 2.093 (with a large sample size the critical *z*-statistic of 1.960 may be used). Because the critical *t*-statistic of 2.093 is to the left of the calculated *t*-statistic of 2.7, meaning that the calculated *t*-statistic is in the rejection range, we reject the null hypothesis and we conclude that the population mean is significantly different from zero.

(Module 6.2, LOS 6.g)

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## Question #67 of 86

Question ID: 1456643

Which of the following statements about hypothesis testing is *most* accurate?

**A)** The power of a test is one minus the probability of a Type I error.

**B)** If you can disprove the null hypothesis, then you have proven the alternative hypothesis.

**C)** The probability of a Type I error is equal to the significance level of the test.

**Explanation**

The probability of getting a test statistic outside the critical value(s) when the null is true is the level of significance and is the probability of a Type I error. The power of a test is 1 minus the probability of a Type II error. Hypothesis testing does not prove a hypothesis, we either reject the null or fail to reject it.

(Module 6.1, LOS 6.c)

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## Question #68 of 86

Question ID: 1456671

An analyst has calculated the sample variances for two random samples from independent normally distributed populations. The test statistic for the hypothesis that the true population variances are equal is a(n):

**A)** *F*-statistic.

**B)** chi-square statistic.

**C)** *t*-statistic.

**Explanation**

The ratio of the two sample variances follows an F distribution.

(Module 6.4, LOS 6.j)

## Question #69 of 86

Question ID: 1456675

A test of whether the population variance is equal to a hypothesized value requires the use of a test statistic that is:

**A)** *t*-distributed.

**B)** chi-squared distributed.

**C)** *F*-distributed.

**Explanation**

In tests of whether the variance of a population equals a particular value, the chi-squared test statistic is appropriate.

(Module 6.4, LOS 6.j)

## Question #70 of 86

Question ID: 1456663

Brandee Shoffield is the public relations manager for Night Train Express, a local sports team. Shoffield is trying to sell advertising spots and wants to know if she can say with 90% confidence that average home game attendance is greater than 3,000. Attendance is approximately normally distributed. A sample of the attendance at 15 home games results in a mean of 3,150 and a standard deviation of 450. Which of the following statements is *most* accurate?

**A)** With an unknown population variance and a small sample size, no statistic is available to test Shoffield's hypothesis.

**B)** Shoffield should use a two-tailed Z-test.

**C)** The calculated test statistic is 1.291.

**Explanation**

Here, we have a normally distributed population with an unknown variance (we are given only the sample standard deviation) and a small sample size (less than 30.) Thus, we will use the *t*-statistic.

The test statistic = $t = (3{,}150 – 3{,}000) / (450 / \sqrt{15})$ = **1.291**

(Module 6.2, LOS 6.g)

## Question #71 of 86

Question ID: 1456678

A manager wants to test whether two normally distributed and independent populations have equal variances. The appropriate test statistic for this test is a:

**A)** F-statistic.

**B)** t-statistic.

**C)** chi-square statistic.

**Explanation**

For a test of the equality of two variances, the appropriate test statistic test is the F-statistic.

(Module 6.4, LOS 6.j)

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## Question #72 of 86

Question ID: 1456665

**Student's *t*-Distribution**

| Level of Significance for One-Tailed Test | | | | | | |
|---|---|---|---|---|---|---|
| **df** | **0.100** | **0.050** | **0.025** | **0.01** | **0.005** | **0.0005** |
| **Level of Significance for Two-Tailed Test** | | | | | | |
| **df** | **0.20** | **0.10** | **0.05** | **0.02** | **0.01** | **0.001** |
| **10** | 1.372 | 1.812 | 2.228 | 2.764 | 3.169 | 4.587 |
| **11** | 1.363 | 1.796 | 2.201 | 2.718 | 3.106 | 4.437 |
| **12** | 1.356 | 1.782 | 2.179 | 2.681 | 3.055 | 4.318 |
| **22** | 1.321 | 1.717 | 2.074 | 2.508 | 2.819 | 3.792 |
| **23** | 1.319 | 1.714 | 2.069 | 2.500 | 2.807 | 3.768 |
| **24** | 1.318 | 1.711 | 2.064 | 2.492 | 2.797 | 3.745 |

