

A SLICE OF PLANET EARTH

Subject: Science, Mathematics

Skills: Computing, Listening, Observation

Duration: 30 minutes (or more depending on depth and discussion)

Setting: Classroom

Materials:

- apple
- plastic knife
- napkin
- copies of the Slice of Planet Earth math worksheet for each student

NOTE: Some teachers prefer to make this activity truly “hands-on” by having each student or pair of students cut their own apple according to the teacher’s instructions. If you feel comfortable with students using plastic knives in the classroom, you may want to consider this option. Otherwise, you can demonstrate the apple cutting at the front of the class.

Michigan Curriculum Framework Content Standards and Benchmarks:

- Science (EG)V.1.E1:** Strand V. Using Earth Science Knowledge, Standard 1. Geosphere, Benchmark E1. Describe major features of the earth’s surface. (Key concepts: Types of landforms - mountains, plains, valleys; bodies of water - rivers, oceans, lakes. Real-world contexts: Examples of Michigan surface features, such as hills, valleys, rivers, waterfalls, Great Lakes; pictures of global land features, including mountains, deserts.)
- Mathematics IV.2.1:** Strand IV. Number Sense and Numeration, Standard 2. Representation and Uses of Numbers, Benchmark 1. Represent whole numbers, fractions and decimals using concrete, pictorial and symbolic representations.

Kent County Collaborative Core Curriculum (KC⁴):

- Science:** 3:5
4:4
- Mathematics:** 3:1, 3:2, 3:3, 3:5, 3:6
4:2, 4:3, 4:7, 4:8, 4:11
5:1, 5:2, 5:3, 5:4, 5:6, 5:11, 5:12

OVERVIEW

By observing (or performing) the slicing of an apple, students become aware of the small fraction of the Earth’s limited land resources that support all human life.

OBJECTIVES

After participating in this activity, students will be able to:

- Deduce that only a small fraction of the Earth supports all human life.
- Understand fractions when counting and coloring-pieces.
- Describe major features of the Earth’s surface.

BACKGROUND

It is important to realize that land on our planet, or geosphere, makes up only about 1/4 of the Earth’s total surface. Land features include mountains, deserts, polar regions, valleys, plains, prairie, farmland, forests, and wetlands. Each of these features shares a portion of the total amount of land on the planet.

Students tend to think of the land on the planet as being limitless, yet simple calculations demonstrate the fact that the amount of land is limited. The quality of this limited amount of land must be maintained. Human beings have a responsibility to conserve land, use it wisely and protect its quality.

The purpose of this lesson is for students to acquire an understanding of the fragile nature of land as a resource.

PROCEDURE

As you go through this brief demonstration, ask the students the questions that are in quotation marks before revealing the answers noted in italics.

1. Show the apple to the class. “For this exercise, this apple represents our planet.”
2. Slice the apple into quarters.
3. Hold out three quarters. “What does this part of the apple represent?” *They represent the water and oceans of the world.*

ASSESSMENT OPTIONS

4. "What fraction is left?" $\frac{1}{4}$ "This represents all the land on the earth."
5. Slice this section in half. Hold up one of the pieces. "This portion represents the areas where people can't live: the polar areas, deserts, swamps, very high or rocky mountains." Set this piece aside.
6. Hold up the other piece. "What fraction of the whole apple is this?" $\frac{1}{8}$ "This piece represents the land where people can live, but not all of the soil is good for growing food."
7. Slice the $\frac{1}{8}$ piece into four equal sections. Hold three of the sections in one hand and one section in the other. Hold out the single section. "What fraction of the apple is this?" $\frac{1}{32}$
8. Hold out the three sections in your left hand. "These $\frac{3}{32}$ represent the areas too rocky, too wet, too cold, too steep, or with too poor soil to actually grow food. They also contain the cities, suburbs, highways, shopping centers, schools, parks, factories, parking lots and other places people live, work, or use in other ways, but can no longer grow food."
9. Carefully peel the $\frac{1}{32}$ slice of Earth. Hold this peel out so they can see it. "This tiny bit of peeling represents the surface, the very thin layer of the Earth's crust upon which food is grown to feed everyone on Earth. It is less than five feet deep. It takes 100 years for one inch of this topsoil to form."
10. For dramatic effect, you can eat the small piece of apple peel, saying, "If we do not take care of this land, it will be gone."
11. Discuss with the students their observations.
 - Did they realize the small fraction of Earth that supports all human life? What were the other features of the earth's surface?
 - What things cause land erosion? One example is deforestation and loss of natural vegetation. Branches and leaves shelter the soil from the force of rain and wind. Root systems help to hold soil in place. So when trees and vegetation are lost, the soil is blown and washed away.
 - What are some ways we could help to preserve natural open-space and farmland? By choosing not to build anything on land that could be used to grow food. Or, when building is necessary, use wise land use planning and building practices.
12. Assign students to complete the Slice of Planet Earth math worksheet. This can be done in pairs, individually, or for homework. It can also be done while performing the slicing activity or during a review of the slicing.
13. Have students practice retelling the Slice of Planet Earth activity to their partner. Allow them to use apple pieces or a worksheet to explain different parts of the Earth. Assign the students to also retell the story as homework.

