Duke Energy reported that the cost of electricity for an efficient home in a particular neighborhood of Cincinnati, Ohio was $104 per month (Home Energy Report, Duke Energy, March, 2012). A researcher believes that the cost of electricity for a comparable neighborhood in Chicago, Illinois is higher. A sample of homes in this Chicago neighborhood will be taken and the sample mean monthly cost of electricity will be used to test the following null and alternative hypotheses.

\[ H_0 : \mu \leq 104 \]
\[ H_a : \mu > 104 \]

a. Assume the sample data lead to rejection of the null hypothesis. What would be your conclusion about the cost of electricity in the Chicago neighborhood?

The input in the box below will not be graded, but may be reviewed and considered by your instructor.

_________________

b. What is the Type I error in this situation?

The Type I error is ________________ \( H_0 \) when it is ________________ .

What are the consequences of making this error?

The input in the box below will not be graded, but may be reviewed and considered by your instructor.

_________________

c. What is the Type II error in this situation?

The Type II error is ________________ \( H_0 \) when it is ________________ .

What are the consequences of making this error?

The input in the box below will not be graded, but may be reviewed and considered by your instructor.

_________________
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.
\[ H_0: \mu \] _______________
\[ H_A: \mu \] _______________

b. In this situation, a Type I error would occur if it was concluded that the new compensation plan provides a population mean weekly sales _______________ when in fact it does not.

c. In this situation, a Type II error would occur if it was concluded that the new compensation plan provides a population mean weekly sales _______________ when in fact it does not.
Exercise 9.17

The mean hourly wage for employees in goods-producing industries is currently $24.57 (Bureau of Labor Statistics website, April 12, 2012). Suppose we take a sample of employees from the manufacturing industry to see if the mean hourly wage differs from the reported mean of $24.57 for the goods-producing industries.

a. State the null hypotheses we should use to test whether the population mean hourly wage in the manufacturing industry differs from the population mean hourly wage in the goods-producing industries.

1. \( H_0: \mu = 24.57 \)
2. \( H_0: \mu \neq 24.57 \)
3. \( H_0: \mu > 24.57 \)

Choose correct answer from above choice

b. Suppose a sample of 30 employees from the manufacturing industry showed a sample mean of $23.89 per hour. Assume a population standard deviation of $2.40 per hour and compute the \( p \)-value. Round your answer to four decimal places.


c. With \( \alpha = 0.05 \) as the level of significance, what is your conclusion?

The input in the box below will not be graded, but may be reviewed and considered by your instructor.


d. Repeat the preceding hypothesis test using the critical value approach. Round your answer to two decimal places. Enter negative values as negative numbers.
4. 

{Exercise 9.31}

The Coca-Cola Company reported that the mean per capita annual sales of its beverages in the United States was 423 eight-ounce servings (Coca-Cola Company website, February 3, 2009). Suppose you are curious whether the consumption of Coca-Cola beverages is higher in Atlanta, Georgia, the location of Coca-Cola's corporate headquarters. A sample of 36 individuals from the Atlanta area showed a sample mean annual consumption of 460.4 eight-ounce servings with a standard deviation of $s = 101.9$ ounces. Using $\alpha = .05$, do the sample results support the conclusion that mean annual consumption of Coca-Cola beverage products is higher in Atlanta?

a. Define the hypotheses that include selecting the sign of the null hypothesis and the alternative hypothesis and the numeric value.

$$H_0: \mu = \ldots$$

$$H_a: \mu = \ldots$$

b. Calculate $t$. Round your answer to 2 decimal places.

$c$. Identify the degrees of freedom.

$d$. Determine the Exact $p$-value. Round your answer to 4 decimal places.

$e$. Reject or Do Not Reject he null hypothesis.
Many investors and financial analysts believe the Dow Jones Industrial Average (DJIA) provides a good barometer of the overall stock market. On January 31, 2006, 9 of the 30 stocks making up the DJIA increased in price (The Wall Street Journal, February 1, 2006). On the basis of this fact, a financial analyst claims we can assume that 30% of the stocks traded on the New York Stock Exchange (NYSE) went up the same day.

a. Formulate null and alternative hypotheses to test the analyst's claim.

\[ H_0: p \] _______________
\[ H_a: p \] _______________

b. A sample of 50 stocks traded on the NYSE that day showed that 24 went up. What is your point estimate of the population proportion of stocks that went up (to 2 decimals)?

_____ 

c. Conduct your hypothesis test using \( \alpha = .01 \) as the level of significance.

Calculate the value of the test statistic (to 2 decimals).

_____

What is the \( p \)-value (to 4 decimals)?

_____

Can you conclude that the proportion of stocks going up is not .30?

_____________
6. {Exercise 9.47}

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 \( \sigma = 10 \). Use \( \alpha = .05 \). Compute the probability of making a Type II error using the population means shown below (to 4 decimals).

a. \( \mu = 18.0 \)

______

b. \( \mu = 22.5 \)

______

c. \( \mu = 21.0 \)

______

7. {Exercise 9.51 (Algorithmic)}

A production line operation is tested for filling weight accuracy using the following hypotheses.

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Conclusion and Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>( H_0: \mu = 16 )</td>
<td>Filling okay, keep running</td>
</tr>
<tr>
<td>( H_A: \mu \neq 16 )</td>
<td>Filling off standard; stop and adjust machine</td>
</tr>
</tbody>
</table>

The sample size is 32 and the population standard deviation is \( \sigma = 0.9 \). Use \( \alpha = .05 \).

a. What would a Type II error mean in this situation?

_________________

b. What is the probability of making a Type II error when the machine is overfilling by .5 ounces (to 4 decimals)?

______

c. What is the power of the statistical test when the machine is overfilling by .5 ounces (to 4 decimals)?

______

d. What information does the power curve contain for the production manager?

_________________
8.

{Exercise 9.55}

Consider the following hypothesis test.

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

The population standard deviation is 10. Use \( \alpha = 0.05 \). How large a sample should be taken if the researcher is willing to accept a 0.05 probability of making a Type II error when the actual population mean is 22 (to the nearest whole number)?

_______

9.

{Exercise 9.57}

A special industrial battery must have a life of at least 300 hours. A hypothesis test is to be conducted with a 0.04 level of significance. If the batteries from a particular production run have an actual mean use life of 285 hours, the production manager wants a sampling procedure that only 10% of the time would show erroneously that the batch is acceptable. What sample size is recommended for the hypothesis test? Use 30 hours as an estimate of the population standard deviation.

_______