

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 a nut 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.

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 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

Oklahoma Academic Standards

GRADE 6

Speaking and Listening: R.1,2,3;
W.1,2. Reading and Writing
Process: R.1,2,3
World Geography: 3.1A; 4.5
Number & Operations: 1.3,4;
3.1,3; 4.4. Measurement: 3.1,2.
Data

GRADE 7

Speaking and Listening: R.1,2,3;
W.1,2. Reading and Writing
Process: R.1,2,3
Algebraic Reasoning: 2.1,2,3

GRADE 8

Speaking and Listening: R.1,2,3;
W.1,2. Reading and Writing
Process: R.1,2,3

Materials

gram scale

several nutcrackers

five pecans for each student

small bowls

yogurt cups

string

metal clothes hangers

pennies

US map

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 2015 Oklahoma was fifth of 16 states in the US that grow pecans. Pecans are our largest specialty crop. Outside the United States pecans are only grown in a few countries, including Australia, Canada, India, Israel and Mexico. Up until 10 years ago no one grew or ate pecans outside the US.

Procedures

1. 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.
 - Students will compare and contrast in a short paper.
2. Divide students into groups of four or five. Pass out pecans for students to explore in groups.
 - Students will write at least one thing on each side of the thinking cube, using the guidelines on the “Thinking Cube Page” included with this lesson.
 - Allow time for students to share what they wrote in their groups.
 - Toss a cube with each of the six categories written on it.
 - Call on a group to share what the group has written on that side of a cube.
 - Pass out the Reading Page included with this lesson.
 - After students read the information, allow them time to edit their thinking cubes by adding more information or correcting what they originally wrote. Allow time for class discussion.
 - Toss the dice again, this time asking groups to share answers to the following questions:
 - What prior knowledge was correct?
 - What knowledge was incorrect?
 - What did you read to support or invalidate what you wrote?
 - What information did you add to your cube?”
 - Students will choose a vocabulary word and create a thinking cube to describe/define it.
 - Students will swap cubes to study and review vocabulary.
3. Based on the background information, students will locate the origins of the pecan on a map of the US and trace its path into Mexico.
 - Students will list the US states in the path of the pecan and compare the list with the top pecan-producing states listed in the background information.
4. 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.)

5. 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.

6. Acquire hard shell and paper shell pecans and let students try cracking both kinds.

—Students will taste both kinds of nuts and decide which kind tastes better.

—Students will graph results of their taste test.

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

Ag Career: Agricultural Grader

DESCRIPTION: Sort agricultural products according to their size, quality and type. Following sorting, each product is then labeled according to the U.S. Department of Agriculture (USDA) grade. Some products are graded entirely on their visual characteristics, while others must be analyzed for nutritional content. Most agricultural graders specialize in grading one or just a few types of related products. Graders must discard damaged or defective foods, weigh some types of food and assist in the packaging of food products by categorizing each food according to its characteristics.

SKILLS: Good vision and attention to detail, ability to lift products and stand for many hours, strong written communication skills, since agricultural graders, like most government regulators, are required to report the findings of their work in detail, independent work skills, ability to perform repetitive tasks

EDUCATION: Agricultural graders performing nutritional analyses generally have high school diplomas. Agricultural graders responsible for grading agricultural products purely on their visual characteristics do not necessarily have any formal education.

Agricultural graders are often trained on the job, regardless of the highest educational level they have completed. Time spent in training may vary by task and site, from a few days to a few months.

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

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, 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.

