

d. What percentage of the team is at least 5 ft 6 in tall?

2.12 A survey of 100 resort club managers on their annual salaries resulted in the following frequency distribution:

Annual Salary (\$1,000s)	15–25	25–35	35–45	45–55	55–65
No. of Managers	12	37	26	19	6

- The data value "35" belongs to which class?
- Explain the meaning of "35–45."
- Explain what "class width" is, give its value, and describe three ways that it can be determined.
- Draw a frequency histogram of the annual salaries for resort club managers. Label class boundaries.

2.13 During the Spring 2009 semester, 200 students took a statistics test from a particular instructor. The resulting grades are given in the following table.

Test Grades	Number
50–60	13
60–70	44
70–80	74
80–90	59
90–100	9
100–110	1
Total	200

- What is the class width?
- Draw and completely label a frequency histogram of the statistics test grades.
- Draw and completely label a relative frequency histogram of the statistics test grades.
- Carefully examine the two histograms in parts (b) and (c), and explain why one of them might be more useful to a student and to the instructor.

2.14 The speeds of 55 cars were measured by a radar device on a city street:

23	22	38	43	24	35	26	28	18	20	
25	23	22	52	31	30	41	45	29	27	43
28	28	27	25	29	28	24	37	28	29	18
28	33	25	27	25	34	32	36	22	32	33
21	23	24	18	48	23	16	38	26	21	23

- Classify these data into a grouped frequency distribution by using class boundaries 12–18, 18–24, ..., 48–54.
- Find the class width.
- For the class 24–30, find the class midpoint, the lower class boundary, and the upper class boundary.
- Construct a frequency histogram of these data.

2.15 A survey of 100 resort club managers on their annual salaries resulted in the following frequency distribution.

Annual Salary (\$1,000s)	15–25	25–35	35–45	45–55	55–65
No. of Managers	12	37	26	19	6

- Prepare a cumulative frequency distribution for the annual salaries.

- Prepare a cumulative relative frequency distribution for the annual salaries.
- Construct an ogive for the cumulative relative frequency distribution found in part (b).
- What value bounds the cumulative relative frequency of 0.75?
- 75% of the annual salaries are below what value? Explain the relationship between (d) and (e).

Objective 2.3

*2.12 The cost for taking your pet aboard a flight with you in the continental United States varies according to airline. The prices charged by 14 of the major U.S. airlines in June 2009 were (in dollars):

69	100	100	100	125	150	100	60	100	125	75	100	125	100
----	-----	-----	-----	-----	-----	-----	----	-----	-----	----	-----	-----	-----

Find the mean cost for flying your pet with you.

2.13 For those 7th graders with cell phones, the number of programmed numbers in their phones were:

100	37	12	20	53	10	20	50	35	30
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- Find the mean number of programmed numbers on a 7th grader's cell phone.
 - Find the median number of programmed numbers on a 7th grader's cell phone.
 - Explain the difference in values of the mean and median.
 - Remove the most extreme value and answer (a) through (c) again.
 - Did removing the extreme value have more of an effect on the mean or median? Explain why.
- 2.14 The number of cars owned per apartment in a sample of tenants in a large complex is 1, 2, 1, 2, 2, 2, 1, 2, 3, 2. What is the mode?
- 2.15 Each year around 160 colleges compete in the American Society of Civil Engineer's National Concrete Canoe Competition. Each team must design a seaworthy canoe from concrete, a substance not known for its capacity to float. The canoes must weigh between 100 and 350 pounds. When last year's entries weighed in, the weights ranged from 138 to 349 pounds.
- Find the midrange.
 - The information given contains 4 weight values, explain why you did use two of them in (a) and did not use the other two.
- 2.16. Consider the sample 2, 4, 7, 8, 9. Find the following:
- mean, \bar{x}
 - median, \tilde{x}
 - mode
 - midrange

Objective 2.4

- 2.17 a. The data value $x = 45$ has a deviation value of 12. Explain the meaning of this.
- b. The data value $x = 84$ has a deviation value of -20 . Explain the meaning of this.

