Question #1 of 92

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

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

B) Less than for the null and greater than for the alternative.

C) Equal to for the null and not equal to for the alternative.

Explanation

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

(Study Session 3, Module 12.1, LOS 12.b)

Question #2 of 92

A goal of an "innocent until proven guilty" justice system is to place a higher priority on:

A) the null hypothesis.

B) avoiding type II errors.

C) avoiding type I errors.

Explanation

In an "innocent until proven guilty" justice system, the null hypothesis is that the accused is innocent. The hypothesis can only be rejected by evidence proving guilt beyond a reasonable doubt, favoring the avoidance of type I errors.

(Study Session 3, Module 12.1, LOS 12.d)

Question #3 of 92

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_0: $\mu \leq 18$ 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.

(Study Session 3, Module 12.1, LOS 12.c)

Question #4 of 92

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

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

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

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

(Study Session 3, Module 12.1, LOS 12.a)

Question #5 of 92

The use of the F-distributed test statistic, $F = s_1^2 / s_2^2$, to compare the variances of two populations does NOT require 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.

(Study Session 3, Module 12.3, LOS 12.j)

Question #6 of 92

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).

(Study Session 3, Module 12.1, LOS 12.c)

Question #7 of 92

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: $\mu_{DR} \neq \mu_{LR}$.

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: $\mu_{DR} < \mu_{LR}$.

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). Note that this is a one-sided alternative because of the "greater than" belief.

(Study Session 3, Module 12.1, LOS 12.b)

Question #8 of 92

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 not equal.

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

C) fails to reject the null hypothesis.

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.

(Study Session 3, Module 12.3, LOS 12.h)

Question #9 of 92

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: $\mu_d \neq \mu_{d0}$.

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

C) H_0: $\mu_d = \mu_{d0}$ 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.

(Study Session 3, Module 12.3, LOS 12.i)

Question #10 of 92

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

B) The alternative hypothesis would be H_a: mean > 7.

C) The null hypothesis would be: H_0: mean = 7.

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.

(Study Session 3, Module 12.1, LOS 12.d)

Question #11 of 92

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) significance level of the test is 5%.

B) power of the test is 95%.

C) 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. The power of a test is one minus the probability of a Type II error, which cannot be calculated from the information given.

(Study Session 3, Module 12.1, LOS 12.c)

Question #12 of 92

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**
24	1.318	1.711	2.064	2.492	2.797	3.745
25	1.316	1.708	2.060	2.485	2.787	3.725

A pitching machine is calibrated to deliver a fastball at a speed of 98 miles per hour. Every day, a technician samples the speed of twenty-five fastballs in order to determine if the machine needs adjustment. Today, the sample showed a mean speed of 99 miles per hour with a standard deviation of 1.75 miles per hour. Assume the population is normally distributed. At a 95% confidence level, what is the *t*-value in relation to the critical value?

A) The *t*-value exceeds the critical value by 1.5 standard deviations.

B) The critical value exceeds the *t*-value by 1.3 standard deviations.

C) The *t*-value exceeds the critical value by 0.8 standard deviations.

Explanation

t = (99 – 98) / (1.75 / √25) = 2.86. The critical value for a two-tailed test at the 95% confidence level with 24 degrees of freedom is ±2.06 standard deviations. Therefore, the *t*-value exceeds the critical value by 0.8 standard deviations.

(Study Session 3, Module 12.1, LOS 12.c)

Question #13 of 92

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

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

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

C) Select the level of significance, 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.

(Study Session 3, Module 12.1, LOS 12.a)

Question #14 of 92

Identify the error type associated with the level of significance and the meaning of a 5 percent significance level.

	Error type	α = 0.05 means there is a 5 percent probability of
A)	Type I error	rejecting a true null hypothesis
B)	Type II error	rejecting a true null hypothesis
C)	Type I error	failing to reject a true null hypothesis

Explanation

The significance level is the risk of making a Type 1 error and rejecting the null hypothesis when it is true.

(Study Session 3, Module 12.1, LOS 12.c)

Question #15 of 92

A test of a hypothesis that the means of two normally distributed populations are equal based on two independent random samples:

A) is done with a t-statistic.

B) is based on a Chi Square statistic.

C) is a paired-comparisons test.

Explanation

We have two formulas for test statistics for the hypothesis of equal sample means. Which one we use depends on whether or not we assume the samples have equal variances. Either formula generates a test statistic that follows a T-distribution.

