3-D Dairy

Graphing dairy production statistics

math: graphing

Background

The milk most of us drink comes from the udder of a female bovine animal, a cow. The primary purpose for milk is as food for the calf. Although females from all cattle breeds produce milk and meat, some cattle are better at giving milk, and some are better at providing meat. Holstein is the breed that produces the largest quantity of milk.

Milk was named Oklahoma's official state beverage on November 2, 2002. In 2007, Oklahoma had 1,300 farms with milk cows and an average of 69,000 milk cows. Oklahoma dairy cows produced 1.13 billion pounds of milk during 2007 at a value of $237 million. Dairy was the 6th most valuable agricultural commodity in Oklahoma in 2007.

The dairy farmer's work day begins and ends with milking. One of the most important jobs is keeping everything very clean. That is the only way to make sure bacteria doesn't get into the milk and cause it to spoil. In 1856, Dr. Louis Pasteur discovered that heat killed bad germs. Today we use this process, called pasteurization, to make milk safe to drink.

Cows have four parts to their stomachs, compared with humans, who have only one part. This allows cows to eat grass, something humans are unable to digest. After the cow takes a bite of grass or other food, the food moves to the **rumen**. The food is then passed to the **reticulum**, which is a membrane with honey-combed ridges. These ridges break the food down into smaller pieces. Then the cow regurgitates these pieces so it can chew them again. The partly-digested food that comes back into the cow's mouth is called "cud." The cow rechews the food to break it down even more. This is what the cow is doing when it chews its cud. As the cow swallows, and saliva washes the cud back into the cow's system, the food now flows into the **omasum**, the third section of the stomach. During this process the food breaks down into vitamins and nutrients that the cow's body absorbs to meet its daily nutritional needs. The fourth division of the cow's stomach is the **abomasum**. The final digestive process takes place there. In the abomasum the cow's system gets all the remaining good value it needs from the food before letting it pass to the intestines. The average dairy cow spends six hours a day eating and eight hours "chewing its cud." The average dairy cow also consumes 300 pounds of water each day.

Cows produce twice the amount of milk today as they did during the 1960s. Milk is used to make butter, cheese, ice cream, yogurt and other dairy products. It is also used in the production of nonfood items like glue and other adhesives. One quart of milk weighs 2.15 pounds. It takes about 23 pounds of milk to make one pound of butter. It takes about 12 pounds of milk to make one gallon of ice cream.

P.A.S.S.

GRADE 6
Math Process—2.1; 3.1; 5.1,3
Math Content—5.1,3

GRADE 7
Math Process—2.1; 3.1; 5.1,3
Math Content—5.3

GRADE 8
Math Process—2.1; 3.1; 5.1,3
Math Content—5.3

Materials

8 1/2 by 11 sheets of cardstock in bright colors

scissors

markers

Vocabulary

abomasum—the fourth compartment of the ruminant stomach that follows the omasum and has a true digestive function
adhesive—a substance that sticks
bacteria—any of a group of single-celled microorganisms that live in soil, water, the bodies of plants and animals, or matter obtained from living things and are important because of their chemical effects and disease-causing abilities
bovine—any of a group of ruminant mammals including the oxen, bison, and buffalo that have hollow horns and are related to the sheep and goats
breed—a group of animals or plants usually found only under human care and different from related kinds
commodity—a product of agriculture or mining
dairy—the department of farming or of a farm that is concerned with the production of milk, butter, and cheese
digest—to convert (food) into absorbable form
intestine—the tubular part of the alimentary canal that extends from the stomach to the anus
omasum—the third chamber of the ruminant stomach that is situated between the reticulum and the abomasum
pasteurization—the process of heating a liquid (as milk) to a temperature high enough and keeping it at that temperature long enough to kill many objectionable germs and then cooling it rapidly without causing a major change in its chemical composition
regurgitate—to throw or pour back or out from or as if from a cavity
reticulum—the second compartment of the stomach of a ruminant in which folds of the mucous membrane form hexagonal cells
rumen—the large first compartment of the stomach of a cud-chewing mammal (as a cow) in which cellulose is broken down by the action of microorganisms and in which food is stored prior to chewing
saliva—a slightly alkaline secretion of water, mucin, protein, salts, and often a starch-splitting enzyme (as ptyalin) that is secreted into the mouth by salivary glands, lubricates ingested food, and often begins the breakdown of starches
udder—a large bag-shaped organ (as of a cow) consisting of two or more mammary glands enclosed in a common pouch but with each having a separate nipple