Roy Fisher, CFA, wants to determine whether there is a significant difference, at the 5% significance level, between the mean monthly return on Stock GHI and the mean monthly return on Stock JKL. Fisher assumes the variances of the two stocks' returns are equal. Using the last 12 months of returns on each stock, Fisher calculates a *t*-statistic of 2.0 for a test of equality of means. Based on this result, Fisher's test:

**A)** rejects the null hypothesis, and Fisher can conclude that the means are equal.

**B)** fails to reject the null hypothesis.

**C)** rejects the null hypothesis, and Fisher can conclude that the means are not equal.

**Explanation**

The null hypothesis for a test of equality of means is $H_0$: μ1 − μ2 = 0. Assuming the variances are equal, degrees of freedom for this test are ($n_1 + n_2 - 2$) = 12 + 12 − 2 = 22. From the table of critical values for Student's *t*-distribution, the critical value for a two-tailed test at the 5% significance level for df = 22 is 2.074. Because the calculated *t*-statistic of 2.0 is less than the critical value, this test fails to reject the null hypothesis that the means are equal.

(Module 6.3, LOS 6.h)

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## Question #73 of 86

Question ID: 1456633

Which of the following statements about hypothesis testing is *least* accurate?

**A)** If the alternative hypothesis is $H_a$: $\mu > \mu_0$, a two-tailed test is appropriate.

**B)** The null hypothesis is a statement about the value of a population parameter.

**C)** A Type II error is failing to reject a false null hypothesis.

**Explanation**

The hypotheses are always stated in terms of a population parameter. Type I and Type II are the two types of errors you can make – reject a null hypothesis that is true or fail to reject a null hypothesis that is false. The alternative may be one-sided (in which case a > or < sign is used) or two-sided (in which case a ≠ is used).

(Module 6.1, LOS 6.c)

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## Question #74 of 86

Question ID: 1456681

Which of the following statements about parametric and nonparametric tests is *least* accurate?

**A)** The test of the mean of the differences is used when performing a paired comparison.

**B)** Nonparametric tests rely on population parameters.

**C)** The test of the difference in means is used when you are comparing means from two independent samples.

**Explanation**

Nonparametric tests are not concerned with parameters; they make minimal assumptions about the population from which a sample comes. It is important to distinguish between the test of the difference in the means and the test of the mean of the differences. Also, it is important to understand that parametric tests rely on distributional assumptions, whereas nonparametric tests are not as strict regarding distributional properties.

(Module 6.4, LOS 6.k)

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## Question #75 of 86

Question ID: 1456657

A survey is taken to determine whether the average starting salaries of CFA charterholders is equal to or greater than $62,500 per year. What is the test statistic given a sample of 125 newly acquired CFA charterholders with a mean starting salary of $65,000 and a standard deviation of $2,600?

**A)** 0.96.

**B)** -10.75.

**C)** 10.75.

**Explanation**

With a large sample size (125) and an unknown population variance, either the *t*-statistic or the *z*-statistic could be used. Using the *z*-statistic, it is calculated by subtracting the hypothesized parameter from the parameter that has been estimated and dividing the difference by the standard error of the sample statistic. The test statistic = (sample mean – hypothesized mean) / (sample standard deviation / (sample size$^{1/2}$)) = (X − μ) / (s / $n^{1/2}$) = (65,000 – 62,500) / (2,600 / $125^{1/2}$) = (2,500) / (2,600 / 11.18) = 10.75.

(Module 6.2, LOS 6.g)

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## Question #76 of 86

Question ID: 1456651

An analyst conducts a two-tailed test to determine if mean earnings estimates are significantly different from reported earnings. The sample size is greater than 25 and the computed test statistic is 1.25. Using a 5% significance level, which of the following statements is *most* accurate?

**A)** The analyst should reject the null hypothesis and conclude that the earnings estimates are significantly different from reported earnings.

**B)** To test the null hypothesis, the analyst must determine the exact sample size and calculate the degrees of freedom for the test.

