MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) Assume that the change in daily closing prices for stocks on the New York Stock Exchange is a random variable that is normally distributed with a mean of $0.35 and a standard deviation of $0.33. Based on this information, what is the probability that a randomly selected stock will close up $0.75 or more?

1) _____
A) 0.7100 B) 0.3869
C) 0.1131 D) None of the above.

2) The manager at a local movie theater has collected data for a long period of time and has concluded that the revenue from concession sales during the first show each evening is normally distributed with a mean equal to $336.25 and a variance equal to 1,456. Based on this information, what are the chances that the revenue on the first show will exceed $800?

2) _____
A) Approximately 0.1255 B) About 0.3745
C) Essentially zero D) None of the above.

3) A measure computed from the entire population is called: 3) _____
A) a qualitative value. B) a mean.
C) a parameter. D) a statistic.

4) The role of the sample mean in a confidence interval estimate for the population mean is to: 4) _____
A) determine the amount by which the estimate will miss the true population mean.
B) determine the margin of error in the estimate.
C) establish the level of confidence for the estimate.
D) None of the above are true.

5) A major cell phone service provider has determined that the number of minutes that its customers use their phone per month is normally distributed with a mean equal to 445.5 minutes with a standard deviation equal to 177.8 minutes. The company is thinking of changing its fee structure so that anyone who uses the phone less than 250 minutes during a given month will pay a reduced monthly fee. Based on the available information, what percentage of current customers would be eligible for the reduced fee?

5) _____
A) Approximately 52 percent
B) About 86 percent
C) About 36 percent
D) None of the above.

6) A large midwestern university is interested in estimating the mean time that students spend at the student recreation center per week. A previous study indicated that the standard deviation in time is about 40 minutes per week. If the officials wish to estimate the mean time within ± 10 minutes with a 90 percent

confidence, what should the sample size be?

6) _____
A) 302
B) 62
C) 44
D) Can't be determined without knowing how many students there are at the university.

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

7) If it is assumed that the daily changes in stock prices (increases or decreases) are normally distributed with a mean equal to $0.00 and a standard deviation equal to $3.00, why is it useful to convert to a standard normal distribution prior to finding the probability that a daily change will be greater than $4.50?

7) _____

8) What are the disadvantages of using a small sample to estimate the population mean?

8) _____

9) Explain what is meant by a p-value.

9) _____

10) A major U.S. oil company has developed two blends of gasoline. Managers are interested in determining whether a difference in mean gasoline mileage will be obtained from using the two blends. As part of their study, they have decided to run a test using the Chevrolet Impala automobile with automatic transmissions. They selected a random sample of 100 Impalas using Blend 1 and another 100 Impalas using Blend 2. Each car was first emptied of all the gasoline in its tank and then filled with the designated blend of the new gasoline. The car was then driven 200 miles on a specified route involving both city and highway roads. The cars were then filled and the actual miles per gallon were recorded. The following summary data were recorded:

	Blend 1	Blend 2
Sample Size	100	100
Sample Mean	23.4 mpg	25.7 mpg
Sample St. Dev.	4.0 mpg	4.2 mpg

Based on the sample data, using a 0.05 level of significance, what conclusion should the company reach about whether the population mean mpg is the same or different for the two blends? Use the test statistic

approach to test the null hypothesis.

10) _____

11) In estimating a population mean, under what conditions would the t-distribution be used?

11) _____

12) The money spent by people at an amusement park, after paying to get in the gate, is thought to be uniformly distributed between $5.00 and $25.00. If two people are randomly surveyed, what is the probability that first person will spend between $8.00 and $12.00 and the second person will spend over $15.00?

12) _____

13) The proportion of parts in an inventory that are outdated and no longer useful is thought to be 0.10. To check this, a random sample of n = 100 parts is selected and 14 are found to be outdated. Based upon this information, what is the probability of 14 or more outdated parts?

13) _____

TRUE/FALSE. Write 'T' if the statement is true and 'F' if the statement is false.
14) If the time it takes for a customer to be served at a fast-food chain business is thought to be uniformly distributed between 3 and 8 minutes, then the probability that the time it takes for a randomly selected customer will be less than 5 minutes is 0.40.

14) _____

15) The population of soft drink cans filled by a particular machine is known to be normally distributed with a mean equal to 12 ounces and a standard deviation equal to 0.25 ounces. Given this information, the sampling distribution for a random sample of n = 25 cans will also be normally distributed with a mean equal to $\dfrac{12}{\sqrt{25}}$ ounces.

15) _____

16) When developing a confidence interval estimate, the confidence level is calculated based on the size of the sample and the population standard deviation.

16) _____

17) In estimating a population proportion, the factors that are needed to determine the required sample size are the confidence level, the margin of error and some idea of what the population proportion is.

17) _____

18) An accounting firm has been hired by a large computer company to determine whether the proportion of accounts receivables with errors in one division (Division 1) exceeds that of the second division (Division 2). The managers believe that such a difference may exist because of the lax standards employed by the first division.   To conduct the test, the accounting firm has selected random samples of accounts from each division with the following results:

	Division 1	Division 2
Sample size	$n_1 = 100$	$n_2 = 100$
Errors found	$x_1 = 13$	$x_2 = 8$

Based on this information and using a significance level equal to 0.05, the test statistic for the hypothesis test is approximately 1.153 and, therefore, the null hypothesis is not rejected.