Activities

HOOK

1. Give students a blank piece of paper and instruct them to draw a dairy cow using the following shapes:
   - At least 2 rectangles
   - Exactly 3 irregular quadrilaterals
   - At least 4 non polygons
   - one pentagon (regular or irregular)
   - one hexagon (regular or irregular)
2. Read and discuss background and vocabulary.
   —On the picture of a cow the student has drawn, he/she will write one fact about dairy cows in Oklahoma that he/she learned from the background.

IMPLEMENT

1. Provide each student with a sheet of cardstock, scissors, markers and the Oklahoma milk production data provided with this lesson.
   Students will create a 3-dimensional bar graph using the data provided.
   —Review the data set as a class.
   —Students will decide which datum they will graph.
   —Students will follow the instructions with the data to make their 3-dimentional bar graphs.

SUMMARIZE

Students will use their bar graphs to answer the questions on the data sheet.

Extra Reading

Alphin, Elaine Marie, and Elaine Verstraete, *Germ Hunter: A Story About Louis Pasteur*, Carolrhoda, 2003.

Birch, Beverly, and Christian Birmingham, *Pasteur's Fight Against Microbes*, Barron's, 1996.

Hall, Donald, *The Milkman's Boy*, Walker, 1997.

Older, Jules, and Lyn Severance, *Cow*, Charlesbridge, 1998.

Patrick, Jean LS, and Alvis Upitis, *Cows, Cats and Kids: A Veterinarian's Family at Work*, Boyd's Mills, 2003.

Pukite, John, *A Field Guide to Cows*, Scholastic,

Name _____

2003-2007 Milk Production Data for Oklahoma

	2003	2004	2005	2006	2007
milk produced (million pounds)	336	330	311	311	296
average number of milk cows	82,000	78,000	75,000	73,000	69,000
average pounds of milk per cow	16,000	16,192	16,480	16,630	16,580
number of operations with milk cows	1,500	1,500	1,400	1,400	1,300
annual all milk value	179,744	221,025	201,468	179,672	239,096

Source: Oklahoma Agricultural Statistics, 2008, Oklahoma Department of Agriculture, Food and Forestry

3-D Dairy Data Graph

Select one of the datum above to graph.

Step 1: Fold cardstock in half from bottom to top.

Step 2: On the left-hand side write the y-axis title, then draw the y-axis and scale.

Step 3: Draw bars representing given data. (The bottom of the bars should be on the fold.)

Step 4: Write main graph title.

Step 5: Cut along the sides of each bar. (Caution: Do not cut along the top of the bars.)

Step 6: Open cardstock and refold so that the bottom half sits as the base. The top half should be perpendicular to the base.

Step 7: From the backside of the cardstock, push each bar through so that it pops out on the front side. Crease each bar at the top and bottom where it meets the paper.

Step 8: Label each bar at the base.

Step 9: At the bottom write the x-axis title.

x-axis—the horizontal number line of a graph
y-axis—the vertical number line of a graph

Reasoning Questions:

1. Which year was the best year for the data you chose to graph?
2. Which year was the worst year?
3. Is there a trend to our data? Can you predict what it will be in the next five years?
4. Is the graph misleading in any way?

Content Questions:

1. What is the mean, median, mode, and range of our data?
2. Are there any outliers in our set of data?
3. Which is the x-axis? y-axis?
4. What increments did you choose for your y-axis scale?

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.