(Study Session 3, Module 12.3, LOS 12.h)

Question #16 of 92

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 null hypothesis cannot be rejected.

C) the test is inconclusive.

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.

(Study Session 3, Module 12.1, LOS 12.c)

Question #17 of 92

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) nonparametric test.

B) parametric test.

C) mean-rank test.

Explanation

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

(Study Session 3, Module 12.3, LOS 12.k)

Question #18 of 92

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.

(Study Session 3, Module 12.3, LOS 12.k)

Question #19 of 92

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) variances are not equal.

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

C) variances are 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.

(Study Session 3, Module 12.3, LOS 12.j)

Question #20 of 92

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) -1.96 and 1.96.

B) -1.685 and 1.685.

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%.

(Study Session 3, Module 12.2, LOS 12.g)

Question #21 of 92

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) t-statistic.

B) chi-square statistic.

C) F-statistic.

Explanation

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

(Study Session 3, Module 12.3, LOS 12.j)

Question #22 of 92

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 hypothesis test, Jack Olson observes a t-statistic of -1.38 based on a sample of 20 observations where the population mean is zero. If you choose a 5% significance level, you should:

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

B) fail to reject the null hypothesis 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 -1.38, 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.

(Study Session 3, Module 12.2, LOS 12.g)

Question #23 of 92

Which of the following statements about statistical results is *most* accurate?

A) If a result is statistically significant and economically meaningful, the relationship will continue into the future.

B) A result may be statistically significant, but may not be economically meaningful.

C) If a result is statistically significant, it must also be economically meaningful.

Explanation

It is possible for an investigation to determine that something is both statistically and economically significant. However, statistical significance does not ensure economic significance. Even if a result is both statistically significant and economically meaningful, the analyst needs to examine the reasons why the economic relationship exists to discern whether it is likely to be sustained in the future.

(Study Session 3, Module 12.2, LOS 12.e)

Question #24 of 92

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

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

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 crtical 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.

(Study Session 3, Module 12.2, LOS 12.g)

Question #25 of 92

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.

(Study Session 3, Module 12.2, LOS 12.g)

Question #26 of 92

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

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

C) Brickley should not receive either 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 Soberg 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.

(Study Session 3, Module 12.2, LOS 12.g)

Question #27 of 92

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

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

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.

(Study Session 3, Module 12.1, LOS 12.d)

Question #28 of 92

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) F-distributed.

C) Chi-squared distributed.

Explanation

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

(Study Session 3, Module 12.3, LOS 12.j)

Question #29 of 92

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) larger of the two sample means.

B) average difference between pairs of returns.

C) difference between the sample means for each population.

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.

(Study Session 3, Module 12.3, LOS 12.i)

Question #30 of 92

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

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

Explanation

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

(Study Session 3, Module 12.1, LOS 12.c)

Question #31 of 92

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: μ = 0.10 versus H_a: μ ≠ 0.10.

B) H_0: μ ≥ 0.10 versus H_a: μ < 0.10.

C) H_0: $\mu \le 0.10$ 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.

(Study Session 3, Module 12.1, LOS 12.b)

Question #32 of 92

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

A) 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.

B) 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.

C) 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.

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.

(Study Session 3, Module 12.1, LOS 12.c)

Question #33 of 92

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

A) a Type II error increases.

B) incorrectly rejecting the null increases.

C) incorrectly accepting the null decreases.

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.

(Study Session 3, Module 12.1, LOS 12.c)

Question #34 of 92

A researcher is testing the hypothesis that a population mean is equal to zero. From a sample with 64 observations, the researcher calculates a sample mean of -2.5 and a sample standard deviation of 8.0. At which levels of significance should the researcher reject the hypothesis?

1% significance	5% significance	10% significance

A) Reject	Fail to reject	Fail to reject	✗
B) Fail to reject	Reject	Reject	✓
C) Fail to reject	Fail to reject	Reject	✗

Explanation

This is a two-tailed test. With a sample size greater than 30, using a *z*-test is acceptable. The test statistic = $\frac{-2.5}{8.0/\sqrt{64}}$ = –2.5. For a two-tailed *z*-test, the critical values are ±1.645 for a 10% significance level, ±1.96 for a 5% significance level, and ±2.58 for a 1% significance level. The researcher should reject the hypothesis at the 10% and 5% significance levels, but fail to reject the hypothesis at the 1% significance level.

