CHAPTER FOUR
Data Analysis

The garden provides an exciting arena in which to collect, organize, and analyze information. Children's thinking and reasoning skills are developed and honed as they create tables and graphs and compare the data they collect for flowers, shadows, and plant predators. Data can be displayed in many different ways to give us information, and the way the data is organized influences our interpretation. Being able to analyze the data critically to determine the "facts" versus the "inferences" allows us to make informed decisions.

Data is often collected using tally marks, and then the number of occurrences is counted and recorded. Tables and graphs are the two common methods of displaying data. Frequency tables show how often something occurs. Graphs create a visual representation of the data, and include bar graphs, pictographs, circle graphs, and line graphs.

Data analysis includes statistics. Common statistics related to collection of data are the "average" or mean, the mode (most frequently occurring number), and the median (the value that falls in the middle of a distribution, above and below which lie an equal number of values). These are all measures of central tendency.

The activities in this chapter provide engaging opportunities to identify attributes of data, determine frequency, create graphs, and interpret data. In particular, the "Flowers: Graph and Graph Again" activity provides an opportunity for children to see how the same data can be displayed in two distinct graphs and provide very different information.

For more information on **Data Analysis** visit the ***Math in the Garden*** web page at *http://botanicalgarden.berkeley.edu/*.

Data Snacks

This activity introduces data collection and interpretation, including the meaning of range.

Ages 5-13

Youth explore a variety of fresh fruit and vegetable snacks and analyze their food preferences. They predict which food will be eaten by the greatest number of people in the group and compute the actual results. This activity models methods that children can use in many areas of their lives to investigate questions that interest them.

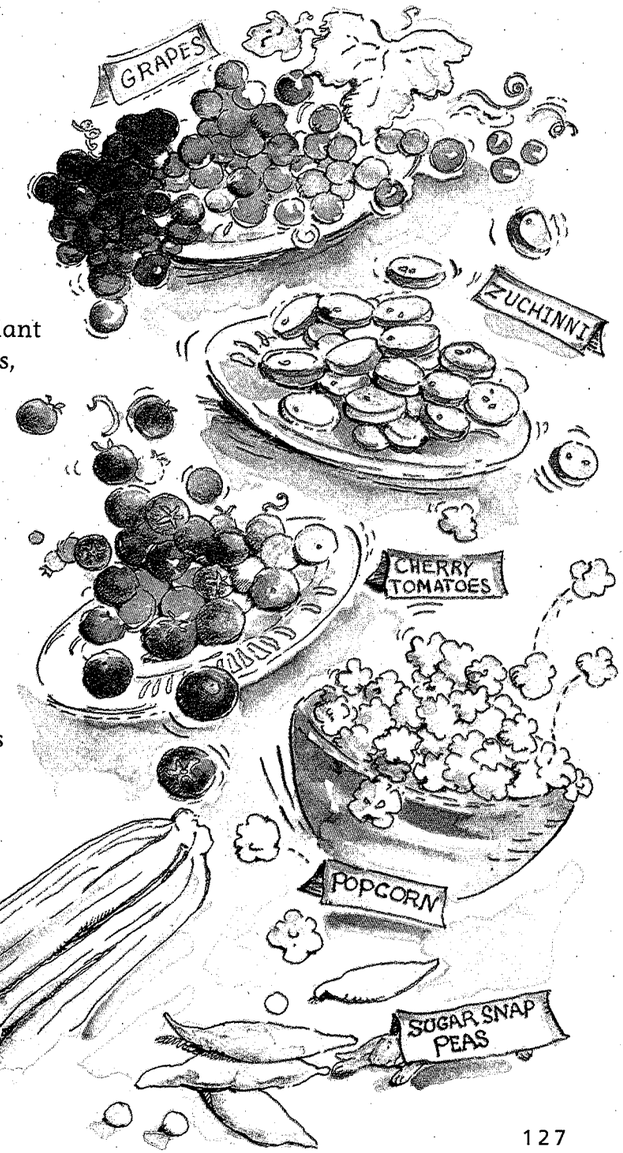
What You Need

For Each Person

- paper plate
- napkin
- journal
- pencil

For the Group

- 4 to 5 different kinds of fresh plant snacks in about equal quantities, such as carrots, celery sticks, zucchini rounds, grapes, cucumber slices, olives, popcorn, and cherry tomatoes
- knife
- cutting board
- serving implements and containers
- paper towels
- databoard
  - "Snack Data" chart
  - paper for data collection ideas
- colored marking pen
- several pieces of paper to make "tent" labels



Getting Ready

1. Gather and prepare the food items to exhibit a variety of fruits and vegetables from the garden. Place each type of food in its own container.