2.18 All measures of variation are nonnegative in value for all sets of data.

- What does it mean for a value to be "nonnegative"?
- Describe the conditions necessary for a measure of variation to have the value zero.
- Describe the conditions necessary for a measure of variation to have a positive value.

2.19 Consider the sample 2, 4, 7, 8, 9. Find the following:

- Range
- Variance s^2 , using formula (2.5)
- Standard deviation, s

2.20 Fifteen randomly selected college students were asked to state the number of hours they slept the previous night. The resulting data are 5, 6, 6, 8, 7, 7, 9, 5, 4, 8, 11, 6, 7, 8, 7. Find the following:

- Variance s^2 , using formula (2.5)
- Variance s^2 , using formula (2.9)
- Standard deviation, s

2.21 Consider the following two sets of data:

Set 1	45	80	50	45	30
Set 2	30	80	35	30	75

Both sets have the same mean, which is 50. Compare these measures for both sets: $\Sigma(x - \bar{x})$, $SS(x)$, and range. Comment on the meaning of these comparisons relative to the distribution.

2.22 Comment on the statement: "The mean loss for customers at First State Bank (which was not insured) was \$150. The standard deviation of the losses was -\$125."

Objective 2.5

2.23 Refer to the table of exam scores in Table 2.15 on page 43 for the following.

- Using the concept of depth, describe the position of 91 in the set of 50 exam scores in two different ways.
- Find P_{20} and P_{95} for the exam scores in Table 2.15.
- Find P_{80} and P_{95} for the exam scores in Table 2.15.

*2.24 The U.S. Geological Survey collected atmospheric deposition data in the Rocky Mountains. Part of the sampling process was to determine the concentration of ammonium ions (in percentages). Here are the results from the 52 samples:

2.9	4.1	2.7	3.5	1.4	5.6	13.3	3.9	4.0
2.9	7.0	4.2	4.9	4.6	3.5	3.7	3.3	5.7
3.2	4.2	4.4	6.5	3.1	5.2	2.6	2.4	5.2
4.8	4.8	3.9	3.7	2.8	4.8	2.7	4.2	2.9
2.8	3.4	4.0	4.6	3.0	2.3	4.4	3.1	5.5
4.1	4.5	4.6	4.7	3.6	2.6	4.0		

- Find Q_1
- Find Q_2
- Find Q_3
- Find the midquartile
- Find P_{30}
- Find the 5-number summary
- Draw the box-and-whiskers display

2.25 An exam produced grades with a mean score of 74.2 and a standard deviation of 11.5. Find the z-score for each test score x :

- $x = 54$
- $x = 68$
- $x = 79$
- $x = 93$

2.26 A sample has a mean of 120 and a standard deviation of 20.0. Find the value of x that corresponds to each of these standard scores:

- $z = 0.0$
- $z = 1.2$
- $z = -1.4$
- $z = 2.05$

2.27 The ACT Assessment* is designed to assess high school students' general educational development and their ability to complete college-level work. The table lists the mean and standard deviation of scores attained by the 3,908,557 high school students from the 2006 to 2008 graduating classes who took the ACT exams.

2006–2008	English	Mathematics	Reading	Science	Composite
Mean	20.6	21.0	21.4	20.9	21.1
Standard deviation	6.0	5.1	6.1	4.8	4.9

SOURCE: American College Testing

Convert the following ACT test scores to z-scores for both English and Math. Compare placement between the two tests.

- $x = 30$
- $x = 23$
- $x = 12$
- Explain why the relative positions in English and Math changed for the ACT scores of 30 and 12.
- If Jessica had a 26 on one of the ACT exams, on which one of the exams would she have the best possible relative score? Explain why.

Objective 2.6

2.28 The empirical rule indicates that we can expect to find what proportion of the sample included between the following?

- $\bar{x} - s$ and $\bar{x} + s$
- $\bar{x} - 2s$ and $\bar{x} + 2s$
- $\bar{x} - 3s$ and $\bar{x} + 3s$

2.29 The mean lifetime of a certain tire is 30,000 miles and the standard deviation is 2,500 miles.

- If we assume the mileages are normally distributed, approximately what percentage of all such tires will last between 22,500 and 37,500 miles?
- If we assume nothing about the shape of the distribution, approximately what percentage of all such tires will last between 22,500 and 37,500 miles?

