SESSION FOUR
EXPLORING THE MEDIAN

Outcomes

- To learn the meaning of median and range
- To learn how to construct a stem-and-leaf plot
- To learn how to construct a box-and-whisker plot
- To discuss the advantages and disadvantages of a bar graph, stem-and-leaf plot and box-and-whisker plot

Overview

This session involves participants in estimating and collecting data, then using that data to construct various graphical representations and explore the median. Through group discussion, participants will compare the various representations and identify some of their advantages and disadvantages.

Time

15 minutes	The first part of the session allows participants to share their homework.
75 minutes	This extensive investigation involves estimating the number of raisins that come in a small box, then using the estimates to construct a bar graph, stem-and-leaf plot, and box-and-whiskers plot.
30 minutes	In this activity, participants practice constructing a bar graph, stem-and-leaf plot, and box-and-whisker plot using data collected by counting the raisins in their boxes. They also use the **All About Us** data that was collected the first session.

Materials

Facilitator	Transparencies (English & Spanish)
• Chart paper, 1" grid	*BLM 19: Constructing a Stem-and-Leaf Plot* *BLM 20: Questions for Comparing Data* *BLM 22: Constructing a Box-and-Whisker Plot* *BLM 23: Questions About Graphs*
Participant	**Handouts (English & Spanish)**
• Graph paper, 5 mm grid, one per participant • Colored pencils • Post-its®, 3x3, two different colors for each participant • Raisins, one small box (.5 oz. if available) per participant • Napkins or paper towels • Chart paper with grid, one sheet per group • Black markers, one per group • Grid strips from 1" grid chart paper, one per participant	**One per participant for class** *BLM 18: Estimation Data* *BLM 19: Constructing a Stem-and-Leaf Plot* *BLM 21: Many Ways to Describe Data* *BLM 22: Constructing a Box-and-Whisker Plot* **One per participant for home** *BLM 24: Bringing Mathematics Home 4*

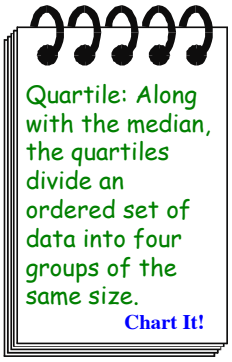
Activities

Preparation of Classroom	Notes
1. Be sure to shop for raisins in time to find small boxes. 2. If using a chalkboard, it must be very clean in order for the Post-it® notes to stick properly. 3. Cut strips lengthwise from the 1" grid chart paper. The strips should be one square wide and very long. 4. Post the **All About Us** charts around the room. They will be used during this session.	
Discussion of Homework (10 minutes)	
1. Have participants check the graph from their homework with their small group. See if the class has any questions about the graphs. 2. Have participants share the graphs that they found from magazines or newspapers with their group. Ask for a few volunteers to share their graphs and the questions that they wrote.	
Organizing Estimations (75 minutes)	
1. Hold up a small box of raisins and ask: • *How many raisins are in this small box of raisins?* Ask for some estimates and write them on the board. 2. Distribute to each participant: one box of raisins, Post-it® notes of one color and the **Estimation Data** handouts. Have the participants estimate the number of raisins in their box and write their estimates on the Post-it® notes (large and dark). 3. Put all the Post-its® on the chalkboard and discuss ways to organize the estimates. When the class has decided on a method of organizing the estimates, have several volunteers organize the Post-its® on the chalkboard. Have all participants record the data on the **Estimation Data** handout, as they will be using this information for the session. 4. Now use the Post-its® to make a large bar graph on the chalkboard, putting intervals on the horizontal axis (in this case use 20-29, 30-39, etc., to be consistent with the stem-and-leaf plot that will be introduced). Put frequency of occurrence on the vertical axis. Have participants volunteer to construct the graph and provide the labels for the axes and the title for the graph.	Use dark markers to write on Post-its®. Have one person in each group collect the notes and post them. This person might be the one born on the day closest to today. Have participants copy data to their handout.