2. On the picnic table, arrange the containers of food in a line that can be easily viewed by the group and sampled in a buffet style. To make sure that favorite foods are not taken before everyone gets a chance to sample, distribute them evenly along the line.

3. Cut the paper into strips and make "tent" labels for each snack item.

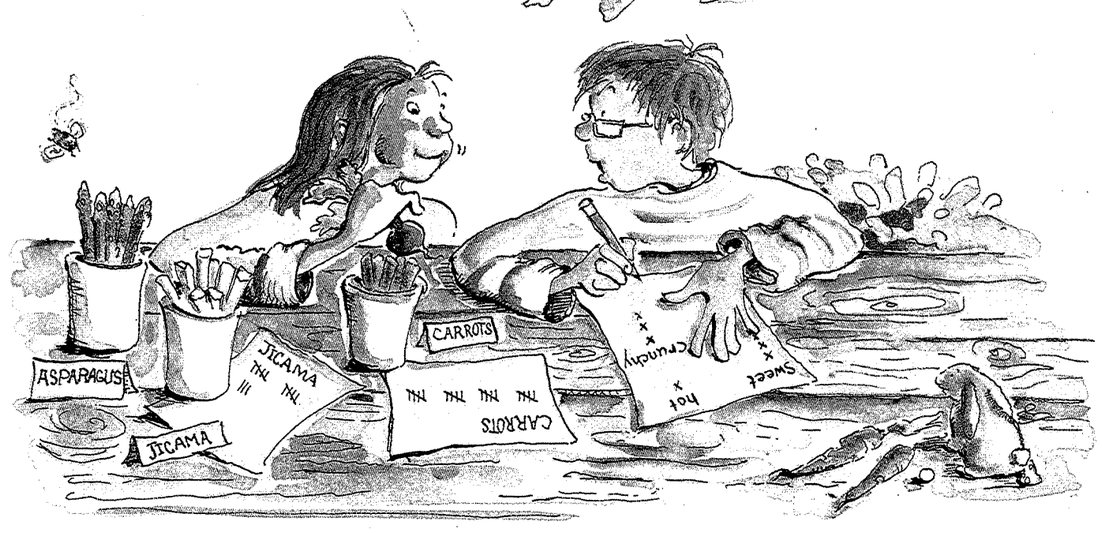
4. On the databoard, make a "Snack Data" chart listing the foods to be sampled.

Here We Go

1. Gather the group around a picnic table and show them the snack buffet and the "Snack Data" chart. Ask the youth to silently think about which of the various foods they have tasted. They can share this information later.

2. Tell them you want to find out more about what they like to eat and to let them taste some new foods. Explain that a goal of the snack experience is to increase the variety of fresh fruits and vegetables they have eaten.

3. Ask the youth to predict silently which food item they think will be eaten by the greatest number of people in the group.



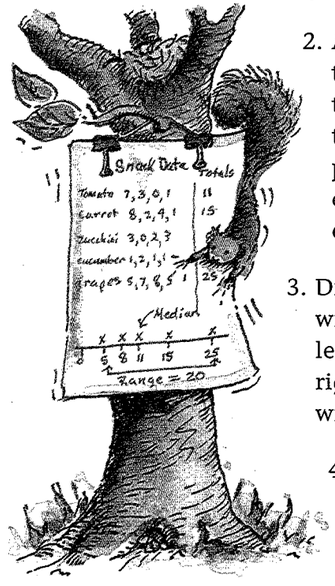
4. Ask:
   - What are some ways we can find out what snack will be eaten by the most people? List their ideas on the databoard and help them formulate data collection methods. [counting how many tried each snack; having each person record how many of each snack he or she ate; having people write their names on a card next to each snack as they take it]

5. Tell them that today we are going to collect data by tally marks. In their journals they should tally the numbers for each item they eat. (If they eat 5 pieces of cucumber they will have 5 tally marks next to cucumber.)