2.30 Using the empirical rule, determine the approximate percentage of a normal distribution that is expected to fall within the interval described.

- Less than the mean
- Greater than 1 standard deviation above the mean
- Less than 1 standard deviation above the mean
- Between 1 standard deviation below the mean and 2 standard deviations above the mean

problems

Objective 4.1

- 4.1 If you roll a die 40 times and 9 of the rolls result in a "5," what empirical probability was observed for the event?
- 4.2 A single die is rolled. What is the probability that the number on top is the following?
- A 3
 - An odd number
 - A number less than 5
 - A number greater than 3
- 4.3 Mrs. Gordon wondered if her class was watching too much television on school nights. To find out, she did a quick poll of her seventh graders. Here are her results:

Hours	Number
0	2
1	3
2	2
3	0
4	3
5	2
6	1

- What percentage of the class is not watching television on school nights?
 - What percentage of the class is watching, at most, 2 hours of television on school nights?
 - What percentage of the class is watching at least 4 hours of television on school nights?
- 4.4 The table here shows the average number of births per day in the United States as reported by the CDC.

Day	Number
Sunday	7,563
Monday	11,733
Tuesday	13,001
Wednesday	12,508
Thursday	12,514
Friday	12,396
Saturday	8,605
Total	78,410

Based on this information, what is the probability that one baby identified at random was:

- Born on a Monday?
 - Born on a weekend?
 - Born on a Tuesday or Wednesday?
 - Born on a Wednesday, Thursday, or Friday?
- 4.5 One single-digit number is to be selected randomly.
- List the sample space.
 - What is the probability of each single digit?
 - What is the probability of an even number?
- 4.6 Two dice are rolled. Find the probabilities in parts (b)–(e). Use the sample space and chart representation given on page 76.

- Why is the set $\{2, 3, 4, \dots, 12\}$ not a useful sample space?
 - $P(\text{white die is an odd number})$
 - $P(\text{sum is 6})$
 - $P(\text{both dice show odd numbers})$
 - $P(\text{number on black die is larger than number on white die})$
- 4.7 Let x be the success rating of a new television show. The following table lists the subjective probabilities assigned to each x for a particular new show by three different media critics. Which of these sets of probabilities are inappropriate because they violate a basic rule of probability? Explain.

Success Rating, x	Judge		
	A	B	C
Highly Successful	0.5	0.6	0.3
Successful	0.4	0.5	0.3
Not Successful	0.3	-0.1	0.3

- 4.8 The odds for the Saints winning next year's Super Bowl are 1 to 6.
- What is the probability that the Saints will win next year's Super Bowl?
 - What are the odds against the Saints winning next year's Super Bowl?
- 4.9 Alan Garole, a jockey at Saratoga Race Course had 195 starts between July and September 2008. Of those 195 starts, he finished with 39 first places, 17 second places, and 28 third places. If all the 2008 racing season conditions held for him at the beginning of the 2009 season, what would have been:
- the odds in favor of Alan Garole coming in first place during the 2009 race season at Saratoga?
 - the probability of Alan Garole coming in first place during the 2009 race season at Saratoga?
 - the odds in favor of Alan Garole placing (coming in 1st, 2nd, or 3rd) during the 2009 race season at Saratoga?
 - the probability of Alan Garole placing during the 2009 race season at Saratoga?
 - Based on the above statistics, should you bet for Alan Garole to come in first or to place? Why?
- 4.10 Many young women aspire to become professional athletes. Only a few make it to the big time as indicated in the table.

