

# Applications

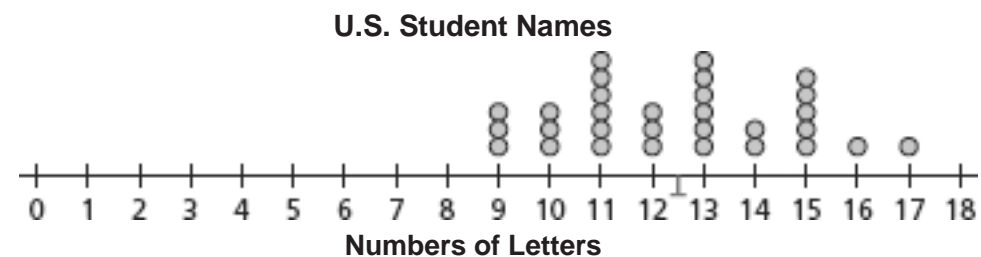
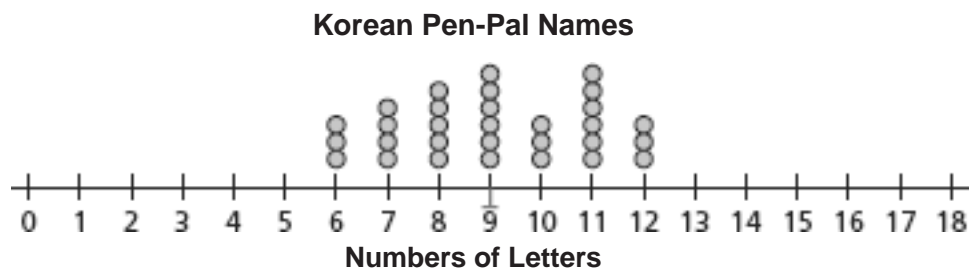
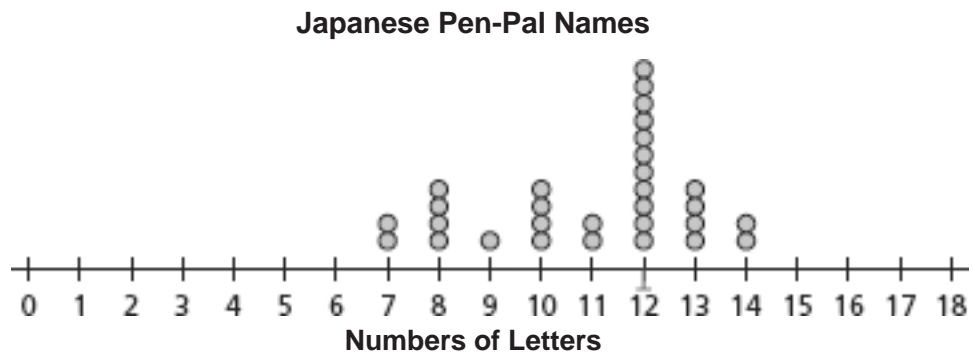
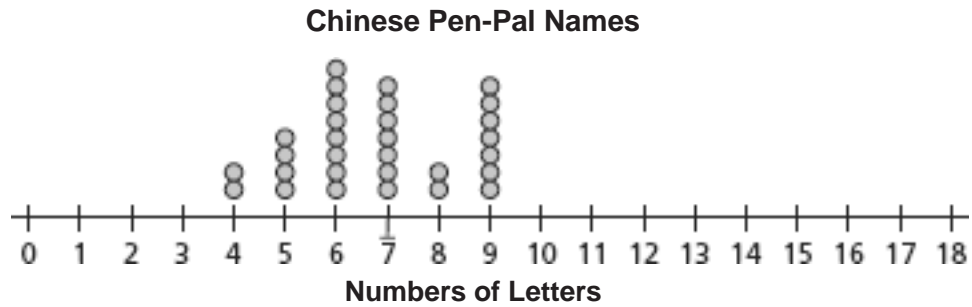
Servers at the Mugwump Diner receive tips for excellent service.

