

## SESSION THREE REPRESENTING DATA

### Outcomes

- To understand how to represent data in a frequency table, bar graph, and circle graph
- To understand the advantages and disadvantages of each

### Overview

This session is very interactive and is designed to provide participants with experience building frequency tables, bar graphs, and circle graphs from their own data. The frequency table is developed using the data collected from the participants about their birth months. The bar graph and circle graph are first developed physically so that the participant becomes part of the final product of representing the data. These graphs are then transferred to a more standard form. As a result, participants have a learning experience that addresses different learning styles.

### Time

- 15 minutes**      The first part of the session allows participants to share their survey results.
- 15 minutes**      In the first activity, participants examine two different ways of displaying data. They notice that a frequency table has advantages over a mere listing of data.
- 15 minutes**      Participants work in groups to summarize the results of the survey they conducted during the past week. They bring results to the whole group and summarize all results in a frequency table.
- 30 minutes**      Participants form a physical bar graph based on data about their birth month. This information is then graphed.
- 40 minutes**      The last organizational form that the participants explore is a circle graph. Using the data collected about birth months, the participants form a human circle graph. The percentages are estimated using a hundredths disk. Each participant then records the circle graph on paper so that they have a model for their homework. Their homework is to make a bar graph and a circle graph with the results of their surveys from the week before.

### Materials

Facilitator	Transparencies (English & Spanish)
<ul style="list-style-type: none"> <li>• Transparency of recording sheet for class survey (developed the previous week)</li> <li>• Chart paper with 1" grid</li> <li>• Masking tape, 1 roll</li> <li>• One copy of BLM 16: Hundredths Disk for class use</li> </ul>	<p><i>BLM 8: Part 1: Scores on a Math Test</i>  <i>BLM 9: Part 2: Scores on a Math Test</i>  <i>BLM 11: Characteristics of a Frequency Table</i>  <i>BLM 12: Birth Month Data</i>  <i>BLM 13: Constructing a Frequency Table</i>  <i>BLM 14: Bar Graph Template</i>  <i>BLM 15: Favorite Foods Graph</i></p>

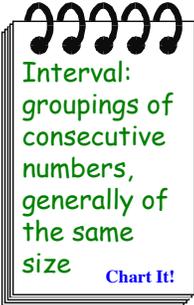
## Materials

Participant	Handouts (English & Spanish)
<ul style="list-style-type: none"> <li>• Chart markers, one set per group</li> <li>• Strips from 1" grid chart paper, 4-5 per participant</li> <li>• Colored pencils</li> <li>• Scissors, one per participant</li> <li>• Rulers, one per group</li> <li>• Calculators</li> <li>• Compasses</li> </ul>	<p><b>One per participant for class</b>  <i>BLM 8: Part 1: Scores on a Math Test</i>  <i>BLM 9: Part 2: Scores on a Math Test</i>  <i>BLM 10: Many Ways to Organize Data</i>  <i>BLM 12: Birth Month Data</i>  <i>BLM 14: Bar Graph Template</i>  <i>BLM 15: Favorite Foods Graph</i>  <i>BLM 16: Hundredths Disk</i></p> <p><b>One per participant for home</b>  <i>BLM 14: Bar Graph Template</i>            (4-5 per participant)  <i>BLM 17: Bringing Mathematics Home 3</i></p>

## Activities

Preparation of Classroom	Notes
<ol style="list-style-type: none"> <li>1. Cut strips lengthwise from the 1" grid chart paper. The strips should be one square wide and very long.</li> <li>2. Set up the <b>Chart It!</b></li> <li>3. Place the name cards from last class near the front of the room where participants can easily find them.</li> <li>4. Optional: Post the <b>All About Us</b> charts around the room. They will not be directly referred to in this session.</li> </ol>	
Discussion of Homework (15 minutes)	
<ol style="list-style-type: none"> <li>1. Display the transparency of the survey questions from session one. Have groups discuss their survey results (from the homework) and how they organized their information. Give each group a transparency for summarizing their information.</li> <li>2. Have groups report their findings. As they report, have the class notice the different ways that the information is organized.</li> <li>3. After participants have presented their methods of organization, tell participants that the theme tonight will be just that: organization of information. The specific ones that will be discussed tonight are: frequency tables, frequency bar graphs and circle graphs.</li> </ol>	