18) _____

19) If a manager is attempting to estimate the mean amount spent per customer per visit at his store, the sample mean would be the appropriate point estimate.   19) _____

20) An analyst for a financial investment firm recently went through the effort to determine the required sample size for estimating the mean number of transactions per year for the clients of his firm. The calculations, which were based on a 95 percent confidence level and a margin of error of ± 3, gave a required sample size of 300. Given this information, the value used for the population standard deviation must have been about 26.5 transactions.   20) _____

1) C

2) C

3) C

4) D

5) D

6) C

7) The area under the normal curve represents probability and sums to 1.0. If we were to attempt to find the probability of a closing price exceeding $4.50 based on the original normal distribution, we would have to integrate the normal distribution function from $4.50 to infinity. Although possible, finding the integral of the normal distribution function is not a trivial matter. However, by converting the normal distribution to a standard normal distribution, we are determining a z value corresponding to the $4.50 point. Then we can use the standard normal table to find the probability since the table contains integrals (areas) for all z values (to two decimal places) between 0.00 and 3.09.

8) A small sample impacts the estimation of a population mean in two main ways. First, in developing a confidence interval estimate for μ, we need the standard error of the sampling distribution. The standard error is computed as $\frac{\sigma}{\sqrt{n}}$. In a given situation, a small value of n will result in larger standard error. Then, when we develop the confidence interval using $\bar{x} \pm z\frac{\sigma}{\sqrt{n}}$, the width of the interval is greater than would be the case for a larger sample size. Thus, the margin of error is larger, which is undesirable. Further, in most applications, the population standard deviation, σ, is unknown and we must estimate it using s, the sample standard deviation. In these cases, when the sample size is small, we use the t-distribution to get the critical value for the confidence interval formula of the form: $\bar{x} \pm t\frac{s}{\sqrt{n}}$. Since the t-distribution is more spread out than the z-distribution, the width of the interval will be wider when the small sample size is used. Thus, the width is expanded in two ways-larger standard error and larger critical value.

9) A p-value is the probability of getting a sample mean that is as extreme or more extreme than the one observed from a population with the hypothesized parameter. For instance, if the sample mean that we find in our sample is "substantially" different than the hypothesized population mean, a small p-value will be computed. If the calculated p-value is less than alpha (α), the null hypothesis should be rejected.

10) The hypothesis test involves a test for the difference between population means and is based on large samples from each population. The appropriate null and alternative hypotheses are:

$$H_o : \mu_1 = \mu_2$$

$$H_a : \mu_1 \neq \mu_2$$

This will be a two-tailed test since we are interested in testing whether there is a difference between the two population means with respect to miles per gallon and neither blend of gasoline is predicted to be superior to the other.

The critical value for a two-tailed test with a significance level of 0.05 is found in the Standard Normal table to be $z = \pm 1.96$. The test statistic in this case is computed using:

$$z = \frac{\bar{x}_1 - \bar{x}_2 - 0}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} = \frac{(23.4 - 25.7) - 0}{\sqrt{\frac{16}{100} + \frac{17.64}{100}}} = \frac{-2.3}{.58} = -3.9655$$

Since $z = -3.9655 < -1.96$, we reject the null hypothesis and conclude that the population means are not equal. Based on the samples, we infer that blend 2 will provide higher mean mileage.

11) The t-distribution is used to obtain the critical value for a confidence interval estimate for the population mean when the value for the population standard deviation is unknown and the sample size is reasonably small. Technically, the t-distribution can be used when the standard deviation is not known, but since the t-distribution and the z-distribution converge for large samples, it generally does not matter in cases where the sample size is large. It should be noted that the t-distribution is based on the assumption that the population is normally distributed. However, the t-distribution is usable as long as the population is "reasonably" symmetric.

12) The continuous uniform probability distribution has a function: $f(x) = \frac{1}{b-a}$ where b is the upper extreme of the distribution (\$25.00) and a is the lower extreme (\$5.00). Then $f(x) = \frac{1}{25.00 - 5.00} = \frac{1}{20} = 0.05$. Now, $p(8.00 \leq x \leq 12.00) = f(x)(12.00 - 8.00) = 0.05(4.00) = 0.20$. Thus, there is a 0.20 probability that someone will spend between \$8.00 and \$12.00 after getting into the amusement park. The chance that the second person will spend more than \$15.00 is found as $0.05(25.00 - 15.00) = 0.50$. Then using the multiplication rule for independent events introduced in Chapter 4, we find the desired probability as: $0.20 \times 0.50 = 0.10$. Thus, there is a 0.10 chance that the event of interest will occur.

13) We are interested in finding $P(p > 0.14)$. The sampling distribution for a proportion will be approximately normal as long as both $n\pi$ and $n(1 - \pi)$ are greater than 5. That applies in this case. The standard deviation for the sampling distribution is given by $\sqrt{\frac{\pi(1 - \pi)}{n}}$. Thus, to find the probability, we standardize the sample proportion as follows:

$$z = \frac{p - \pi}{\sqrt{\frac{\pi(1 - \pi)}{n}}} = \frac{.14 - .10}{\sqrt{\frac{.10(.90)}{100}}} = 1.33.$$

Then we can go to the standard normal table for $z = 1.33$. We get 0.4082. Subtracting this form 0.5000,

we get 0.0918, which is the probability we are looking for.

14) TRUE

15) FALSE

16) FALSE

17) TRUE

18) TRUE

19) TRUE

20) TRUE