Student Athletes	Women's Basketball
High School Student Athletes	452,929
High School Senior Student Athletes	129,408
NCAA Student Athletes	15,096
NCAA Freshman Roster Positions	4,313
NCAA Senior Student Athletes	3,355
NCAA Student Athletes Drafted	32

- a. What are the odds in favor of a high school female athlete being drafted by a pro basketball team?
- b. What are the odds against a female basketball player who makes a freshman college roster playing as a senior?
- c. What is the probability of a high school female athlete being drafted by a pro basketball team?
- d. What is the probability of a NCAA senior female athlete being drafted by a pro basketball team?
- 4.11 Classify each of the following as a probability or a statistics problem:
- a. Determining how long it takes to handle a typical telephone inquiry at a real estate office
- b. Determining the length of life for the 100-watt lightbulbs a company produces
- c. Determining the chance that a blue ball will be drawn from a bowl that contains 15 balls, of which 5 are blue
- d. Determining the shearing strength of the rivets that your company just purchased for building airplanes
- e. Determining the chance of getting "doubles" when you roll a pair of dice

Objective 4.2

- 4.12 Three hundred viewers were asked if they were satisfied with TV coverage of a recent disaster.

	Gender	
	Female	Male
Satisfied	80	55
Not Satisfied	120	45

One viewer is to be randomly selected from those surveyed.

- a. Find $P(\text{satisfied})$
- b. Find $P(\text{satisfied} \mid \text{female})$
- c. Find $P(\text{satisfied} \mid \text{male})$
- 4.13 Saturday mornings are busy times at the Webster Aquatic Center. Swim lessons ranging from Red Cross Level 2, Fundamental Aquatic Skills, through Red Cross Level 6, Swimming and Skill Proficiency, are offered during two sessions.

Level	Number of People in 10 A.M. Class	Number of People in 11 A.M. Class
2	12	12
3	15	10
4	8	8
5	2	0
6	2	0

Lauren, the program coordinator, is going to randomly select one swimmer to be interviewed for a local television spot on the center and its swim program. What is the probability that the selected swimmer is in the following?

- a. A Level 3 class

- b. The 10 A.M. class
- c. A level 2 class, given that it is the 10 A.M. session
- d. The 11 A.M. session, given that it is the Level 6 class
- 4.14 During the Spring 2009 semester at Monroe Community College, a random sample of students was questioned on their knowledge of the meaning of "sustainability." The primary motivation for the survey was to investigate how interested students might be in a Sustainability Certificate and to discover the best means of informing them of this option. The following table lists how much 224 students agreed with the statement: "Sustainability is important to me."

Level of agreement with statement "Sustainability is important to me"					
Generation (ages)	Strongly Agree		Strongly Disagree		Total
	Agree	Disagree	Disagree	Agree	
Millennium Y (18–29)	74	109	11	1	195
Generation X (30–44)	14	8	1	0	23
Baby Boomers (45+)	2	3	0	1	6
All Respondents	90	120	12	2	224

SOURCE: Monroe Community College, Sustainability Certificate Survey

Find the probability that a randomly selected student

- a. "strongly agrees" that sustainability is important to her.
- b. is a member of Generation X.
- c. "disagrees" with the importance of sustainability to them given she is a member of the Millennium Y generation.
- d. is a member of the Baby Boomers given that she "agrees" with the importance of sustainability.
- 4.15 In 2007, data from two Youth Risk Behavior Surveys were analyzed to investigate seatbelt use among high school students aged 16 or older. The results were published in the September 2008 issue of *American Journal of Preventive Medicine*. Results (in percents) are included in the table that follows:

Characteristic	Always use when driving		Do not always use when driving	
	Always use when passenger	Do not always use when passenger	Always use when passenger	Do not always use when passenger
Total	38.4	20.6	3.4	37.6
Age (years)				
16	38.2	22.5	3.2	36.1
17	38.1	19.9	3.6	38.4
≥18	39.4	18.4	3.6	38.6

SOURCE: <http://www.ajpm-online.net/>

If one student is selected at random from this population, what is the probability that the student selected:

- a. Always uses a seatbelt when driving and always uses a seatbelt when a passenger?
- b. Always uses a seatbelt when driving but not always when a passenger, given they are 18 or older?

- c. Does not always use a seatbelt when driving and always does when a passenger, knowing they are 16?
- d. Always wears a seatbelt when driving?
- e. Does not always wear a seatbelt when driving and is 17 years old.

