

# Answers

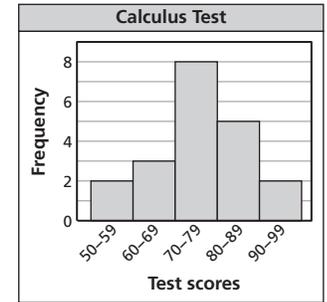
42. vertex:  $(6, -7)$ , axis of symmetry:  $x = 6$
43. vertex:  $(8, -6)$ , axis of symmetry:  $x = 8$
44.  $x = 4$       45.  $x = 4$       46.  $x = 5$
47.  $x = 16$       48.  $12i$       49.  $7i$
50.  $50i$       51.  $-132i$       52.  $40i\sqrt{5}$
53.  $-24i\sqrt{2}$       54.  $-1 - 9i$       55.  $-9 - 8i$
56.  $6 + 10i$       57.  $8 - 23i$       58.  $-2i$
59.  $17 + 5i$       60.  $-150 + 15i$       61.  $48 - 30i$
62.  $-42 - 134i$       63.  $158 - 189i$       64.  $-578i$
65.  $-44 + 240i$       66. 3      67. 4
68. 5      69. 216      70. 36
71. 27      72. 2.08      73. 0.43
74. 9      75. 6.87      76. 8
77. 243      78.  $e^{10}$       79.  $e^8$
80.  $6e^9$       81.  $3e^{18}$       82.  $64e^{36x}$
83.  $729e^{-12x}$       84. 8, 9, 10, 11, 12, 13
85. 3, 2, 1, 0, -1, -2      86. -7, -6, -5, -4, -3, -2
87. 1, 8, 27, 64, 125, 216
88. -1, 6, 25, 62, 123, 214
89. -2, 1, 6, 13, 22, 33      90. 36, 25, 16, 9, 4, 1
91. 4, 9, 16, 25, 36, 49      92. 40
93. 285      94. 110      95. 123      96. -78
97.  $\frac{208}{105}$       98.  $\frac{565}{252}$       99. 12      100. 1785
101. a. \$12.75  
b. 264 days
102. a.  $a_n = n + 2$   
b. 33 dancers  
c. 42 dancers  
d. 9 dancers

## Chapter 11

### 11.1 Start Thinking

mean = 75

Score	Frequency
50–59	2
60–69	3
70–79	8
80–89	5
90–99	2



*Sample answer:* The histogram appears to have a reasonably symmetric distribution about the mean value of 75.

### 11.1 Warm Up

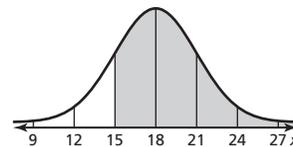
- mean = 18.1, median = 17.5
- mean =  $\frac{855}{7} \approx 122.14$ , median = 120
- mean =  $\frac{177}{40} \approx 4.43$ , median = 4.6

### 11.1 Cumulative Review Warm Up

- $g(x) = -|x - 1| + 3$
- $g(x) = -\frac{1}{2}|x| - 5$

### 11.1 Practice A

- 50%
- 47.5%
- 0.15%
- 99.85%
- 47.5%
- 68%
- 47.5%
- 16%
- a. 81.5%    b. 16%
- The probability that  $x$  is from 15 to 27 was found instead of the probability that  $x$  is at least 15.



The probability that  $x$  is at least 15 is 0.84.

### 11.1 Practice B

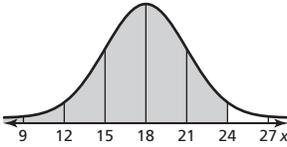
- 16%
- 5%
- 97.5%
- 83.85%
- 13.5%
- 97.35%

# Answers

7. 84%      8. 2.5%

9. a. 95%    b. 2.5%

10. The probability that  $x$  is from 18 to 24 was found instead of the probability that  $x$  is at most 24.



The probability that  $x$  is at most 24 is 0.975.

