

Calculating Your Foodometer

Written by GEF Staff



Grades: Middle School

Subject: Health, Math, Science, Social Studies

Time: Two to Three 50-minute class periods

*** Standards:** Students will...

Health Standard 2: Know environmental and external factors that affect individual and community health.

Benchmark #3: Know local, state, federal, and international efforts to contain an environmental crisis and prevent a recurrence (e.g., acid rain, oil spills, solid waste contamination, nuclear leaks, ozone depletion).

Math Standard 1: Uses a variety of strategies in the problem-solving process.

Benchmark #1: Understand how to break a complex problem into simpler parts or use a similar problem type to solve a problem.

Benchmark #2: Use a variety of strategies to understand problem-solving situations and processes (e.g., considers different strategies and approaches to a problem, restates problem from various perspectives).

Math Standard 3: Use basic and advanced procedures while performing the processes of computation.

Benchmark #4: Select and uses appropriate computational methods (e.g., mental, paper and pencil, calculator, computer) for a given situation.

Science Standard 9: Understand the sources and properties of energy.

Benchmark #11: Understand the origins and environmental impacts of renewable and nonrenewable resources, including energy sources like fossil fuels (e.g., coal, oil, natural gas).

Science Standard 14: Understand how human actions modify the physical environment.

Benchmark # 1: Understand the environmental consequences of people changing the physical environment (e.g., the effects of ozone depletion, climate change, deforestation, land degradation, soil salinization and acidification, ocean pollution, groundwater-quality decline, using natural wetlands for recreational and housing development).

Benchmark #4: Understand the environmental consequences of both the unintended and intended outcomes of major technological changes in human history (e.g., the effects of automobiles using fossil fuels, nuclear power plants creating the problem of nuclear-waste storage, the use of steel-tipped plows or the expansion of the amount of land brought into agriculture).

Geography Standard 16: Understand the changes that occur in the meaning, use, distribution and importance of resources.

Benchmark #1: Understand the reasons for conflicting viewpoints regarding how resources should be used (e.g., attitudes toward electric cars, water-rationing, urban public transportation, use of fossil fuels,

excessive timber cutting in old growth forests, buffalo in the western United States, soil conservation in semiarid areas).

Benchmark #2: Know strategies for wise management and use of renewable, flow, and nonrenewable resources (e.g., wise management of agricultural soils, fossil fuels, and alternative energy sources; community programs for recycling or reusing materials).

Geography Standard 2: Know the location of places, geographic features, and patterns of the environment.

Benchmark #1: Know the location of physical and human features on maps and globes (e.g., culture hearths such as Mesopotamia, Huang Ho, the Yucatan Peninsula, the Nile Valley; major ocean currents; wind patterns; land forms; climate regions).

Objectives: Students will be able to...

- Develop an understanding of the environmental impact of travel.
- Apply basic math and problem solving strategies.
- Examine management techniques for fossil fuels usage.
- Demonstrate an understanding of maps and their uses.

Materials:

- "Where Does Your Food Come From" worksheet provided below
- "Calculating Your Foodometer" worksheet provided below
- "Food Mile Challenge" worksheet provided below
- Pencils with erasers
- Glass Jar and 1500 Beans
- $\frac{1}{4}$ Measuring Cup
- Access to Computers (optional)
- Map(s) of the United States

Overview: In recent events, 192 countries met in Copenhagen to discuss global warming. The United States and China are the biggest concern for environmentalists, emitting 40% of green house gases. The United States plans to reduce 30% of their emissions by 2025, 42 percent by 2030, and 80 percent by 2050. However, there is much debate on how to reduce emissions. The technology for cleaner energy is expensive, and not always an option for developing nations, or countries in economic crisis. In an effort to reduce emissions, the US has made stricter car regulations for tailpipe emissions and higher fuel standards. Many propose to put caps on stationary sources such as coal burning factories, but the idea was rejected by the US Chamber of Commerce. They were afraid that it would force companies to move business over seas, creating even more job loss.

Within the last few years, a growing concern for environmentalists has been food related emissions. Scientists began collecting data on the amount of green house gasses made during production and travel from the farm to our plates. "Food Mile" is the distance from the growing location to where the product is consumed; however, its calculations and environmental importance has been greatly debated. Some agricultural researchers use a WASD (Weighted Average Source Distance) that combine all travel, from production to consumption, and the weighted amount of produce shipped to calculate food miles using the formula below:

$$\text{WASD: } \frac{(m(k) \times d(k))}{\sum m(k)}$$

Where:

k = different location points of the production

m = weight (amount) from each point of production

d = distance from each point of production to each point of use (or sale).

The amount of food imported to the United States has been rising since 1970, which indicates that the average amount of food miles has been increasing over time. One study shows the average WASD for locally grown produce to reach supermarkets is 56 miles, while the WASD for imported produce to reach those same supermarket was 1,494 miles, nearly 27 times further. With the increase in gas prices, and a greater concern for the overall well being of the environment, an interest in the WASD calculations has been quickly rising. Environmentalists grew concerned that food travel greatly impacted greenhouse gas emissions such as carbon dioxide, a key factor in global warming. Their proposed solution was to eat locally grown produce within 100 miles of each household's location, thus decreasing the amount of food miles traveled and lowering green house gas emissions.

