COB191, Business Statistics, Test 4, Fall 2004 Name _____

DO NOT TURN TO THE NEXT PAGE UNTIL YOU ARE INSTRUCTED TO DO SO!

The following exam consists of 40 questions: 30 multiple choices and 10 problems. You will have 75 minutes to complete the test. This means that you have, on average, about 1.875 minutes per question.

1. Record the test number shown above on your scantron sheet now. Also record your name and instructor. Write your PeopleSoft number in the appropriate blanks on your scantron, then blacken in the corresponding digits. Check them. An incorrect ID number can cost you 10 points on this exam!

2. Answer each question on the scantron sheet. You are welcome to write on this exam, but your scantron will record your graded answer for the multiple choice questions.

3. You should provide as much details as you could for the questions 31 to 40 in order to get any partial credit.

4. Keep your eyes on your own paper. If you believe that someone sitting near you is cheating, raise your hand and quietly inform a teacher of this. We'll keep an eye peeled, and your anonymity will be respected.

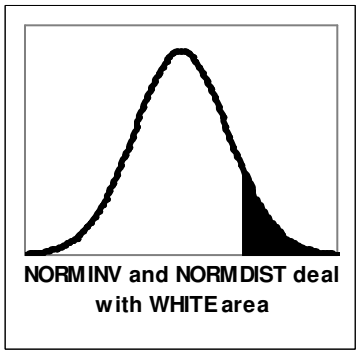
5. If any question seems unclear or ambiguous to you, raise your hand, and your teacher will attempt to clarify it.

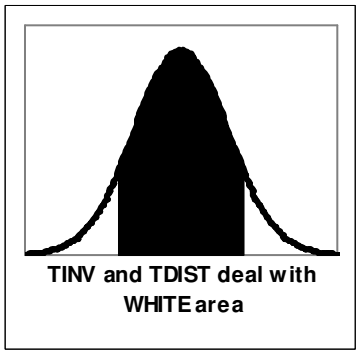
Pledge: On my honor as a JMU student, I pledge that I have neither given nor received unauthorized assistance on this examination.

Signature _____

Possibly Useful Excel Functions

=BINOMDIST(# successes, # trials, prob of success, cumulative)
=POISSON(# successes, mean, cumulative)
=NORMDIST(x value, mean, st.dev, TRUE)
=NORMINV(probability, mean, st. dev)
=TDIST(t value, deg. freedom, # of tails)
=NORMSDIST(z value)
=NORMSINV(probability)
=TINV(probability, deg. freedom)





Multiple Choices

1. 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.

2. A Type II error is committed when
   a) we reject a null hypothesis that is true.
   b) we don't reject a null hypothesis that is true.
   c) we reject a null hypothesis that is false.
   d) we don't reject a null hypothesis that is false.

3. If the *p* value is less than α in a two-tailed test,
   a) the null hypothesis should be rejected.
   b) the null hypothesis should not be rejected.
   c) a one-tailed test should be used.
   d) no conclusion should be reached.

4. If a test of hypothesis has a Type I error probability (α) of 0.01, we mean
   a) if the null hypothesis is true, we don't reject it 1% of the time.
   b) if the null hypothesis is true, we reject it 1% of the time.
   c) if the null hypothesis is false, we don't reject it 1% of the time.
   d) if the null hypothesis is false, we reject it 1% of the time.

5. For a given level of significance (α), if the sample size *n* is increased, the probability of a Type II error (β)
   a) will increase.
   b) will remain the same.
   c) will decrease.
   d) will increase and then decrease.

6. Suppose we wish to test H_0: $\mu \leq 47$ versus H_A: $\mu > 47$. What will result if we conclude that the mean is less than 47 when its true value is really 52?
   a) We have made a Type I error.
   b) We have made a correct decision
   c) We have made a Type II error.
   d) We have made a $\alpha - \beta$ error.

7. Suppose a 95% confidence interval for μ turns out to be (1,000, 2,100). To make more useful inferences from the data, it is desired to reduce the width of the confidence interval. Which of the following will result in a reduced interval width?
   a) Increase the sample size.
   b) Decrease the confidence level.
   c) Increase the confidence level and decrease the sample size.
   d) Increase the sample size and decrease the confidence level.

8. Suppose the ages of students in COB191 Statistics follow a skewed-right distribution with a mean of 20 years and a standard deviation of 2 years. If we randomly sampled 100 students, which of the following statements about the sampling distribution of the sample mean age is incorrect?
   a) The standard deviation of the sampling distribution is equal to 2 years.
   b) The mean of the sampling distribution is equal to 20 years.
   c) The shape of the sampling distribution is approximately normal.
   d) The standard deviation of the sample mean is 2/10.