Activities

Organizing Estimations (continued)	Notes
4. Now use the Post-its® to make a large bar graph on the chalkboard, putting intervals on the horizontal axis (in this case use 20-29, 30-39, etc., to be consistent with the stem-and-leaf plot that will be introduced). Put frequency of occurrence on the vertical axis. Have participants volunteer to construct the graph and provide the labels for the axes and the title for the graph. 5. Tell participants that they are going to look at some other ways of organizing data. Hand out **Constructing a Stem-and-Leaf Plot** and display the transparency. Discuss how to create one while you model it on the overhead. Have the participants make their own stem-and-leaf plot using the raisin estimates. 6. Display the **Questions for Comparing Data** transparency. Redraw the stem-and-leaf plot on a blank transparency, then rotate it 90° counterclockwise. Give groups 15 minutes to discuss the following questions. Then discuss with the whole group. • Compare the stem-and-leaf plot and the bar graph. • What is similar? Different? • When might it be more useful to use a stem-and-leaf plot than a bar graph? 7. Have participants make notes of things they want to remember on their handout **Many Ways to Organize Data** (from session 3). 8. Tell them that now that they have done such a good job of organizing the data, we need to describe it. Ask: • *What would you say is a typical estimate with our class?* • *How did you decide?* 9. Hand out **Many Ways to Describe Data.** Tell them that as we discuss organizing data, we will also be discussing some standard ways to describe data. The first is the median. Ask if someone knows what a median is and can identify it with the basketball score estimates. 10. Ask them what the highest and lowest estimates for the basketball score estimates are. Explain that the difference between these estimates is the range. Ask what the range is for the scores.	Median: The median of a set is the value in the middle when data are arranged in numerical order, or, for an even number of values, half of the sum of the two middle values. **Chart It!** Range: The difference between the lowest and highest number in a set of data. **Chart It!**

Activities

Organizing Estimations (continued)	Notes
11. After discussing the median of the basketball score estimates, explain that there are many ways to find the median and we will go through a few. Show them how one way is to count the number of items and divide it by 2, then count that far from one end of a list of ordered data. 12. Hand out the 1" grid strips. Have participants record the estimates from the raisin activity in order from smallest to largest using one square for each entry. 13. Have participants fold the strip in half to find the median. Ask what the median is and record it. Explain that if the fold is on the line between two numbers, the median is half way between the two numbers. Ask them what would be median if the fold falls between 11 and 13. 11 and 12? 14. Tell participants there is a way of organizing the data that uses the median. It is called a box-and-whisker plot. 15. Hand out **Constructing a Box-and-Whisker Plot** and display the transparency. Follow the instructions on the hand out modeling it on the overhead with the participants. You may have to demonstrate how to construct a box-and-whisker plot. Have volunteers make the folds in front of the whole group, then have each person do his/her own. To demonstrate, you might use a long (8ft) strip of continuous computer paper divided into equal segments. Write in the data, then fold the paper in half. Fold in half again to obtain the quartiles. 16. Display the **Questions About Graphs** transparency. Give groups about 15 minutes to discuss the following questions then discuss in the whole group. • What is different about a bar graph and a box and whiskers plot? • What information can you obtain from a stem-and-leaf plot that you cannot obtain from a box-and-whisker plot? • When do you think it would be more appropriate to use a box-and-whisker plot rather than a stem-and-leaf plot? • How can we determine which is the best graph form to use to display our data?	 While the median splits a set of data into two parts, quartile splits a set of data into four parts. The median of the lower half of the data is called the first quartile because scores below it are in the bottom quarter of the data. The median is also called the second quartile. The median of the upper half of the data is called the third quartile. **Questions About Graphs discussion:** A bar graph enables you to determine how many data points there are and how many repetitions there are for each value. A box-and-whisker plot gives a quick view of the range of the data, the median, where most of the data lie, and outliers. A box-and-whisker plot might be especially helpful if we had, say, two classes estimate the number of raisins and we wanted to compare their estimates quickly. The graph we choose depends partly on the kind of data we have and the kind of questions we want to answer with the graph.

Activities

Applications (30 minutes)	Notes
1. Repeat activities in small groups, omitting the developmental activities: • count raisins and put on different color Post-its® • record the class data on their **Estimation Data** sheet • make a bar graph • make a stem-and-leaf plot • make a box-and-whiskers plot 2. Have each group graph one of the **All About Us** charts from the first session write a question that can be easily answered about their graph share their graphs and questions.	
Take Home Activities (5 minutes)	
1. Hand out **Bringing Mathematics Home 4** 2. Have participants look at the instructions as you explain the homework assignment to them. 3. Let the participants know that they should be ready to share their experience with the homework at the next session.	
Preparation for the Next Session	
1. Collect name cards for use in the next sessions. 2. Save the **Chart It!** and bring them to the next class. If desired, you may have the log typed and distributed to participants at the next class.	