1. a. On Monday, four servers earned the tips below. Find the range of the tips.



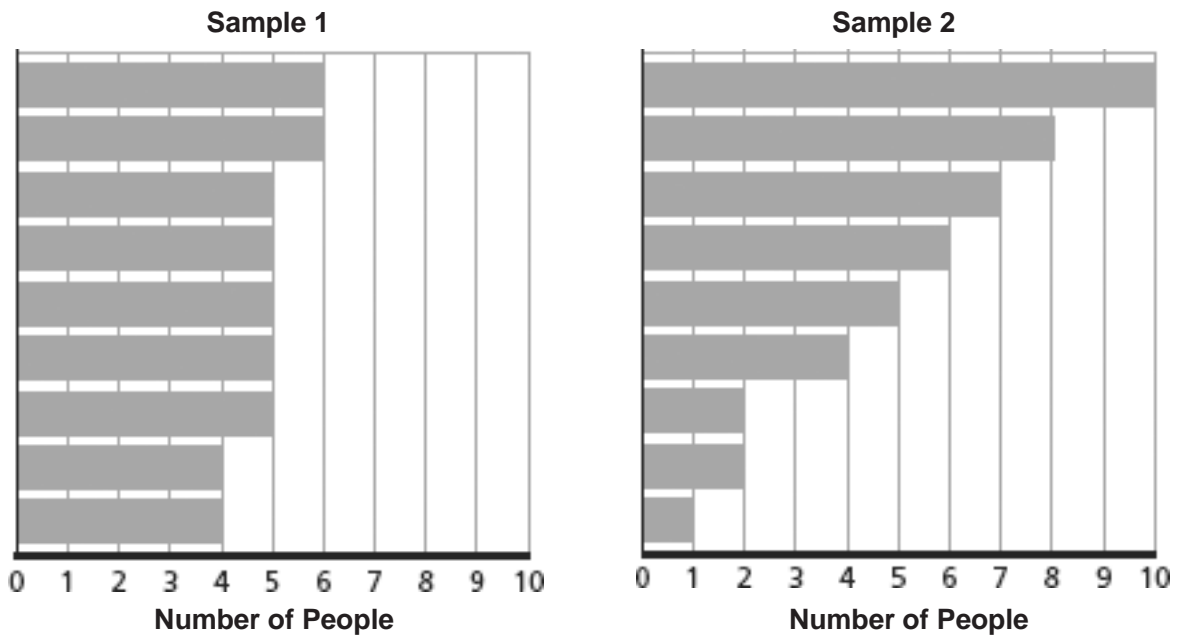
- k. What range of tips did each server get? Explain.
  - c. Yanna was busy clearing a table when the tips were shared. Yanna also received \$16.10 in tips. Suppose Yanna's tips were included with the other tips, and the total was shared equally among the five servers. Without doing any computations, will the four servers receive less than, the same as, or more than they did before Yanna's tips were included? Explain.
2. On Tuesday, all five servers shared their tips equally. Each received \$16.45. Does this mean someone originally received \$16.45 in tips? Explain.
3. a. On Wednesday, Yanna received \$13.40 in tips. When tips were shared equally among the five servers, each received \$15.25. How could this have happened? Explain.
  - b. Based on the information in part (a), what can you say about the variability of the tip data on Wednesday? Explain your reasoning.

4. Recall the name-length data from Investigation 1. You explored name lengths from several different countries. The dot plots below show four distributions of data. Each dot plot shows the median ( $\perp$ ).



- a. What is the interquartile range (IQR) of each distribution? Explain how you found each IQR.
- b. Using the IQRs, for which distribution is the middle 50%, the least spread out? The most spread out? Explain.

5. Below are two ordered-value bar graphs (Sample 1 and Sample 2), each showing nine households with a mean of five people per household.



