Probability, Statistics, and Data Analysis

Activity Set 1

Trainer Guide

NGSSS K.G.2.1

Sorting Shoes

In this activity, participants sort shoes, ask comparison questions, and count shoes by attribute to collect and record data.

MATERIALS
- *Transparency/Page: Sorting Shoes*
- blank transparency (1)
- chart paper (1 sheet)
- scratch paper (1 for each group)
- participants' shoes

VOCABULARY
- sort
- attribute
- data

TIME: 15 minutes

Transparency: Sorting Shoes

INTRODUCE

- Display *Transparency: Sorting Shoes*.
- Ask volunteers to describe how the shoes in the transparency were sorted. Ask participants if the shoes could be sorted in other ways. (by color, size, and style attributes such as laces versus buckles)
- Explain that participants will sort and graph data about their own shoes in this activity.
- Tell participants that each of them will take off one of their shoes, display it on the floor, and compare their shoes with other shoes to collect data.
- Have participants form groups of 10 to 12 people.

DISCUSS AND DO

- Have participants remove one shoe and place it on the floor.
- Instruct the groups to brainstorm on how to sort the shoes. Have them consider the attributes that could be used for sorting (e.g., color, size, laces, buckles, pointy, or flat).
- Get the groups' attention.
- Display a blank transparency.
- Ask each group to report their brainstorming ideas for sorting as you list the attributes on the blank transparency.
- Explain that, as a whole group, they will agree on the sorting attribute they will use to sort their group's shoes. Write the agreed-upon sorting attribute(s) at the top of a sheet of chart paper (e.g., laces, no laces; brown, black, white; large, medium, small).
- Ask each group to tally the shoes in its group using the agreed-upon attribute(s) on a piece of scratch paper.
- Give participants 5 minutes to sort and tally their group's shoes.
- Explain to participants that with their help you will make a whole-group tally chart with the data they have gathered in their groups.
- Ask one group at a time to report its shoe attribute tally.
- Record each group's data under the agreed-upon sorting attribute at the top of the sheet of chart paper.

CONCLUDE

- Ask volunteers if the tally chart accurately represents the collected data about the shoes in the participant group.
- Explain to participants that the chart provides statistical information that can be represented in many different ways.
- Ask volunteers to suggest other ways the statistical information could be represented:
  - using the shoes
  - pictures
  - bar graph
  - numbers
- Discuss with participants how the statistics from the shoe tally chart could be compared through more-than and less-than questions or statements.
- Point out that statistics involves the collection of data and statements of numerical information.

End of Sorting Shoes

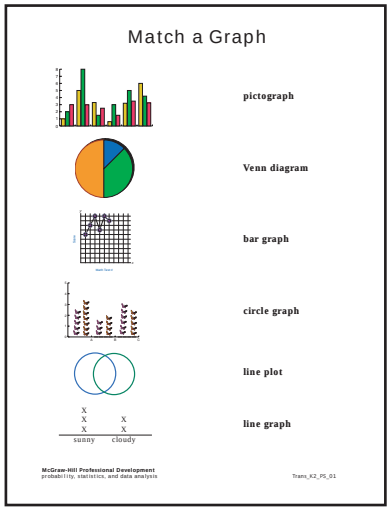
Picture This

In this activity, participants explore various kinds of graphs to display the collected shoe-sorting activity data.

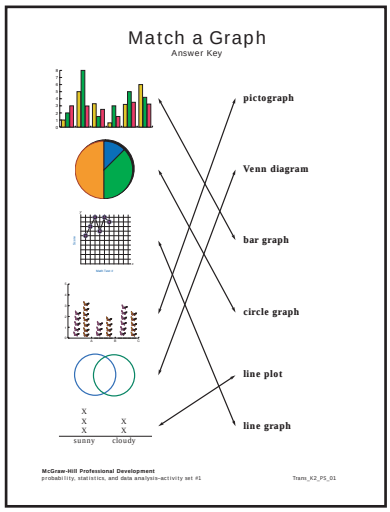
MATERIALS
- *Transparency/Page: Match a Graph*
- *Transparency: Bar Chart*
- *Transparency: Frequency Graphs*
- *Transparency: Venn Diagram*
- *Transparency: Match a Graph Answer Key*
- 7 sheets of chart paper (6 sheets for the group activity)

VOCABULARY
- bar graph
- circle graph
- Venn diagram
- pictograph
- line plot
- line graph

TIME: 20 minutes



Transparency: Match a Graph



Transparency: Match a Graph Answer Key

Transparency: Bar Chart

INTRODUCE

- Ask participants to name various kinds of graphs that can be used to display the shoe-sorting data they collected in the previous activity. Possible answers include:
  - bar graph
  - circle graph (pie chart)
  - pictograph
- Record responses on chart paper and leave room to write additional information next to each entry.

DISCUSS AND DO

- Display *Transparency: Match a Graph*.
- Have participants take out their matching pages.
- Give participants 2 minutes to match the graph pictures to the names.
- Ask volunteer participants for the names that go with each picture.
- Draw a line, on the transparency, connecting each name to its picture. Correct answers are shown on *Transparency: Match a Graph Answer Key*.
- Explain that there are a few guidelines that can be applied to selecting the kind of data appropriate to each kind of graph.
- Display *Transparency: Bar Chart*.
- Explain that in the photograph, the children have made a bar graph by standing in the boxes of the carpet graph. A bar graph is good for comparing pieces of data. We can tell from the bar graph that dogs and cats are more popular than fish.
- Have a volunteer write on the chart paper, “compares pieces of data” beside “bar graph.”
- Redisplay *Transparency: Match a Graph*.