## 11.1 Enrichment and Extension

1.  $P \approx -0.178$ , so the distribution is approximately symmetric
2.  $P \approx 0.381$ , so the distribution is approximately symmetric
3.  $P \approx 1.160$ , so the distribution is skewed to the right

## 11.1 Puzzle Time

FISH AND SHIPS

## 11.2 Start Thinking

The theoretical probability is  $\frac{1}{8}$ ; *Sample answers:*

Some students may find that it takes only one toss of the three coins to get all three to land heads up. However, as a group they should notice that the average number of tosses is somewhere around eight. The experimental probability will quite likely differ from the theoretical probability. However, as the number of tosses increases (sample size increases), the two probabilities should get closer together.

## 11.2 Warm Up

1. The sample space is the set of all 52 cards.
2. The sample space is the set given that includes all possible color combinations with two spins; {Red-Red, Red-Blue, Red-Yellow, Red-Green, Blue-Blue, Blue-Yellow, Blue-Green, Blue-Red, Yellow-Yellow, Yellow-Green, Yellow-Red, Yellow-Blue, Green-Green, Green-Red, Green-Blue, Green-Yellow}
3. The sample space is the set of all possible responses and may include, yes, no, and maybe.
4. The sample space is the set of all possible responses and may include, yes, no, and sometimes.

## 11.2 Cumulative Review Warm Up

1.  $(4, 0)$
2. infinitely many solutions of the form  $(x, x - 8)$
3.  $(-2, 1)$     4.  $\left(4, -\frac{3}{4}\right)$     5.  $(4, 3)$     6.  $(0, 0)$

## 11.2 Practice A

1. sample; There are more than 25 bags of popcorn.
2. population; degrees of every (all) employees
3. The population is all students at the university, and the sample is the 1641 students that were surveyed. Of the students surveyed, 479 of them do not know the name of their college's mascot.
4. The population is all people in the United States, and the sample is the 1000 households with at least one child that were surveyed. Of the households surveyed, 874 of them have two or more computers.
5. parameter; it is referring to all of the football players on the team
6. statistic; it is referring to only the surveyed utility bills
7. a. The maker's claim is most likely true.  
b. The maker's claim is most likely false.

## 11.2 Practice B

1. population; every student in the school
2. sample; more than 80 people could access the website
3. The population is every employee in the office building, and the sample is the 648 employees that were surveyed. Of the employees surveyed, 147 of them ride the subway to work each day.
4. The population is all homeowners in the State of Florida, and the sample is the 2500 homeowners that were surveyed. Of the homeowners surveyed, 1145 of them have switched their homeowner's insurance policy to a different company within the last 3 years.
5. statistic; it is referring to only the surveyed hockey players
6. parameter; it is referring to all the sold tickets
7. a. The maker's claim is most likely false.  
b. The maker's claim is most likely true.

# Answers

## 11.2 Enrichment and Extension

- a and b.** Type I: Decide garlic is effective in reducing tick bites when it really is not effective; Consequence: People would consume more garlic but not have the protection against tick bites and could develop Lyme's disease (or some other disease carried by ticks); Type II: Decide garlic is not effective in reducing tick bites when it really is effective; Consequence: People would not use the garlic (a nontoxic treatment) to prevent tick bites, but have to use a toxic repellent.

**c.** *Sample answer:* Type I is more serious because people could potentially develop a serious disease from tick bites.
- a and b.** Type I: Say that there are too many defects when in reality there are not; Consequence: You would stop the assembly process when there is no problem, wasting production time; Type II: Say that there are not too many defects when in reality there are; Consequence: You would continue with the assembly process, but have many defective products, which could cause you to lose money.

**c.** *Sample answer:* The factory owner might consider Type I more serious because he loses production time for no reason, which could cause him to lose more money than the defective products.
- a and b.** Type I: It is decided that the shop is not meeting standards, when it is.; Consequence: The shop and state might be in trouble when it shouldn't be; Type II: The shop is certified as meeting standards when it is not; Consequence: Cars that are polluting the environment are being used.

**c.** *Sample answer:* Either could be argued as worse depending on if you work for the state or care about the welfare of the environment.
- a and b.** Type I: The software seems like it helps (and the professor buys it) even when it really did not; Consequence: The students are wasting their time using the software, and it is a waste of money; Type II: The software doesn't seem to help (and the professor doesn't buy it) when it would have helped; Consequence: The students would be missing out on software that helps them.

