Corn Calculations

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Grade Level: 6 - 8

Academic Area(s): Math

Topic(s): Ratios & Proportional Relationships, Statistics & Probability, Represent & Interpret Data

Kansas Foundation for Agriculture in the Classroom

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Overview:
Kansas is among the top ten corn-producing states. Genetics and environmental factors during the growing season determine the number of kernels on an ear of corn.

Objectives:
The student will:
1. Collect and record data from five ears of corn as a group.

2. Calculate minimum, maximum, mode, median, mean and range based on collected data from five ears of corn.

3. Compare the results from each group's data.

Recommended Resources:
From Kernel to Corn
By: Robin Nelson
AR Points: 0.5

Background Information and Facts:

Corn originated in Central Mexico about 7,000 years ago and developed from a wild grass. Corn was referred to as "maize" by the American Indians. In 1621, the American Indians taught the pilgrims how to grow corn which played a crucial role in the settlement of the Europeans. The scientific name of corn is *Zea mays.* It is a member of the grass family that can be grown in almost every continent except Antarctica. Corn is America's number one field crop. Corn leads all other crops in value and volume of production. It is also the most widely distributed crop in the world. Kansas ranked eighth in the nation for corn production in 2014, producing 566,200 bushels of corn on a total of 4,050 acres of land.

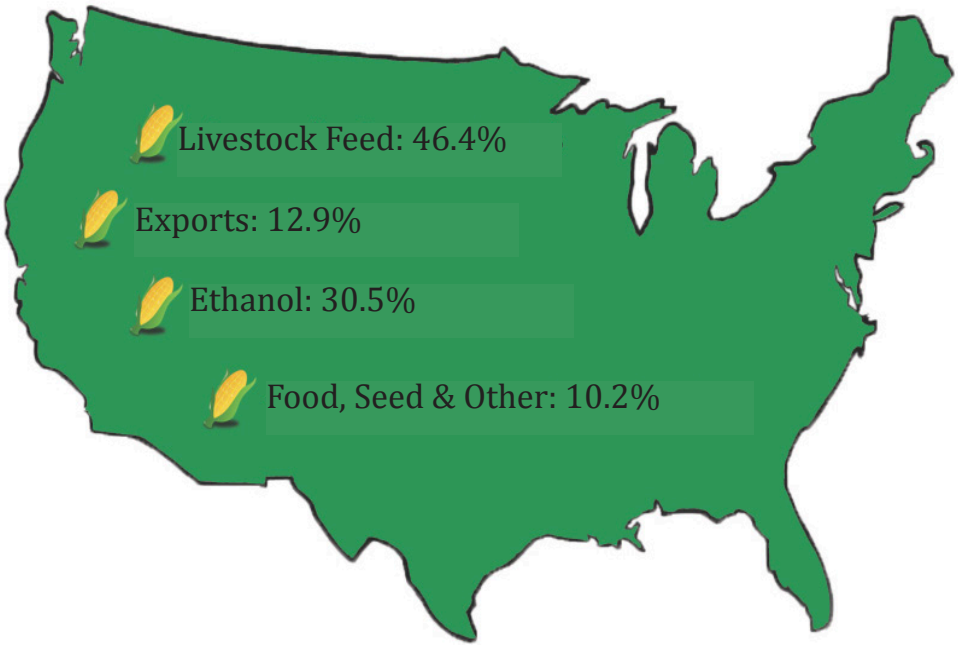
Corn is used as a renewable resource to produce fuel alcohol (ethanol). Fuel alcohol makes gasoline burn cleaner, reducing air pollution, and it doesn't pollute the water.

Contents:

Worksheets:
- Counting Kernels
- Data Collection Questions

Handouts:
- Counting Kernels

Estimated Teaching Time:
- Activity 1: 50 minutes



In Kansas, corn is planted early in the spring between late March and mid-May. The stem of a corn plant can grow to be seven to ten feet tall. There is a tassel located on the top of the corn plant which produces pollen. The pollen is caught by the silks of all potential kernels on each each ear of corn. One or two ears of corn are produced on each plant. Each ear contains approximately 800 kernels within sixteen rows. It takes approximately fifty to sixty days after pollination, the kernels start to lose moisture and begin to dry down.