For this assignment, we will be focusing on the approximate locations of produce, using the state capital cities as the farm location. In this instance, food mile calculations will be the distance from the "farm location" to their hometown. Although not a precise WASD calculation, it provides students with opportunity to see where their food comes from and an estimation of how many miles their food travels.

Kidspeak: In recent events, President Obama proposed to cut green house gas emissions by 30% by the year 2025. Scientists and politicians debate on how exactly to cut emissions. There are, however, ways people have been trying to cut green house gas emissions on their own. One way people have been reducing emissions is by looking at "food miles." "Food mile" is the distance from where a product is grown to where it is eaten. It helps researchers calculate how many miles our food travels. This information is important in figuring out how much emissions, such as carbon dioxide from gas in our cars, is related to food. Gases like carbon dioxide have affected our environment negatively creating global warming which is a slow increase in the earth's temperature. The average distance a single piece of food travels from the farm to your plate is 1500 miles. That's like driving from Boston, MA to Omaha Nebraska. To reduce food miles, people have been eating locally grown food within 100 miles of their home.

Eco-Fact: The United States and China account for 40% of green house gas emissions worldwide.

Procedure:

Introduction:

1. Prepare a clear glass jar with 1500 beans (any kind will do). To make preparation faster, count how many beans are in $\frac{1}{4}$ cup. Then continually add $\frac{1}{4}$ cup to the jar until it reaches about 1500 beans. Have a map at the front of the class of the United States, as well.
2. Explain to the class that today we will be talking about food miles. Food miles are simply how far a single food item travels from the farm to your plate.
3. Show the class the jar of beans. Explain that the jar represents how many miles on average a single piece of food travels in the US, with one bean equaling one mile.
4. Ask students how many beans do you think is in the jar? Allow everyone to examine the jar, and write down their guesses on the board.
5. Explain that there are 1500 beans in the jar. That's a lot of miles! The average distance one piece of food travels from the farm to your plate is 1500 miles. That is like driving from Boston, MA to Omaha, Nebraska.
6. Have volunteers point out where Boston and Omaha are on the map. That's a long distance!

Initial Activity: Calculating Your Foodometer

1. Hand out one "Calculating Your Foodometer" and "Where Does Your Food Come From" worksheet to each student.
2. Explain the directions to the class: Each student will choose five food items from the list provided on the "Where Does Your Food Come From?" worksheet, and record the item and it's location on the "Calculating Your Foodometer" worksheet. Using Google Earth, or a traditional map, have students

calculate the distance from their hometown to the items location. In this case the capital city of a state will be considered the farm's location. Once students have completed their measurements for all five food items, they can answer the questions at the bottom of "Calculating Your Foodometer" worksheet.

3. Discuss with the class their findings by going over the questions on the worksheet.

4. Ask the class why they think food travels so far. Also ask why they think that food isn't grown closer to where we live. The reason is because certain food can only grow in certain climates. Climate is determined by the average temperature and amount of rainfall each part of the world receives. Therefore, fruit like pineapple, can only be grown in areas that are warm and tropical like Hawaii. Another reason is price. Sometimes it is cheaper to grow food in other areas than in our home state.

Food Mile Challenge:

1. Explain that now that we know where some of our food comes from, let's try a food mile challenge.

2. Split the class into groups of two to four students and hand out the "Food Mile Challenge" worksheet. Students may also use the "Where Does Your Food Comes From" worksheet.

3. Discuss the directions with the class. The goal is to create a meal that has the shortest food mile distance. Our meals will consist of at least four food items. For example, if we wanted our meal to be tacos, we would need beef, cheese, flour to make tortillas, and tomatoes. Then, we would look at the "Where Does Your Food Comes From" worksheet to help find the food's location. Using Google Earth, or a traditional map, measure the distance from your hometown to the food's location and record it on the "Food Mile Challenge" worksheet. Then calculate and record the total food miles distance. Remind students that they can try different meals and food item combination, before recording their final choice in the chart. Once the group thinks they have the shortest food mile distance they can get, discuss the "Food for Thought" questions on the "Food Mile Challenge" worksheet.

Closing:

1. Have each group reveal their meal and total food mile distance and record it on the board.

2. Discuss with the class which meal had the shortest food mile distance and why.

3. Have a group discussion about the "Food for Thought" questions. Other ways people can decrease their food miles is by eating locally grown produce within 100 miles of their home. Not all ingredients may be able to be bought locally, but buying as many items as they can locally, can significantly reduce their food miles. Another way is by growing their own food in gardens.

Adaptations:

- To make the lesson easier, students can work in pairs for the initial activity, and can omit the food mile challenge.

- Another adaptation would be to have the entire class choose a meal and work on it together to create the shortest food mile distance.

- To make the lesson more challenging, omit the "Where Does Your Food Come From" worksheet. Instead, have students find the locations of produce themselves using the [USDA's website](#).

- To help students get meal ideas, use the [USDA's My Pyramid](#).