**c.** *Sample answer:* Either could be argued for. Because the software is expensive, Type I might be more serious, because the money could have been spent elsewhere.

## 11.2 Puzzle Time

ON A MAP

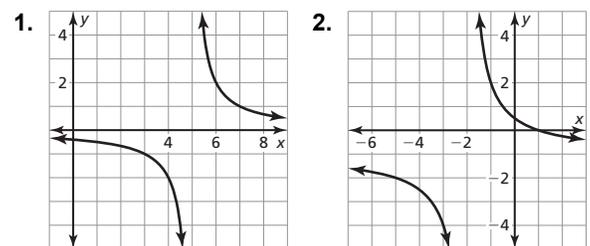
## 11.3 Start Thinking

- Sample answer:* Surveying 50 random students at your school may not give the school board good information in regards to allocating funds for a robotics team. Depending on the total number of students in the school, the 50 surveyed may be a very small percentage or a very large percentage of the entire school population. The school board could get better information by surveying all the students to determine exactly how many (what percentage) of the students are actually interested in participating in robotics.
- Sample answer:* If the Student Government Association wants to know if families would be interested in participating in a school carnival, they should probably survey the parents as well as the students.

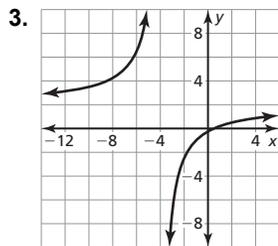
## 11.3 Warm Up

- Sample answer:* Because the survey only includes pet owners, it is quite likely that they would want hotels to accept pets. It might be better to survey hotel guests in general rather than pet owners who are likely biased in favor of pets.
- Sample answer:* Shoppers in the mall are quite likely to be biased toward extended mall hours so that they can shop longer. A better option would be to survey shoppers along with mall employees and store owners, as well as people living in the neighborhood around the mall.
- Sample answer:* Students would most likely be biased in such a way to encourage a decreased homework load. Surveying teachers, parents, administrators, and students might give more reliable results.
- Sample answer:* Because the survey includes individuals inside an athletic club, they are probably more likely to exercise. Surveying a larger and more diverse group would give more reliable results.

## 11.3 Cumulative Review Warm Up



# Answers



## 11.3 Practice A

1. self-selected sample      2. convenience sample
3. systematic; These customers shop at a locally-owned hardware store, so they would probably want the store to remain opened for business.
4. systematic; Members with last names that begin with the later letters of the alphabet do not get an opportunity to voice their opinion, and some of the first 20 members with the same last names might be related.
5. unbiased; The sample represents the population.
6. unbiased; The students are randomly selected.
7. A sensitive question is being asked. This type of question is better asked anonymously.
8. By saying “could be toxic,” one would feel guilty if he or she did not agree. These words could be removed from the question and the individual could make his or her own judgment about lesions.

## 11.3 Practice B

1. cluster sampling
2. systematic sampling
3. cluster; The cluster was not randomly selected; People who own waterfront property will support lower taxes for those who own waterfront property
4. self-select; Those who are listening to the station probably prefer country music, so they are more likely to vote for country music
5. biased; Local fisherman are not likely to support the bill, because they would probably want to catch as many lobster as possible.
6. biased; Only one age group was surveyed.
7. People may hesitate to vocalize their agreement if they are standing next to employees at the plant. This question would be better asked anonymously.

8. The use of the words “far beyond” could influence someone to not disagree. The words could be removed.

## 11.3 Enrichment and Extension

1. Method 1: experiment; Method 2: survey; Method 3: observational study; Method 1 is most reliable; Method 2 and 3 depend on finding farms using the desired fertilizers, and different farms may use different amounts of fertilizer.
2. Method 1: experiment; Method 2: observational study; Method 3: survey. Method 1 is most reliable; Method 2 may not be random, and Method 3 relies on the drivers accurately remembering their battery usage.

