STA 321 Spring 2015
Practice for the second exam

Multiple Choice
Identify the choice that best completes the statement or answers the question.

____ 1. Random samples of size 49 are taken from an infinite population whose mean is 300 and standard deviation is 21. The mean and standard error of the sample mean, respectively, are:
a. 300 and 21
b. 300 and 3
c. 300 and 0.43
d. None of these choices.

____ 2. As a general rule in computing the standard error of the sample mean, the finite population correction factor is used only if the:
a. sample size is smaller than 5% of the population size.
b. sample size is greater than 5% of the sample size.
c. sample size is more than half of the population size.
d. None of these choices.

____ 3. A sample of size 40 is taken from an infinite population whose mean and standard deviation are 68 and 12, respectively. The probability that the sample mean is larger than 70 equals
a. $P(Z > 70)$
b. $P(Z > 2)$
c. $P(Z > 0.17)$
d. $P(Z > 1.05)$

____ 4. The expected value of the sampling distribution of the sample mean $\overline{X}$ equals the population mean μ :
a. only when the population is normally distributed.
b. only when the sample size is large.
c. only when the population is infinite.
d. for all populations.

____ 5. The owner of a fish market has an assistant who has determined that the weights of catfish are normally distributed, with a mean of 3.2 pounds and standard deviation of 0.8 pounds. If a sample of 25 fish yields a mean of 3.6 pounds, what is the *Z*-score for this sample mean?
a. –2.50
b. 2.50
c. –0.50
d. None of these choices.

____ 6. As a general rule, the normal distribution is used to approximate the sampling distribution of the sample proportion only if:
a. the sample size n is greater than 30.
b. the population proportion p is close to 0.50.
c. the underlying population is normal.
d. np and $n(1 - p)$ are both greater than or equal to 5.

____ 7. If two populations are normally distributed, the sampling distribution of the difference in the sample means, $\bar{X}_1 - \bar{X}_2$, is:
a. approximately normal for any sample sizes.
b. approximately normal if both sample sizes are large.
c. exactly normal for any sample sizes.
d. exactly normal only if both sample sizes are large.

____ 8. If two random samples of sizes n_1 and n_2 are selected independently from two populations with variances σ_1^2 and σ_2^2, then the standard error of the sampling distribution of the sample mean difference, $\bar{X}_1 - \bar{X}_2$, equals:
a. $\sqrt{(\sigma_1^2 - \sigma_2^2)/n_1 n_2}$
b. $\sqrt{\frac{\sigma_1^2}{n_1}} - \sqrt{\frac{\sigma_2^2}{n_2}}$
c. $\sqrt{\frac{\sigma_1^2}{n_1} - \frac{\sigma_2^2}{n_2}}$
d. $\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$

____ 9. If two random samples of sizes 30 and 36 are selected independently from two populations with means 78 and 85, and standard deviations 12 and 15, respectively, then the standard error of the difference $\bar{X}_1$ and $\bar{X}_2$ is equal to:
a. 0.904
b. 3.324
c. 3.391
d. 0.833

____ 10. A Type I error is committed if we make:
a. a correct decision when the null hypothesis is false.
b. a correct decision when the null hypothesis is true.
c. an incorrect decision when the null hypothesis is false.
d. an incorrect decision when the null hypothesis is true.

____ 11. A spouse suspects that the average amount of money spent on Christmas gifts for immediate family members is above $1,200. The correct set of hypotheses is:
a. H_0: $\mu = 1200$ vs. H_1: $\mu < 1200$
b. H_0: $\mu > 1200$ vs. H_1: $\mu = 1200$
c. H_0: $\mu = 1200$ vs. H_1: $\mu > 1200$

d. H_0: $\mu < 1200$ vs. H_1: $\mu = 1200$

____ 12. In a criminal trial, a Type I error is made when:
a. a guilty defendant is acquitted.
b. an innocent person is convicted.
c. a guilty defendant is convicted.
d. an innocent person is acquitted.

