

# A Tough Nut to Crack

## Objective

Students will read about the origins of the pecan and trace its path from Mexico to Oklahoma. Students will use gram scales to weigh pecans before and after shelling and determine percentage of shell to kernel. Students will grade pecans based on their findings. Students will make their own balance scales.

## Background

Before recorded history, pecan trees grew wild along the river banks of what is now Southern Illinois. Flood waters moved their seeds across western Missouri into southeastern Kansas, Oklahoma, central Texas and Mexico. Accounts by early Spanish and French explorers show that native American tribes living in these areas moved around to follow the pecan harvest. The Spanish explorer Cabeza de Vaca was held captive by one of these tribes from 1529 until he escaped in 1535. In his journals he wrote that the people lived on nothing but pecans for two months of every year. During the rest of the year they pounded pecan kernels, added them to boiling water and used the mixture as seasoning for other foods.

The pecan is a form of hickory. The word “pecan” comes from the Algonquin word “pakan,” which means “a tough nut to crack,” or nuts so hard as to require a stone for cracking. Pakan was the name for walnuts, hickory nuts and pecans.

Many of the pecans grown in Oklahoma are small native pecans which are very tough to crack. The French in Louisiana named these nuts that were scarcely bigger than the thumb “pecane,” changing the “k” to “c” and added the “e” so that the last syllable would be accented. In areas of the South outside the French influence the “e” was dropped and the name became pecan with a hard “a.” Both pronunciations are recognized as correct.

Pecan trees can live to be more than 100 years old. After about six to eight years, a tree will start producing nuts. The nuts are the tree’s seeds. The nut has a soft outer husk. The hard, brown pecan shell forms within this husk. The pecan kernel is within the shell. It is soft and clings to the inside of the shell until the fall, when it starts to congeal and separate from the shell. Pecans that are ripe are easier to separate from the shell than those that are not. When the nuts are mature, the husks split open into four pieces, and the nut will fall out.

The price pecan growers can get for their pecans depends on the percentage of edible kernels in a sample. The grower weighs out one pound of pecans and carefully cracks them, either by hand or in a mechanical cracker. He or she picks out the edible kernels, weighs them and calculates what percentage they are of the total weight of pecans. In the best pecans the edible kernels make up 50 percent or more of the total weight. Some of the

## Oklahoma C3 Standards

### GRADE 6

Science Process—1.2; 4.1,2,3;  
5.2,3,4

Physical Science—1.1

Social Studies PALS—  
1.A.3,B.4,D.10

Social Studies Content—1.1,4;  
2.1.B,2.A; 3.1.A; 4.1

### **COMMON CORE**

**Math Practice—MP.1,2,3,4,5,6**

**Math Content—**

**6.EE.1,2,3,5,6,7,8; 6.NS.1;  
6.SP.4; 6.RP.3**

**Language Arts—6.RI.4;  
6.L.4,6,10**

### GRADE 7

Science Process—1.2; 4.1,2,3;  
5.2,3,4

Physical Science—1.1

Social Studies PALS—  
1.A.3,B.4,C.7,D.10

Social Studies Content—1.2

**Math Practice—MP.1,2,3,4,5,6**

**Math Content—**

**7.NS.1,2; 7.G.4; 7.SP.3**

**Language Arts—7.RI.3,4; 7.L.4**

### GRADE 8

Science Process—1.2; 4.1,2,3;  
5.2,3,4

Physical Science—1.1

Social Studies PALS—  
1.A.3,C.7,D.10

**Math Practice—MP.1,2,3,4,5,6**

**Math Content—8.SP.1**

**Language Arts—8.L.4,6**

## Resources Needed

gram scale

several nutcrackers

five pecans for each student

small bowls

yogurt cups

string

metal clothes hangers

pennies

US Map

newer varieties of pecans have edible kernels weighing up to 60 percent of the total weight. Inedible or rejected kernels are those that are poorly developed, rotten, or moldy or those that have dark spots which indicate insect damage.

After the grower has picked out the edible kernels, he or she can then separate them into three piles according to their color and development. The best pecans (No. 1) are bright colored, full bodied and solid. The next best (No. 2) are bright colored but light-weight. No. 3 kernels are brown colored and either full-bodied or light-weight.

NASA packs pecans for the astronauts to eat because they are dry, compact, contain important nutrients and are easy to digest. Pecans are low in sodium and have no cholesterol. They are high in energy. They also contain protein, vitamin A, phosphorous, potassium and magnesium. The oil they contain (95 percent) is mostly unsaturated. Unsaturated fat is the kind people need because it helps lower blood cholesterol.

Most of the pecans grown in the United States are grown in Georgia, Texas, Oklahoma, Louisiana, Arkansas, Mississippi, Missouri, Tennessee, Kansas, New Mexico, Arizona, South Carolina, Alabama and Florida. In 2010 Oklahoma was sixth of 16 states in the US that grow pecans. Outside the United States pecans are only grown in a few countries, including Australia, Canada, India, Israel and Mexico.

## Activities

### ACTIVITY 1

1. Read and discuss background information.
2. Students will locate the origins of the pecan on a map of the US and trace its path into Mexico.

### ACTIVITY 2

1. Divide the class into groups of four or five, and provide each group with a copy of the worksheet and each member with five pecans.
  - Students will use a gram scale to weigh pecans and record the weight on the worksheet.
  - Show students how to use the nutcrackers to crack the pecans.
  - Students will crack the pecans and separate the shell fragments from the kernels.
  - Students will weigh the kernels and record the weight on the worksheet.
  - Students will assign first, second and third prizes to the pecans within each group, based on the proportions of kernel to shells. (See background.)