Using Student's t-distribution, the critical values for 60 degrees of freedom (the closest available in a typical table) are ±1.671 for a 10% significance level, ±2.00 for a 5% significance level, and ±2.66 for a 1% significance level. The researcher should reject the hypothesis at the 10% and 5% significance levels, but fail to reject the hypothesis at the 1% significance level.

(Study Session 3, Module 12.2, LOS 12.g)

Question #35 of 92

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 I error. ✗

B) is correct. ✗

C) made a Type II error. ✓

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.

(Study Session 3, Module 12.1, LOS 12.c)

Question #36 of 92

What kind of test is being used for the following hypothesis and what would a *z*-statistic of 1.68 tell us about a hypothesis with the appropriate test and a level of significance of 5%, respectively?

H_0: B ≤ 0

H_A: B > 0

A) One-tailed test; reject the null. ✓

B) One-tailed test; fail to reject the null. ✗

C) Two-tailed test; fail to reject the null.

Explanation

The way the alternative hypothesis is written you are only looking at the right side of the distribution. You are only interested in showing that B is greater than 0. You don't care if it is less than zero. For a one-tailed test at the 5% level of significance, the critical *z* value is 1.645. Since the test statistic of 1.68 is greater than the critical value we would reject the null hypothesis.

(Study Session 3, Module 12.2, LOS 12.g)

Question #37 of 92

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: $\mu \geq 0.05$.

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

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

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 "less than" belief.

(Study Session 3, Module 12.1, LOS 12.b)

Question #38 of 92

If we fail to reject the null hypothesis when it is false, what type of error has occured?

A) Type III.

B) Type II.

C) Type I.

Explanation

A Type II error is defined as failing to reject the null hypothesis when it is actually false.

(Study Session 3, Module 12.1, LOS 12.c)

Question #39 of 92

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) 19.99.

C) 2.31.

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) / (population 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.

(Study Session 3, Module 12.1, LOS 12.c)

Question #40 of 92

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 σ/√n of the null hypothesis value.

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

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

Explanation

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

(Study Session 3, Module 12.2, LOS 12.g)

Question #41 of 92

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

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

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

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.

(Study Session 3, Module 12.2, LOS 12.f)

Question #42 of 92

In a test of the mean of a population, if the population variance is:

A) unknown, a z-distributed test statistic is appropriate.

B) known, a *t*-distributed test statistic is appropriate.

C) known, a z-distributed test statistic is appropriate.

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 variance 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.

(Study Session 3, Module 12.2, LOS 12.g)

Question #43 of 92

Which of the following statements about the variance of a normally distributed population is *least* accurate?

A) The test of whether the population variance equals σ_0^2 requires the use of a Chi-squared distributed test statistic, $[(n - 1)s^2] / \sigma_0^2$.

B) The Chi-squared distribution is a symmetric distribution.

C) A test of whether the variance of a normally distributed population is equal to some value σ_0^2, the hypotheses are: H_0: $\sigma^2 = \sigma_0^2$, versus H_a: $\sigma^2 \neq \sigma_0^2$.

Explanation

The Chi-squared distribution is not symmetrical, which means that the critical values will not be numerically equidistant from the center of the distribution, though the probability on either side of the critical values will be equal (that is, if there is a 5% level of significance and a two-sided test, 2.5% will lie outside each of the two critical values).

(Study Session 3, Module 12.3, LOS 12.j)

Question #44 of 92

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) t-statistic.

B) chi square statistic.

C) *F-statistic*.

Explanation

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

(Study Session 3, Module 12.3, LOS 12.j)

Question #45 of 92

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: ρ ≠ 0.

B) H_a: ρ > 0.

C) H_a: ρ < 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.

(Study Session 3, Module 12.1, LOS 12.b)

Question #46 of 92

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: μ < 0.15 versus H_a: μ ≥ 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

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

(Study Session 3, Module 12.1, LOS 12.b)

Question #47 of 92

If the null hypothesis is H_0: ρ ≤ 0, what is the appropriate alternative hypothesis?

A) H_a: ρ < 0.

B) H_a: ρ > 0.

C) H_a: ρ ≠ 0.

Explanation

The alternative hypothesis must include the possible outcomes the null does not.

(Study Session 3, Module 12.1, LOS 12.a)

Question #48 of 92

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 newly acquired CFA charterholders with a mean starting salary of $67,000 and a standard deviation of $5,200?

A) -1.63.

B) 21.62.

C) 1.63.

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 − μ) / (σ / $n^{1/2}$) = (67,000 – 58,500) / (5,200 / $175^{1/2}$) = (8,500) / (5,200 / 13.22) = 21.62.