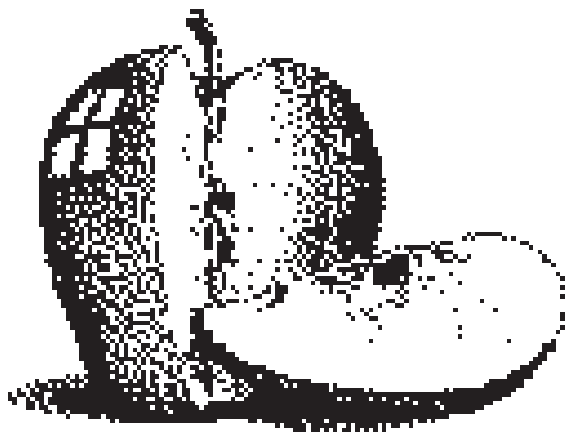
1. Have each student write the ending to this statement, "I learned that..." Was the student surprised by the tiny piece of potential farmland at the end of the lesson? If potential farmland is $\frac{1}{32}$ of the earth's surface, what are the other features of the earth's surface? Name and/or draw these features.
2. Assess the mathematical understanding of fractions by evaluating the students' worksheets for completeness and accuracy.

Adaptations/Extensions

1. If the students are unable to cut an apple, allow them to cut a soft round pear with a plastic knife.
2. Assign students to perform this demonstration at home for parents and/or siblings. Have them conduct an interview after the demonstration to get feelings and responses from the audience.

Computer Extensions

1. Math Solutions. Online Newsletter. Burns, Marilyn. Learning from Student Writing: Comparing Fractions With 5th Graders. Fall 1998. 9 May 2002. <http://www.mathsolutions.com/mb/content/newslettersfall_98_nl_2.html> *Abstract: I continued helping the class learn ways to compare fractions. As always, I learned a great deal from the students, especially from their written work. Most revealing to me was the variety of strategies that students developed for comparing fractions. (...) I describe some of what I learned from their writing and offer suggestions for how you can use writing with your students.*
2. Dositey Corporation. Fractional Pizza 9 May 2002. <<http://www.dositey.com/problems/k2/problem37.htm>> Student worksheet.
3. Dositey Corporation. Homepage 9 May 20. <<http://www.dositey.com/>> Short interactive lessons, games, exercises, printable worksheets, open-ended questions, and more.
4. Rand, Richard. Visual Fractions Jan. 2002. 4 April 2002. <<http://www.visualfractions.com/entercircle.html>> Identify Fractions uses circles to demonstrate the meaning of numerator and denominator.
5. Natural Resources Conservation Service. Broad Land Use/Cover by State. May 2001. 9 May 2002. <<http://www.nrcs.usda.gov/technical/land/meta/m5150.html>> United States map shows a pie chart in each state for that state's land usage. Adult information, but interesting pie charts for students to read.
6. Shodor. FRACTION FACTS 2002. 9 May 2002. <http://www.shodor.org/interactivate/lessons/fractionfacts.html> Teacher lesson plan: discussions and activities are designed to introduce students to fractions, including operations with fractions, converting fractions to decimals and percents. The activities provide ample practice opportunities to reinforce the information from the discussions.



SOURCE

Adapted with permission from Counting on People: Elementary Population and Environmental Activities, "Earth: The Apple of Our Eye," by Pamela Wasserman and Anne Scullard. Published by Population Connection, 1994. Background information adapted from Project WILD, "How Wet is Our Planet?" Pg. 8.

Worksheet developed by Anne Williamson, curriculum consultant for *United Growth for Kent County*, a grant project of Michigan State University Extension.

ADDITIONAL RESOURCES

Contacts:

Grand Valley Metro Council
Land Conservancy of West Michigan
Michigan Department of Agriculture
Michigan Farm Bureau
Michigan Farmland and Community Alliance
Michigan Geographic Alliance
Michigan Land Use Institute
Michigan State University Extension
Timberland Resource Conservation and Development
U.S. Department of Agriculture
United Growth for Kent County

References and Teacher Resources:

Ag in the Classroom. Kids, Crops, and Critters. (4-6 grade.
Approx. 70 lessons. Contact Bonnie (309) 557 3334. \$20.
Illinois: Illinois Farm Bureau.
Fisher, Ron. *Heartland of a Continent*. National Geographic Society, 1991.
Fiday, Beverly and David. *Time to go*. Harcourt Brace Jovanovich, 1980.
MacLachlan, Patricia. *All the Places to Love*. Harper Collins, 1994.