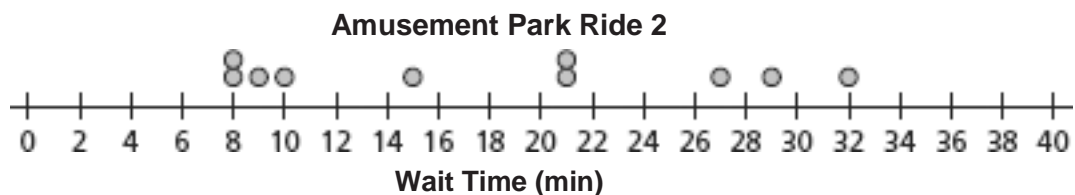
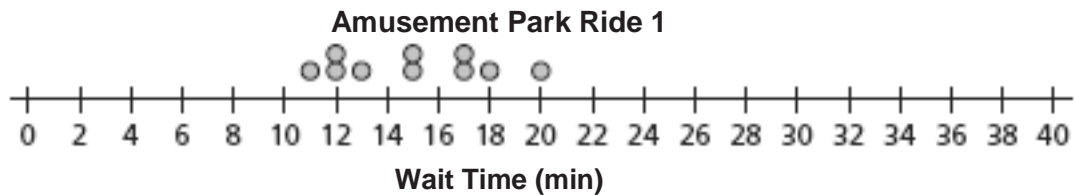
- For each sample, how many *moves* does it take to even out the bars so that the mean is 5? A “move” is the movement of one person from one household to another household.
- Draw an ordered-value bar graph showing nine households in which each data value is 5. Use the same scale as the other two graphs and label it Sample 3. How does this show that the mean is five people?
- The closer a data value is to the mean, the fewer moves it takes to even out the data. In which graph (Sample 1, 2, or 3) are the data closest to the mean (vary the least)? Farthest from the mean (vary the most)? Explain.
- Using the three ordered-value bar graphs, find the mean absolute deviation (MAD) for each set of data. Based on the MADs, which set of data varies the most from the mean of five people? Varies the least? Explain.

6. Jeff and Elaine are studying for their final exam. The grading spreadsheet below shows their practice-test scores. Each test has a top score of 100.

File Edit Tool View Chart Class Help											
Algebra 1 Practice Tests						Algebra 1 Homework					
Class	Name	Student Number	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6	Test 7	Test 8	Test Average
001	Jeff	# 18	75	80	75	80	75	80	85	90	
001	Elaine	# 24	60	70	80	70	80	90	100	90	

Low Score  High Score

- Make a line plot of each person's practice tests scores.
  - What are the median and IQR of each distribution?
  - What are the mean and MAD of each distribution?
  - On the day of the exam, who is more likely to receive a score of 80, Jeff or Elaine? Explain your reasoning.
7. The dot plots below show the distributions of ten wait times at two rides.

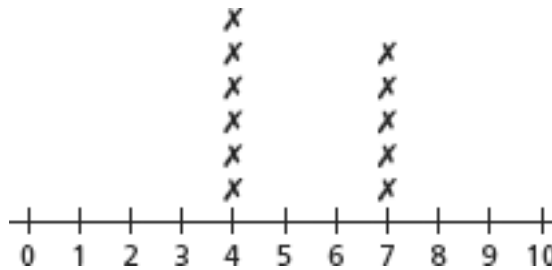


- Find the mean of each data set.
- Compute the MAD of each data set.

- c. Compare the MADs. In which distribution do the data vary more from the mean? Explain.
- d.
  - i. Make your own data set of ten wait times. Draw a dot plot.
  - ii. Compute the MAD.
  - iii. Compare the three distributions. In which distribution do the data vary more from the mean? Explain your thinking.

For Exercises 8–10, use the line plots below.

**Distribution A**



**Distribution B**



**Distribution C**



8. Find the interquartile range (IQR) and mean absolute deviation (MAD) of each data set.
9. Using the MAD, which distribution has the least variation from the mean? The most?
10. Using the IQR, which distribution has the greatest spread in the middle 50% of data? The least?

