In these activities you will use outliers to analyze data sets. After completing the activities, discuss and/or present your findings to the rest of the class.

Activity 1 [Page 1.3]

1. Select **menu> Class> Set 2** to look at the number of text messages sent/received from students in another class. Select **Summarize**, then **UQ** − **LQ** = **IQR**.

   a. What is $\frac{1}{2}$ IQR?

   b. Estimate how many times you will have to **Move boundary out 1/2 IQR** before none of the dots will be left outside of the dotted segments.

   c. Select **UQ** − **LQ** = **IQR**. Check your conjecture to b. How long are the dotted segments?

2. Sometimes it is important to determine whether a value is extreme and really distinct from the others. These values are called *outliers*. An outlier is any value that lies outside of the box by a distance of three $\frac{1}{2}$ IQRs in either direction.

   a. How many IQRs is three $\frac{1}{2}$ IQRs?

   b. Use **Move boundary in 1/2 IQR** and **Move boundary out 1/2 IQR** to identify the students who are outliers in terms of the number of text messages they send/receive in this class.

c. Select **Box Plot/Outliers**. How can you tell from the box plot which students are outliers with respect to the number of texts they send/receive?

d. Give a plausible explanation for why these students might be outliers.

3. Reset. Select **Set 1**. Show the box plot with outliers for the distribution.

a. Identify students in this class who are outliers.

b. Give a plausible explanation for why students might be outliers.

c. Select **Set 3**. Do you think the distribution will have any outliers? Use the TNS activity to check your thinking.

4. Mathematicians like formulas.

a. If x represents a value, which of the formulas below do you think can be used to find an outlier? Explain your reasoning.

i. $x > UQ$ ii. $x > UQ + IQR$

iii. $x > UQ + \frac{1}{2}IQR$ iv. $x > UQ + \frac{3}{2}IQR$

b. Use your reasoning from question a above to write a formula to describe an outlier at the left end of a distribution.

c. If *LQ=135*, *UQ=185*, identify each as true or false. An outlier will be any value

i. larger than 185.

ii. larger than 210.

iii. larger than 260.

iv. smaller than 60.

5. Which of the following are true? Give an example from the TNS activity to support your reasoning.

a. The smallest and largest values of any distribution are outliers.

b. Not all distributions have outliers.

c. An outlier will be more than one box plot width plus half of the width of the box plot to the left and right of the box.

d. The segments on each side of the box always extend $1\frac{1}{2}\cdot \text{IQR}$ beyond the LQ and the UQ.

Activity 2 [Page 1.5]

1. Work with a partner. Write a short description of the effect of outliers on the measures of center and spread. Use **menu> New Class** to find distributions that support your thinking.

Activity 3 [Page 2.2]

1. Look at the distributions with the IQR segments.
   a. Which distributions will probably not have an outlier? Explain how you know.

   b. Find 1.5 IQR for each of the classes.

   c. Use your work from the question above to estimate whether each distribution has an outlier.

2. Select **New Classes**.
   a. Decide if students in any of the classes brought a lot more or a lot less items than their classmates. Use the IQR to help you decide. Check your work with a partner.

   b. Determine the total number of items brought by one of the classes. Calculate the mean number of items for that class. Explain how you found your answer.

   c. Select **New Classes** until you find two of the four classes with outliers. Check your work with a partner.