1) We have created a 95% confidence interval for $\mu$ with the result (0.56, 3.44). What conclusion will we make if we test $H_0: \mu = 0.1$ versus $H_1: \mu \neq 0.1$ at $\alpha = 0.05$?
   A) Fail to reject $H_0$  B) Accept $H_0$  C) Reject $H_0$  D) None

2) If, as a result of a hypothesis test, we reject the null hypothesis when it is true, then we have committed
   A) a Type II error.  B) no error.  C) a Type I error.  D) an error.

3) A major department store chain is interested in estimating the average amount its credit card customers spent on their first visit to the chain's new store in the mall. Fifteen credit card accounts were randomly sampled and analyzed with the following results: $\bar{X} = 50.50$ and $s^2 = 400$. Construct a 90% confidence interval for the mean.
   A) $50.50 \pm 6.92$  B) $50.50 \pm 9.10$  C) $50.50 \pm 13.55$  D) $50.50 \pm 11.08$

4) A university dean is interested in determining the proportion of students who receive some sort of financial aid. Rather than examine the records for all students, the dean randomly selects 200 students and finds that 118 of them are receiving financial aid. Use a 95% confidence interval to estimate the true proportion of students who receive financial aid.
   A) 0.57 ± 0.059  B) 0.59 ± 0.070  C) 0.59 ± 0.057  D) 0.45 ± 0.033

5) A university dean is interested in determining the proportion of students who receive some sort of financial aid. The dean randomly selects 200 students and finds that 118 of them are receiving financial aid. The 90% confidence interval for $p$ is 0.59 ± 0.057. Interpret this interval.
   A) We are 95% confident that 59% of the students are on some sort of financial aid.
   B) 95% of the students get between 53% and 65% of their tuition paid for by financial aid.
   C) We are 95% confident that the true proportion of all students receiving financial aid is between 0.53 and 0.65.
   D) We are 95% confident that between 53% and 65% of the sampled students receive some sort of financial aid.

Question 6–9: The weight of apples is normally distributed with a mean of 7 ounces and a standard deviation of 2 ounces. A random sample of 30 apples is taken and put in a box.

6) What is the standard error for the sample mean (average weight of apples in a box)?
   A) 0.365  B) 0.200  C) 0.500  D) 0.067

7) What is the probability that the sample mean will be between 6.5 ounces and 7 ounces?
   A) 0.0853  B) 0.5000  C) 0.4147  D) 0.1370

8) What is the probability that the sample mean will be above 8 ounces?
   A) 0.0500  B) 0.2740  C) 0.9969  D) 0.0031

9) Below what value do 35.2% of the sample means fall?
   A) 7.1387  B) 6.8613  C) 7.5012  D) 6.4998

A quality control engineer is interested in the mean length of sheet insulation being cut automatically by machine. It is known that the standard deviation in the cutting length is 0.15 feet. A sample of 70 cut sheets yields a mean length of 12.14 feet. Construct a 99% confidence interval for the mean length cut by machine.

10) the confidence interval goes from ________ to ________.
    A) 12.09 to 12.19  B) 12.00 to 12.50  C) 11.75 to 12.25  D) 11.34 to 12.76
Question 11-13: The owner of a local nightclub has recently surveyed a random sampled of 144 customers of the club with \( \bar{X} = 30.45\), \( s = 4\). She would like to determine whether or not the mean age of her customers is over 30.

11) Give the null and alternative hypotheses.
   A) \( H_0: \bar{X} = 30 \) and \( H_1: \bar{X} \neq 30 \)
   B) \( H_0: \mu \geq 30 \) and \( H_1: \mu < 30 \)
   C) \( H_0: \mu \leq 30 \) and \( H_1: \mu > 30 \)
   D) \( H_0: \bar{X} \leq 30 \) and \( H_1: \bar{X} > 30 \)

12) Using the sample information provided, calculate the value of the test statistic.
   A) \( t = (30 - 30.45) / (4/12) \)
   B) \( t = (30.45 - 30) / 4 \)
   C) \( t = (30 - 30.45) / (4/12^2) \)
   D) \( t = (30.45 - 30) / (4/12) \)

13) Suppose \( \alpha = 0.01 \). Which of the following is correct?
   A) At \( \alpha = 0.01 \), we accept \( H_1 \).
   B) At \( \alpha = 0.01 \), we reject \( H_0 \).
   C) At \( \alpha = 0.01 \), we fail to reject \( H_0 \).
   D) No decision should be made.

Question 14-16: A major videocassette rental chain is considering opening a new store in an area that currently does not have any such stores. The chain will open if there is evidence that more than 20% of the households in the area are equipped with videocassette recorders (VCRs). It conducts a telephone poll of 250 randomly selected households in the area and finds that 65 have VCRs.

14) State the test of interest to the rental chain.
   A) \( H_0: p \leq 0.2 \) versus \( H_1: p > 0.2 \)
   B) \( H_0: p \leq 0.26 \) versus \( H_1: p > 0.26 \)
   C) \( H_0: m \leq 0.2 \) versus \( H_1: m > 0.2 \)
   D) \( H_0: p \leq 0.02 \) versus \( H_1: p > 0.02 \)

15) The \( p \)-value associated with the test statistic in this problem is approximately equal to
   A) 0.0250
   B) 0.9911
   C) 0.0089
   D) 0.0178

16) The decision on the hypothesis test using a 1% level of significance is
   A) no decision should be made
   B) to accept \( H_0 \)
   C) to fail to reject \( H_0 \)
   D) to reject \( H_0 \)

Question 17-19: A real estate company is interested in testing whether, on average, families in Gotham have been living in their current homes for less time than families in Metropolis have. A random sample of 50 families from Gotham and a random sample of 70 families in Metropolis yield the following data on length of residence in current homes.