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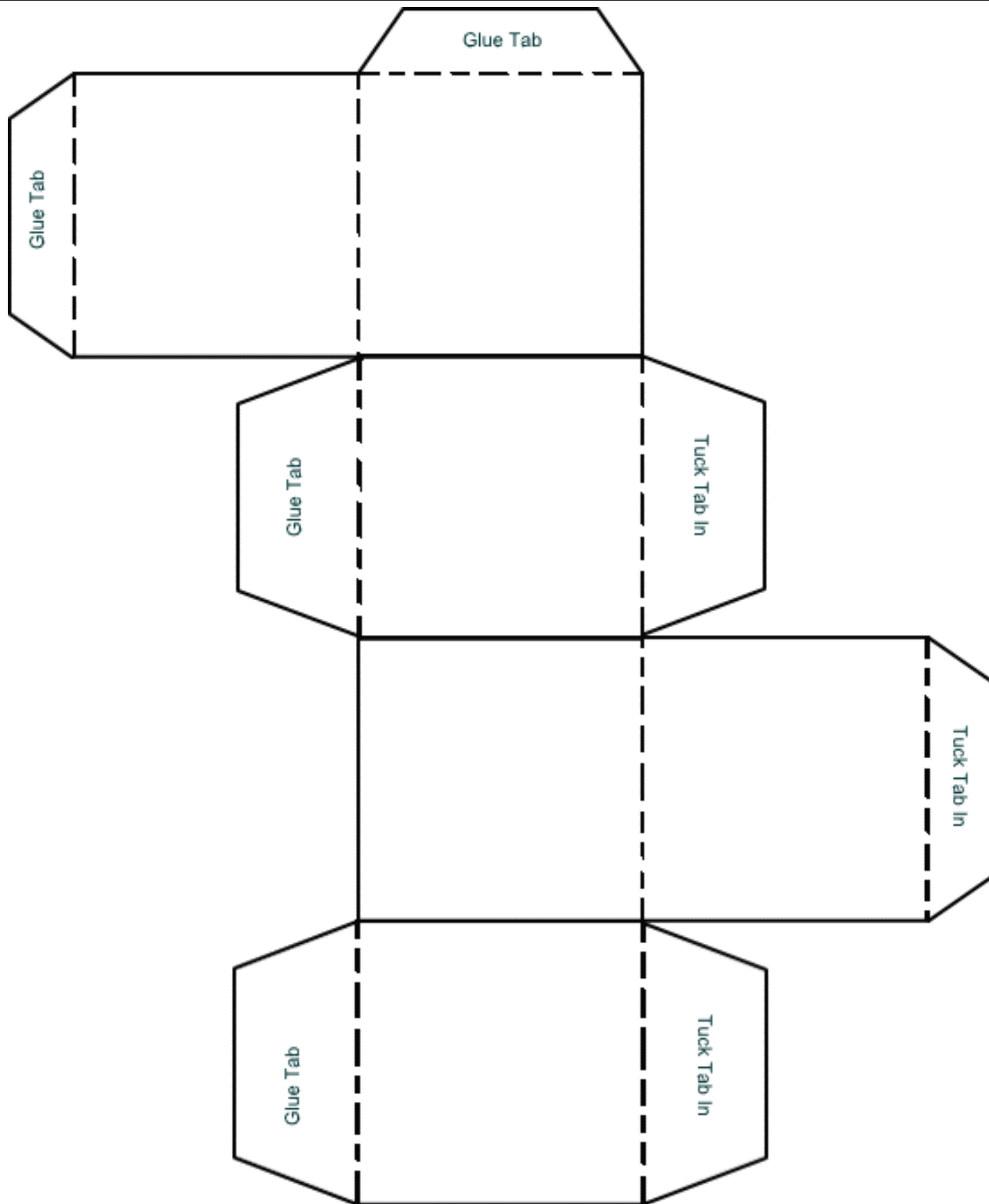
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Thinking Cube

The Thinking Cube has six sides. These sides are designed to help you understand exactly what you will be writing about.

1. DESCRIBE IT.

Consider/visualize the subject in detail and describe what you see-colors, shapes, sizes, memories, etc.

2. COMPARE IT.

To what is it similar? From what is it different?

3. ASSOCIATE IT.

What does it make you think of? You might associate it with similar things, or you can think of different things, times, places, people, etc.

4. ANALYZE IT.

Tell how it is made or how it functions. What is it made of? What are its parts? If you're not sure, make an educated guess!

5. APPLY IT.

Tell what you can do with it. How can it be used? How does it work?

6. ARGUE FOR OR AGAINST IT.

Is it positive or negative? Why is it important to know about it? Take a stand. Substantiate your stand with reasons, facts or opinions.

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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

—

45

= .55 or 55/100 or 55/100 or 55 percent

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	45 to 55% edible kernels	30 to 45% edible kernels	25 to 30% edible kernels
Excellent	Good	Fair	Poor

Name _____

Continental United States



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.