Dent corn is the most important commercial corn variety grown in the United States. Dent corn has indentions on both sides of its kernels and contain an inner starch layer, or endosperm, which is surrounded by a hard outer layer called the seed coat. Yellow dent corn is the most popular type of dent corn grown in Kansas.

Sweet corn is a result of a natural genetic mutation of field corn. Sweet corn was developed in 1779 by American Indians and later acquired by the European settlers. The variety was called Papoon. Sweet corn contains twice as much sugar in its endosperm as compared to field corn making it suitable for human consumption. It can be grown in three different colors: yellow, white and bicolor. The average U.S. consumption of sweet corn per person was 21.3 pounds in 2014.

A genetic mutation that occured at least 4,000 years ago created popcorn. The U.S. is the main supplier of popcorn for the rest of the world. The outer covering (hull) of the kernel is thinner, which allows it to explode when heated. Heat huilds pressure inside the kernel to burst the hull.

Important Facts

An ear of corn averages 800 kernels in 16 rows.

A pound of corn consists of approximately 7,280,000 kernels.

A single farmer provides food and fiber for 155 people today, compared to 23 people in 1960.

One bushel of corn weighs 56 pounds.

In 2014, the average consumption of sweet corn in the U.S. was approximately 21.3 pounds per person.

There are over 200 varieties of sweet corn.

Americans consume 16 billion quarts of popcorn each year.

Acre: a unit of area used in measurement equal to 43,560 square feet.

Bushel: a unit of measure commonly used to measure wheat, corn and soybeans. One bushel is equal to 56 pounds of corn.

Coproduct: an additional product resulting from the production of the primary product.

Corn: a member of the grass family of plants that produces ears with multiple rows of kernels; the most widely distributed agricultural crop in the world.

Corn Oil: the oil extracted from the germ of the corn kernel.

Cornmeal: the flour ground from the whole kernel of corn.

Cornstarch: a dense powder obtained from the endosperm of the corn kernel.

Cornsugar: a sugar from corn that has no chemical bond between the fructose and the other sugars, primarily glucose; contains the same number of calories as table sugar. (high fructose corn syrup)

Dent Corn: a type of corn characterized by distinctive indentations that form on both sides of the kernels when the corn is mature and ready to harvest.

Ethanol: an alcohol made by fermenting and distilling simple sugars; ethyl alcohol.

Feed Grains: a crop category that includes grain crops fed to livestock, such as corn and grain sorghum.

Field Corn: corn grown for optimal kernel production.

Growing Degree Days: the necessary number of days at optimal air temperature (the temperature at which a plant will grow best) for a specific plant variety to reach maturity.