## 11.3 Puzzle Time

TO UNWIND

## 11.4 Start Thinking

To determine if a spinner is fair, you could examine its design and make sure each space has the same area and that the spinner actually spins freely over each space. You could also test the spinner by recording the results of 100 or 1000 (or more) spins to see if each number/color came up about the same number of times. In a similar way, you could examine a coin to make sure that one side didn't seem to be weighted. Then you could test the coin by recording the results of 100 or 1000 (or more) flips to see if each side came up about the same number of times.

## 11.4 Warm Up

1. experiment                      2. observational study

## 11.4 Cumulative Review Warm Up

1.  $3^{1/3}$                       2.  $32\sqrt{3}$                       3.  $9\sqrt{3}$
4.  $\sqrt[6]{12}$                       5. 2                              6.  $5^{1/2}$

## 11.4 Practice A

1. This study is a randomized comparative experiment. The treatment is the use of the computer for testing. The treatment group is the 150 students who test on the computer. The control group is the 150 students who test using paper and pencil.
2. This study is not a randomized comparative experiment because the people were not randomly assigned to a control group and a treatment group. The conclusion may not be valid. There may be other reasons why those who drank water had lower cholesterol.

# Answers

- This study is best done as an experiment. Half of the team is randomly assigned to yoga, and the other half is not.
- This study is best done as an observational study because a time frame of 10 years is too long for an experiment of this type. After 10 years, the drugs may be obsolete. The effects of the drugs can be examined on those who have already taken them.
- Muscle damage is more likely as one gets older. Thus, the breakdown according to age may affect the results. This study can be improved by just randomly assigning people to groups, regardless of age.
  - The experimental design is good. However a potential problem may be that injuries can occur.

## 11.4 Practice B

- This study is not a randomized comparative experiment because the people were not randomly assigned to a control group and a treatment group. The conclusion may not be valid. There may be other reasons why those who switched were more satisfied with the condition of their pool.
- This study is a randomized comparative experiment. The treatment is the use of the recyclables containers. The treatment group is the 75 customers who used the recyclables containers. The control group is the 75 customers who used the recyclables bins.
- This study is best done as an observational study because the organization cannot force someone to donate 20% to charity. Job satisfaction can be rated for those who already give 20% to charity.
- This study is best done as an experiment. The rancher randomly chooses half the cows to receive the new feed, and the other half do not.
- The experimental design is good. However, a possible potential problem may be that someone dislikes the taste of diet soda.
  - A potential problem is the division based on exercise habits. Those who exercise regularly tend to eat less sugar, and may tend to drink more diet soda than the other group. Thus, their bodies may already be conditioned to the sugar cravings. This design could be improved by dividing the group randomly rather than based on exercise habits.

## 11.4 Enrichment and Extension

- class size: small, medium, large; textbook: traditional, new
  - final grades
  - 6
  - The experiment could be blind or double-blind. The students might not know they are part of an experiment, but the teacher would probably know that he/she was part of an experiment. If they didn't, that would diminish bias, and it could be done.
- watering: daily, three days a week; fertilizer: traditional, organic
  - average final heat rating for the plot at the end of the growing season
  - 4
  - The plants will not have bias. Blinding the botanist could occur so that he/she does not know which fertilizer each plot got, but as for watering, the botanist would know, so the experiment could be blind but not-double-blind.
- new or old dog food
  - improvement in kidneys
  - 2
  - The experiment could be blind or double-blind. The dogs will not have bias. Blinding the feeder could be done and would diminish bias.
- walking: using no device, a standard walker, or a rolling walker; responding (or not responding) to a signal while walking
  - Cadence was measured.
  - 6
  - The subjects don't need to be told what is being tested when they are directed to walk but it would be difficult to do a blind or double blind experiment.
- Sample answer:* Randomly divide the subjects into two groups of 50. Give 50 the inhaler and 50 the shot. Measure insulin levels three times a day. Compare the results.

## 11.4 Puzzle Time

WAVY

# Answers

## 11.5 Start Thinking

The sample survey results show that 35% of the students have part-time jobs; *Sample answer:* Because the original prediction is 10 percentage points off, we may choose to change our prediction based on the sample survey. However, we may also decide to redo the survey with a greater number of students to make sure our sample was a good representation of the entire population.