6. Have the children suggest how they will share the food fairly, and post their guidelines. [take only one or two of the snacks until everyone has made their selection; if you touch a piece of food, you must eat it; ask the leader before taking seconds]

Counting, Eating, and Analyzing

1. Observe how the youth make their choices and what they talk about. Encourage them to taste something new or something they haven't eaten in a while. To help you assess their prior experience and stimulate discussion, ask:
   - What new food did you try?
   - How were you surprised by the taste of any of the snacks?
   - What food would you recommend to a friend?
   - Which food did you eat the largest quantity of?
   - Which food did you eat the smallest quantity of?



2. After about 10 minutes, have the children count the tallies and record the total number next to each item listed in their journals. Remind them to record their data for each item on the group "Snack Data" chart, putting a zero next to an item if they did not eat any. For each food item have volunteers help you add the total number eaten by the group and record it on the chart.

3. Draw a line near the bottom of the "Snack Data" chart. This will become a numberline for plotting data. Put a "0" at the left-most end of the line, and put the highest total near the right-most end. Place the other totals along the number line with reasonable spacing according to their relative amount.

4. Plot the totals on the numberline. Have volunteers help analyze the data. Ask:
   - What is the largest number to plot on our numberline?

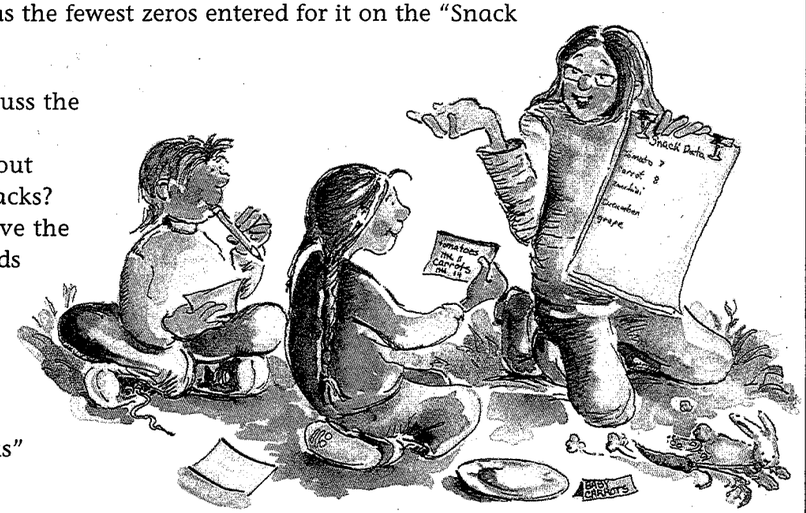
❀ What is the smallest number to plot on our numberline?

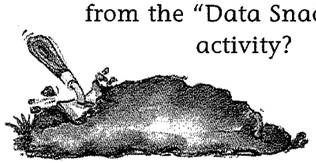
5. Point out that the difference between the high and low numbers for the different foods is the range of data for food eaten by our group. [most-often eaten item and least-often eaten item] Invite volunteers to help you identify and record the range of data for the food consumed.

Range = difference between the largest number and smallest number in a data sample. (For example: The range of 25 grapes eaten and 5 cucumbers eaten is 20.)

6. Continue plotting totals until all of the numbers have been plotted on the numberline. Ask:
   ❀ What is the range of the data? [25-5=20]
   ❀ How can we tell which item was tasted by the greatest number of people? [The food item that has the fewest zeros entered for it on the "Snack Data" chart.]

7. Encourage youth to discuss the activity. Ask:
   ❀ What did you like about collecting data on snacks?
   ❀ How could you improve the data-collecting methods for the next time?
   ❀ What helped you decide to try a new food?
   ❀ What did you learn from the "Data Snacks" activity?





More Math in the Garden

Snack Preference Study Each time you have a snack, conduct another snack preference study. Older youth can total the data, compute final averages and percents, and graph results.

Geometric Snacks Have youth design snacks that display various geometric shapes and examples of symmetry.

Leaf Attributes

This activity reinforces skills of observation, comparing, matching, and identifying attributes, which are essential to sorting, classifying, and analyzing data.

Ages 5-13

Youth compare the attributes of various leaves and organize them into an "attribute train" based on shared characteristics. They take a first look at the diversity of plants as expressed through their rich array of leaf form, structure, color, and texture.

What You Need

For Each Person
- journal
- pencil

For the Group
- collection of leaves
- databoards
- transparent tape