Lesson 9.1.1

9-7. **a:** Population: U.S. employees; the population is too large to conveniently measure so sampling should be used.

b: Population: students in the class. A census can be taken.

c: Population: All carrots. To measure the Vitamin A in a carrot, it must be destroyed, so even if it were possible to measure all carrots, it would not be wise. Sampling must be used.

d: Population: The public (the media does not generally make this population very clear). It could be all voting adults, all adults, or all people in the state. In any case, the population is too large, so sampling must be used.

e: Population: Elevator cables. To find this, elevator cables must hold greater and greater weight until they break. If all elevator cables were tested, there would be none left to use for elevators. Sampling must be used.

f: Population: Your friends. A census can be taken.

9-8. **a:** The five-number summary is (1, 19.5, 29, 40.5, 76 cups of coffee per hour).

b: The typical number of cups sold in an hour is 29 as determined by the median. Looking at the shape of the distribution the median is a satisfactory representation of the distribution. The distribution has a skew. There is a gap between 60 and 70 cups. The IQR is 21 cups. Seventy-six cups of coffee in one hour is an apparent outlier.

9-9. **a:** $(x \pm 1), (x \pm 7)$

b: Neither are factors. Use substitution to determine whether $x = -1$ and $x = 1$ are zeros. Or you could use the Remainder Theorem and divide to see that neither are factors because there is a remainder.

9-10. $a \leq \frac{25}{24}$

9-11. **a:** 30º or 150º **b:** 120º or 240º **c:** 45º or 225º

d: 35.26º, 144.74º, 215.26º, or 324.76º

9-12. $f(g(x)) = g(f(x)) = x$

9-13. **a:** 10 times stronger **b:** $10^{0.8} = 6.3$ times stronger

c: $\log(0.5) \approx -0.3$, so $6.2 - 0.3 \approx 5.9$ on the Richter scale

9-14. **a:** $(x + 2 - \sqrt{3})(x + 2 + \sqrt{3}) = x^2 + 4x + 1$

b: $(x + 2 - i)(x + 2 + i) = x^2 + 4x + 5$

9-15. posts: \$3, boards: \$2, piers: \$10

Lesson 9.1.2

9-22. **a:** The question implies that the questioner holds this opinion, thus biasing results.

b: The question assumes that the respondent believes that the climate is changing and will think that one of the given factors is important, and that it is important to slow global climate change, biasing results.

c: The question implies that teacher salaries should be raised.

9-23. Sample questions given:

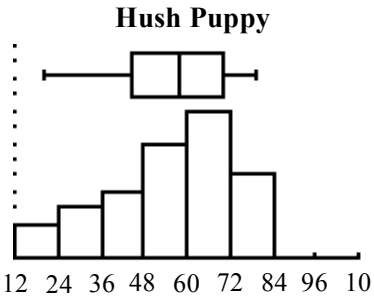
a: Are a majority of Americans in favor of replacing the Electoral College with a popular vote?

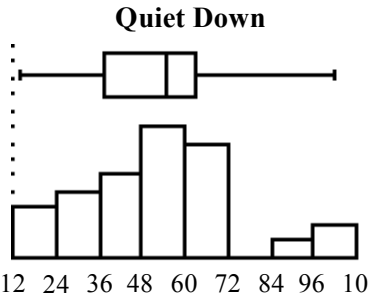
b: Do consumers prefer the taste of the new "improved" cookie recipe?

c: What was the class average on the semester final exam?

d: What was the average for high school students taking the state math proficiency examination last year?

9-24. **a:** See plots at right. Hush Puppy: min = 19.7, Q1 = 44.5, med = 58.3, Q3 = 70.1, max = 79.5; Quiet Down: min = 14.2, Q1 = 37.4, med = 54.85, Q3 = 63.3, max = 102.1



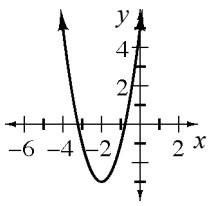


b: Hush Puppy: The distribution is left skewed so its center and spread are best described by the median of 58.3 dB and IQR of 25.6 dB there are no apparent outliers. Quiet Down: Has some potential outliers over 100 dB or is perhaps dual-peaked. The main body of data has a left skew. The center and spread are best described by the median of 54.85 dB and IQR of 25.9 dB.

c: Answers will vary.

d: The Hush Puppy looks better now because those three high readings from the Quiet Down model are a lot more significant. Or perhaps the Quiet Down could be redesigned to eliminate those high readings.