Students can search throughout the interactive website to find healthy meal ideas and recipes.

Extensions:

- Students can [calculate the amount of green house gas emissions their meal creates](#) using the this website.

Because of its weight, the average miles per gallon of a typical food truck is five to six miles per gallon. After the class has completed their calculations, have students share their findings and discuss effects of greenhouse gas emissions.

- Using the [local harvest website](#) the class can create the same meal but using only local ingredients within 100 miles of their home. Calculate how many food miles were saved by using local ingredients.

- Using the [My Pyramid Menu Planner](#) students can find healthy meal ideas using the produce they selected for the food miles projects.

GEF Community: Join the GEF Community online. Students can share with the GEF Community the meals that they created with the shortest food mile distance. In addition, students can discuss how they can change eating habits and make good choices in the future.

Food Mile Challenge

Directions: Working with your group members, create a meal with the shortest food mile distance. A meal must have at least four food items. List the items in the shopping list below. Using a map, measure the distance from your hometown to the item's location and record the data in the chart. Then calculate the final food mile total, and record below. You may use the space below the chart for calculations, and trying out different combinations of food to create the shortest distance.

	Food Item	Location	Distance Traveled
1.			
2.			
3.			
4.			
			Total

Food For Thought:
Did any of your findings surprise you?
Why are food miles an important topic? What other things can people do to decrease food miles?

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Calculating Your Foodometer

How far does your food travel? Choose five food items from the "Where Does Your Food Come From" worksheet. Using a map, calculate the distance from your hometown to the capital city of the state that produces your chosen food item. Use the table below to record your data findings, and then answer the questions below.

	Food Item	Location	Distance Traveled
1.			
2.			
3.			
4.			
			Total

Directions: Use the data to answer the questions below. Be sure to include your calculations below each answer.

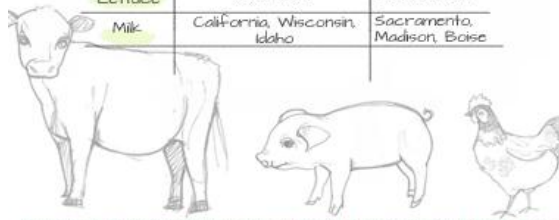
1. What is the total distance your food traveled? _____
2. What is the average distance your food traveled? _____
3. What is the shortest distance one of your items of food traveled? _____
4. What is the farthest distance one of your items traveled? _____

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Where Does Your Food Come From?

Ever wonder where your food comes from? The average distance a single food item travels from the farm to your table is 1500 miles. That's like driving from Boston, Massachusetts to Omaha, Nebraska! Listed below are a selection of common produce found in super markets, and the top states that produce them.

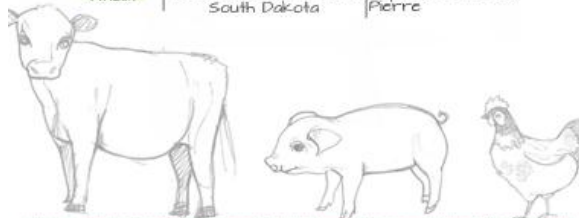
Produce	State	Capital City
Apples	Washington, New York, Michigan	Seattle, Albany, Lansing
Bananas	Hawaii, Florida	Honolulu, Tallahassee
Beef	Texas, Nebraska, Kansas	Austin, Lincoln, Topeka
Broccoli	California, Arizona	Sacramento, Phoenix
Butter	California, Wisconsin, Pennsylvania	Sacramento, Madison, Harrisburg
Carrots	California, Texas, Florida	Sacramento, Austin, Tallahassee
Cheese	Wisconsin, California, Idaho	Madison, Sacramento, Boise
Chicken	Georgia, Arkansas, Alabama	Atlanta, Little Rock, Montgomery
Corn	Iowa, Illinois	Des Moines, Springfield
Grapes	California, Washington, Oregon	Sacramento, Seattle, Salem
Lettuce	California	Sacramento
Milk	California, Wisconsin, Idaho	Sacramento, Madison, Boise



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Where Does Your Food Come From?

Produce	State	Capital City
Oats	Wisconsin, Minnesota, South Dakota	Madison, Saint Paul, Pierre
Onions	California, Oregon, Idaho	Sacramento, Salem, Boise
Oranges	Florida, California	Tallahassee, Sacramento
Peanuts	Georgia	Atlanta
Peas	North Dakota, South Dakota, Montana	Bismarck, Pierre, Helena
Pineapples	Hawaii	Honolulu
Pork	Iowa, North Carolina, Minnesota	Des Moines, Raleigh, Saint Paul
Potatoes	Idaho, Washington, Wisconsin	Boise, Seattle, Madison
Rice	Arkansas, California, Louisiana	Little rock, Sacramento, Baton Rouge
Sweet Potatoes	North Carolina, California, Mississippi	Raleigh, Sacramento, Jackson
Tomatoes	California, Florida	Sacramento, Tallahassee
Turkey	North Carolina	Raleigh
Wheat	Kansas, North Dakota, South Dakota	Topeka, Bismarck, Pierre



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1. Click on the image above
2. Click on the small "print" icon at the top left of the lesson
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