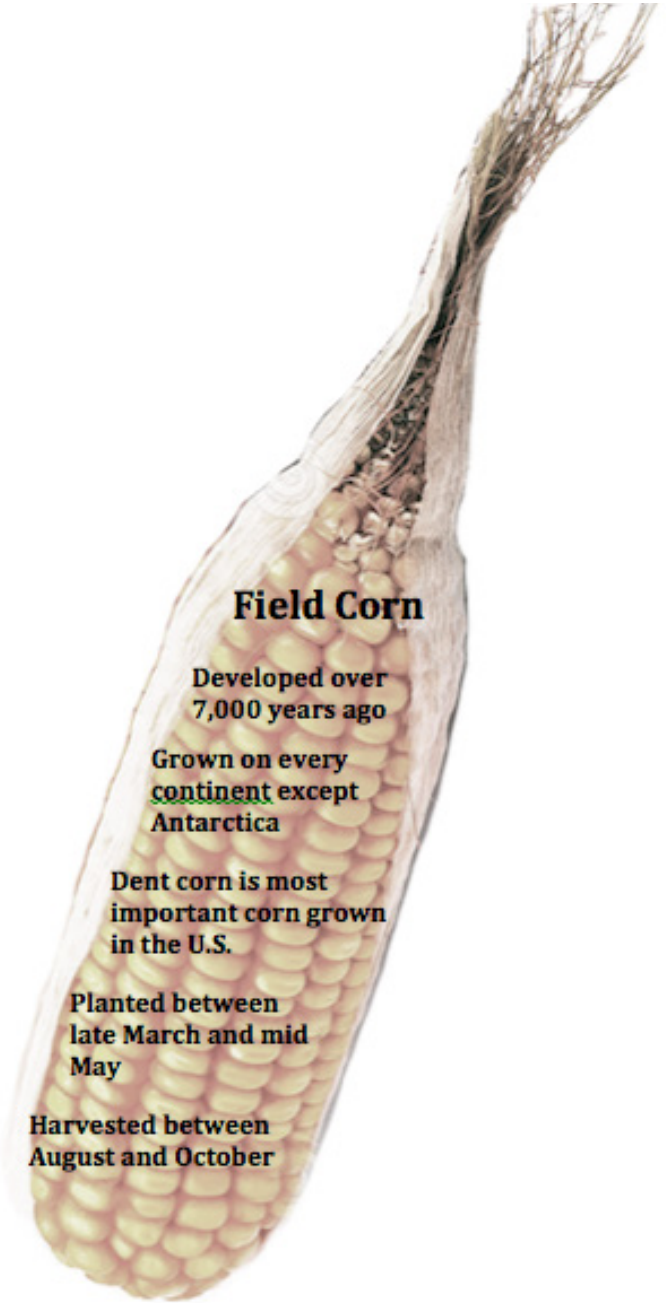
Growing Season: the period during which plants can grow, specifically defined as the time period between the day of the last frost (freezing low temperature) in the spring and the first frost in the fall.

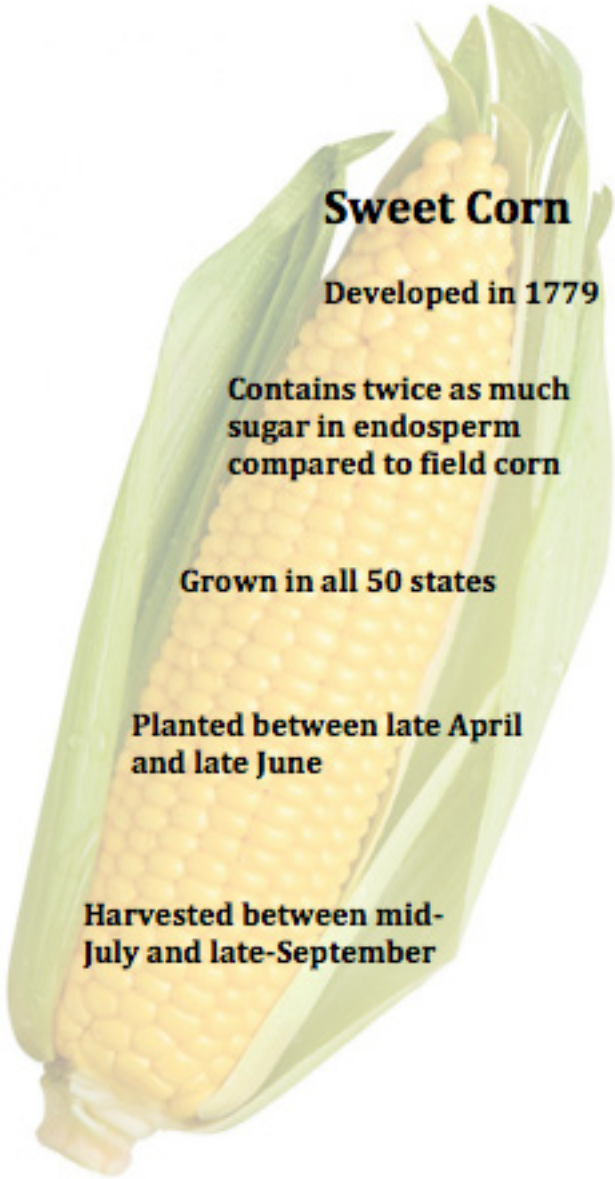
Hull: the outer covering of a fruit or seed.

