

9.3 EXERCISES

 PRACTICE

Find the mean, median, mode, range, and standard deviation for each data set. When applicable state whether the data set is unimodal, bimodal, or multimodal. Round answers to one more decimal place than the largest number of decimal places given in the data. All data sets are samples unless stated otherwise.

- 19, 32, 15, 21, 25, 22, 22, 28, 27, 27, 26
- \$11.40, \$32.00, \$22.50, \$12.01, \$10.08, \$18.30, \$18.40, \$32.00
- 45, 21, 26, 26, 45, 37, 22, 33, 26, 21, 42, 37, 41, 43, 46, 35, 31, 29, 46
- 310, 310, 310, 310, 310, 310
- 9, 3, -5, -3, -7, 3, 0, 6, -9, -7, -3, -8
- The following data represent sample ACT scores from students at a local high school.

13	26
10	20
24	30
25	31
6	24
35	35
26	15

- The following are lengths of each movie in the complete Harry Potter film series. Note that because these include all of the films in the series, this is a population.

Time Lengths for Harry Potter Film Series

Movie Title	Time (in Minutes)
<i>Harry Potter and the Philosopher's Stone</i> (2001)	152 minutes
<i>Harry Potter and the Chamber of Secrets</i> (2002)	161 minutes
<i>Harry Potter and the Prisoner of Azkaban</i> (2004)	141 minutes
<i>Harry Potter and the Goblet of Fire</i> (2005)	157 minutes
<i>Harry Potter and the Order of the Phoenix</i> (2007)	138 minutes
<i>Harry Potter and the Half-Blood Prince</i> (2009)	153 minutes
<i>Harry Potter and the Deathly Hallows Part 1</i> (2010)	146 minutes
<i>Harry Potter and the Deathly Hallows Part 2</i> (2011)	130 minutes

8. The following table shows the top 15 busiest airports from January to November 2011.

Top 15 Busiest Airports from January to November 2011	
Airport	Total Passengers
Amsterdam Schiphol Airport	46,213,944
Beijing Capital International Airport	71,284,796
Dallas/Fort Worth International Airport	53,126,399
Denver International Airport	48,402,802
Dubai International Airport	46,287,234
Frankfurt Airport	52,191,355
Hartsfield-Jackson Atlanta International Airport	85,165,259
Hong Kong International Airport	48,587,000
John F. Kennedy International Airport	44,045,938
London Heathrow Airport	63,912,107
Los Angeles International Airport	56,819,805
Madrid Barajas Airport	46,019,110
O'Hare International Airport	61,370,268
Paris Charles de Gaulle Airport	56,254,938
Soekarno-Hatta International Airport	47,513,248
Tokyo International Airport	56,969,971

Source: Wikipedia, s.v. "World's busiest airports by passenger traffic," http://en.wikipedia.org/wiki/World%27s_busiest_airports_by_passenger_traffic

For each data set, determine the most appropriate measure of center.

9. Styles of houses in a suburb: ranch, colonial, bungalow, etc.
10. Grades on the final in Biology 210 at State University.
11. The ratings on a customer satisfaction survey: strongly disagree, disagree, neither agree nor disagree, agree, and strongly agree.
12. Salaries for janitorial staff at the state governmental buildings that include the Director of Sanitation's salary.

APPLICATIONS

Use the formula for the mean, $\bar{x} = \frac{x_1 + x_2 + \cdots + x_n}{n}$, to find the missing piece of data.

13. John knows that his first 4 tests grades were 84, 79, 82, and 88. Find John's grade on the fifth test if his average was 83.8.
14. A small boat that ferries visitors to a resort island has strict guidelines on the weight allowed for passenger luggage. Consequently the five vacationers are limited to a maximum average luggage weight of 40 pounds (lb). The following are the weights of three out of five pieces of luggage: 39 lb, 32 lb, and 43 lb. The two pieces of luggage that haven't been weighed will have to split the remaining weight allowance. Determine the maximum average possible weight allowance for each remaining bag.

Use the Empirical Rule to answer each question.