(Study Session 3, Module 12.1, LOS 12.c)

Question #49 of 92

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

B) 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 not 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.

(Study Session 3, Module 12.2, LOS 12.g)

Question #50 of 92

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.

(Study Session 3, Module 12.1, LOS 12.b)

Question #51 of 92

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**
16	1.746	2.120
17	1.740	2.110
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 18 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) The null hypothesis Mak needs to test is that the mean share of viewers is greater than 8.5%.

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

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

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 17 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 **1.74.**

Step 5: Calculate the sample (test) statistic. The test statistic = $t = (9.6 - 8.5) / (10.0 / \sqrt{18})$ = **0.4667**. (*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.

(Study Session 3, Module 12.2, LOS 12.g)

Question #52 of 92

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 null hypothesis.

C) rejecting a true alternative hypothesis.

Explanation

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

(Study Session 3, Module 12.1, LOS 12.c)

Question #53 of 92

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

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

Explanation

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

(Study Session 3, Module 12.1, LOS 12.c)

Question #54 of 92

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.

(Study Session 3, Module 12.1, LOS 12.b)

Question #55 of 92

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

A) hypothesis to be proved through statistical testing. ✗

B) hoped-for outcome. ✓

C) hypothesis that is accepted after a statistical test is conducted. ✗

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.

(Study Session 3, Module 12.1, LOS 12.a)

Question #56 of 92

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

A) H_0: $\mu = 0.15$ versus H_a: $\mu \neq 0.15$. ✗

B) H_0: $\mu < 0.15$ 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. We expect to reject the null.

(Study Session 3, Module 12.1, LOS 12.b)

Question #57 of 92

An analyst conducts a two-tailed z-test to determine if small cap returns are significantly different from 10%. The sample size was 200. The computed z-statistic is 2.3. Using a 5% level of significance, which statement is *most* accurate?

A) Reject the null hypothesis and conclude that small cap returns are significantly different from 10%. ✓

B) Fail to reject the null hypothesis and conclude that small cap returns are close enough to 10% that we cannot say they are significantly different from 10%. ✗

C) You cannot determine what to do with the information given. ✗

Explanation

At the 5% level of significance the critical z-statistic for a two-tailed test is 1.96 (assuming a large sample size). The null hypothesis is H_0: x = 10%. The alternative hypothesis is H_A: x ≠ 10%. Because the computed z-statistic is greater than the critical z-statistic (2.33 > 1.96), we reject the null hypothesis and we conclude that small cap returns are significantly different than 10%.

(Study Session 3, Module 12.2, LOS 12.g)

Question #58 of 92

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 all mitigating factors that can cause statistically significant results to be less than economically significant.

(Study Session 3, Module 12.2, LOS 12.e)

Question #59 of 92

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) 0.91.

B) -10.56.

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 − μ) / (σ / n$^{1/2}$) = (64,000 – 59,000) / (5,500 / 135$^{1/2}$) = (5,000) / (5,500 / 11.62) = 10.56.

(Study Session 3, Module 12.1, LOS 12.c)

Question #60 of 92

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

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

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

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

Explanation

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

(Study Session 3, Module 12.2, LOS 12.f)

Question #61 of 92

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) indicates that the researcher will reject the null hypothesis.

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

C) has a significance level of 95%.

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).

(Study Session 3, Module 12.1, LOS 12.c)

Question #62 of 92

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

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

C) One minus the confidence level of the test represents the probability of making a Type II 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.

(Study Session 3, Module 12.1, LOS 12.c)

Question #63 of 92

A bottler of iced tea wishes to ensure that an average of 16 ounces of tea is in each bottle. In order to analyze the accuracy of the bottling process, a random sample of 150 bottles is taken. Using a *t*-distributed test statistic of -1.09 and a 5% level of significance, the bottler should:

A) not reject the null hypothesis and conclude that bottles do not contain an average of 16 ounces of tea.

B) not reject the null hypothesis and conclude that bottles contain an average 16 ounces of tea.

C) reject the null hypothesis and conclude that bottles contain an average 16 ounces of tea.

Explanation

H_0: $\mu = 16$; H_a: $\mu \neq 16$. Do not reject the null since $|t| = 1.09 < 1.96$ (critical value).

(Study Session 3, Module 12.1, LOS 12.d)

Question #64 of 92

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) 1.78.

B) 19.06.