Kernel: the seed of a cereal grain; the edible content of a nut or seed.

Maize: another name for corn; historically used by the American Indians and still used in many countries today.

Shelling: the process of removing kernels of corn from the corn cob.


Field Corn
Developed over 7,000 years ago
Grown on every continent except Antarctica
Dent corn is most important corn grown in the U.S.
Planted between late March and mid May
Harvested between August and October

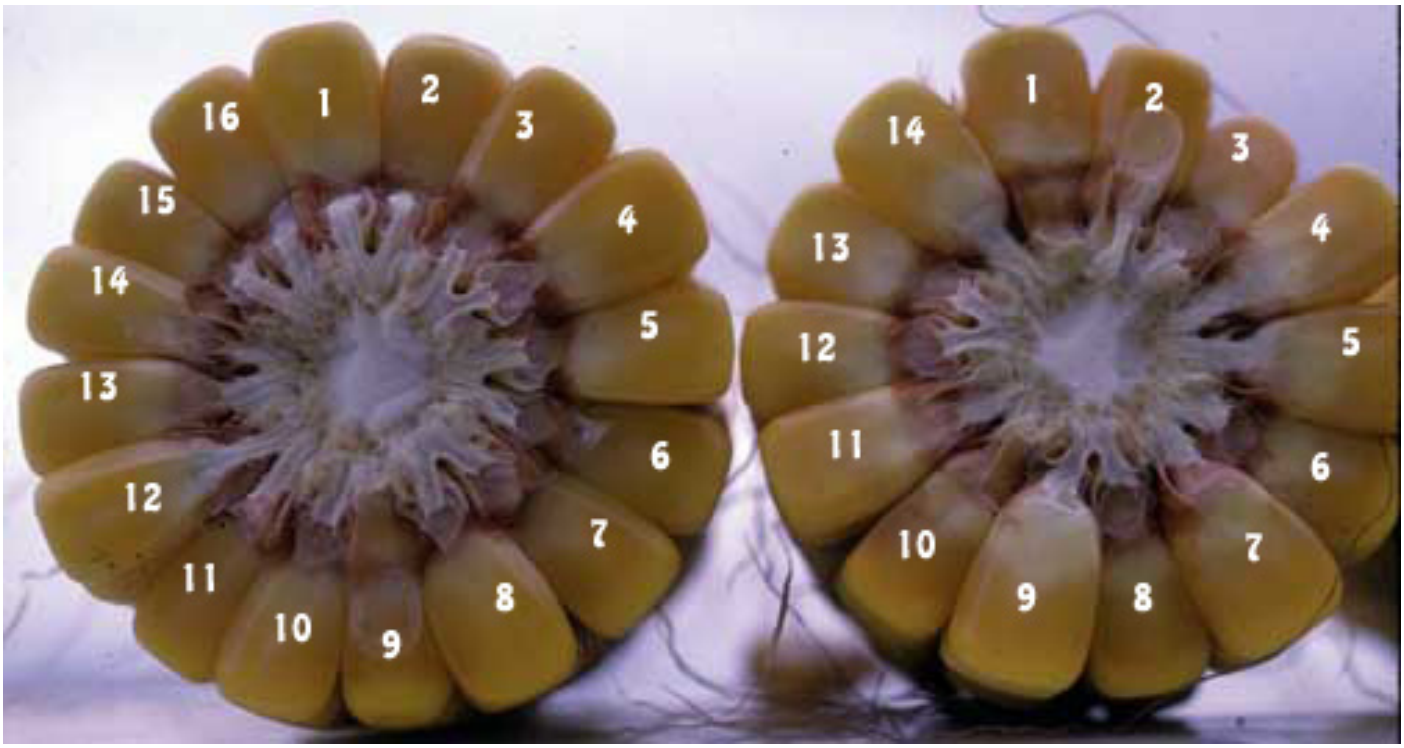

Sweet Corn
Developed in 1779
Contains twice as much sugar in endosperm compared to field corn
Grown in all 50 states
Planted between late April and late June
Harvested between mid-July and late-September

How to calculate the number of kernels on an ear of corn:
Corn ears can come in all sizes depending on many factors during growth. Water, sunlight, soil nutrients, temperature, humidity and other things all play a part in the number of kernels on an ear of corn.