Gotham: \( \bar{X}_G = 24 \) months, \( s^2_G = 400 \)
Metropolis: \( \bar{X}_M = 33 \) months, \( s^2_M = 550 \)

17) Which of the following represents the relevant hypotheses tested by the real estate company?
   A) \( H_0: \mu_G - \mu_M \geq 0 \) versus \( H_1: \mu_G - \mu_M < 0 \)
   B) \( H_0: \mu_G - \mu_M \leq 0 \) versus \( H_1: \mu_G - \mu_M > 0 \)
   C) \( H_0: \bar{X}_G - \bar{X}_M \geq 0 \) versus \( H_1: \bar{X}_G - \bar{X}_M < 0 \)
   D) \( H_0: \mu_G - \mu_M = 0 \) versus \( H_1: \mu_G - \mu_M \neq 0 \)

18) What is the value of test statistic?
   A) \( t = -1.65 \)
   B) \( t = -2.20 \)
   C) \( t = -3.59 \)
   D) \( t = 2.52 \)

19) Suppose \( \alpha = 0.05 \). Which of the following represents the result of the relevant hypothesis test (using \( n=120 \))?
   A) fail to reject \( H_0 \)
   B) no decision.
   C) reject \( H_0 \)
   D) reject \( H_1 \)

20) When testing \( H_0: \mu_1 - \mu_2 = 0 \) versus \( H_1: \mu_1 - \mu_2 \neq 0 \), the test statistic was found to be \( -1.65 \). Suppose \( \alpha = 0.05 \), which of the following is correct?
   A) we fail to reject \( H_0 \)
   B) we reject \( H_0 \)
   C) no decision should be made
   D) we fail to reject \( H_1 \)
Question 21-22: A buyer for a manufacturing plant suspects that his primary supplier of raw materials is overcharging. To determine if his suspicion is correct, he contacts a second supplier and asks for the prices. He wants to compare these prices with those of his primary supplier:

<table>
<thead>
<tr>
<th>Material</th>
<th>Primary Supplier</th>
<th>Secondary Supplier</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$55</td>
<td>$45</td>
<td>$10</td>
</tr>
<tr>
<td>2</td>
<td>$48</td>
<td>$47</td>
<td>$1</td>
</tr>
<tr>
<td>3</td>
<td>$31</td>
<td>$32</td>
<td>-$1</td>
</tr>
<tr>
<td>4</td>
<td>$83</td>
<td>$77</td>
<td>$6</td>
</tr>
<tr>
<td>5</td>
<td>$37</td>
<td>$37</td>
<td>$0</td>
</tr>
<tr>
<td>6</td>
<td>$55</td>
<td>$54</td>
<td>$1</td>
</tr>
</tbody>
</table>

mean: $2.83  standard deviation: $4.26

21) the hypotheses that the buyer should test are:
   A) $H_0 : \mu_D \leq 0; \ H_1 : \mu_D > 0$
   B) $H_0 : \mu_D \leq 0; \ H_1 : \mu_D < 0$
   C) $H_0 : \mu_D \geq 0; \ H_1 : \mu_D < 0$
   D) $H_0 : \mu_D = 0; \ H_1 : \mu_D \neq 0$

22) Suppose $\alpha = 0.1$. Which of the following represents the result of the relevant hypothesis test?
   A) fail to reject $H_0$
   B) reject $H_0$
   C) no decision
   D) reject $H_1$

Question 23-25: A corporation randomly selects 100 salespeople and finds that 70 salespeople would like to take a self-improvement course. The firm did a similar study 10 years ago in which 61 salespeople out of a random sample of 120 salespeople wanted a self-improvement course. The groups are assumed to be independent random samples. Let $p_1$ and $p_2$ represent the true proportion of workers who would like to attend a self-improvement course in the recent study and the past study, respectively.

23) If the firm wanted to test if this proportion has changed from the previous study, which represents hypotheses?
   A) $H_0: p_1 - p_2 = 0$ versus $H_1: p_1 - p_2 \neq 0$
   B) $H_0: p_1 - p_2 \leq 0$ versus $H_1: p_1 - p_2 > 0$
   C) $H_0: p_1 - p_2 \neq 0$ versus $H_1: p_1 - p_2 = 0$
   D) $H_0: p_1 - p_2 \geq 0$ versus $H_1: p_1 - p_2 < 0$

24) What is the value of the test statistic?
   A) 1.267
   B) 3.251
   C) 1.934
   D) 2.884

25) The company tests to determine at the 0.05 level whether the population proportion has changed from the previous study. Which of the following is most correct?
   A) Reject the null hypothesis and conclude that the proportion of employees who are interested in a self-improvement course has not changed over the intervening 10 years.
   B) fail to reject the null hypothesis, there is not enough evidence to conclude that the proportion of employees who are interested in a self-improvement course has changed over the intervening 10 years.
   C) Reject the null hypothesis and conclude that the proportion of employees who are interested in a self-improvement course has changed over the intervening 10 years.
   D) fail to reject the null hypothesis, there is not enough evidence to conclude that the proportion of employees who are interested in a self-improvement course has not changed over the intervening 10 years.
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) C
2) C
3) B
4) B
5) C
6) A
7) C
8) D
9) B
10) A
11) C
12) D
13) C
14) A
15) C
16) D
17) A
18) B
19) C
20) A
21) A
22) B
23) A
24) D
25) C