9. Which of the following is true regarding the sampling distribution of the mean for a large sample size?
   a) It has the same shape, mean, and standard deviation as the population.
   b) It has a normal distribution with the same mean as the population but with a smaller standard deviation.
   c) It has a normal distribution with the same mean and standard deviation as the population.
   d) It has the same shape and mean as the population, but has a smaller standard deviation.

The problem below is associated with questions 10 to 12

Americans spend an average of 8.6 minutes per day reading newspapers (USA Today, April 10, 1995) with a standard deviation of 0.5 minutes. A researcher believes that individuals in management positions spend more than the national average time per day reading newspapers. In order to test his claim with 95% confidence level, the researcher selected a sample of 16 individuals in management positions with the average of 9.2 minutes and the standard deviation of 0.52 minutes per day reading newspapers. It is assumed the time Americans spend per day to read newspapers is normally distributed.

10. What is the parameter of interest in this problem?
    a. $\bar{X}$ = 8.6 minutes b. μ = 8.6 minutes c. $\bar{X}$ = 9.2 minutes d. μ = 9.2 minutes

11. Specify the alternative hypotheses Ha:
    a. $\mu > 8.6$ minutes b. $\mu > 9.2$ minutes c. $\mu \leq 8.6$ minutes d. $\mu \geq 8.6$ minutes

12. Which test would you use and why?
    a. *Z*-test of a population mean because the population is normally distributed and its sample standard deviation should be used.
    b. *t*-test of population mean because the population is normally distributed and its sample standard deviation is given
    c. *t*-test of population mean because the population is normally distributed and its standard deviation is given
    d. *Z*-test of a population mean because the population is normally distributed and its standard deviation is given

The problem below is associated with questions 13 to 15.
Gallup Poll questioned 1,004 adults national wide on November 14 to 16 "Do you approve or disapprove of the way George W. Bush is handling his job as president?" Fifty percent of the people in the sample said YES. A researcher would like to test whether George W. Bush has at least fifty percent public support?

13. What is the parameter of interest in this problem?
    a. $p_s = 0.5$ b. $p = 0.5$ c. $\bar{X} = 0.5$ d. $\mu = 0.5$

14. Specify the alternative hypotheses Ha:
    a. $p < 0.5$ b. $p > 0.5$ c. $\mu < 0.5$ d. $p \geq 0.5$

15. Which test would you use and why?
    a. *Z*-test of a population proportion because the population is normally distributed and its standard deviation is given
    b. *Z*-test of a population proportion because the population is normally distributed and its sample standard deviation could be determined.
    c. *Z*-test of a population proportion because the sample size is large based upon the central limit theorem.
    d. *t*-test of population proportion because the sample size is large and the population standard deviation is not given

The problem below is associated with questions 16 to 17.
The International Air Transport Association surveys business travelers to develop ratings of transatlantic gateway airports. The maximum possible rating is 10. A magazine devoted to business travel decided to classify airports according to the rating they receive. Airports with a population mean rating higher than 8.5 will be designated as providing superior service. Suppose a simple random sample of 9 business travelers were asked to rate Dulles International Airport, and that the 9 ratings obtained were 7, 8, 10, 11, 5, 9, 6, 8, and 8. The sample mean is $\bar{X} = 8$ and the sample standard deviation is s = 1.87. Assuming that the population of ratings can be approximated by a normal probability distribution, should Dulles International Airport be designated as providing superior services?

16. Specify the alternative hypotheses Ha:
    a. $\mu > 8.5$ b. $\mu < 8.5$ c. $\bar{X} > 8$ d. $\mu \geq 8.5$

17. Which test should you use and why?
    a. *z*-test of a population mean because the population is approximately normally distributed, its sample standard deviation is given and its sample size is small.
    b. *t*-test of population mean because the population is approximately normally distributed, its sample standard deviation is given and its sample size is small.
    c. *t*-test of a population mean because the population is approximately normally distributed, its sample standard deviation is not given and its sample size is small.
    d. *t*-test of population mean because the population is approximately normally distributed, its standard deviation is given and its sample size is large.