## 11.5 Warm Up

1. 185.8                      2. 4.8

## 11.5 Cumulative Review Warm Up

- $x^5 - 15x^4 + 90x^3 - 270x^2 + 405x - 243$
- $16x^4 + 160x^3 + 600x^2 + 1000x + 625$
- $-128x^7 + 448x^6 - 672x^5 + 560x^4 - 280x^3 + 84x^2 - 14x + 1$
- $x^4 + 4x^3y^2 + 6x^2y^4 + 4xy^6 + y^8$
- $64a^6 - 576a^5b + 2160a^4b^2 - 4320a^3b^3 + 4860a^2b^4 - 2916ab^5 + 729b^6$
- $x^{24} - 8x^{21}y^4 + 28x^{18}y^8 - 56x^{15}y^{12} + 70x^{12}y^{16} - 56x^9y^{20} + 28x^6y^{24} - 8x^3y^{28} + y^{32}$

## 11.5 Practice A

- The sample mean is 9.3, so an estimate for the population mean would be 9.3.
  - The sample proportion is approximately 0.233, so an estimate for the population proportion would be 0.233.
  - The sample proportion is approximately 0.267, so an estimate for the population proportion would be 0.267.
- Not very confident because the sample mean is an estimate of the population mean.
- Based on your survey, 0.43 is just outside the margin of error, so you can conclude that the claim is probably incorrect.
  - Based on your survey, 0.43 is within the margin of error, so you can conclude that the claim is probably correct.
  - 95% of the time, a sample proportion should lie in the interval from 0.29 to 0.57.

## 11.5 Practice B

- The sample mean is 5.825, so an estimate for the population mean would be 5.825.
  - The sample proportion is 0.325, so an estimate for the population proportion would be 0.325.
  - The sample proportion is 0.275, so an estimate for the population proportion would be 0.275.
- Not very confident because the sample mean is an estimate of the population mean.
- Based on your survey, 0.45 is outside the margin of error, so you can conclude that the claim is probably incorrect.
  - Based on your survey, 0.45 is within the margin of error, so you can conclude that the claim is probably correct.
  - 95% of the time, a sample proportion should lie in the interval from 0.31 to 0.59.

## 11.5 Enrichment and Extension

- Sample answer:* Should the school start a foreign language club?
- Sample answer:* yes; The type of club is specific and it is an easy yes or no answer.
- The entire student population.
- Sample answer:* I will ask 100 students chosen randomly by ID number.
- Sample answer:* no; The sample is random.
- Sample answer:* yes; The sample is random.
- Sample answer:* yes; I may need to change the question to, "Would you join a foreign language club if it were offered?"
- Sample answer:* Yes, the results became more accurate the more people I surveyed.

## 11.5 Puzzle Time

A SWALLOW

# Answers

## 11.6 Start Thinking

*Sample answer:* The company might produce a small amount of the sports drink in the suggested size bottle and see how the sales compare to the original size over a given period of time. They could do the same thing with a label change. They could test a small market with just a change in the label. And finally, they could produce a small amount of the sports drink with both a change in size and labeling. By comparing the sales within similar markets, they could determine if the label change or the change in size, or both, affect the sales in a positive or negative way.

## 11.6 Warm Up

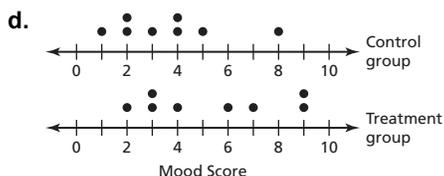
- mean of the control: 14.79; mean of the treatment: 15.02; difference: 0.23
- mean of the control: 59.6; mean of the treatment: 55.4; difference:  $-4.2$

## 11.6 Cumulative Review Warm Up

- 1
- $\tan^2 x$
- $2\csc x$
- $\cos x$
- $\sec x$
- $\cos x - 1$

## 11.6 Practice A

- a. 3.625
- 5.375
- 1.75



- e. The plot of the data shows that the two sets are fairly symmetric. The control group may have a possible outlier, but it is a valid data item. So, the mean is a suitable measure of center. The mean score of the treatment group is 1.75 higher than that of the control group. It appears that mood therapy might be slightly effective, but the sample size is small and the difference could be due to chance.

