

Discovering Math: Data and Graphs

Teacher's Guide

Grade Level: K–2

Curriculum Focus: Mathematics

Lesson Duration: Two class periods

Program Description

Discovering Math: Data and Graphs – From simple graphs to sampling to determining what is common to a group, introduce young students to the basic concepts of statistics and data analysis.

Lesson Plan

Student Objectives

- Collect and represent information about objects or events in simple graphs.
- Explain how a large group can be characterized by studying just a few of the members.

Materials

- *Discovering Math: Data and Graphs* video
- Data Collection Charts 1–3 (see below)
- Pictograph Templates 1–2 (see below)
- One-inch grid graph paper

Procedures

1. Ask students to recall the two types of graphs they learned about on the video. Discuss the pictograph and the bar graph. Review that pictographs use pictures to represent the data collected; bar graphs use bars to represent data. Model examples of pictographs and bar graphs, or use images of graphs from the video. Discuss how pictographs and bar graphs can be used to compare numbers of things, or to show how many or how much of something there is.
2. Tell students that they will collect data to create a pictograph to see how many of them like vanilla, chocolate, or strawberry ice cream.
 - Give each student Data Collection Chart 1. Explain each part of the chart: ice cream flavor, tally section, and number section.

Ask each student to identify a favorite ice cream flavor of those listed on the chart. As they respond, model how to tally the data. Students should follow along and tally the data on their charts.

When the survey is complete, count the tallies and mark the number of students who like each flavor in the far right column.

- Give each student Pictograph Template 1.

Have students fill in the “Key” information on their pictograph template. Ask the class to pick what the picture will be. Determine the value of each picture in the pictograph.

- Younger students should use a one-to-one scale (one picture = one person).
- Older students could use a one-to-two scale (one picture = two people).

Discuss the importance of establishing value of each picture in the pictograph. Explain how this value determines how many pictures will be used for each flavor. Model some examples.

- If each picture equals one person and four people like chocolate, then how many pictures will we draw next to chocolate?
- If each picture equals two people and three people like vanilla, then how many pictures will we draw next to vanilla?

Now students can use the information from their data collection charts to complete the pictograph by drawing the correct number of pictures next to each ice cream flavor.

- Students can share their pictographs with the class. Have them create questions about their pictographs that other students can answer.
 - Review the term sample. Explain that a sample is a part used for investigating the whole, such as a set of individuals chosen from a whole population. Samples are used to collect data. Ask the students who made up the sample for the ice cream pictograph. Discuss with students that, just like in the video, they can learn about other children’s favorite ice cream flavors based on the data they collected and the graph they created.
 - As an extension choose another topic for a pictograph and allow students to repeat previous steps independently. Use the blank handouts, Data Collection Form 2 and Pictograph Template 2, for this activity.
3. Tell students that they will be creating a bar graph to compare the number of birthdays in each season. Remind students that bar graphs are a good tool to use when comparing data.
- Give each student Data Collection Chart 3. Review each part of the chart: season of birthday, tally section, and number section.
- Ask each student to identify the season of his or her birthday. As they respond, model how to tally the data. Students should follow along and tally the data on their charts.
- When the survey is complete, count the tallies and mark the number of students who have a birthday in each season.
- Give each student a piece of one-inch grid graph paper. Explain that they will use the data in their charts to create a bar graph.

Determine the scale increments for the bar graph.

- Younger students should use a one-to-one scale (one square = one person).
- Older students could use a one-to-two scale (one square = two people).

Discuss the importance of establishing the scale. Explain how this scale determines how many squares will be filled in for each season. Model some examples.

- If each square equals one person and two people have fall birthdays, then how many squares will we fill in for fall?
- If each square equals two people and five people have summer birthdays, then how many squares will we fill in for summer?

Use graph paper to set up the bar graph. Include a title, labels for the X and Y axis, and the scale.

Have students use their data collection chart to complete the bar graph by creating the correct height bars to represent the number of people who have birthdays in each season.

- Students can share their bar graphs with the class. Have them create questions about their bar graphs that other students can answer.
- Ask students what they know about the students in their class and their birthdays. Give them a chance to use the information from their sample to predict the seasons of birthdays in another class. If possible, allow the students to survey another class, collect data, and create another bar graph. Compare the data in the two bar graphs to learn if the first sample was a good predictor of the new data.
- As an extension students can create their own idea for a bar graph, collect the data, and create the graph independently. Use the blank Data Collection Chart 2 for this activity.

Assessment

Use the following three-point rubric to evaluate students' work during this lesson.

- **3 points:** Students produced complete graphs, including all the requested information; clearly demonstrated the ability to collect and represent data in pictographs and bar graphs; and demonstrated an understanding that one can find out about a group of things by studying just a few of them.
- **2 points:** Students produced adequate graphs, including most of the requested information; satisfactorily demonstrated the ability to collect and represent data in pictographs and bar graphs; and satisfactorily demonstrated an understanding that one can find out about a group of things by studying just a few of them.
- **1 point:** Students created incomplete graphs with little or none of the requested information; did not clearly demonstrate the ability to collect and represent data in pictographs and bar graphs; and did not demonstrate an understanding that one can find out about a group of things by studying just a few of them.

Vocabulary

bar graph

Definition: A graph that shows rectangles with lengths proportional to numbers as a visual way of comparing the numbers

Context: The students created a bar graph to represent the number of students that were absent each day of the week. Then they could easily compare the data collected.

data

Definition: Information, usually in numerical form, that can be used for calculating, reasoning, and planning

Context: The teacher collected data on her students' favorite sports. The class represented the data in a bar graph.

pictograph

Definition: A diagram representing statistical information by pictures

Context: The students created a pictograph to represent the favorite sports data they had collected. A baseball hat was chosen as the picture to represent the data and each baseball hat represented two students.

sample

Definition: A part used for investigating the whole

Context: The scientists studied a small sample of 25 bald eagles to learn about the behavior of the larger population.

