Applications

1. a. The median is 3. Order the data from least to greatest. The median is the value that separates the data into two parts with an equal number of data values in each part. For 16 households, the median is located between the 8th and 9th data values. Both have a value of 3, so the median is 3.

b. Yes, six of the households have 3 children. This is possible because the median is located using the data values. The only time the median will not be equal to one of the data values is when there is an even number of data values, where the two middle values are not identical.

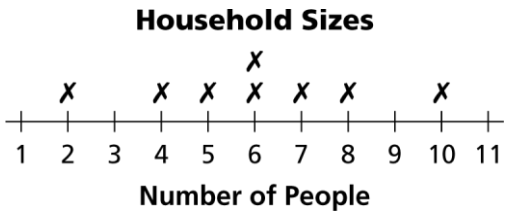
2. a. The mean is 4. You add the data values together and divide by the number of data values to get the mean; (64 ÷ 16 = 4). Or, you find the mean by making an ordered-value bar graph, showing the data for each of the households, and then evening out the bars so there are 16 households, each with 4 members. The mean tells you the value that each data item would have if they all had the same value.

b. There are no squares over the number 4 on the line plot, which means there are no households in the data set with four children. This is possible because there are households with more than four children and households with less than four children to balance each other.

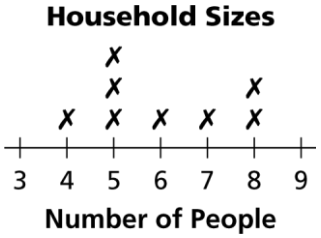
3. Answers will vary. The mean (4) is influenced by the high data value of 11. So, the median (3) may be a better measure of a typical size.

4. D

5. Possible answer:

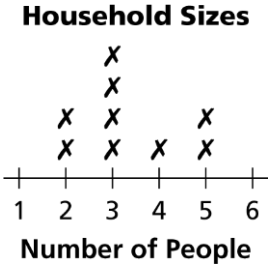


6. Possible answer:



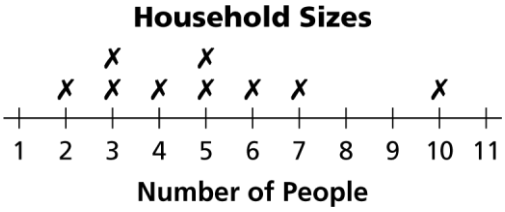
7. Answers will vary depending on the distributions in Exercises (5) and (6). It is possible for the medians to be different when the means are the same.

8. Possible answer:



For nine households to have a mean of $3\frac{1}{3}$ people, there would have to be a total of $9 \times 3\frac{1}{3}$, or 30 people.

9. Possible answer:



For nine households to have a mean of five people, there would have to be a total of 9 × 5, or 45 people. If one household has ten people, that leaves 35 others to distributed between the remaining eight households.

10. numerical

11. categorical

12. categorical

13. categorical

14. numerical

15. categorical

16. numerical

Connections

17. a. $\frac{3}{4}$ hour

b. G

18. a. 32 ounces per player; 1,152 ounces ÷ 36 (two teams of 18 players) = 32 ounces.

b. The mean; it represents the total amount of water evenly-shared among the 36 players.

19. a. Sabrina and Diego danced $3\frac{3}{4}$ hours and Marcus danced $2\frac{1}{4}$ hours.

b. The mean is less than the median. The median is $3\frac{3}{4}$ hours; the mean is less than $3\frac{3}{4}$ hours because the low data value of $2\frac{1}{4}$ hours decreases the average amount of hours each person danced.

20. a. The mean tells Jon that if all the rabbits in the data set that was used to find the mean lived to be the same age, that age would be 7 years. What actually happens is that some of the rabbits don't live to 7 years and some of the rabbits live beyond 7 years.

b. Knowing the maximum age, minimum age, and median age would give Jon more information about the possible lifespan of his rabbit.

21. If the typical price of a box of granola bars is \$1.33 and there are nine different brands of granola, the total price for the nine boxes is \$11.97. You would have to price the boxes so the total price would be \$11.97. You could have the nine brands all priced at \$1.33, or have just a few priced at \$1.33, or have no brands priced at \$1.33. Here is one possibility: \$1.35, \$1.39, \$1.49, \$1.17, \$1.29, \$1.35, \$1.25, \$1.29, \$1.39.