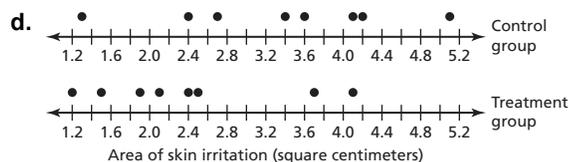
f. *Sample answer:*

	Mood Score							
Control Group	5	9	2	3	3	7	8	4
Treatment Group	1	3	4	2	6	9	2	4

- Sample answer:* 5.125
- Sample answer:* 3.875
- Sample answer:*  $-1.25$

## 11.6 Practice B

- a. 3.35
- 2.425
- $-0.925$



- e. The plot of the data shows that the two sets are fairly symmetric and have no extreme values. So, the mean is a suitable measure of center. The mean score of the treatment group is 0.925 lower than that of the control group. It appears that photo therapy might be slightly effective, but the sample size is small and the difference could be due to chance.

f. *Sample answer:*

	Area of Skin Irritation (square centimeters)							
Control Group	4.1	2.5	5.1	1.2	3.4	3.7	2.7	1.3
Treatment Group	4.2	2.1	3.6	2.4	1.5	1.9	2.4	4.1

- Sample answer:* 3
- Sample answer:* 2.775
- Sample answer:*  $-0.225$

## 11.6 Enrichment and Extension

- Because zero is not in the interval, there is sufficient evidence to suggest beef hotdogs have a higher fat content than meat.
- Because zero is in the interval, there is insufficient evidence to suggest route A is faster than route B.
- Because zero is not in the interval, there is sufficient evidence to suggest front loading washers take longer than top loading washers.
- Because zero is not in the interval, there is sufficient evidence to suggest children's cereals have more sugar than adults' cereals.

# Answers

## 11.6 Puzzle Time

ROCKET

### Cumulative Review

- mean: 12, median: 14, mode: 14
- mean: 45, median: 46, mode: 46
- mean 69.7, median: 68, mode: 80
- mean: 44.1, median: 44, mode: 43 and 47
- mean: 13.3, median: 16, mode: none
- mean: 15.4, median: 15, mode: 14 and 15
- mean: 59.6, median: 59.5, mode: none
- mean: 8.1, median: 10, mode: 10 and 11
- 4.3; *Sample answer:* The typical data value differs from the mean by about 4.3 units.
- 2.6; *Sample answer:* The typical data value differs from the mean by about 2.6 units.
- 6.6; *Sample answer:* The typical data value differs from the mean by about 6.6 units.
- 1.6; *Sample answer:* The typical data value differs from the mean by about 1.6 units.
- 2.6; *Sample answer:* The typical data value differs from the mean by about 2.6 units.
- 3.8; *Sample answer:* The typical data value differs from the mean by about 3.8 units.
- inverse variation
- direct variation
- neither
- neither
- direct variation
- direct variation
- $y = \frac{7}{x}; \frac{7}{3}$
- $y = -\frac{40}{x}; -\frac{40}{3}$
- $y = -\frac{7}{x}; -\frac{7}{3}$
- $y = -\frac{10}{x}; -\frac{10}{3}$
- $y = \frac{56}{9x}; \frac{56}{27}$
- $y = \frac{3}{2x}; \frac{1}{2}$
- $y = \frac{4}{5x}; \frac{4}{15}$
- $y = \frac{8}{3x}; \frac{8}{9}$
- mean: 84.7, median: 85, mode: 71, 75, 77, 92, and 95
- $\frac{1}{2x - 9x^4}$
- $\frac{6 + 2x^3}{3}$
- $\frac{x - 4}{x + 5}$
- $\frac{x + 9}{x + 4}$
- $\frac{x - 9}{x + 6}$
- $\frac{x - 5}{x + 3}$
- $\frac{y^4}{3x^4}$
- $\frac{y^2}{6}$
- $\frac{x^2 - 6x + 8}{x}$
- $\frac{x + 2}{x - 10}$
- $\frac{x - 2}{x + 7}$
- $\frac{x + 3}{x - 10}$
- $\frac{20}{7x}$
- $\frac{x - 3}{2x^2}$
- $\frac{8 + 3x}{x - 2}$
- $\frac{3x^2 - 1}{x + 5}$
- $\frac{-7x}{3x + 4}$
- $\frac{x^3 + x^2}{x^2 + 1}$
- $\frac{-x^2 + 4x + 18}{x^2 + 3x - 40}$
- $\frac{x^2 + 2x - 38}{x^2 - 12x + 35}$
- $\frac{3x^2 - 27x - 68}{x^2 - 12x + 11}$
- $\frac{x^2 + x + 62}{x^2 - 11x - 12}$
- a.  $P = 10x + 32$   
b.  $A = 6x^2 + 39x + 63$   
c. 52 in.; 165 in.<sup>2</sup>
- $\sin \theta = \frac{3}{5}, \cos \theta = \frac{4}{5}, \tan \theta = \frac{3}{4}, \csc \theta = \frac{5}{3},$   
 $\sec \theta = \frac{5}{4}, \cot \theta = \frac{4}{3}$
- $\sin \theta = \frac{3}{5}, \cos \theta = \frac{4}{5}, \tan \theta = \frac{3}{4}, \csc \theta = \frac{5}{3},$   
 $\sec \theta = \frac{5}{4}, \cot \theta = \frac{4}{3}$
- $\sin \theta = \frac{3}{7}, \cos \theta = \frac{2\sqrt{10}}{7}, \tan \theta = \frac{3\sqrt{10}}{20},$   
 $\csc \theta = \frac{7}{3}, \sec \theta = \frac{7\sqrt{10}}{20}, \cot \theta = \frac{2\sqrt{10}}{3}$
- $\sin \theta = \frac{4\sqrt{137}}{137}, \cos \theta = \frac{11\sqrt{137}}{137}, \tan \theta = \frac{4}{11},$   
 $\csc \theta = \frac{\sqrt{137}}{4}, \sec \theta = \frac{\sqrt{137}}{11}, \cot \theta = \frac{11}{4}$