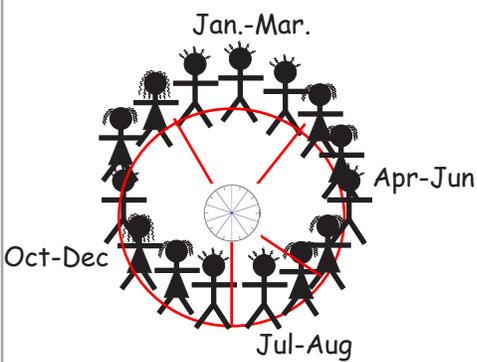
**Activities**

Organizing Data in a Frequency Table (15 minutes)	Notes
<p>1. Start the discussion of organization by handing out <b>Part 1: Scores on a Math Test</b> and <b>Part 2: Scores on a Math Test</b> and display the transparencies. Have participants answer the questions on both sheets.</p> <p>2. Discuss the following questions:</p> <ul style="list-style-type: none"> <li>• Which method of entering data helps you to answer the questions quickly?</li> <li>• Why?</li> <li>• Mr. Rodriguez used a frequency table to organize his information. What intervals does Mr. Rodriguez use in his frequency table?</li> </ul> <p>Make sure that participants understand that an interval is a group of consecutive numbers. For most frequency tables, the intervals are the same size. Ask participants why it makes sense, in this case, to make an exception and vary the size of the intervals. Use the <b>Chart It!</b> to record the definition of interval.</p> <p>3. Hand out <b>Many Ways to Organize Data</b> and display the transparency. Tell participants that they can record ideas after each method has been explained and tried.</p> <p>4. Display the <b>Characteristics of a Frequency Table</b> transparency.</p> <p>5. Discuss characteristics of a frequency table using Mr. Rodriguez’s table as a model.</p>	<div data-bbox="1127 327 1321 632" style="border: 1px solid black; padding: 5px; margin-bottom: 20px;">  </div> <p style="text-align: center;"><u>Characteristics of a Frequency Table</u></p> <ul style="list-style-type: none"> <li>• Shows intervals or groups of consecutive numbers</li> <li>• Intervals should generally have the same size</li> <li>• Intervals must be non-overlapping and exhaustive of the set of data</li> <li>• Has tallies or frequencies to show number of times an item occurs</li> <li>• Data are ordered and tallied</li> </ul>
Constructing a Frequency Table (15 minutes)	
<p>1. Tell participants that they are going to collect some new information about the class. Hand out the <b>Birth Month Data</b> sheet and display the transparency. Have each participants state the month of their birth so that all can hear and record a tally mark on their data sheet. Check to see that everyone was successful in filling out their frequency table. Tell them that they will use this information again later in the session.</p> <p>2. Display the <b>Constructing a Frequency Table</b> transparency. Discuss the steps in constructing a frequency table from a set of data. Have participants make a blank frequency table for each of their survey questions from the homework.</p> <p>3. Have participants get out their homework surveys from the last session and record the data from the survey questions. Have them:</p>	<p>Note that other countries tally by fives also, but their tally groupings may look differently. If there are participants from countries that can share their methods, it will be interesting for the class to see this.</p> <p style="text-align: center;"><u>Constructing a Frequency Table</u></p> <ul style="list-style-type: none"> <li>• Make a table with 3 columns</li> <li>• List the intervals in the first column, labeling it</li> <li>• Label the second column “Tally.” Make a tally mark in the second column next to each interval for every score that falls within that interval</li> <li>• Label the 3<sup>rd</sup> column “Frequency.” Record the total number of tally marks for each interval in the 3<sup>rd</sup> column.</li> <li>• Title the frequency table</li> </ul>

## Activities

Constructing a Frequency Table (continued)	Notes
<p>a) Individually, record all of their data on the frequency table.</p> <p>b) In small groups, combine all group members' data.</p> <p>c) As a class, compile all data from the small groups on the Chart It! Make sure that all of the participants have recorded the class data from each survey question on the frequency table, as they will need it for their homework assignment.</p> <p>4. Ask the class what they can conclude from the data that they just organized.</p>	
Constructing a Bar Graph (30 minutes)	
<p>1. Tell the participants to think about how Mr. Rodriguez made intervals in his frequency table. Suggest that they decide on intervals that could be used to group the months. They may decide on 2 months grouped together, 3, 4 or even 6. Write the groupings on the chalk board, spaced evenly apart so that the participants can form a human bar graph coming out from the groupings.</p> <p>2. Have participants get up and form a line in front of each interval, single file, coming out from the wall.</p> <p>3. Have participants count the number in their line and write that number on the blackboard under their interval.</p> <p>4. With the group still in line, make a frequency table showing the total number of people born in each interval of the year on the <b>Chart It!</b>.</p> <p>5. Tell participants that they have just created a human bar graph. A bar graph organizes information into columns, and you can tell how many times each interval occurs by the height of the column or bar.</p> <p>6. Tell the participants that they are now going to represent their human bar graph on paper. Hand out <b>Bar Graph Template</b> and display the transparency. Discuss a title for the graph, and labeling and numbering of the axes. Ask: <i>What is an appropriate scale for the vertical axis?</i></p> <p>7. Have participants color in one square to represent each person that has a birthday during each interval.</p>	<p>The data from a frequency table can be represented in several ways. Some of the ways are:</p> <p><b>Bar graph:</b> A bar graph is a graphical representation of data that indicates the number of times that a value, a range of values, or a category occurs in a set of data. Both graphical representations can be used to display data from a frequency table. A bar graph can be drawn vertically or horizontally.</p> <p><b>Line plot:</b> A line plot represents the frequency of data using on a number line, but not vertical axis. X's are placed above the number line to indicate frequency. In a line plot, the number line is usually horizontal..</p> <p><b>Histogram:</b> The difference between a histogram and a bar graph is that in a histogram there are no spaces between consecutive bars and the data are strictly numerical, while in a bar graph, categories may be used..</p> <p>It may be appropriate to have categories instead of intervals with the survey question data.. The responses may have been yes/no, or picking a favorite movie or sport. If this is the case, have participants list the categories where they would have listed the intervals.</p>

