

11.3 Exercises

✓ CONCEPT CHECK

1. The arithmetic mean is the _____ of all the data points _____ by the number of data points.
2. If a data set contains an _____ amount of values, the median is the middle value in the ordered list.
3. If a graph is skewed to the right, the majority of the data points fall on the _____ side of the distribution.
4. True or False: If all values in a data set are equal, the data set has no mode.
5. True or False: The values in a data set with a standard deviation of 3.5 is more spread out than the values in a data set with a standard deviation of 1.2.

💡 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.

6. 19, 32, 15, 21, 25, 22, 22, 28, 27, 27, 26
7. \$11.40, \$32.00, \$22.50, \$12.01, \$10.08, \$18.30, \$18.40, \$32.00
8. 45, 21, 26, 26, 45, 37, 22, 33, 26, 21, 42, 37, 41, 43, 46, 35, 31, 29, 46
9. 310, 310, 310, 310, 310, 310
10. 9, 3, -5, -3, -7, 3, 0, 6, -9, -7, -3, -8
11. The following data represent sample ACT scores from students at a local high school.

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

12. 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

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

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

APPLICATIONS

Use the formula for the mean to find the missing piece of data.

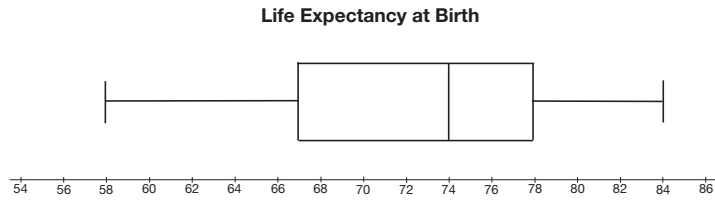
17. John knows that his first 4 tests grades were 84, 79, 82, and 88. Find John's grade on the fifth test if his average was 83.8.
18. A family has four children. Edward has a height of 58 inches, David 52 inches, and Chloe 44 inches. How tall is Benjamin if the average height of the children is 52.5 inches?
19. Ella went to a butcher shop to buy some meat. She chose five pieces of meat, three of which weighed 960 g, 840 g, and 1120 g. If Ella needs at least 5 kilograms of meat, how much should the other two pieces weigh, on average?
20. Jacob and his five friends choose what drinks to order at a coffee shop. The first three people want a cappuccino for \$4.50, a latte for \$4.25, and hot tea for \$3.50. How much, on average, can the next three people spend on each drink if the total check should not exceed \$25?

21. 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?
22. 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.
23. 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?
24. People who are 6 feet and 1 inch tall are in the 90th percentile among American adults. Which of the following is the most likely percentile for people who are 6 feet and 7 inches tall: 80th, 85th, 90th, 95th, or 99th?
25. The average annual temperature in Georgia is at the 90th percentile among all the US states, while the temperature in North Carolina is at the third quartile. Which state has the higher average annual temperature?
26. Ethan's salary is at the third quartile at the company he works. His wife's salary is at the second quartile at the company she works. Are we able to determine which of them has a higher salary? Explain.
27. A doctor told Amelia that her child's weight was at the 30th percentile in the average growth chart. Does the child weigh more or less than the median weight for his age?
28. Last year, the Smiths were at the 72nd percentile of the nation's income distribution. This year, they are at the third quartile. Did their position go up or down?
29. Consider the prices of 20 used cars sold on an online platform.

\$24,400	\$25,270	\$27,570	\$33,430	\$28,500
\$33,340	\$33,760	\$37,240	\$23,270	\$24,790
\$21,590	\$21,870	\$33,650	\$35,890	\$30,560
\$34,910	\$38,680	\$36,310	\$36,640	\$36,030

- Find the five-number summary of the used car prices.
- What percentage of used car prices are at or below \$23,270?
- What is the range of used car prices on the platform?

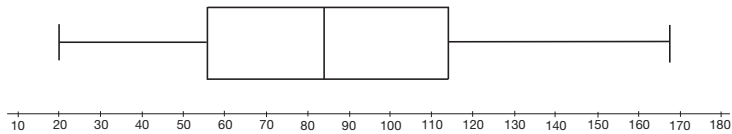
30. Consider the given box plot.



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

31. Calculate the values needed to construct a box plot for the following data. Sketch a graph of the box plot.

26	26	26	34	40	46	54
58	64	74	74	76	82	82
86	96	100	110	110	112	112
116	120	130	158	162	166	168



32. 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.

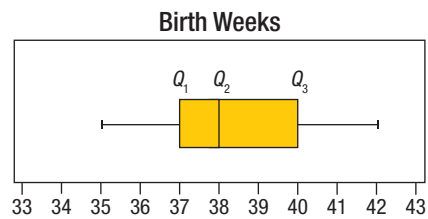
Weight of Adult Male Dogs by Breed (in pounds)			
	English Mastiffs	Golden Retrievers	Rottweilers
Min	190	55	95
Q_1	205	65	105
Q_2	220	68	112
Q_3	225	70	120
Max	240	85	135

- a. Which breed has the largest range of weight?
- b. Which breed has the least variation in weight?
- c. Which breed has the largest median weight?

33. 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?
34. The following graph contains a box plot.



- 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.
35. Calculate the values needed to construct a box plot for the following data. 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

36. 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

37. 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.
38. Does the standard deviation of a data set equaling zero imply that all entries in the data set equal zero?
39. Explain the difference between Amelia making an 82 on her pre-calculus exam and scoring in the 82nd percentile in mathematics on the ACT test.
40. Describe two data sets, one that might have a large variation and one that might have a small variation.
41. 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