Additional Lessons:

Project Food, Land, and People: What Will the Land Support? Pg. 337-350.
Read aloud to the students *Fanny's Dream* by Caralyn Buehner. (New York: Dial Books for Young Readers)

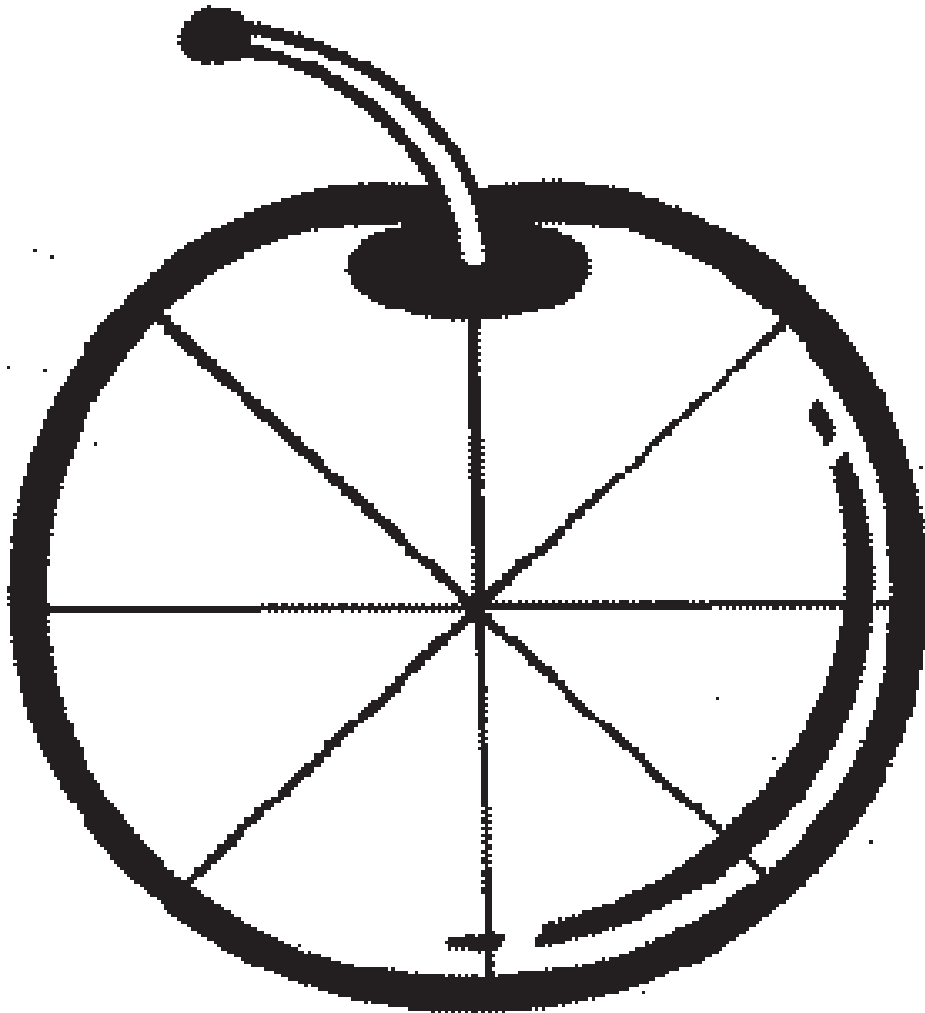
CONCEPTUAL FRAMEWORK REFERENCE

IIA1, IIB1, IID1, IIB1

A Slice of Planet Earth

Name: _____

Directions: Fill in the missing answers and follow the instructions.



1. The apple, representing the earth, is divided into _____ equal parts.
2. Color $\frac{3}{4}$ of the apple blue. This represents all the water on earth.
3. Continue dividing the whole apple into 32 equal parts.

4. Outline the remaining $\frac{1}{4}$ of the apple green. This represents all the land on earth.
5. Fill in the missing numerator.
 - A. $\frac{\quad}{32}$ of the apple are blue, and represent water covering the earth.
 - B. $\frac{\quad}{32}$ of the apple are outlined in green, representing land on the earth.
6. Color in $\frac{1}{2}$ of the green section with brown. This portion represents land where people can not live such as mountain tops, deserts, and polar caps.
7. Color in $\frac{3}{32}$ of the remaining green section with red. This section represents cities and unfarmable land such as wetlands and rocky areas
8. Fill in the missing numerator.
 - A. $\frac{\quad}{32}$ of the apple are unlivable (brown).
 - B. $\frac{\quad}{32}$ of the apple are unfarmable (red).
 - C. $\frac{\quad}{32}$ of the apple is left for farmland and open space! (white)
9. Actually, only the skin, or crust of the earth, is available for farmland. Circle the outside edge of the remaining $\frac{1}{32}$ green section, and label it "Farmland".

EXTRA CREDIT: On plain paper, draw 32 apple pieces.

- A. Color $\frac{3}{4}$ of the pieces blue. These represent water covering the earth.
- B. Color $\frac{1}{8}$ of the pieces brown. These represent land where people cannot live such as mountain tops, deserts, and polar caps.
- C. Color $\frac{3}{32}$ of the pieces red. These represent cities and unfarmable land such as wetlands and rocky areas.
- D. Outline in green the last white $\frac{1}{32}$ piece, this represents open space and land available for farming on the earth's crust. Label it "Farmland".