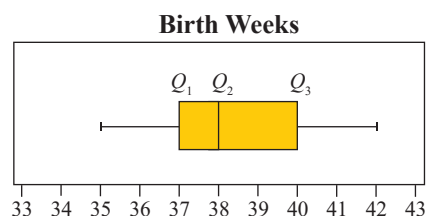
15. Although there is some controversy around the precise average body temperature of adults, new data suggest that the mean is 98.2° with a standard deviation of 0.6° and has a bell-shaped distribution.
- According to this distribution, approximately what percentage of body temperatures are between 97° and 99.4° ?
 - Approximately what percentage of temperatures are greater than 98.8° ?
 - Approximately what percentage of temperatures are no more than 98.2° ?
16. In 2011, high school seniors had the following mean and standard deviation on the mathematics portion of the SAT exam: $\mu = 514$ and $\sigma = 117$.
- Approximately what percentage of scores were greater than 397 but less than 631?
 - What two scores have approximately 95% of the data between them?
 - Approximately what percentage of high school seniors had mathematics scores between the first and second quartiles?
 - Describe where the best and worst 0.3% of scores lie.

Solve each problem.

17. Marcel scored in the 91st percentile on the MCAT (Medical College Admissions Test). The medical school he is applying to only accepts students who score in the top 10% on the MCAT. Did Marcel score well enough to be considered for his school of choice?
18. The five-number summary is a numerical description of data that includes the minimum data point, the maximum data point, and the data points representing quartiles Q_1 , Q_2 , and Q_3 . The following are house prices in one neighborhood.

\$181,865	\$119,442	\$152,750	\$100,960	\$159,635
\$150,963	\$133,702	\$149,788	\$145,495	\$182,500
\$112,021	\$120,900	\$145,850	\$164,590	\$144,413

- Find the five-number summary of the house prices.
 - What percentage of house prices is at or below \$159,635?
 - What is the range of house prices for this neighborhood?
19. The following graph contains a box plot. A box plot is a graphic display of a five-number summary, which was introduced in Exercise 18. The endpoints represent the minimum and maximum data values, while the lines sectioning off the box in the middle represent each of the quartiles as shown in the graph.



- Based on the box plot, estimate each of the values in the five-number summary.
- The midrange is the average of the minimum and maximum data values. Estimate the midrange from the box plot.

20. Using the information given in Exercise 19, calculate the values needed to construct a box plot for the following data as described in Exercise 19. Sketch a graph of the box plot.

310 320 450 460 470 500 520 540
 580 600 650 700 710 840 870 900
 1000 1200 1250 1300 1400 1720 2500 3700

21. Given the five-number summary for three data sets, sketch a box plot for each, side-by-side on the same graph. Then answer the following questions based on your box plots.

Committees and the Ages of Members

	Membership	Finance	Publicity
Min	23	26	25
Q_1	27	32	26
Q_2	29	38	27
Q_3	33	44	29
Max	35	46	33

- Which committee has the largest range of ages?
- Which committee has the least variation in the ages?
- Which committee has the smallest median?

 **WRITING & THINKING**

22. Given the following measures of center, decide the likely shape of the distribution: mean = 22.5, median = 17.0, mode = 17.0.
23. Accounting 101 has five class sections. All five classes took the same final. The mean scores on the final for each class were 72, 78, 76, 74, and 79. Can the mean final score for all students in Accounting 101 be found by averaging the mean scores in each class? Explain your answer.
24. Does the standard deviation of a data set equaling zero imply that all entries in the data set equal zero?
25. Is it possible for a data set to have a standard deviation of -2.5 ?
26. Explain the difference between Amelia making an 82 on her precalculus exam and scoring in the 82nd percentile in mathematics on the ACT test.
27. Describe two data sets, one that might have a large variation and one that might have a small variation.
28. Suppose that, in a list of data, 37% of the data are greater than 45. True or False: Q_1 must be greater than 45.

29. Lucas received an e-mail containing the five-number summary for the company sales data that he asked for. Unfortunately, the e-mail cut off the summary labels and scrambled their order. Can you still determine which number is the first quartile, Q_1 ? Explain your answer.

five-number summary: 11, 17.5, 9, 13.5, 19

30. Suppose that 110 male students are surveyed and that 52% have a height less than 1.776 m.
- True or False: Of those surveyed, the mean height must be under 1.776 m.
 - True or False: Of those surveyed, the median height must be under 1.776 m.
31. If we know that a salary of \$65,300 was in the 67th percentile in a company survey, can we determine how many employees were in the sample? Why or why not?