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 − μ) / (σ / n$^{1/2}$) = (65,000 – 57,000) / (4,500 / 115$^{1/2}$) = (8,000) / (4,500 / 10.72) = 19.06.

(Study Session 3, Module 12.1, LOS 12.c)

Question #65 of 92

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

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

B) 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.

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

(Study Session 3, Module 12.2, LOS 12.g)

Question #66 of 92

Which of the following statements regarding Type I and Type II errors is *most* accurate?

A) A Type I error is rejecting the null hypothesis when it is actually true.

B) A Type I error is failing to reject the null hypothesis when it is actually false.

C) A Type II error is rejecting the alternative hypothesis when it is actually true.

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 risk level or alpha risk.

(Study Session 3, Module 12.1, LOS 12.c)

Question #67 of 92

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) fail to 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 less than or equal to 100.

C) reject the null hypothesis and conclude that the population mean is greater that 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.

(Study Session 3, Module 12.2, LOS 12.g)

Question #68 of 92

An analyst is testing to see if the mean of a population is less than 133. A random sample of 50 observations had a mean of 130. Assume a standard deviation of 5. The test is to be made at the 1% level of significance. The analyst should:

A) fail to reject the null hypothesis.

B) accept the null hypothesis.

C) reject the null hypothesis.

Explanation

The null hypothesis is that the mean is greater than or equal to 133.

The test statistic = (sample mean – hypothesized mean) / ((sample standard deviation / (sample size)$^{1/2}$)) = (130 – 133) / (5 / 50$^{1/2}$) = (-3) / (5 / 7.0711) = -4.24.

The critical value for a one-tailed test at a 1% level of significance is -2.33.

The calculated test statistic of -4.24 falls to the left of the critical value of -2.33, and is in the rejection region. Thus, the null hypothesis can be rejected at the 1% significance level.

(Study Session 3, Module 12.2, LOS 12.g)

Question #69 of 92

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) t test.

B) Chi-square test.

C) F test.

Explanation

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

(Study Session 3, Module 12.3, LOS 12.j)

Question #70 of 92

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: μ = 100; H_a: μ ≠ 100.

C) H_0: X ≤ 100; H_a: X > 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.

(Study Session 3, Module 12.1, LOS 12.b)

Question #71 of 92

A Type I error:

A) rejects a true null hypothesis.

B) rejects a false null hypothesis.

C) fails to reject a false 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.

(Study Session 3, Module 12.1, LOS 12.c)

Question #72 of 92

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

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

C) fail to reject the null hypothesis that the population mean is not 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.

(Study Session 3, Module 12.2, LOS 12.g)

Question #73 of 92

A Type II error:

A) fails to reject a true null hypothesis.

B) fails to reject a false 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.

(Study Session 3, Module 12.1, LOS 12.c)

Question #74 of 92

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 of the strategy.

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

C) only the transaction costs and tax effects 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.

(Study Session 3, Module 12.2, LOS 12.e)

Question #75 of 92

The power of the test is:

A) equal to the level of confidence.

B) the probability of rejecting a true null hypothesis.

C) the probability of rejecting a false 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).

(Study Session 3, Module 12.1, LOS 12.d)

Question #76 of 92

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 equal to 100.

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

Explanation

H_0:μ ≤ 100; H_a: μ > 100. Reject the null since z = 3.4 > 1.65 (critical value).

(Study Session 3, Module 12.2, LOS 12.g)

Question #77 of 92

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) higher level 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 accepting the null hypothesis when it is false (a type II error), over rejecting it when it is true (a type I error).

(Study Session 3, Module 12.1, LOS 12.d)

Question #78 of 92

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) not rejected.

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

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

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.

(Study Session 3, Module 12.3, LOS 12.j)

Question #79 of 92

The table below is for five samples drawn from five separate populations. The far left columns give information on the population distribution, population variance, and sample size. The right-hand columns give three choices for the appropriate tests: z = z-statistic, and t = t-statistic. "None" means that a test statistic is not available.

Sampling From			*Test Statistic Choices*		
Distribution	*Variance*	*n*	***One***	***Two***	***Three***
Non-normal	0.75	100	z	z	z
Normal	5.60	75	z	z	z
Non-normal	n/a	15	t	t	none
Normal	n/a	18	t	t	t
Non-normal	14.3	15	z	t	none

Which set of test statistic choices (One, Two, or Three) matches the correct test statistic to the sample for all five samples?

A) Three.

B) One.

C) Two.