9-25. $y = 2(x+2)^2 - 3$, (–2, –3). See graph at right.



9-26. $y = 6, z = 2$

9-27. **a:** $x = 4$ **b:** $x = 200$

9-28. **a:** $\frac{\pi}{6}$ **b:** $\frac{\pi}{12}$ **c:** $-\frac{5\pi}{12}$ **d:** $\frac{7\pi}{2}$

9-29. $y = -\frac{1}{4}(x-2)(x+2)^2$

9-30. **a:** $\frac{160\pi}{3}$, about 167.6 cubic feet **b:** 6 feet

c: It is not changing, the angle is ≈ 68.20°

Lesson 9.1.3

9-36. **a:** This information could be found on the web for all American League players. It would be a census and the answer would be a parameter.

b: An experiment would need to be conducted on a sample of eggs. The findings would be a statistic.

c: Random high school students could be surveyed, possibly from different high schools in different parts of the country. Surveying every high school student would be almost impossible, so this survey would be a sample and the answer would be a statistic.

9-37. **a:** closed **b:** open **c:** open **d:** closed

9-38. Answers will vary.

9-39. $\frac{2}{9}$; $k = 7, 8$ are factorable.

9-40. blue block: 8 grams, red block: 16 grams

9-41. **a:** The more rabbits you have, the more new ones you get, a linear model would grow by the same number each year. A sine function would be better if the population rises and falls, but more data would be needed to apply this model.

b: $R = 80,000(5.4772...)^t$

c: $\approx$ 394 million

d: 1859, it seems okay that they grew to 80,000 in 7 years, *if* they are growing exponentially.

e: No, since it would predict a huge number of rabbits now. The population probably leveled off at some point or dropped drastically and rebuilt periodically.

9-42. $\frac{3}{x+5}$

9-43. $\frac{x}{x+2}$

9-44. **a:** $\frac{4\pi}{5}$ **b:** $\frac{15\pi}{9}$ **c:** 100º **d:** 255º **e:** 1710º **f:** $\frac{11\pi}{9}$

Lesson 9.2.1

9-50. **a:** When asked to choose between an "m" and a "q," most people prefer "m," regardless of the Cola taste.

b: The "to protect" interpretation is not part of the Bill of Rights; it will bias the results.

c: The statistics chosen for the lead-in will bias the results.

9-51. **a:** Only certain types of people typically respond.

b-d: Answers will vary.

e: Students should observe some clear preferences for some numbers, letters, and colors. This would provide evidence that people cannot behave or choose randomly.

9-52. Mean: 7.6 g, mean distance-squared: $\frac{2.56+0.16+0.16+1.96+0.36}{5-1} = 1.3$,
sample standard deviation≈ 1.14 g (and not ≈ 1.02).

9-53. $\left(\frac{1}{2}, 6, -3\right)$

9-54. $x^2 + 25$

9-55. $2, \pm 5i$

9-56. $\pm\frac{15}{17}$

9-57. **a:** $3 + 2i$ **b:** $1 + 4i$ **c:** $5 + i$ **d:** $-\frac{1}{2} + \frac{5}{2}i$

9-58. **a:** $x = 32$ **b:** $x = \frac{1}{6}$

Lesson 9.2.2

9-62. **a:** Not likely; this samples the population of people with phone numbers listed online that are home midday. In each of these, we could also notice that we only get responses from those who agree to participate in our polling activities—already a very unrepresentative sample.

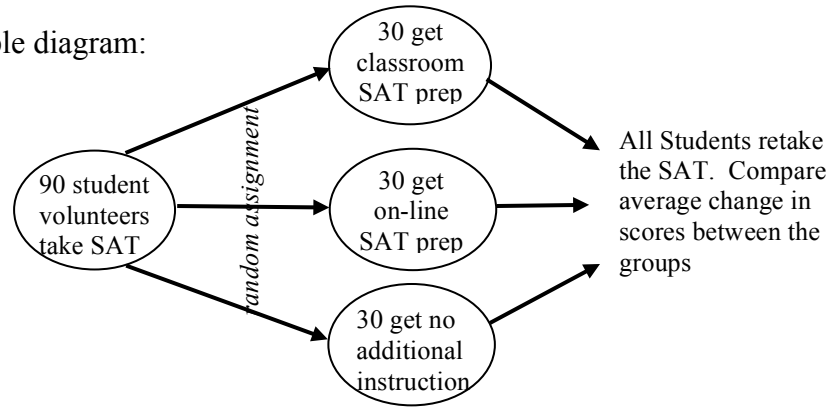
b: Not likely; this samples the population of people who shop at this particular grocery store.

c: Not likely; this samples the population of people who attend movies.

d: Not likely: this samples the population of people who go downtown at the time you are there.

e: This sample is likely to be more representative, as it is closer to random.