### EXTENSIONS

1. Students will use the following instructions to make their own balance scales with yogurt containers:
  - Punching three holes about a quarter inch down from the rims of two small yogurt containers.
  - Thread a 10-inch string through each hole, and tie the ends.
  - Tie one yogurt container onto each end of a coat hanger. Use tape to keep the string from sliding.
  - Hang in a spot where the containers can hang free.
  - Use a kitchen scale to find out how many pennies it takes to make 1/2 ounce

and one ounce.

—Use the pennies to act as counterweights for the pecans.

3. Gather pecans from under a tree in the fall. Bring some with the husks still clinging to them and some with very loose husks so students can see the difference between a ripe and unripe pecan.
4. Acquire hard shell and paper shell pecans and let students try cracking both kinds. Then invite students to taste both kinds of nuts and decide which kind tastes better.

## Extra Reading

Kelly, Jacqueline, *The Evolution of Calpurnia Tate*, Henry Holt, 2009.

Louri, Peter, *On the Texas Trail of Cabeza de Vaca*, Boyds Mills, 2008.

Hughes, Meredith Sayles, *Hard to Crack: Nut Trees*, Lerner, 2001.

Tafolla, Carmen, and Sharyll Tenayuca and Terry Ybanez, *That's Not Fair!/No Es Justo!: Emma Tenayuca's Struggle for Justice/La lucha de Emma Tenayuca por la justicia*, Wings, 2008.

Waldman, Stuart, *We Asked for Nothing: The Remarkable Journey of Cabeza de Vaca*, Mikaya, 2003.

## Vocabulary

**Algonquin**— a family of North American Indian languages spoken in an area from Labrador to the Carolinas between the Atlantic coast and the Rocky Mountains

**cholesterol**— a substance found in animal tissue and various foods that is normally synthesized by the liver and is important as a constituent of cell membranes. Its level in the bloodstream can influence the pathogenesis of certain conditions, such as the development of atherosclerotic plaque and coronary artery disease.

**congeal**—to solidify

**digest**—to process food in the body into a form that can be absorbed and used or excreted

**edible**—fit to be eaten

**hickory**—any of several, chiefly North American, deciduous trees, having smooth or shaggy bark, compound leaves and hard, smooth nuts with an edible kernel

**husk**—the outer membranous covering of some fruits, nuts, and grains; an empty outer shell or covering that no longer serves any useful purpose

**kernel**—the edible content of a nut or fruit stone

**magnesium**—a mineral essential to a healthy diet which aids in bone growth and energy metabolism and strengthens teeth. Magnesium is found in wheat bran, whole grains, raw leafy green vegetables, nuts (especially almonds and cashews), soybeans, bananas, apricots and spices.

**nutrient**—a substance that provides nourishment, e.g. the minerals that a plant takes from the soil or the constituents in food that keep a human body healthy and help it to grow

**pecan**—a tree of the southern United States, having

deeply furrowed bark and edible nuts

**phosphorous**—a chemical element found in mineral forms in meats, poultry, fish, cheese, egg yolks, dried peas and beans, milk and milk products, soft drinks, nuts and almost all foods which helps strengthen teeth and aids in bone growth and energy metabolism.

**potassium**—a soft, silver-white, highly or explosively reactive metallic element that occurs in nature only in compounds. It is obtained by electrolysis of its common hydroxide and found in, or converted to, a wide variety of salts used especially in fertilizers and soaps.

**protein**—any of a group of complex organic macromolecules that contain carbon, hydrogen, oxygen, nitrogen, and usually sulfur and are composed of one or more chains of amino acids. Proteins are fundamental components of all living cells and include many substances, such as enzymes, hormones, and antibodies, that are necessary for the proper functioning of an organism. They are essential in the diet of animals for the growth and repair of tissue and can be obtained from foods such as meat, fish, eggs, milk, and legumes.

**sodium**— a mineral found in table salt which helps regulate water balance in the body and plays a role in maintaining blood pressure

**unsaturated fat**—fats commonly found in vegetable and plant sources, usually liquid at room temperature

**Vitamin A**—a fat-soluble vitamin found in some vegetables, fish, milk, and eggs, important for vision; important to the health of the outer layer of cells in the skin and organs. A deficiency leads to roughening of the skin and night blindness.

Name \_\_\_\_\_

# A Tough Nut to Crack

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Place all of your pecans on the scale at one time, and write the mass in the space provided below.

Total mass of the pecans = \_\_\_\_\_ grams.

Crack your pecans by putting two in your hand and squeezing. Then carefully pick out the kernels, and place those that are edible in a pile. Edible kernels are kernels you can eat. Kernels that are moldy or rotten or have large dark spots or many small dark spots are inedible. Put the inedible kernels aside, and weigh the edible kernels.

Mass of edible kernels = \_\_\_\_\_ grams.

Compute what percentage of the total weight of the pecans is taken up by edible kernels by writing an algebraic equation. Use your calculator to divide the weight of the edible kernels by the total weight of the pecans.

For example:

Total mass of pecans = 45 grams

Total mass of edible kernels = 25 grams

25

— = .55 or 55/100 or 55/100 or **55 percent**

45

The **edible kernels** of your pecans are \_\_\_\_\_ percent of the total mass.

What is the relationship between the circumference of the shell and the edible kernels?

Use formulas to find the circumference in terms of Pi.

*Use the following scale to rate your pecans.*

55% or higher edible kernels Excellent	45 to 55% edible kernels Good	30 to 45% edible kernels Fair	25 to 30 % edible kernels Poor
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# Continental United States

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Oklahoma Ag in the Classroom is a program of the Oklahoma Cooperative Extension Service, the Oklahoma Department of Agriculture, Food and Forestry and the Oklahoma State Department of Education.