Objective 4.3

- 4.16 According to the American Pet Products Association 2007–2008 National Pet Owners Survey, about 63% of all American dog owners—some 60 million—are owners of one dog. Based on this information, find the probability that an American dog owner owns more than one dog.
- 4.17 According to the Sleep Disorder Channel (<http://www.sleepdisorderchannel.com/>), sleep apnea affects 18 million individuals in the United States. The sleep disorder interrupts breathing and can awaken sufferers as often as five times an hour. Many people do not recognize the condition even though it causes loud snoring. Assuming there are 304 million people in the United States, what is the probability that an individual chosen at random will not be affected by sleep apnea?
- 4.18 If $P(A) = 0.4$, $P(B) = 0.5$, and $P(A \text{ and } B) = 0.1$, find $P(A \text{ or } B)$.
- 4.19 Jason attends his high school reunion. Of the attendees, 50% are female. Common knowledge has it that 88% of people are right-handed. Being a left-handed male, Jason knows that of a given crowd, only approximately 6% are left-handed males. If Jason talks to the first person he meets at the reunion, what is the probability that the person is a male or left-handed?
- 4.20 A and B are events defined on a sample space, with $P(A) = 0.7$ and $P(B | A) = 0.4$. Find $P(A \text{ and } B)$.
- 4.21 A and B are events defined on a sample space, with $P(A) = 0.6$ and $P(A \text{ and } B) = 0.3$. Find $P(B | A)$.
- 4.22 Juan lives in a large city and commutes to work daily by subway or by taxi. He takes the subway 80% of the time because it costs less, and he takes a taxi the other 20% of the time. When taking the subway, he arrives at work on time 70% of the time, whereas he makes it on time 90% of the time when traveling by taxi.
- a. What is the probability that Juan took the subway and is at work on time on any given day?
 - b. What is the probability that Juan took a taxi and is at work on time on any given day?
- 4.23 Nobody likes paying taxes, but cheating is not the way to get out of it! It is believed that 10% of all taxpayers intentionally claim some deductions to which they are not entitled. If 9% of all taxpayers both intentionally claim extra deductions and deny doing so when audited, find the probability that a taxpayer who does take extra deductions intentionally will deny it.

- 4.24 If you decide to play the carnival game on page 87, you would like to win the \$5 prize, but what is the probability that you will?
- a. Draw and completely label a tree diagram including the probabilities for all possible drawings.
 - b. What is the probability of drawing a red marble on the second drawing? What additional information is needed to find the probability? What "conditions" could exist?
 - c. Calculate the probability of winning the \$5 prize.
 - d. Is the \$2 prize or the \$5 prize harder to win? Which is more likely? Justify your answer.
- 4.25 Suppose that A and B are events defined on a common sample space and that the following probabilities are known: $P(A) = 0.3$, $P(B) = 0.4$, and $P(A|B) = 0.2$. Find $P(A \text{ or } B)$.
- 4.26 Given $P(A \text{ or } B) = 1.0$, $P(\overline{A \text{ and } B}) = 0.7$, and $P(\overline{B}) = 0.4$, find:
- a. $P(B)$
 - b. $P(A)$
 - c. $P(A | B)$
- 4.27 The probability of C is 0.4. The conditional probability that C occurs, given that D occurs is 0.5. The conditional probability that C occurs, given that D does not occur is 0.25.
- a. What is the probability that D occurs?
 - b. What is the conditional probability that D occurs, given that C occurs?