- Count the number of complete kernel rows per ear and count the numer of kernels in each row.
- Multiply each ear's row number by the number of kernels in that row to calculate the total number of kernels for each row. Then add all the rows together to get the total.
- If row number changes from butt to tip (e.g., pinched ears) due to stress, estimate an average row number for the ear.
- Don't count the extreme butt or tip kernels, but rather begin and end where you perceive there are complete "rings" of kernels around the cob. Do not count the aborted kernels.
- If kernel numbers are uneven among the rows of an ear, estimate an average value for kernel number per row.

Example of a 16-row ear of corn

Example of a 14-row ear of corn



Preparation:
1. Gather materials.
2. Put one chart on the board for each group to record all of their data and one chart to compare all of the groups data together.
2. Copy Counting Kernels student worksheets.
3. Read *From Kernel to Corn* by Robin Nelsen.

Procedures:
1. Divide the class into groups of five.

2. Distribute five ears of corn to each group.

3. Each group counts the number of kernels on each ear of corn and records it on the Counting Kernels student worksheet page three.

4. Using that data, students will calculate the mean, median, mode, maximum, minimum and range for their five ears of corn.

5. Each group records their data on the board onto a chart provided by the teacher where they record their total number of kernels, mean, median, mode, maximum, minimum and range from all of their data.

6. After all of the groups have recorded their data, discuss the results as a class.

7. Using the other chart on the board record each group's total number of kernels.

8. As a class, find the mean, median, mode, maximum, minimum and range of the total number of kernels each group had.

9. Have students answer as a group or individually, the discussion questions on page three of this activity.
   - How do the numbers differ from group to group? How are they alike?
   - Which group had the maximum number of kernels? Which group had the minimum?

Materials:
- Various ears of field corn preserved from harvest in late summer or fall in freezer or use squirrel corn found in most farm supply stores (contact local extension office or Kansas Corn Growers Association for more information)
- Counting kernels student worksheets
- Calculator

Group Number: _____ Date: _____

Instructions: Record the total number of kernels on each ear of corn in the chart below then find the mean, median, mode, minimum, maximum and range of the corn kernel data.

	Ear 1	Ear 2	Ear 3	Ear 4	Ear 5	Total
Number of Kernels						

Find the following using the data from above.

Mean:

Median:

Mode:

Minimum:

Maximum:

Range:

Name: _____ Date: _____

Instructions: Answer questions thoroughly as a group or individually.

1. How do the numbers differ from group to group?

2. How are the numbers alike?

3. What was the maximum number of kernels that a group recorded?

4. What was the minimum number of kernels that a group recorded?

Extensions:

Social Studies:

- Students create a timeline of corn history using the *Exploring Plants: Kansas Crops Educator's Guide*, the Illinois Ag in the Classroom Corn Fact Sheet and by researching other corn history.

Math:

- Graph the data collection results using line graphs.

- Calculate the percentage of corn in two cups of birdseed.
    1. Weigh two cups of birdseed.
    2. Separate corn from other birdseed materials and weigh the corn.
    3. Determine percent of corn in the birdseed.

Recommended Resources:

Kansas Foundation for Agriculture in the Classroom (KFAC):
www.ksagclassroom.org.
Look for other lesson plans, resource materials and teacher training opportunities!

Exploring Plants: Kansas Crops Educator's Guide - look in the index for corn.

Corn Fun Facts Poster:
http://www.ksagclassroom.org/teachers/lesson/fun_facts_corn.pdf

Other resources/websites:
Illinois Ag in the Classroom Corn Ag Mag:
http://bit.ly/1MUAyBm

Illinois Ag in the Classroom Corn Fact Sheet:
http://bit.ly/20aXjuy

Kansas Corn Commission and Kansas Corn Growers Association:
http://kscorn.com/

National Corn Growers Association "World of Corn 2015":
http://bit.ly/1GKo6qY