

# Creature Features

## *Math Grows Up (Statistics)*

### Objective

Students will be able to research and classify animals of the temperate forest; make a circle graph; collect, display (using a bar graph or line plot), interpret, and analyze a set of data collected.

### Overview of the Lesson

Students use an integrated approach to learning as they combine language arts, research, art, science and math skills to a unit of study on the temperate forest. Students think about animals they might see, classify the animals, and choose one to research. They make bar and circle graphs depicting the animals students think they would see. Students then collect real-world data from a field trip to the California Woods Nature Preserve. On their field trip they count and classify all of the animals they actually see. Students use the data to make graphic displays such as the bar graph, circle graph, and line plot.

### Materials

#### Teacher:

- 2 strips of paper, 5 different colors, each having ten squares
- Scissors
- Push pin, tack, or small circle
- Tape (Clear)
- Marker
- Yarn
- Ribbon

**Each Student:**

- Activity Sheet: Animal Data
- Computer software
- Cards for pictures of animal
- Crayons or markers
- Activity Sheet: Centimeter Square Graph Paper

**Procedure**

This lesson deals with a field trip to a forest reserve called California Woods. A similar development could be used for a field trip to a place of interest in your area. Have students choose an animal that lives in the temperate forest to research. Provide a variety of resources for students to use including books, encyclopedias, and software to find information on their chosen animal. Students should also draw and color a picture of their animal that will be used later to make a class bar graph. The pictures need to be a uniform size for the graph. The size would be determined by the amount of room available for the class bar graph. You may wish to make the pictures for the students. Students can color and cut out the pictures.

Make a large horizontal bar graph on a wall or bulletin board. The bar graph will display the classifications of the animals that have been researched. The classifications will include reptiles, amphibians, mammals, birds, and insects. Students then take turns placing their pictures on the graph in the appropriate place.

After all of the pictures have been placed on the graph, encourage students to analyze the data. One way to promote discourse is to challenge the students to make the graph "talk." Cut-out a sheet of white construction paper to resemble a cartoon bubble. Inside the bubbles write statements about the data. For example, a bubble may say, "There are the same number of birds as insects." Place the bubble near the bird and insect data on the graph. Continue with other statements capturing student's comments as they analyze the graph.

Tell the class that you are now going to use the data in the bar graph and construct a circle or pie graph. To do this you will need strips of paper about the size of the ten bar in a set of Base Ten Blocks. These strips would be 10 squares in length and about one inch in width. You will need a different color to represent each animal classification and enough squares for each animal in the classifications. Ask the students to name the number of animals that are mammals. Show the class the strips of 10 squares and ask how many it will take to equal the number of mammals. If it takes more than one strip of ten, tape two strips together. If it does not take a whole strip, use scissors to cut off unnecessary squares. Write the classification on the strip. Continue this same procedure for the remaining classifications. Tape all of the strips together to form one continuous line.

On the floor arrange the long strip of the five classifications in a circle. Tape the two ends together. Using long pieces of ribbon that can reach from one side of the circle to the other, have a student lay the ribbon across the widest part of the circle. Choose another student to do the same task so that the ribbons cross in the center of the circle. Place a push pin, tack or tape a small circle to denote the center. Remove the ribbons. Now use string or colored yarn to mark off the sections of the circle graph. Students will secure the yarn at the center of the circle and use the color boundaries of the paper strips to outline each section of the graph. They may lay the yarn on top of the strip or tape it to the strip after it has been cut to the appropriate length. Place a label denoting the animal classification in each section.

Students might also use computer software and this data set to generate a circle graph. If possible, print it.

We have now analyzed the data concerning the animals students think they will see on their field trip. Students then take a field trip to the California Woods Nature Preserve. At the preserve, they use Activity Sheet: Animal Data to count and classify all of the animals they saw.

Once the students have collected their real-world data set, encourage them to work in groups to display their data in a circle graph and bar graph. They can use the data from one person in the group to make the graphs. Eventually each student should construct their own graphs. Use Activity Sheet: Centimeter Graph Paper.

Also, the computer can generate a bar graph of the data that was collected.

Use the class data to make a line plot for each animal classification. Display line plots for each classification on the board. Students may come to the board and place an X on the spot representing the number of animals in that classification that they saw. Ask students to look for clumps or clusters of data. After all of the line plots have been made, ask the students to distinguish which line plot would enable us to make a better prediction concerning the number of animals in that classification a person could expect to find at California Woods. Focus student attention on the range of data on each line plot. Those with a large range of data would be more difficult to predict while those that have data tightly clustered would be easier.

### ***Mathematically Speaking . . .***

Creating circle graphs with young students can be quite difficult if the data cannot be divided into equal parts. Techniques like those used in this video help tremendously with student understanding of this concept. Students in the intermediate grades may benefit from using circle graphs as a link to understanding fractions and percents. If a student has surveyed favorite pizza toppings of a group of 20 students and finds that 5 out of 20 chose sausage, then the student could multiply  $5/20$  or  $1/4$  times 360 (degrees in a circle) to determine the portion of the circle that represents sausage preference.

## Extensions & Connections

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Have the students write letters to the rangers at the California Woods Nature Preserve describing the data that they collected on the field trip.

Have the students design a scientific collection of data on an insect population in a one square meter area on the school grounds, a park, or their backyard. They would tally only the animals which are observed within this designated location.

## Resources

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*Wasatch: Projects for the Real World.* The Wasatch Educational Systems. Salt Lake City, Utah. (any available graphics program may be used. Some suggestions include: *The Cruncher*, *Jostens*, *Silver Burdette Interactive Mathematics*.)

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## Ideas for Online Discussion

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(Some ideas may apply to more than one standard of the **NCTM Professional Standards for Teaching Mathematics**.)

### Standard 1: Worthwhile Mathematical Tasks

- These teachers in the video have an opportunity to team teach. What are your feelings about this approach?
- How does this lesson encourage students to make connections for mathematical ideas?
- What do you consider to be the most difficult concept taught in this lesson?

### Standard 4: Tools for Enhancing Discourse

- The teachers in the video made the graphs "talk" using cartoon bubbles. What ways or techniques do you use to promote student discourse when analyzing data sets?
- How do you involve the students in making their own concrete materials and how does this enhance understanding?

### Standard 5: Learning Environment

- How does this lesson utilize "beyond-the-classroom experiences" as an effective teaching technique? How can you make field trips more meaningful learning experiences?
- The teachers in this lesson utilized technology in generating graphs. Share information on software that you have utilized in the math classroom. With a limited number of computers, how do you ensure that each student had ample time to explore ideas using this technology?
- What evidence did you see that leads you to believe learning environment fosters mathematical understanding?
- These teachers effectively use all of the space in their classroom from the walls to the floor. What are ways that you effectively use all of the physical space in your classroom?

### Standard 6: Analysis of Teaching and Learning

- As the lesson unfolds, how do the teachers analyze whether the students are learning the concepts? What additional methods of assessment would you suggest?

Name \_\_\_\_\_

## Animal Data

I saw....



birds



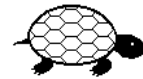
mammals



insects



amphibians



reptiles

\_\_\_\_\_

I saw the most \_\_\_\_\_ .

----- cut ----- cut ----- cut -----

Name \_\_\_\_\_

## Animal Data

I saw....



birds



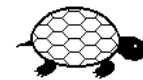
mammals



insects



amphibians



reptiles

\_\_\_\_\_

I saw the most \_\_\_\_\_ .

# CENTIMETER SQUARE GRAPH PAPER