Objective 4.4

- 4.28 Determine whether each of the following pairs of events is mutually exclusive.
- a. Five coins are tossed: "one head is observed," "at least one head is observed."
 - b. A salesperson calls on a client and makes a sale: "the sale exceeds \$100," "the sale exceeds \$1,000."
 - c. One student is selected at random from a student body: the person selected is "male," the person selected is "older than 21 years of age."
 - d. Two dice are rolled: the total showing is "less than 7," the total showing is "more than 9."
- 4.29 Explain why $P(A \text{ and } B) = 0$ when events A and B are mutually exclusive.
- 4.30 If $P(A) = 0.3$, $P(B) = 0.4$, and if A and B are mutually exclusive events, find:
- a. $P(\overline{A})$
 - b. $P(\overline{B})$
 - c. $P(A \text{ or } B)$
 - d. $P(A \text{ and } B)$
- 4.31 One student is selected from the student body of your college. Define the following events: M—the student selected is male, F—the student selected is female, S—the student selected is registered for statistics.
- a. Are events M and F mutually exclusive? Explain.
 - b. Are events M and S mutually exclusive? Explain.
 - c. Are events F and S mutually exclusive? Explain.
 - d. Are events M and F complementary? Explain.
 - e. Are events M and S complementary? Explain.

- f. Are complementary events also mutually exclusive events? Explain.
- g. Are mutually exclusive events also complementary events? Explain.
- 4.32 Do people take indoor swimming lessons in the middle of the hot summer? They sure do at the Webster Aquatic Center. During the month of July 2009 alone, 283 people participated in various forms of lessons.

Swim Categories	Daytime	Evenings
Preschool	66	80
Levels	69	56
Adult and diving	10	2
Total	145	138

- If one swimmer was selected at random from the July participants:
- Are the events the selected participant is "daytime" and "evening" mutually exclusive? Explain.
 - Are the events the selected participant is "preschool" and "levels" mutually exclusive? Explain.
 - Are the events the selected participant is "daytime" and "preschool" mutually exclusive? Explain.
 - Find $P(\text{preschool})$.
 - Find $P(\text{daytime})$.
 - Find $P(\text{not levels})$.
 - Find $P(\text{preschool or evening})$.
 - Find $P(\text{preschool and daytime})$.
 - Find $P(\text{daytime} \mid \text{levels})$.
 - Find $P(\text{adult and diving} \mid \text{evening})$.
- 4.33 One student is selected at random from a student body. Suppose the probability that this student is female is 0.5 and the probability that this student works part time is 0.6. Are the two events "female" and "working" mutually exclusive? Explain.
- 4.34 Two dice are rolled. Define events as follows: A—sum of 7, C—doubles, E—sum of 8.
- Which pairs of events, A and C, A and E, or C and E, are mutually exclusive? Explain.
 - Find the probabilities $P(A \text{ or } C)$, $P(A \text{ or } E)$, and $P(C \text{ or } E)$.
- 4.35 An aquarium at a pet store contains 40 orange swordfish (22 females and 18 males) and 28 green swordtails (12 females and 16 males). You randomly net one of the fish.
- What is the probability that it is an orange swordfish?
 - What is the probability that it is a male fish?
 - What is the probability that it is an orange female swordfish?
 - What is the probability that it is a female or a green swordtail?
 - Are the events "male" and "female" mutually exclusive? Explain.
 - Are the events "male" and "swordfish" mutually exclusive? Explain.

Objective 4.5

- 4.36 Determine whether each of the following pairs of events is independent:
- Rolling a pair of dice and observing a "1" on the first die and a "1" on the second die
 - Drawing a "spade" from a regular deck of playing cards and then drawing another "spade" from the same deck without replacing the first card
 - Same as part (b), except the first card is returned to the deck before the second drawing
 - Owning a red automobile and having blonde hair
 - Owning a red automobile and having a flat tire today
 - Studying for an exam and passing the exam
- 4.37 A and B are independent events, and $P(A) = 0.7$ and $P(B) = 0.4$. Find $P(A \text{ and } B)$.
- 4.38 Suppose $P(A) = 0.3$, $P(B) = 0.4$, and $P(A \text{ and } B) = 0.12$
- What is $P(A|B)$?
 - What is $P(B|A)$?
 - Are A and B independent?
- 4.39 A single card is drawn from a standard deck. Let A be the event "the card is a face card" (a jack, a queen, or a king), B is a "red card," and C is "the card is a heart." Determine whether the following pairs of events are independent or dependent:
- A and B
 - A and C
 - B and C
- 4.40 A box contains four red and three blue poker chips. Three poker chips are to be randomly selected, one at a time.
- What is the probability that all three chips will be red if the selection is done with replacement?
 - What is the probability that all three chips will be red if the selection is done without replacement?
 - Are the drawings independent in either part (a) or (b)? Justify your answer.
- 4.41 The U.S. space program has a history made up of many successes and some failures. Space flight reliability is of the utmost importance in the launching of space shuttles. The reliability of the complete mission is based on all of its components. Each of the six joints in the *Challenger* space shuttle's booster rocket had a 0.977 reliability. The six joints worked independently.
- What does it mean to say that the six joints work independently?
 - What was the reliability (probability) for all six of the joints working together?
- 4.42 In a 2008 study by Experian Automotive, it was found that the average number of vehicles per household in the United States is 2.28 vehicles. The results also showed that nearly 35% of households have three or more vehicles (<http://www.autospies.com/news/Study-Finds-Americans-Own-2-28-Vehicles-Per-Household-26437/>).