# Answers

57.  $x = 12$

58.  $x = 7\sqrt{2}$

59.  $x = 3\sqrt{3}$

60.  $x = 4$

61. *Sample answer:*  $-272^\circ$  and  $448^\circ$

62. *Sample answer:*  $-665^\circ$  and  $55^\circ$

63. *Sample answer:*  $-\frac{11\pi}{4}$  and  $\frac{5\pi}{4}$

64. *Sample answer:*  $-\frac{7\pi}{6}$  and  $\frac{17\pi}{6}$

65. *Sample answer:*  $-300^\circ$  and  $60^\circ$

66. *Sample answer:*  $-\frac{10\pi}{3}$  and  $\frac{2\pi}{3}$

67.  $\frac{11\pi}{18}$

68.  $\frac{31\pi}{18}$

69.  $-240^\circ$

70.  $150^\circ$

71.  $-\frac{\pi}{3}$

72.  $-135^\circ$

73.  $\sin 180^\circ = 0$ ,  $\cos 180^\circ = -1$ ,  $\tan 180^\circ = 0$ ,  
 $\csc 180^\circ = \text{undefined}$ ,  $\sec 180^\circ = -1$ ,  
 $\cot 180^\circ = \text{undefined}$

74.  $\sin 495^\circ = \frac{\sqrt{2}}{2}$ ,  $\cos 495^\circ = -\frac{\sqrt{2}}{2}$ ,

$\tan 495^\circ = -1$ ,  $\csc 495^\circ = \sqrt{2}$ ,

$\sec 495^\circ = -\sqrt{2}$ ,  $\cot 495^\circ = -1$

75.  $\sin\left(-\frac{\pi}{3}\right) = -\frac{\sqrt{3}}{2}$ ,  $\cos\left(-\frac{\pi}{3}\right) = \frac{1}{2}$ ,

$\tan\left(-\frac{\pi}{3}\right) = -\sqrt{3}$ ,  $\csc\left(-\frac{\pi}{3}\right) = \frac{-2\sqrt{3}}{3}$ ,