11. The frequency table below shows the number of pets owned by students in three different sixth-grade classes.

**Pet Ownership**

Number of Pets	Class 1	Class 2	Class 3
0	5	4	2
1	3	1	2
2	5	5	5
3	2	3	4
4	0	3	1
5	0	1	2
6	1	2	3
7	0	0	0
8	0	0	1
9	0	0	1
10	0	0	0
11	0	1	0
12	0	0	1
13	1	0	0
14	1	0	1
15	0	0	0
16	0	0	0
17	0	0	1
18	0	0	0
19	0	0	1
20	0	0	0
21	0	0	1
22	0	0	0
23	1	0	0
24	1	0	0

- Draw a line plot or dot plot of each data set. Use the same scale on each graph so you can easily compare the distributions.
- Compute the median and IQR for each distribution. Write at least three statements to compare the classes using the median and IQR.
- Below are the means and MADs for each data set. Write at least three statements to compare the classes using the means and MADs.

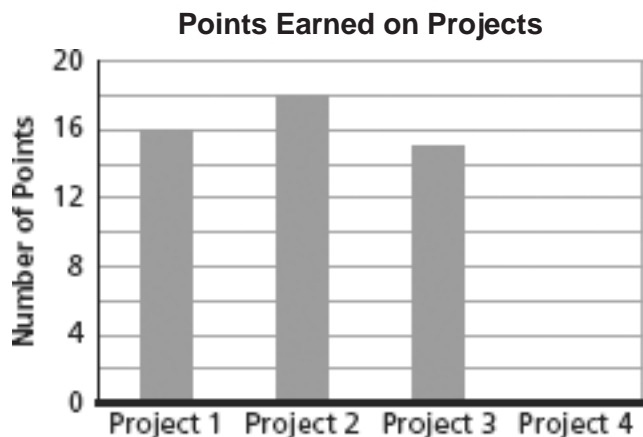
**Pet Ownership Statistics**

Number of Pets	Class 1	Class 2	Class 3
Mean	5	2.67	6
MAD	3.6	1.74	4.46

# Connections

---

For Exercises 12 and 13, use the bar graph below.



- 12. a.** Malaika's mean score is 17 points. How many points did Malaika receive on Project 4? Explain.
- b.** What is the range of Malaika's scores on the four projects? What does this tell you about the variation in her scores?
- 13.** Each project has a maximum score of 20 points.
- a.** What would Malaika's mean score be if she had a total of 80 points for the four projects? A total of 60 points?
- b.** Give four possible project scores that would result in each mean score in part (a).
- c.** What is the range of the scores for each of your sets of four project scores? What does this tell you about how spread out or variable the scores are?
- d.** Are these ranges more spread out, or variable, than the range of Malaika's set of scores? Explain.

For Exercises 14–16, use the tables below.

**Caffeine Content of Selected Soda Drinks**

Name	Caffeine in 8 Ounces (mg)
Soda A	38
Soda B	37
Soda C	27
Soda D	27
Soda E	26
Soda F	24
Soda G	21
Soda H	15
Soda J	23

**Caffeine Content of Selected Other Drinks**

Name	Caffeine in 8 Ounces (mg)
Energy Drink A	77
Energy Drink B	70
Energy Drink C	25
Energy Drink D	21
Iced Tea A	19
Iced Tea B	10
Coffee Drink	83
Hot Cocoa	2
Juice Drink	33

- 14. a.** Find the mean and median amounts of caffeine in the soda drinks.
- b.** Find the mean and median amounts of caffeine in the other drinks.
- c.** Using parts (a) and (b), is it possible to say which type of drink—sodas or other drinks—has greater variability in caffeine content? Explain.
- d.** Write three statements comparing the amounts of caffeine in sodas and other drinks.
- 15.** Indicate whether each statement is true or false.
- a.** Soda B has more caffeine than Soda F or Soda D.
- b.** Energy Drink C has about three times as much caffeine per serving as Energy Drink A.
- c.** 75%, of all the drinks have 25 mg or less of caffeine per serving.



