1. (3 points) A production line operation is designed to fill cartons with laundry detergent to a mean weight of 32 ounces. A sample of cartons is periodically selected and weighed to determine whether underfilling or overfilling is occurring. If the sample data lead to a conclusion of underfilling or overfilling, the production line will be shut down and adjusted to obtain proper filling.
   a. Formulate the null and alternative hypotheses that will help in deciding whether to shut down and adjust the production line.
   b. Comment on the conclusion and the decision when $H_0$ cannot be rejected
   c. Comment on the conclusion and the decision when $H_0$ can be rejected

2. (3 points) Carpetland salespersons average $8000 per week in sales. Steve Contois, the firm’s vice president, proposes a compensation plan with new selling incentives. Steve hopes that the results of a trial selling period will enable him to conclude that the compensation plan increases the average sales per salesperson.
   a. Develop the appropriate null and alternative hypotheses
   b. What is the Type I error in this situation? What are the consequences of making this error?
   c. What is the Type II error in this situation? What are the consequences of making this error?

3. (4 points) Consider the following hypothesis test:

   \[ H_0: \mu \geq 20 \]
   \[ H_a: \mu < 20 \]

   A sample of 50 provided a sample mean of 19.4. The population standard deviation is 2.
   a. Compute the value of the test statistic
   b. What is the p-value
   c. Using $\alpha = .05$, what is your conclusion?
   d. What is the rejection rule using the critical value. What is your conclusion?
4. (5 points) The mean length of a work week for the population of workers was reported to be 39.2 hours. Suppose that we would like to take a current sample of workers to see whether the mean length of a work week has changed from the previously reported 39.2 hours.
   a. State the hypotheses that will help us determine whether a change occurred in the mean length of a work week.
   b. Suppose a current sample of 112 workers provided a sample mean of 38.5 hours. Use a population standard deviation $\sigma = 4.8$ hours. What is the p-value?
   c. At $\alpha = 0.5$ can the null hypothesis be rejected? What is your conclusion?
   d. Repeat the preceding hypothesis test using the critical value approach.

5. (5 points) The cost of a one-carat VS2 clarity, H color diamond from Diamond Source USA is $5,600. A Midwestern jeweler makes calls to contacts in the diamond district of New York City to see whether the mean price of diamonds there differs from $5,600.
   a. Formulate hypotheses that can be used to determine whether the mean price in New York City differs from $5,600.
   b. Assume that a sample of 25 New Your City contacts provided a sample mean price of $5,835 and a sample standard deviation of $520. What is the p-value?
   c. At $\alpha = 0.05$, can the null hypothesis be rejected? What is your conclusion?
   d. Repeat the preceding hypothesis test using the critical value approach.

6. (3 points) The Heldrich Center for Workforce Development found that 40% of Internet users received more than 10 email messages per day. A similar study on the use of email was repeated in 2002.
   a. Formulate the hypotheses that can be used to determine whether the proportion of Internet users receiving more than 10 email messages per day increased.
   b. If a sample of 425 Internet users found 189 receiving more than 10 email messages per day, what is the p-value?
   c. At $\alpha = 0.05$, what is your conclusion?

7. (3 points) Consider the following hypothesis test.

\[ H_0: \mu = 20 \]
\[ H_a: \mu \neq 20 \]

A sample of 200 items will be taken and the population standard deviation is 10. Use $\alpha = 0.05$. Compute the probability of making a Type II error if the population mean is
   a. $\mu = 18.0$
   b. $\mu = 22.5$
   c. $\mu = 21.0$
8. (3 points) A Cornell University study of wage differentials between men and women reported that one of the reasons wages for men are higher than wages for women is that men tend to have more years of work experience than women. Assume the following sample summaries show the years of experience for each group.

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>100</td>
<td>85</td>
</tr>
<tr>
<td>\bar{x}</td>
<td>14.9 years</td>
<td>10.3 years</td>
</tr>
<tr>
<td>\sigma</td>
<td>5.2 years</td>
<td>3.8 years</td>
</tr>
</tbody>
</table>

a. What is the point estimate of the difference between the two population means?
b. At 95% confidence, what is the margin of error?
c. What is the 95% confidence interval estimate of the difference between the two population means?

9. (4 points) Periodically, Merrill Lynch customers are asked to evaluate Merrill Lynch financial consultants and services. Higher ratings on the client satisfaction survey indicate better service with 7 the maximum service rating. Independent samples of service ratings for two financial consultants are summarized here. Consultant A has 10 years of experience while consultant B has 1 year of experience. Use \( \alpha = 0.05 \) and test to see whether the consultant with more experience has the higher population mean service rating.

<table>
<thead>
<tr>
<th>Consultant A</th>
<th>Consultant B</th>
</tr>
</thead>
<tbody>
<tr>
<td>n_1 = 16</td>
<td>n_2 = 10</td>
</tr>
<tr>
<td>\bar{x}_1 = 6.82</td>
<td>\bar{x}_2 = 6.25</td>
</tr>
<tr>
<td>S_1 = .64</td>
<td>S_2 = .75</td>
</tr>
</tbody>
</table>

a. State the null and alternative hypotheses.
b. Compute the value of the test statistic.
c. What is the p-value?
d. What is your conclusion?

10. (2 points) The cost of transportation from the airport to the downtown area depends on the method of transportation. One-way costs for taxi and shuttle bus transportation for a sample of 10 major cities follow. Provide a 95% confidence interval for the mean cost increase associated with taxi transportation.

<table>
<thead>
<tr>
<th>City</th>
<th>Taxi($)</th>
<th>Shuttle Bus($)</th>
<th>City</th>
<th>Taxi($)</th>
<th>Shuttle Bus($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlanta</td>
<td>15.00</td>
<td>7.00</td>
<td>Minneapolis</td>
<td>16.50</td>
<td>7.50</td>
</tr>
<tr>
<td>Chicago</td>
<td>22.00</td>
<td>12.50</td>
<td>New Orleans</td>
<td>18.00</td>
<td>7.00</td>
</tr>
<tr>
<td>Denver</td>
<td>11.00</td>
<td>5.00</td>
<td>New York</td>
<td>16.00</td>
<td>8.50</td>
</tr>
<tr>
<td>Houston</td>
<td>15.00</td>
<td>4.50</td>
<td>Philadelphia</td>
<td>20.00</td>
<td>8.00</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>26.00</td>
<td>11.00</td>
<td>Washington</td>
<td>10.00</td>
<td>5.00</td>
</tr>
</tbody>
</table>