____ 13. In order to determine the *p*-value, which of the following is not needed?
a. The level of significance.
b. Whether the test is one-tail or two-tail.
c. The value of the test statistic.
d. All of these choices are true.

____ 14. In testing the hypotheses H_0: $\mu = 75$ vs. H_1: $\mu < 75$, if the value of the test statistic z equals -2.42, then the *p*-value is:
a. 0.5078
b. 2.4200
c. 0.9922
d. 0.0078

____ 15. If we reject the null hypothesis, we conclude that:
a. there is enough statistical evidence to infer that the alternative hypothesis is true.
b. there is not enough statistical evidence to infer that the alternative hypothesis is true.
c. there is enough statistical evidence to infer that the null hypothesis is true.
d. there is not enough statistical evidence to infer that the null hypothesis is true.

____ 16. We have created a 95% confidence interval for μ with the result (8, 13). What conclusion will we make if we test H_0: $\mu = 15$ vs. H_1: $\mu \neq 15$ at $\alpha = 0.05$?
a. Reject H_0 in favor of H_1
b. Accept H_0 in favor of H_1
c. Fail to reject H_0 in favor of H_1
d. We cannot tell what our decision will be from the information given

____ 17. The rejection region for testing H_0: $\mu = 80$ vs. H_1: $\mu < 80$, at the 0.10 level of significance is:
a. $z > 1.96$
b. $z < 0.90$
c. $z > 1.28$
d. $z < -1.28$

____ 18. The power of a test is measured by its capability of:
a. rejecting a null hypothesis that is true.
b. not rejecting a null hypothesis that is true.
c. rejecting a null hypothesis that is false.
d. not rejecting a null hypothesis that is false.

____ 19. If some natural relationship exists between each pair of observations that provides a logical reason to compare the first observation of sample 1 with the first observation of sample 2, the second observation of sample 1 with the second observation of sample 2, and so on, the samples are referred to as:

a. matched pairs.
b. independent samples.
c. nonrandom samples.
d. None of these choices.

____ 20. In testing for differences between the means of two independent populations the null hypothesis is:

a. $H_0: \mu_1 - \mu_2 = 2$
b. $H_0: \mu_1 - \mu_2 = 0$
c. $H_0: \mu_1 - \mu_2 > 2$
d. $H_0: \mu_1 - \mu_2 < 2$

____ 21. If we are testing for the difference between the means of two independent populations with equal variances, samples of $n_1 = 15$ and $n_2 = 15$ are taken, then the number of degrees of freedom is equal to

a. 29
b. 28
c. 14
d. 13

____ 22. A political analyst in Texas surveys a random sample of registered Democrats and compares the results with those obtained from a random sample of registered Republicans. This would be an example of:

a. independent samples.
b. dependent samples.
c. independent samples only if the sample sizes are equal.
d. dependent samples only if the sample sizes are equal.

____ 23. In testing for a mean difference for paired samples the null hypothesis is:

a. $H_0: \mu_D = 0$
b. $H_0: \mu_D < 0$
c. $H_0: \mu_D > 0$
d. None of these choices.

____ 24. In one-way ANOVA, the amount of total variation that is unexplained is measured by the:

a. sum of squares for hypothesis.
b. sum of squares for error.
c. total sum of squares.
d. degrees of freedom.

____ 25. In the one-way ANOVA where there are *k* treatments and *n* observations, the degrees of freedom for the *F*-statistic are equal to, respectively:

a. *n* and *k*.
b. *k* and *n*.

c. $n - k$ and $k - 1$.
d. $k - 1$ and $n - k$.

____ 26. For which of the following is not a required condition for ANOVA?
a. The populations are normally distributed.
b. The population variances are equal.
c. The samples are independent.
d. All of these choices are required conditions for ANOVA.