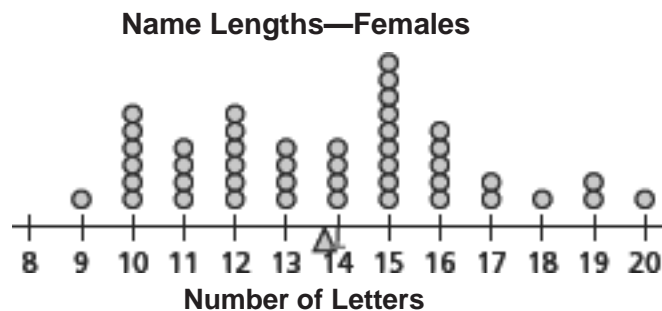
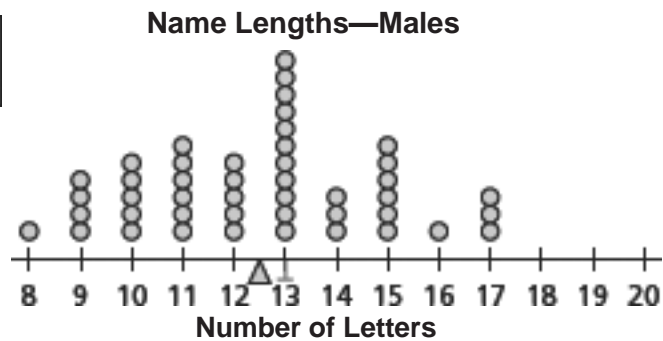
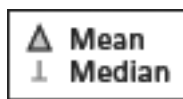
16. In Exercise 14, you found the means and medians of the sodas and the other drinks. Two MADs and two IQRs are listed below.

MAD = 5.16 mg  
IQR = 10 mg

MAD = 25.93 mg  
IQR = 59 mg

- Which statistics describe the variability of caffeine content in the sodas? Explain your reasoning.
- Which statistics describe the variability of caffeine content in the other drinks? Explain.

For Exercises 17 and 18, use the dot plots below.



- Compare the two sets of data. Which group has longer names? Explain.
- Look at the distribution for females. Suppose that the data for four names with 18 or more letters changed. These students now have name lengths of ten or fewer letters.
  - Draw a dot plot showing this change.
  - Will the change affect the median name length for females? Explain.
  - Will the change affect the mean name length for females? Explain.



For Exercises 23–25, use the data below.

- Four pop songs have durations of 162, 151, 174, and 149 seconds.
- Four folk songs have durations of 121, 149, 165, and 184 seconds.

**23. Multiple Choice** What is the MAD of the folk songs' durations?

- F. 18 seconds    G. 19 seconds    H. 18.25 seconds    J. 19.75 seconds

**24. Multiple Choice** What is the MAD of the pop songs' durations?

- A. 2 seconds    B. 5 seconds    C. 6 seconds    D. 9 seconds

**25. Multiple Choice** Which of the following statements is true?

- F. The variability in folk songs' durations is about half that of pop songs.
- G. The variability in folk songs' durations is about twice that of pop songs.
- H. The variability in folk songs' durations is about three times that of pop songs.
- J. The variability in folk songs' durations is about four times that of pop songs.

## Extensions

---

**26.** Mark has an easy way to find his mean test score: "Each math test is worth 100 points. Suppose I get 60 on my first test and 90 on my second. My average would be 75, because half of 60 is 30, half of 90 is 45, and  $30 + 45$  is 75. Now suppose I had three test scores: 60, 90, and 84. My average would be 78, because one third of 60 is 20, one third of 90 is 30, one third of 84 is 28, and  $20 + 30 + 28 = 78$ ."

Does Mark's method always work? Explain.

**27.** Use the data set 20, 6, 10, 8, 12, 16, 14, 15, 14, 7.

- a. Find the mean, mode, and median. Then find the IQR and MAD.
- b. Add 3 to each data value in the set. Now determine the mean, mode, median, IQR, and MAD. What happened? Explain.
- c. Multiply each data value in the set by 2. Now determine the mean, mode, median, IQR, and MAD. What happened? Explain.