**C)** The analyst should fail to reject the null hypothesis and conclude that the earnings estimates are not significantly different from reported earnings.

**Explanation**

The null hypothesis is that earnings estimates are equal to reported earnings. To reject the null hypothesis, the calculated test statistic must fall outside the two critical values. IF the analyst tests the null hypothesis with a z-statistic, the critical values at a 5% confidence level are ±1.96. Because the calculated test statistic, 1.25, lies between the two critical values, the analyst should fail to reject the null hypothesis and conclude that earnings estimates are not significantly different from reported earnings. If the analyst uses a *t*-statistic, the upper critical value will be even greater than 1.96, never less, so even without the exact degrees of freedom the analyst knows any t-test would fail to reject the null.

(Module 6.2, LOS 6.g)

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## Question #77 of 86

Question ID: 1456648

A hypothesis test has a *p*-value of 1.96%. An analyst should reject the null hypothesis at a significance level of:

**A)** 6%, but not at a significance level of 4%.

**B)** 4%, but not at a significance level of 2%.

**C)** 3%, but not at a significance level of 1%.

**Explanation**

The *p*-value of 1.96% is the smallest level of significance at which the hypothesis can be rejected.

(Module 6.2, LOS 6.e)

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## Question #78 of 86

Question ID: 1456605

In the process of hypothesis testing, what is the proper order for these steps?

**A)** Collect the sample and calculate the sample statistics. State the hypotheses. Specify the level of significance. Make a decision.

**B)** Specify the level of significance. State the hypotheses. Make a decision. Collect the sample and calculate the sample statistics.

**C)** State the hypotheses. Specify the level of significance. Collect the sample and calculate the test statistics. Make a decision.

**Explanation**

The hypotheses must be established first. Then the test statistic is chosen and the level of significance is determined. Following these steps, the sample is collected, the test statistic is calculated, and the decision is made.

(Module 6.1, LOS 6.a)

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## Question #79 of 86

Question ID: 1456613

Jill Woodall believes that the average return on equity in the retail industry, μ, is less than 15%. What are the null ($H_0$) and alternative ($H_a$) hypotheses for her study?

**A)** $H_0$: $\mu < 0.15$ versus $H_a$: $\mu \geq 0.15$.

**B)** $H_0$: $\mu \leq 0.15$ versus $H_a$: $\mu > 0.15$.

**C)** $H_0$: $\mu \geq 0.15$ versus $H_a$: $\mu < 0.15$.

**Explanation**

This is a one-sided alternative because of the "less than" belief.

(Module 6.1, LOS 6.b)

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## Question #80 of 86

Question ID: 1456623

A survey is taken to determine whether the average starting salaries of CFA charterholders is equal to or greater than $54,000 per year. Assuming a normal distribution, what is the test statistic given a sample of 75 newly acquired CFA charterholders with a mean starting salary of $57,000 and a standard deviation of $1,300?

**A)** -19.99.

**B)** 2.31.

**C)** 19.99.

**Explanation**

With a large sample size (75) the z-statistic is used. The z-statistic is calculated by subtracting the hypothesized parameter from the parameter that has been estimated and dividing the difference by the standard error of the sample statistic. Here, the test statistic = (sample mean – hypothesized mean) / (sample standard deviation / (sample size)$^{1/2}$ = (X − μ) / (σ / n$^{1/2}$) = (57,000 – 54,000) / (1,300 / 75$^{1/2}$) = (3,000) / (1,300 / 8.66) = 19.99.

(Module 6.1, LOS 6.c)

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## Question #81 of 86

Question ID: 1456635

For a two-tailed test of hypothesis involving a z-distributed test statistic and a 5% level of significance, a calculated z-statistic of 1.5 indicates that:

**A)** the null hypothesis is rejected.

**B)** the test is inconclusive.

**C)** the null hypothesis cannot be rejected.

**Explanation**

For a two-tailed test at a 5% level of significance the calculated z-statistic would have to be greater than the critical z value of 1.96 for the null hypothesis to be rejected.