Explanation

For the exam: ***COMMIT THE FOLLOWING TABLE TO MEMORY!***

When you are sampling from a:	and the sample size is **small**, use a:	and the sample size is **large**, use a:
Normal distribution with a *known* variance	*z*-statistic	*z*-statistic
Normal distribution with an *unknown* variance	*t*-statistic	*t*-statistic*
Nonnormal distribution with a *known* variance	not available	*z*-statistic
Nonnormal distribution with an *unknown* variance	not available	*t*-statistic*

(Study Session 3, Module 12.2, LOS 12.g)

Question #80 of 92

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

A) t-distribution.

B) F-distribution.

C) chi square 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.

(Study Session 3, Module 12.3, LOS 12.h)

Question #81 of 92

Given a normally distributed random variable with a mean of 10% and a standard deviation of 14%, what is a 95% confidence interval for the return next year?

A) -4.00% to 24.00%.

B) -17.44% to 37.44%.

C) -17.00% to 38.00%.

Explanation

10% +/- 14(1.96) = -17.44% to 37.44%.

(Study Session 3, Module 12.1, LOS 12.d)

Question #82 of 92

The first step in the process of hypothesis testing is:

A) selecting the test statistic.

B) the collection of the sample.

C) to state the hypotheses.

Explanation

The researcher must state the hypotheses prior to the collection and analysis of the data. More importantly, it is necessary to know the hypotheses before selecting the appropriate test statistic.

(Study Session 3, Module 12.1, LOS 12.a)

Question #83 of 92

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) The calculated test statistic is 1.291.

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

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

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**

(Study Session 3, Module 12.2, LOS 12.g)

Question #84 of 92

Ryan McKeeler and Howard Hu, two junior statisticians, were discussing the relation between confidence intervals and hypothesis tests. During their discussion each of them made the following statement:

> McKeeler: A confidence interval for a two-tailed hypothesis test is calculated as adding and subtracting the product of the standard error and the critical value from the sample statistic. For example, for a level of confidence of 68%, there is a 32% probability that the true population parameter is contained in the interval.
>
> Hu: A 99% confidence interval uses a critical value associated with a given distribution at the 1% level of significance. A hypothesis test would compare a calculated test statistic to that critical value. As such, the confidence interval is the range for the test statistic within which a researcher would not reject the null hypothesis for a two-tailed hypothesis test about the value of the population mean of the random variable.

With respect to the statements made by McKeeler and Hu:

A) both are incorrect.

B) both are correct.

C) only one is correct.

Explanation

McKeeler's statement is incorrect. Specifically, for a level of confidence of say, 68%, there is a 68% probability that the true population parameter is contained in the interval. Therefore, there is a 32% probability that the true population parameter is not contained in the interval. Hu's statement is correct.

(Study Session 3, Module 12.1, LOS 12.d)

Question #85 of 92

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.

(Study Session 3, Module 12.2, LOS 12.f)

Question #86 of 92

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) 4.00.

B) 8.00.

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)$^{1/2}$ = $(X - \mu) / (\sigma / n^{1/2})$ = $(7 - 5) / (2 / 17^{1/2})$ = (2) / (2 / 4.1231) = 4.12.

(Study Session 3, Module 12.2, LOS 12.g)

Question #87 of 92

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

A) Chi-squared distributed.

B) F-distributed.

C) *t*-distributed.

Explanation

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

(Study Session 3, Module 12.3, LOS 12.j)

Question #88 of 92

An analyst wants to determine whether the monthly 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 variances of two samples, rather than their means.

(Study Session 3, Module 12.3, LOS 12.i)

Question #89 of 92

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

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

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

(Study Session 3, Module 12.1, LOS 12.b)

Question #90 of 92

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

A) rejecting a true alternative hypothesis.

B) rejecting a true null 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.

(Study Session 3, Module 12.1, LOS 12.c)

Question #91 of 92

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.

(Study Session 3, Module 12.1, LOS 12.a)

Question #92 of 92

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

A) Nonparametric tests have fewer assumptions than parametric tests.

B) Nonparametric tests are often used in conjunction with parametric tests.

C) Parametric tests are most appropriate when a population is heavily skewed.

Explanation

For a distribution that is non-normally distributed, a *nonparametric* test may be most appropriate. A nonparametric test tends to make minimal assumptions about the population, while parametric tests rely on assumptions regarding the distribution of the population. Both kinds of tests are often used in conjunction with one another.

(Study Session 3, Module 12.3, LOS 12.k)