The problem below is associated with questions 18 to 30.
The Ford Taurus is listed as having a highway fuel efficiency average of 30 miles per gallon. A consumer interest group conducts automobile tests seeking statistical evidence to show that automobile manufactures overstate the miles – per – gallon ratings for particular models. In the case of the Ford Taurus, hypothesis for the test would be stated as:

Ho: $\mu \geq 30$ Ha: $\mu < 30$

In a sample of 36 mileage tests with the Ford Taurus, the consumer interest group obtained a sample mean highway mileage rating of 29.5 miles per gallon and a sample standard deviation of 1.8 miles per gallon. What conclusion should be drawn from the sample results? Use a significance level $\alpha = 0.05$.

The following questions 18 to 21 should be answered with the critical value approach to hypothesis test:

18. Which test statistic (z* or t*) should be used and what is the value of the test statistic?

a. $z^* = \dfrac{\bar{x} - \mu}{s} = \dfrac{29.5 - 30}{1.8} = -0.278$

b. $z^* = -1.96$

c. $t^* = \dfrac{\bar{x} - \mu}{s/\sqrt{n}} = \dfrac{29.5 - 30}{1.8/\sqrt{36}} = -1.667$

d. $z^* = \dfrac{\bar{x} - \mu}{s/\sqrt{n}} = \dfrac{29.5 - 30}{1.8/\sqrt{36}} = -1.667$

19. Which Excel function should be used to get the critical value?

a. =(-1)*NORMSINV(0.95/2)
b. =NORMSINV(0.95)
c. =(-1)*NORMSINV(0.95)
d. =(-1)*TINV(0.05,35)

20. What are the correct decision rules for the critical value approach to hypothesis test:

a. if z* ≤ -1.645, then conclude H_0, otherwise, if z* > -1.645, then conclude Ha.
b. if z* ≥ -1.960, then conclude H_0, otherwise, if z* < -1.960, then conclude Ha.
c. if t* ≥ -1.690, then conclude H_0, otherwise, if z* < -1.690, then conclude Ha.
d. if z* ≥ -1.645, then conclude H_0, otherwise, if z* < -1.645, then conclude Ha.

21. Which statement is the correct conclusion for the hypothesis test and why?

a. Conclude H_0 because the test statistic is greater than the critical value.
b. Conclude Ha because the test statistic is smaller than the critical value.
c. Conclude H_0 because the test statistic is smaller than the critical value.
d. Conclude Ha because the test statistic is greater than the critical value.

The following questions 22 to 24 should be answered with the p-value approach to hypothesis test:

22. Which Excel function should be used to get the p-value if the test statistic = - 1.5?

a. =NORMSDIST(-1.5)
b. =NORMSINV(-1.5)
c. =TDIST(-1.5)
d. =NORMDIST(29.5,30,1.8,TRUE)

23. What are the correct decision rules with p-value approach (assume the test statistic = -1.5):

a. if p-value is ≤ α, then conclude H_0, otherwise, if p-value > α, then conclude Ha.
b. if p-value is ≥ α, then conclude Ha, otherwise, if p-value < α, then conclude H_0
c. if p-value is ≥ α, then conclude H_0, otherwise, if p-value < α, then conclude Ha.
d. if p-value is ≤ α, then conclude Ha, otherwise, if p-value > α, then conclude H_0.

24. Which statement is the correct conclusion for the hypothesis test (assume the test statistic = -1.5)?

a. Conclude H_0 because the p-value is greater than the significance level α.
b. Conclude Ha because the p-value is greater than the significance level α.
c. Conclude Ha because the p-value is smaller than the significance level α.
d. Conclude H_0 because the p-value is smaller than the significance level α.

The following questions 25 to 26 should be answered with the action limits approach to hypothesis test:

25. Which one(s) can be used to compute the action limit for the problem?

I. $\bar{x} - z\dfrac{s}{\sqrt{n}} = 29.5 - 1.645 \times \dfrac{1.8}{\sqrt{36}} =$

II. $\mu - z\dfrac{s}{\sqrt{n}} = 30 - 1.645 \times \dfrac{1.8}{\sqrt{36}} =$

III. =NORMINV(0.05,30,0.3)

a. 1, II and III
b. I and II only
c. I and III only
d. II and III only

26. Which statement are the correct decision rules with the action limit approach to hypothesis test?

a. if $\bar{x}$ ≥ Lower action limit, then conclude Ha, otherwise, if $\bar{x}$ < Lower action limit, then conclude H_0
b. if $\bar{x}$ ≥ Lower action limit, then conclude H_0, otherwise, if $\bar{x}$ < Lower action limit, then conclude Ha
c. if $\bar{x}$ ≥ Upper action limit, then conclude H_0, otherwise, if $\bar{x}$ < Upper action limit, then conclude Ha
d. if $\bar{x}$ ≥ Upper action limit, then conclude Ha, otherwise, if $\bar{x}$ < Upper action limit, then conclude H_0

The problem below is associated with questions 27 to 30:
If a random sample of another 49 mileage tests with the Ford Taurus reveals a mean mileage of 29.65 miles and standard deviation of 1.65 miles , set up a confidence interval for the mean mileage for the Ford Taurus with the significance level $\alpha = 0.05$.