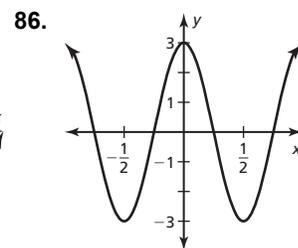
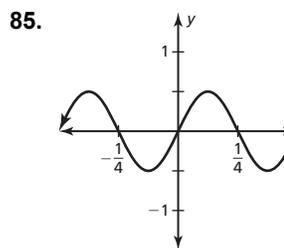
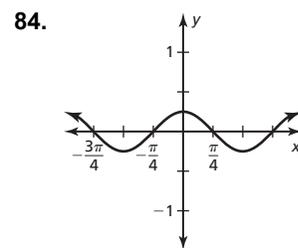
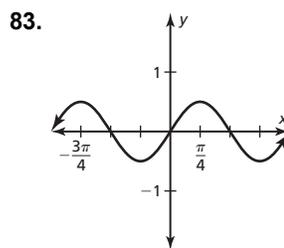
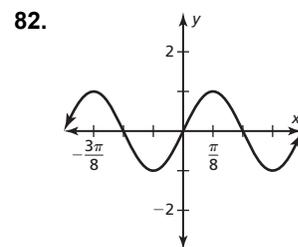
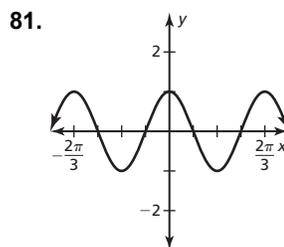
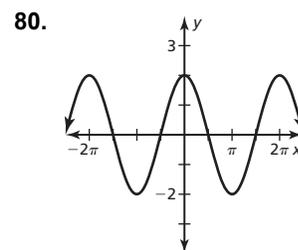
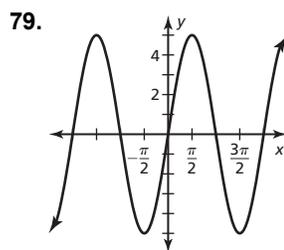
$\sec\left(-\frac{\pi}{3}\right) = 2$ ,  $\cot\left(-\frac{\pi}{3}\right) = -\frac{\sqrt{3}}{3}$

76.  $\sin \frac{\pi}{6} = \frac{1}{2}$ ,  $\cos \frac{\pi}{6} = \frac{\sqrt{3}}{2}$ ,  $\tan \frac{\pi}{6} = \frac{\sqrt{3}}{3}$ ,

$\csc \frac{\pi}{6} = 2$ ,  $\sec \frac{\pi}{6} = \frac{2\sqrt{3}}{3}$ ,  $\cot \frac{\pi}{6} = \sqrt{3}$

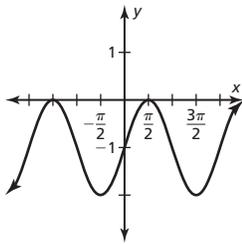
77.  $\sin(-120^\circ) = -\frac{\sqrt{3}}{2}$ ,  $\cos(-120^\circ) = -\frac{1}{2}$ ,  
 $\tan(-120^\circ) = \sqrt{3}$ ,  $\csc(-120^\circ) = -\frac{2\sqrt{3}}{3}$ ,  
 $\sec(-120^\circ) = -2$ ,  $\cot(-120^\circ) = \frac{\sqrt{3}}{3}$

78.  $\sin \frac{7\pi}{4} = -\frac{\sqrt{2}}{2}$ ,  $\cos \frac{7\pi}{4} = \frac{\sqrt{2}}{2}$ ,  $\tan \frac{7\pi}{4} = -1$ ,  
 $\csc \frac{7\pi}{4} = -\sqrt{2}$ ,  $\sec \frac{7\pi}{4} = \sqrt{2}$ ,  $\cot \frac{7\pi}{4} = -1$

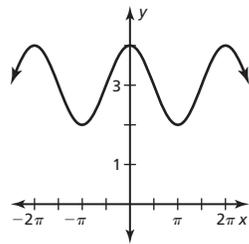


# Answers

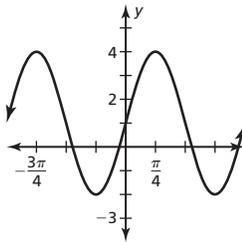
87.



88.



89.



90.