**Activities**

Constructing a Bar Graph (continued)	Notes
<p>8. Have a volunteer hold up their completed graph and have everyone check to see that they have done it correctly.</p> <p>9. Ask participants individually to write a couple of sentences describing what this final graph tells them. Share some of these with the whole group.</p> <p>10. In whole group, discuss at what ages children might construct bar graphs of the various types they have just done. Refer to NCTM and state standards.</p>	
Circle Graphs (40 minutes)	
<p>1. <b>Start by saying:</b>  <i>There is another way that we can represent data, and that is in a circle graph. Let's look at one and see what we can find out.</i></p> <p>2. Hand out <b>Favorite Foods Graph</b> and display the transparency. <b>Ask:</b>  <i>Work with your group to come up with 3 statements about favorite foods as shown on this circle graph.</i></p> <p>3. Have the groups share what they have written.</p> <p>4. Tell the participants that they are now going to make a circle graph out of their birth month data.</p> <p>5. Now have people group together with those who have birth months of the same category (as determined earlier for the frequency table). Outline a large circle on the floor of the room. Have participants stand equally spaced on the circumference of the circle, staying in their birth month groups.</p> <p>6. Mark the center of the circle. Take long pieces of masking tape and tape it from the center of the circle to the circumference, changing to a new piece for each point where a change of birth month category occurs.</p> <p>7. Now place the <b>Hundredths Disk</b> on the floor at the center of the circle; this will allow us to read off about what percent of the participants were born in each category of month, then we can check the percents by calculating them.</p> <p>8. Discuss what questions might be answered by this graph.</p>	<p>This activity provides the opportunity to compare a bar graph to a circle graph and discuss which type one might use to represent certain kinds of data. A bar graph is better when comparing one category to other categories (like the number who are born in the first quarter compared to the second quarter), while the circle graph is better when comparing one category to all the other categories combined (like the number who are born in the first quarter compared to the total class).</p> <p>You might need to review changing a fraction to a percent before this activity.</p> <p>See figure below for example. You should try this beforehand to get the logistics figured out.</p> 

## Activities

Circle Graphs (continued)	Notes
<p>9. Give each participant a grid strip that you have prepared ahead of time. Start at one end of the strip and color code the birth month categories. If there are 3 people with birthdays in Jan.-Mar., have participants color the first 3 squares red. Then use a different color for each category.</p> <p>10. When participants have colored their strip, have them cut the strip one square beyond their coloring, so that this extra square can be used for pasting. Paste the strip together to form a round band, and use this band as the base for the circle graph.</p> <p>11. Once the round bands are made, have participants outline the circle on a large piece of paper. Have them mark the center of the circle, and draw radii to approximate the sectors for each category of birth months.</p> <p>12. Have participants color in the circle graph and label each section. Provide a title for the graph.</p> <p>13. As time permits, discuss similarities and differences between the circle graph and the bar graph of the same data.</p>	
Take Home Activities (5 minutes)	
<p>1. There are several handouts and materials for participants to take home:</p> <ul style="list-style-type: none"> <li>• <b>Bringing Mathematics Home 3</b></li> <li>• <b>Bar Graph Template</b> (one for each survey question)</li> <li>• 4-5 strips of 1" grid paper to make circle graphs for each survey question</li> </ul> <p>2. Have participants look through the materials as you explain the homework assignment to them.</p> <p>3. Let the participants know that they should be ready to share their experience with the homework at the next session.</p>	
Preparation for the Next Session	
<p>1. Collect name cards for use in the next sessions.</p> <p>2. Fold or roll the <b>All About Us</b> charts and bring them to the next session.</p> <p>3. Save the <b>Chart It!</b> and bring them to the next session. If desired, you may have the log typed and distributed to participants at the next session.</p>	