22. No; some children may have spent 39 minutes but, overall, there were children who spent less or more time than this.

23. about 66%

24. about $\frac{3}{4}$ or 0.75 of an hour

25. $2\frac{1}{3}$ hours or 2.333… hours

26. a. Mayor Phillips determined the mean income. The total of the incomes is \$32,000; dividing by the number of incomes, 16, gives \$2,000 per week. Lily Jackson found the median income. There are a total of 16 values, so the median is between the eighth and ninth values. The eighth value is 0 and the ninth value is 200, so finding the median results in \$100 per week. Ronnie Ruis looked at the mode income, which is \$0 per week. Each of their computations is correct.

b. No; no one earns \$2,000 per week.

c. No; no one earns \$100 per week.

d. Yes; eight people earn \$0 per week.

e. Both \$200 and \$100 are reasonable answers. The median of all incomes is \$100. Supposing those who earn \$0 are children, you could find the median of the remaining values, which is \$200. You could also make an argument for using the mode as the typical income, \$200, if you exclude the \$0 data values; the mode is what most people earn. The mean, however, is greatly affected by the one large income value; it would not be a good choice for what is typical.

f. The mode would be \$200. The median would be \$200. The mean would be \$1,640.

27. a. Possible answer: Half the data values are grouped in the interval of 1–5 or 8–17. One quarter of the data values are grouped in the interval 8–13.

b. The range is 29 movies. You may find it by taking the maximum value (30) and subtracting the minimum value (1).

c. The mean is 9 movies. Add to find the total number of the movies watched (225), and then divide the total by the number of students (25).

d. The range is 29 movies and the mean is 9 movies. Since the mean is more toward the minimum than the maximum, more students fall in the low end of the data values.

e. The median number of movies watched is 8. The mean is larger than the median because the large values pull the mean up but have less influence on the median.

28. Numerical; the answer to the question "How many juice drinks do you drink in one day?" is a number.

29. No; the median is the number that separates the ordered data in half. The number of people that drink 5 juice drinks in one day is near the upper end of the data, so 5 cannot be the median.

30. No; there are 100 students, so the median is between the fiftieth and fifty-first ordered data values. A total of 39 students drank 0 or 1 juice drink in one day. This means the median is greater than 1 juice drink, because the fiftieth value will be in the next column—2 juice drinks in one day.

31. The total number of juice drinks is determined by evaluating each bar of the graph:

7 people × 0 = 0 juice drinks

32 people × 1 = 32 juice drinks

29 people × 2 = 58 juice drinks

16 people × 3 = 48 juice drinks

6 people × 4 = 24 juice drinks

5 people × 5 = 25 juice drinks

3 people × 6 = 18 juice drinks

1 person × 7 = 7 juice drinks

1 person × 10 = 10 juice drinks

So, 100 people drank a total of 222 juice drinks in one day.

32. a. Possible answers: grape, cherry, and mango juice drinks

b. The data are categorical. Flavors of juice are not numbers.

c. The graph for the categorical data could have a horizontal axis showing the names of the Juice Drinks and labeled "Kind of Juice Drinks." The vertical axis could display the number of students that said they liked each type of juice drink and be labeled "Frequency." The title of the graph could be "Favorite Juice Drinks Consumed by Students." Each bar of the graph would show how many people had chosen that particular juice drink. The height of the bar would be the frequency of that choice.

Extensions

33. Answers will vary. Pay attention to the students' reasoning. Generally, data reported in newspapers use the mean.

34. There are 365 days in a year. This means the average student spends about 3.2 hours in front of a screen per day.

35. Possible answer: (See Figure 1.)

The challenge for students will be developing the scale for the vertical axis. Because of the range of the data (9 to 303 pets), the scale probably needs to be numbered by at least tens or twenties.

36. Possible answer: Fish occur the most frequently as pets owned, followed by cats and dogs. In Problem 2.4, dogs occur most frequently, followed by cats, but with a definite difference in numbers. The remaining pets are not like those of the students in Problem 2.4. Many of these pets are "indoor" pets. In Problem 2.4, many of the pets were "outdoor" pets that would live on a farm or in more rural areas.

37. Answers will vary. Some students may immediately respond that 841 people were surveyed, indicating that each person surveyed had one pet. Other students may note that this response does not take into account that it is likely that some people surveyed had no pets or had more than one pet. This may lead students to look back at the data from Problem 2.4, in which they know both the total numbers of pets and the number of people surveyed. From this data, students might find the median number of pets a person has (3.5) and use it as a basis for looking at the new data set, dividing 841 pets by 3.5 per student to get the possible number surveyed (about 240 students). Some students may raise a concern that the data from Problem 2.4 may reflect a special group of students who live in the country and therefore often have more pets; perhaps this particular data do not reflect the kinds of people surveyed for Problem 2.4. Students may have other strategies as well.

Figure 1