ASSIGNMENT #1
DUE DATE: February 03, 2004 [in class]
(Chapter 2)

1. To decide whether the growth of trees has been retarded by a drought, a farmer decides to take a sample of heights of 25 trees and obtains the following results (recorded in inches):

   50  54  63  57  75  64  51  58  73  62  60  49  55
   44  52  69  59  67  48  55  46  58  55  62  60

   The minimum and the maximum values are underlined.

   (a) Using an appropriate lower boundary for the first class and a class size of 4 (i.e. let $k = 4$), construct a frequency table for the given data.
   (b) Calculate the relative frequency of each class interval.
   (c) Plot the relative frequency histogram.
   (d) What proportion of the measurements are less than 60?
   (e) How many of the measurements lie between (both inclusive) 51 and 67?
   (f) What percentage of the measurements are at least 51?
   (g) How does the histogram describe the data set?

2. A random sample of twelve households in a particular viewing area produced the following estimates of television viewing hours per household.

   3.0  6.0  7.0  15.0  6.5  12.0  8.0  4.0  5.5  6.0  5.0  12.0

   (a) Calculate the sample mean, median, and mode.
   (b) Calculate the sample variance and hence the sample standard deviation.
   (c) Calculate the sample range.
   (d) What proportion of the measurements lie between (both end points inclusive) one standard deviation of the mean? Compare your result with the Empirical Rule.

3.
   (a) When is the median preferred to the mean as a measure of location?
   (b) Will the median of a data set always be equal to an actual value in the data set? Justify your answer.
   (c) Explain why the mode is often an unacceptable measure of location for quantitative data sets.
1. In a business community, the probability that a resident reads *Time* is 0.70, the probability that a resident reads *Newsweek* is 0.40, and the probability that a resident reads both is 0.30. Let $T$ = “reads *Time*” and $N$ = “reads *Newsweek*”.
   (a) What is the probability that a resident reads at least one of the two magazines?
   (b) What is the probability that a resident reads neither magazine?
   (c) What is the probability that a resident reads *Time* but not *Newsweek*?
   (d) Given that a resident is selected at random, and it turns out that she/he reads *Time*, what is the probability that she/he does not read *Newsweek*?
   (e) If a resident is selected at random, and it turns out that she/he does not read *Time*, what is the probability that she/he reads *Newsweek*?
   (f) What is the probability that a resident reads exactly one of the two magazines?

2. Suppose $A$ and $B$ are two independent events on a sample space $S$ such that $P(A) = 0.60$, $P(B) = 0.45$. Find $P(A \cup B)$.

3. Suppose you randomly select a family with three children. Assume that births of boys and girls are equally likely.
   (a) What is the probability that the family has three girls?
   (b) What is the probability that the family has two boys and a girl?
   (c) What is the probability that the family has a girl, a boy, and a boy, in those order?
   (d) What is the probability that the family has at least one girl?
   (e) What is the probability that the family has at least two boys?
   (f) Suppose the probability of a boy is 0.4, what is the probability of no boys?
ASSIGNMENT #3  
DUE DATE: March 18, 2004  
(Chapter 4)

1. In a marketing department, the following table shows the probability distribution of \( X \), the number of long-distance telephone calls made during a one-hour period.

<table>
<thead>
<tr>
<th>( x )</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>( p(x) )</td>
<td>.33</td>
<td>.28</td>
<td>.15</td>
<td>.10</td>
<td>.08</td>
<td>.06</td>
</tr>
</tbody>
</table>

(a) Compute the following probabilities:

- (i) \( P(X \geq 4) \)
- (ii) \( P(1 < X \leq 4) \)
- (iii) \( P(3X^2 + 2 < 15) \)
- (iv) \( P(\sqrt{X} + 2.5 \geq 4) \)

(b) Compute \( E(X) \)

(c) Find the variance and hence the standard deviation of \( X \).

(d) Find the proportion of \( X \) that lies between (both end points inclusive) one standard deviation of the mean.

(e) Compare your result in (d) with the Empirical rule, which states that 68% will lie within one standard deviation of the mean.

(f) If each telephone call costs $5 irrespective of how long, what is the expected cost of telephone calls during a one-hour period to the marketing department?

2. On the day a poll is conducted, 40% of the registered voters in a district plan to vote for candidate A. Suppose 6 randomly selected registered voters are taken and \( X \) represent the number that will vote for candidate A.