9-63. Sample diagram:

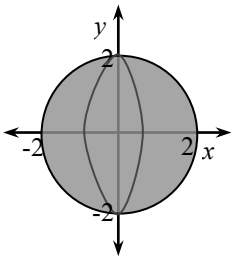


9-64. Children would need to be randomly assigned to treatment groups, one that gets spanked and another where there is no spanking. After a period of years the IQ of both groups can be tested and compared. Any variable that has the suggestion or potential to lower the IQ of a human does not belong in a clinical experiment. Who would decide who, when, and how the spankings would be administered? Would you spank kids randomly?

9-65. Mean: 52 g, mean distance-squared: $\frac{64+64+4+144+4}{5-1} = 70$, sample standard deviation ≈ 8.37g (and not ≈ 7.48g).

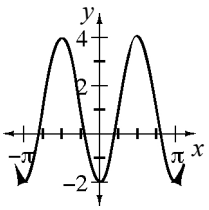
9-66. one point of intersection: (2, 2)

9-67. See graph at right; a sphere, $V = \frac{32\pi}{3}$ cubic units

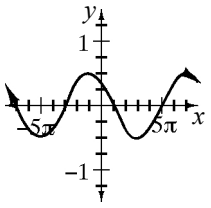


9-68. $x^3 + 8 = (x+2)(x^2 - 2x + 4)$

9-69. **a:**



b:



Lesson 9.3.1

9-75. **a:** They will not show the people who named other stations or people saw the station logo and knew what station the interviewer was from.

b: Surveying outside the gym does not give you a random sample.

c: No, more people drive during the day. You should look at the probability of being in an accident.

d: About half of all power plants are below average. It does not mean that it is unsafe.

9-76. Answers will vary.

9-77. **a:** $3^2 = 9$ **b:** $3^0 = 1$ **c:** $3^3 + 3^1 = 27 + 3 = 30$ **d:** $-\frac{9}{2}$

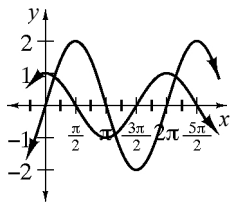
9-78. **a:** $n = 2$; $\frac{1}{7}$ **b:** $n = 0, 1$; $\frac{2}{7}$ **c:** $n = 3, 4, 5, 6$; $\frac{4}{7}$

9-79. $-\frac{1}{\sqrt{5}}$

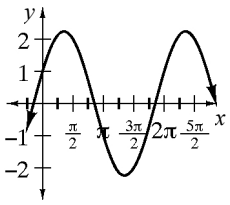
9-80. **a:** $x = 4$ **b:** $x = 9$

9-81. ≈ 278 months or 23 years

9-82. **a:**



b:



9-83. **a:** No

b: No, no number of trials will assure there are no red ones**.**

c: Not possible.

Lesson 9.3.2

9-88. **a:** The typical number of tardy students (center) is the median, 3 students, because 50% of the students fall below 3. The shape is single-peaked and symmetric with no gaps or clusters. The IQR (spread) is 1 student, because Q1 is 2 and Q3 is 3. There are no apparent outliers.

b: $(0.43 + 0.13 + 0.07)(30) = 19$ days

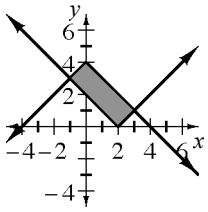
c: $\approx 30\%$

9-89. **a:** Answers will vary.

b: Yes, assuming a sufficient sample size, a controlled randomized experiment can show cause and effect because of the random assignment of subjects to the groups.

9-90. Experiments can be very expensive, time consuming, and in some cases involving humans or animals, unethical.

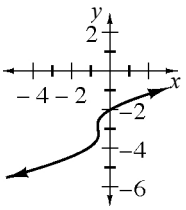
9-91. 6 sq. units; see graph at right.