(Module 6.1, LOS 6.c)

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## Question #82 of 86

Question ID: 1456674

The test of the equality of the variances of two normally distributed populations requires the use of a test statistic that is:

**A)** z-distributed.

**B)** Chi-squared distributed.

**C)** F-distributed.

**Explanation**

The F-distributed test statistic, $F = s_1^2 / s_2^2$, is used to compare the variances of two populations.

(Module 6.4, LOS 6.j)

## Question #83 of 86

Question ID: 1456679

Joe Bay, CFA, wants to test the hypothesis that the variance of returns on energy stocks is equal to the variance of returns on transportation stocks. Bay assumes the samples are independent and the returns are normally distributed. The appropriate test statistic for this hypothesis is:

**A)** a t-statistic. ✗

**B)** a Chi-square statistic. ✗

**C)** an F-statistic. ✓

**Explanation**

Bay is testing a hypothesis about the equality of variances of two normally distributed populations. The test statistic used to test this hypothesis is an F-statistic. A chi-square statistic is used to test a hypothesis about the variance of a single population. A t-statistic is used to test hypotheses concerning a population mean, the differences between means of two populations, or the mean of differences between paired observations from two populations.

(Module 6.4, LOS 6.j)

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## Question #84 of 86

Question ID: 1456687

A test of the hypothesis that two categorical variables are independent is *most likely* to employ:

**A)** contingency tables. ✓

**B)** population parameters. ✗

**C)** *t*-statistics. ✗

**Explanation**

A hypothesis test whether of two categorical variables (e.g., company sector and bond rating) are independent can be performed by constructing a contingency table and calculating a chi-squared statistic.

(Module 6.4, LOS 6.m)

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## Question #85 of 86

Question ID: 1456685

Student's t-distribution, level of significance for a two-tailed test:

| df | 0.20 | 0.10 | 0.05 | 0.02 | 0.01 | 0.001 |
|---|---|---|---|---|---|---|
| **16** | 1.337 | 1.746 | 2.120 | 2.583 | 2.921 | 4.015 |
| **17** | 1.333 | 1.740 | 2.110 | 2.567 | 2.898 | 3.965 |
| **18** | 1.330 | 1.734 | 2.101 | 2.552 | 2.878 | 3.922 |
| **19** | 1.328 | 1.729 | 2.093 | 2.539 | 2.861 | 3.883 |
| **20** | 1.325 | 1.725 | 2.086 | 2.528 | 2.845 | 3.850 |

Based on a sample correlation coefficient of −0.525 from a sample size of 19, an analyst calculates a t-statistic of $\frac{-0.525\sqrt{19-2}}{\sqrt{1-(-0.525)^2}}$ = −2.5433. The analyst can reject the hypothesis that the population correlation coefficient equals zero:

**A)** at a 5% significance level, but not at a 2% significance level.

**B)** at a 1% significance level.

**C)** at a 2% significance level, but not at a 1% significance level.

**Explanation**

With 19 − 2 = 17 degrees of freedom, the critical values are plus-or-minus 2.110 at a 5% significance level, 2.567 at a 2% significance level, and 2.898 at a 1% significance level. Because the t-statistic of −2.5433 is less than −2.110, the hypothesis can be rejected at a 5% significance level. Because the t-statistic is greater than −2.567, the hypothesis cannot be rejected at a 2% significance level (or any smaller significance level).

(Module 6.4, LOS 6.l)

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## Question #86 of 86

Question ID: 1456683

Critical values from Student's t-distribution for a two-tailed test at a 5% significance level:

| df | |
|---|---|
| 28 | 2.048 |
| 29 | 2.045 |
| 30 | 2.042 |

A researcher wants to test a hypothesis that two variables have a population correlation coefficient equal to zero. For a sample size of 30, the appropriate critical value for this test is plus-or-minus:

**A)** 2.042.

**B)** 2.048.

**C)** 2.045.

**Explanation**

The test statistic for a hypothesis test concerning population correlation follows a t-distribution with n − 2 degrees of freedom. For a sample size of 30 and a significance level of 5%, the sample statistic must be greater than 2.048 or less than −2.048 to reject the hypothesis that the population correlation equals zero.

(Module 6.4, LOS 6.l)