Transparency: Frequency Graphs

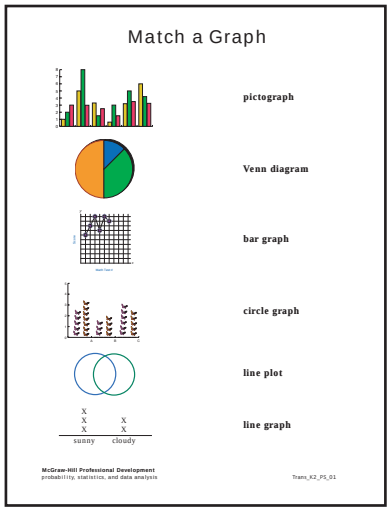
Transparency: Venn Diagram

- Point out the circle graph on the transparency and say that, this type of graph also has another name. Ask participants what that name might be. (pie chart)
- Tell participants that a circle graph is good for showing the relationship of parts to a whole or to other parts.
- Have the volunteer write, on the transparency, "shows relationships of parts to whole or to other parts" beside "circle graph."
- Display *Transparency: Frequency Graphs*.
- Explain that in this photograph we can see several types of line plots. A line plot is good for counting items along a numeric scale, showing trends, and summarizing data. The *My Birthday* chart provides an overview of students' birthdays over the 4 seasons; and *The best part of Thanksgiving dinner* chart provides a summary of the students' opinions on the Thanksgiving meal.
- Have the volunteer write, on the transparency, "counts items along a numeric scale, shows trends, summarizes data" about line plots.
- Point out the *How many children are in your family?* chart and explain that it could also have been made as a pictograph. The students could have placed a photograph or a drawing of each in his or her family on the graph. A pictograph is good for young students; pictures remind them of what the data points represent, and the data points can be arranged like a line plot.
- Have the volunteer write "easily understood by young students" on the chart paper.
- Display *Transparency: Venn Diagram*.
- Point out the Venn diagram. This graph is used to display relationships between sets of data. In this case, one circle represents families with boys only, the other circle represents families with girls only, and the overlap of the circle displays families with both boys and girls.
- Have the volunteer write "shows relationships between sets of data" on the chart paper.

CONCLUDE

- Explain to participants that they will graph the shoe sorting data that they gathered during the sorting-shoes activity. Tell them that they will organize the data on one of the graphs that was shown on *Transparency: Match a Graph*.

TEACHING TIP: If desired, instead of using the shoe-sorting data from the previous shoe-sorting activity, have each group generate new data based on new agreed-upon sorting attributes.



Transparency: Match a Graph

- Redisplay *Transparency: Match a Graph*.
- Point out the 6 different graphs on the transparency. Add that each group will be assigned a different graph to use. They will make their graphs on large chart paper sheets.
- Explain that each group will pose a question about the shoes in its group to discover an attribute about its shoes that makes them similar or different. For example, "What color is most popular in this group's shoes?" might be a good question.
- Have the group display the data on the chart paper using their assigned graph.
- Ask participants to get into the groups they were in for the sorting-shoes activity. Have one member of the group come up to get a sheet of chart paper with its assigned graph.

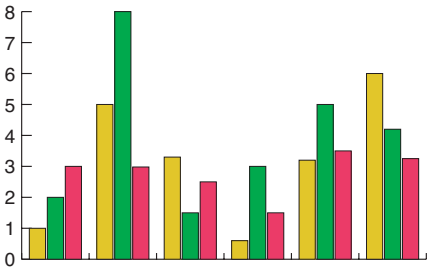
TEACHING TIP: Prepare 6 sheets of chart paper ahead of time. On each of the chart paper sheets, list one of the 5 graph models (i.e., pictograph, line plot, Venn diagram, bar graph, circle graph, or table chart).

- Give the groups 5–10 minutes to complete their assigned graphs.
- Get the groups' attention.
- Have a volunteer from each group share its graph and describe its question and how the group answered it.
- Ask participants if they have ever seen graphs that misrepresented data. Explain that the public, which is open to persuasion by numbers, can be easily fooled by data that are not clearly represented. Data can be manipulated by cleverly using colors in a graph, having a *y*-axis not set at 0, or using irregular increments on the *x*-axis. Learning about numbers and how to represent them fairly offers a critical advantage in being a more astute consumer of information.
- Remind participants that the primary focus in the K–2 years is data collection, organizing the data, and experimenting with the display of data.

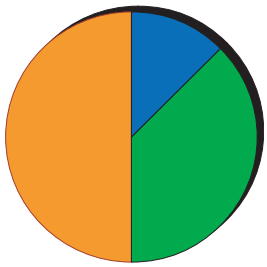
End of Picture This

Sorting Shoes

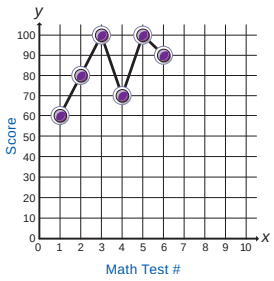
Match a Graph



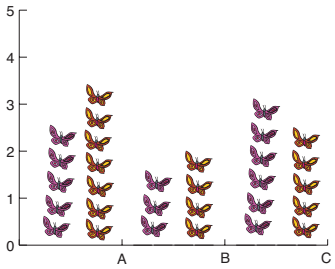
pictograph



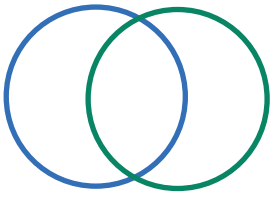
Venn diagram



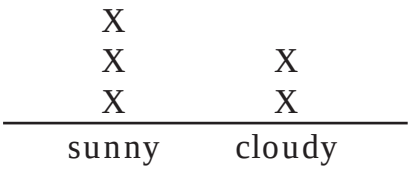
bar graph



circle graph



line plot



line graph