27. Which is the correct standard error of the mean for the problem:
    a. 0.0556 b. 0.0337 c. 0.2357 d. 1.6500

28. Which is the correct equation to be used for the confidence interval?
    a. $\bar{x} \pm z \frac{s}{\sqrt{n}}$ or $29.65 \pm 1.645 \times \frac{1.65}{\sqrt{49}}$
    b. $\mu \pm z \frac{s}{\sqrt{n}}$ or $30 \pm 1.645 \times \frac{1.65}{\sqrt{49}}$
    c. $\mu \pm z \frac{s}{\sqrt{n}}$ or $30 \pm 1.96 \times \frac{1.65}{\sqrt{49}}$
    d. $\bar{x} \pm z \frac{s}{\sqrt{n}}$ or $29.65 \pm 1.96 \times \frac{1.65}{\sqrt{49}}$

29. Which is the correct confidence interval:
    a. 29.5823 and 29.7177 b. 29.1880 and 30.1120 c. 29.2623 and 30.0377 d. 29.5946 and 29.7054

30. What would be the sample size to be used by the consumer interest group in its next sample with an allowable error of ±0.4 with $\alpha = 0.05$ and standard deviation of 2?
    a. 68 b. 39 c. 97 d. 10

Please provide as much computational details as you could to get any partial credit for the following questions..

The problem below is associated with questions 31 to 35

Callaway Golf Company's new forged titanium ERC driver has been described as "illegal" because it promised driving distances that exceeded the USGA's standard. Golf Digest compared actual driving distances with the ERC driver and a USGA approved driver with a population mean driving distance of 280 yards. Using nine test drivers, the mean driving distance by the ERC driver was 286.9 yards and a sample standard deviation driving distance of 10 yards (Golf World, May 12, 2000). It is assumed the driving distance by ERC drivers is normally distributed. (Hint: t-distribution should be used). A confidence level $1-\alpha = 0.95$ is used in the test.

Formulate the null and alternative hypothesis that can be used to determine whether the new ERC driver has a populations mean driving distance greater than 280 yards:

H_0: $\mu \leq 280$ yards Ha: $\mu > 280$ yards

31. Which test statistic (z* or t*) should be used?_____ ___ What is the equation to compute the test statistic? _

    __ ____, What is the value of the Test Statistic? _____

32. What is the critical value? __ __ and what is the Excel function to get the critical value?

    You should try it out on Excel.

33. Draw a chart to indicate the problem and mark clearly the significant level (α), confidence level ($1 - \alpha$), critical value, acceptance region and rejection region on the chart.

34. Describe your decision rules with critical value approach:

Decision Rules:
Otherwise,

35. What is your conclusion and why?

The problem below is associated with questions 36 to 40.

Over the past few months, 20% of the players at Harrisonburg Golf Club have been women. In an effort to increase the proportion of women playing, Harrisonburg Golf Club used a special promotion to attract women golfers. After one week, a random sample of 400 players showed 300 men and 100 women. Course managers would like to determine whether the data support the conclusion that the proportion of women playing at Harrisonburg Golf Club has increased. We are interested in testing Ho: $p = 0.2$, and Ha: $p \neq 0.2$ with a significance level of $\alpha = 0.05$. (Hint: z-test may be used)

36. Draw a chart to indicate the problem and mark clearly the significant level (α), confidence level ($1 - \alpha$), critical values, acceptance region and rejection region on the chart.

37. Please answer the following few questions:
    a. What is the equation to compute the sample statistic? ____
    b. What is the value of the test statistic
    c. What is the critical value? _
    d. What is the Excel function to get the critical value?

    __

38. Describe your decision rules with the critical value approach:

39. Construct a 95% confidence interval for the proportion of women golfer players with the sample information given in the problem.

40. Using the sample information above, what sample size in the next test would be necessary if we wanted to estimate the true proportion to within ± 0.03 of the proportion of women golfer players using 95% confidence?