Academic Standards

Mid-continent Research for Education and Learning (McREL)

McREL's Content Knowledge: A Compendium of Standards and Benchmarks for K-12 Education addresses 14 content areas. To view the standards and benchmarks, visit

<http://www.mcrel.org/compendium/browse.asp>.

This lesson plan addresses the following benchmarks:

- Mathematics: Understands and applies basic and advanced concepts of statistics and data analysis.

National Council of Teachers of Mathematics (NCTM)

The National Council of Teachers of Mathematics (NCTM) has developed national standards to provide guidelines for teaching mathematics. To view the standards online, go to

<http://standards.nctm.org/>.

This lesson plan addresses the following standards:

- Select and use appropriate statistical methods to analyze data.

Support Materials

Develop custom worksheets, educational puzzles, online quizzes, and more with the free teaching tools offered on the Discoveryschool.com Web site. Create and print support materials, or save them to a Custom Classroom account for future use. To learn more, visit

- <http://school.discovery.com/teachingtools/teachingtools.html>
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DVD Content

This program is available in an interactive DVD format. The following information and activities are specific to the DVD version.

How to Use the DVD

The DVD starting screen has the following options:

Play Video – This plays the video from start to finish. There are no programmed stops, except by using a remote control. With a computer, depending on the particular software player, a pause button is included with the other video controls.

Video Index – Here the video is divided into chapters indicated by title. Each chapter is then divided into four sections indicated by video thumbnail icons; brief descriptions are noted for each section. To play a particular segment, press Enter on the remote for TV playback; on a computer, click once to highlight a thumbnail and read the accompanying text description and click again to start the video.

Quiz – Each chapter has four interactive quiz questions correlated to each of the chapter's four sections.

Standards Link – Selecting this option displays a single screen that lists the national academic standards the video addresses.

Teacher Resources – This screen gives the technical support number and Web site address.

Video Index

I. Simple Graphs (7 min.)

Simple Graphs: Introduction

Graphs are useful for seeing and comparing numbers of things such as pets in a neighborhood. Meteorologists use graphs to understand weather patterns.

Example 1: Fish Pictograph

A pictograph can show the number of something. A fish pictograph shows fish from the Great Barrier Reef.

Example 2: Comparing Pictographs

Pictographs can help us compare numbers of things such as the fish seen at the Great Barrier Reef.

Example 3: Bar Graphs

Bar graphs are like pictographs that show how many or how much of something is present. A bar graph of fish seen at the Great Barrier Reef is an example.

II. Sampling (6 min.)

Sampling: Introduction

We can learn about a group by studying a sample of its members. Determining the height of some adult giraffes gives information about the height of giraffes in general.

Example 1: Sampling Whale Sizes

Sampling a pod of whales for size gives information about sizes of whales in other pods.

Example 2: Sampling Horse Groups

A sample tells how many stallions, mares, and foals are in a band.

Example 3: Sampling in Elephant Groups

Herds of elephants are samples showing how many adult males and females and babies travel in a herd. Sampling shows similar patterns in two groups, suggesting a common pattern.

Quiz

I. Simple Graphs

1. A graph shows five cats, three dogs, seven rabbits, and two ducks in a neighborhood. What is the most popular animal in the neighborhood?
A. cats
B. dogs
C. ducks
D. rabbits
2. What type of graph is made of pictures of the objects counted?
A. bar graph
B. pictograph
C. circle graph
D. symbol graph

Answer: D

Answer: B

3. On a graph of favorite ice cream flavors, Chris sees eight pictures of chocolate, three of vanilla, nine of strawberry, and two of peanut butter. What is the least favorite ice cream flavor?
- A. vanilla
 - B. chocolate
 - C. strawberry
 - D. peanut butter

Answer: D

4. What type of graph uses bars to show information?
- A. bar graph
 - B. pictograph
 - C. line graph
 - D. circle graph

Answer: A

II. Sampling

1. The scientists wanted to study a small group of tigers. What do you call a small group that is studied in order to learn about a larger group?
- A. sample
 - B. family
 - C. community
 - D. population

Answer: A

2. A scientist studied a group of 10 whales and found four large whales lived in the group. If she samples another 10 whales, how many large whales would she expect to find?
- A. 1
 - B. 4
 - C. 8
 - D. 10

Answer: B

3. A scientist studied one family of horses and found more female horses than male or baby horses. If he looks at another horse family, what would he probably see?
- A. more male horses than female horses
 - B. more baby horses than female horses
 - C. more female horses than male or baby horses
 - D. more baby horses than female and male horses.

Answer: C

4. What type of graph uses symbols to represent the objects counted?
- A. bar graph
 - B. line graph
 - C. circle graph
 - D. symbol graph

Answer: D

Data Collection Chart 1

Favorite Ice Cream Flavors

Flavor	Tally	Number
Vanilla		
Chocolate		
Strawberry		

Pictograph Template 1

Favorite Ice Cream Flavors

Flavors	Number of People Who Like Flavor
Vanilla	
Chocolate	
Strawberry	
<p>Key = _____ people</p>	

Data Collection Chart 2

Title: _____

	Tally	Number

Data Collection Chart 3

Birthday Season	Tally	Number
Spring		
Summer		
Fall		
Winter		