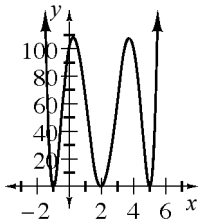
9-92. **a:** $f^{-1}(x) = \sqrt[3]{x+1} - 3$

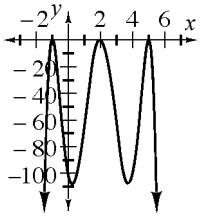
b: See graph below right.

c: Yes, each x is paired with no more than one y.



9-93. **a:** double roots at –1, 2, 5 **b**: Same as the previous except reflected over the x-axis





9-94. **a:** (–4, 0), (–2, 0) and (0, –16) **b:** domain: all real numbers, range: $y \le 2$

9-95. **a:** $y = \frac{1}{4}(x+1)^2 + \frac{3}{8}$, vertex $= \left(-1, \frac{3}{8}\right)$, $x = -1$

b: $y = \frac{1}{4}(x+10)^2 + 16$, vertex = (–10, 16), $x = -10$

9-96. **a:** $x + 3$ **b:** $\sqrt{(x+3)^2 + (y-2)^2}$

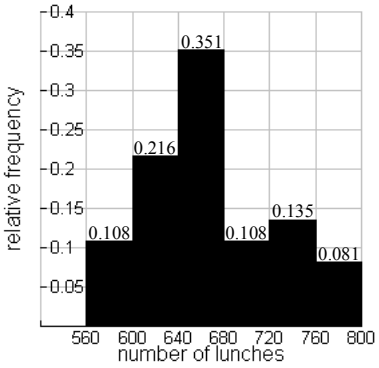
Lesson 9.3.3

9-103. **a:** 667.87 lunches; *sample* standard deviation is 56.17 lunches.

b: (576, 624, 665, 700.5, 785)

c: See histogram at right.

d: Since the shape is fairly symmetric, we'll use mean as the measure of center; the typical number of lunches served is 668. The shape is single peaked and fairly symmetric with no gaps or clusters, the standard deviation is about 56 lunches, and there are no apparent outliers.



e: 10.8%

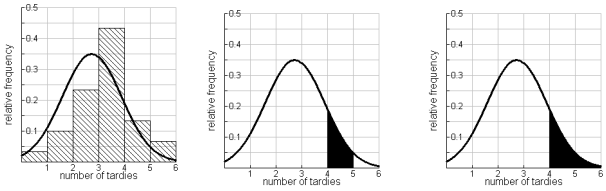
f: Use half of the 680 – 720 bin. 0.216 + 0.351 + (0.5)(0.108) ≈ 62.1%

9-104. **a:** See graph at right.

b: 2.7333 tardy students, 1.1427

c: See graph middle right.

d: See graph middle right. 11.0%

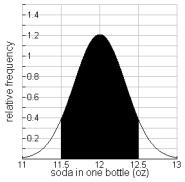


e: See graph far right.
normalcdf(4, 10^99, 2.7333, 1.1427) = 0.1338. 0.1338(180) ≈ 24 days

9-105. **a:** See graph at right.

b: 50 %

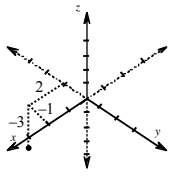
c: See graph at right.
normalcdf(11.5, 12.5, 12, 0.33) = 87%

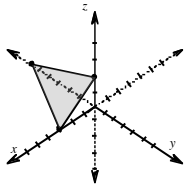


9-106. **a:** $\log_3(5m)$ **b:** $\log_6(\frac{p}{m})$ **c:** not possible **d:** $\log(10) = 1$

9-107. **a:** $\frac{2x^2-2x-7}{(x-3)(x+1)(x-2)}$ **b:** $\frac{-x^2+2x-4}{x(x-2)}$ **c:** $\frac{x+2}{x-5}$ **d:** $x(x^2-2x+4)$

9-108. **a:** $x = \pm\sqrt{26}$ **b:** $x = \frac{-2\pm\sqrt{10}}{3}$





9-109. See graphs at far right.

9-110. **a:** $\sqrt{1224} \approx 34.99$ **b:** $\sqrt{(x+1)^2+(y+1)^2}$

9-111. **a:** $f^{-1}(x) = \frac{1}{3}(\frac{x-5}{2})^2+1 = \frac{1}{12}(x-5)^2+1$ for $x \geq 5$

b: See graph at right.