____ 27. One-way ANOVA is applied to independent samples taken from three normally distributed populations with equal variances. Which of the following is the null hypothesis for this procedure?
a. $\mu_1 + \mu_2 + \mu_3 = 0$
b. $\mu_1 + \mu_2 + \mu_3 \neq 0$
c. $\mu_1 = \mu_2 = \mu_3 = 0$
d. $\mu_1 = \mu_2 = \mu_3$

____ 28. Consider the following partial ANOVA table:

Source of Variation	*SS*	*df*	*MS*	*F*
Treatments	75	*	25	6.67
Error	60	*	3.75	
Total	135	19		

The numerator and denominator degrees of freedom for the *F*-test (identified by asterisks) are
a. 4 and 15
b. 3 and 16
c. 15 and 4
d. 16 and 3

____ 29. In one-way analysis of variance, within-treatments variation is measured by:
a. sum of squares for error.
b. sum of squares for hypothesis.
c. total sum of squares.
d. standard deviation.

____ 30. Which of the following statements about multiple comparison methods is false?
a. They are to be use once the *F*-test in ANOVA has been rejected.
b. They are used to determine which particular population means differ.
c. There are many different multiple comparison methods but all yield the same conclusions.
d. All of these choices are true.

Short Answer

Professors' Salary

Suppose that the starting salaries of female math professors have a positively skewed distribution with mean of $56,000 and a standard deviation of $12,000. The starting salaries of male math professors are positively skewed with a mean of $50,000 and a standard deviation of $10,000. A random sample of 50 female math professors and a random sample of 40 male math professors are selected.

31. {Professors' Salary Narrative} What is the sampling distribution of the sample mean difference $\overline{X}_1 - \overline{X}_2$? Explain.

32. {Professors' Salary Narrative} Find the standard error of the sample mean difference.

Watching Sports

A researcher claims athletes spend an average of 40 minutes per day watching sports. You think the average is higher than that. In testing your hypotheses H_0: $\mu = 40$ vs. H_1: $\mu > 40$, the following information came from your random sample of athletes: $\overline{X} = 42$ minutes, $n = 25$. Assume $\sigma = 5.5$, and $\alpha = 0.10$.

34. {Watching Sports Narrative} Set up the rejection region.

36. {Watching Sports Narrative} Interpret the result.

Runners

A researcher wants to study the average miles run per day for runners. In testing the hypotheses: H_0: $\mu = 25$ miles vs. H_1: $\mu \neq 25$ miles, a random sample of 36 runners drawn from a normal population whose standard deviation is 10, produced a mean of 22.8 miles weekly.

37. {Runners Narrative} Compute the value of the test statistic and specify the rejection region associated with 5% significance level.

38. {Runners Narrative} Develop a 95% confidence interval estimate of the population mean.

39. {Runners Narrative} Explain briefly how to use the confidence interval to test the hypothesis.

Employees Test Scores

Thirty-five employees who completed two years of college were asked to take a basic mathematics test. The mean and standard deviation of their scores were 75.1 and 12.8, respectively. In a random sample of 50 employees who only completed high school, the mean and standard deviation of the test scores were 72.1 and 14.6, respectively.

41. {Employees Test Scores Narrative} Estimate with 90% confidence the difference in mean scores between the two groups of employees.

Auto Tires Wear

To compare the wearing of two types of automobile tires, 1 and 2, an experimenter chose to "pair" the measurements, comparing the wear for the two types of tires on each of 7 automobiles, as shown below.

Automobile	1	2	3	4	5	6	7
Tire 1	8	15	7	9	10	13	11
Tire 2	12	18	8	9	12	11	10

42. {Auto Tires Wear Narrative} Estimate with 90% confidence the mean difference and interpret.

TV Viewing Habits

A statistician employed by a television rating service wanted to determine if there were differences in television viewing habits among three different cities in California. She took a random sample of five adults in each of the cities and asked each to report the number of hours spent watching television in the previous week. The results are shown below. (Assume normal distributions with equal variances.)

Hours Spent Watching Television

San Diego	Los Angeles	San Francisco
25	28	23
31	33	18
18	35	21
23	29	17
27	36	15

43. {TV Viewing Habits Narrative} Set up the ANOVA Table. Use $\alpha = 0.05$ to determine the critical value.