- If two U.S. households are randomly selected, find the probability that both will have three or more vehicles.
- If two U.S. households are randomly selected, find the probability that neither of the two has three or more vehicles.
- If four U.S. households are randomly selected, find the probability that all four will have three or more vehicles.

4.43 A *USA Today* Snapshot titled "Weighing Heavily" (February 5, 2009) provided the results from the National College Health Assessment 2007 Web Summary, in which 34% of the students said that "stress" was the health and mental-health issue that most often hampered their academic performance. If five college students are randomly selected, what is the probability that all five would say that "stress" is the health and mental-health issue that most often hampers their academic performance?

- 4.44 The owners of a two-person business make their decisions independently of each other and then compare their decisions. If they agree, the decision is made; if they do not agree, then further consideration is necessary before a decision is reached. If each has a history of making the right decision 60% of the time, what is the probability that together they:
- Make the right decision on the first try
 - Make the wrong decision on the first try
 - Delay the decision for further study

Objective 4.6

- Describe in your own words why two events cannot be independent if they are already known to be mutually exclusive.
 - Describe in your own words why two events cannot be mutually exclusive if they are already known to be independent.
- One thousand employees at the Russell Microprocessor Company were polled about worker satisfaction. One employee is selected at random.

	Male		Female		Total
	Skilled	Unskilled	Skilled	Unskilled	
Satisfied	350	150	25	100	625
Unsatisfied	150	100	75	50	375
Total	500	250	100	150	1,000

- Find the probability that an unskilled worker is satisfied with work.
- Find the probability that a skilled female employee is satisfied with work.
- Is satisfaction for female employees independent of their being skilled or unskilled?

4.47 $P(R) = 0.5$, $P(S) = 0.3$, and events R and S are independent.

- Find $P(R \text{ and } S)$.
- Find $P(R \text{ or } S)$.
- Find $P(\bar{S})$.
- Find $P(R | S)$.
- Find $P(\bar{S} | R)$.
- Are events R and S mutually exclusive? Explain.

4.48 $P(M) = 0.3$, $P(N) = 0.4$, and events M and N are mutually exclusive.

- Find $P(M \text{ and } N)$.
 - Find $P(M \text{ or } N)$.
 - Find $P(M \text{ or } \bar{N})$.
 - Find $P(M | \bar{N})$.
 - Are events M and N independent? Explain.
- 4.49 Two flower seeds are randomly selected from a package that contains five seeds for red flowers and three seeds for white flowers.
- What is the probability that both seeds will result in red flowers?
 - What is the probability that one of each color is selected?
 - What is the probability that both seeds are for white flowers?

HINT Draw a tree diagram.

- 4.50 A company that manufactures shoes has three factories. Factory 1 produces 25% of the company's shoes, Factory 2 produces 60%, and Factory 3 produces 15%. One percent of the shoes produced by Factory 1 are mislabeled, 0.5% of those produced by Factory 2 are mislabeled, and 2% of those produced by Factory 3 are mislabeled. If you purchase one pair of shoes manufactured by this company, what is the probability that the shoes are mislabeled?