(a) Find the probability that \( X \) is exactly 2.

(b) Find the probability that \( X \) is at most 2.

(c) Find the probability that \( X \) lies between 2 and 4, both points inclusive.

(d) Find the probability that \( X \) is at least 5.

(e) On the average, how many of the 6 voters will vote for candidate A?

(f) If 250 registered voters in the district are considered, how many will vote for candidate A?

(g) Find the standard deviation of \( X \) and explain it’s significance.

(h) Which number of registered voters is most likely to vote for candidate A? Choose one number from the list of \( X = 0, 1, 2, 3, 4, 5, 6 \).
ASSIGNMENT #4
DUE DATE: April 01, 2004
(Chapters 4 and 5)

1. A random sample of size 121 is taken from a population with mean \( \mu = 150 \) and standard deviation \( \sigma = 44 \). The shape of the population is not normal.

(a) By the Central Limit Theorem:
   (i) Name the sampling distribution of \( \bar{X} \).
   (ii) Is the distribution in (i) exact or approximate? Justify your answer.
   (iii) What is the mean of \( \bar{X} \)?
   (iv) What is the standard deviation of \( \bar{X} \)?

(b) What is the probability that
   (i) \( \bar{X} \) will exceed 147.0?
   (ii) \( \bar{X} \) will be less than 154.2?
   (iii) \( \bar{X} \) will fall between 146.0 and 157.0?
   (iv) \( \bar{X} \) will be exactly equal to 152.5?

2. In a laboratory test, a random sample of 36 chicken eggs was found to have a mean amount of cholesterol \( \bar{x} = 230 \) milligrams with a standard deviation \( s = 21 \) milligrams.

(a) Find a point estimate for \( \mu \).
(b) Find the standard error of your point estimate in (a).
(c) Construct a 95% confidence interval for \( \mu \).
(d) Explain the meaning of the confidence interval in (c).
(e) Find a point estimate for the population variance \( \sigma^2 \).

3. In order to estimate the proportion of households that use available recycling facilities in one major city, a random sample of 350 households was selected, and 252 were found to use available recycling facilities.

(a) Find a point estimate for the population proportion \( p \).
(b) Find the standard error of your estimate in (a).
(c) Construct a 97% confidence interval for the population proportion \( p \).
(d) Interpret your result in (b).
(e) Explain the meaning of the confidence interval in (c).
(f) Suppose you wish to reduce the width of the confidence interval in (c). Suggest two ways by which the width of the confidence interval can be reduced.
ASSIGNMENT #5  
DUE DATE: April 22, 2004  
(Chapter 6)

1. A resident of a small community claims that the mean selling time of a residential home exceeds 40 days after it is listed with a real estate company. A random sample of 50 recently sold residential homes shows that \( \bar{x} = 46 \) days and \( s = 20 \) days. We wish to test the resident's claim at \( \alpha = 0.025 \) level of significance.
   
   (a) Formulate the null and the alternative hypotheses in terms of \( \mu \).
   
   (b) State the test statistic.
   
   (c) State the rejection region.
   
   (d) Obtain the value of the test statistic and make an appropriate decision.
   
   (e) Give an appropriate conclusion in terms of the original problem.
   
   (f) Is there a sufficient evidence at \( \alpha = 0.025 \) to refute the resident's claim? Explain.
   
   (g) Suppose the sample size in the problem is 9, what effect(s) if any, would this have on your answers to parts (b) and (c)?

2. The security department of a factory wants to test the claim that the true average time required by the night watchman to walk his round is less than 25 minutes. In a random sample of 16 rounds, the night watchman averaged 24.2 minutes with a standard deviation of 1.5 minutes.

   (a) Formulate the null and the alternative hypotheses in terms of the population mean.
   
   (b) State the test statistic.
   
   (c) State the rejection region corresponding to \( \alpha = 0.05 \).
   
   (d) Obtain the value of the test statistic and make an appropriate decision.
   
   (e) State your conclusion in terms of the original problem.

3. A producer of frozen orange juice claims that more than 54% of all orange juice drinkers prefer its product. To test the validity of this claim, a competitor samples 200 orange-juice drinkers and finds that 116 prefer the producer’s brand. Use the 5-step procedure to carry out the test at \( \alpha = 0.01 \).