NEBRASKA AGRICULTURE IN THE CLASSROOM
NEBRASKA FARM BUREAU FOUNDATION

Activity: Corn Calculations

Activity Level: Advanced

Source: Adapted from Kansas Foundation for Agriculture in the Classroom

Purpose

Learn how to calculate the number of kernels on an ear of corn and bushels per acre and gather data to calculate minimum, maximum, mode, median, mean, and range.

Example Topics It Supplements

Corn production; applied math concepts including maximum, minimum, mode, median, mean and range.

Activity Snapshot

1. Organize and Prepare Supplies

2. Read Background Information

3. Interest Approach

4. Conduct Activity
   Share or have students research corn statistics. Divide into groups and hand out the ear of corn to each student. Have class determine why it is important for a farmer to know about kernels of corn. Complete all the steps and calculations on the Corn Calculations hand out.

5. Ask follow up questions and make the connection to agriculture.

   - What did we learn about the importance of knowing the number of kernels on an ear of corn?

   - How did the numbers differ from group to group? How are they alike?

   - What did you learn that surprised you? Why?

   - What can we share with others about what we learned today?

State Standards It Supports

MA 4.1.2.h—Determine the reasonableness of whole number products and quotients in real-world problems using estimation, compatible numbers, mental computations, or other strategies.
MA 5.1.2.b—Divide four-digit whole numbers by a two-digit divisor, with and without remainders using the standard algorithm.
MA 6.2.3.b—Solve real-world problems involving non-negative rational numbers.
MA 6.4.2.c—Find and interpret the mean, median, mode, and range for a set of data.

Materials

- Handout "Corn Calculations"—1 per student

- Ears of field corn—1 per student (get ears from farmers in the fall. Shuck ears and store them in a cool, dry place until needed)

- Paper—1 per student

What's the Connection to Agriculture?

Farmers need to collect data and use math in order to be efficient producers of crops. For corn, they need to know how to calculate the number of kernels per ear, take an average of a sample group and convert kernels into bushels per acre so they get an estimate of corn yield for their fields. This helps them determine how much corn they will store or sell.

PROCEDURES:

1. Organize and Prepare Supplies
   See "Materials" on cover page.

2. Background Information
   Corn is America's number one field crop. Corn leads all other crops in value and volume of production. Nebraska is ranked #3 in the nation for corn production. Some additional facts about corn:
   - An ear of corn averages 800 kernels in 16 rows.
   - Corn will always have an even number of rows on each cob.
   - One pound of corn consists of approximately 1,300 kernels.
   - There are over 3,500 different uses for corn products.
   - Juices and soft drinks contain corn sweeteners. A bushel of corn can sweeten 400 cans of soft drink.
   - Corn is used to produce fuel alcohol, using a renewable resource to produce fuel. Fuel alcohol makes gasoline burn cleaner, reducing air pollution, and it doesn't pollute the water.

   Corn is the biggest crop commodity in Nebraska. It is important to know what an ear of corn is and the impact it has on us in terms of food and fuel.

3. Interest Approach
   Divide students into groups of three or four. If large writing surface is available, have groups work together at their own writing space—if not, students may use one piece of paper per group. Explain to students their groups will have 45 seconds to list as many facts about corn as they know. The task is to see who can come up with the longest list. After time is up compare group lists and discuss the information. Pose question: Why is knowing about corn important? *Answer: Nebraska is ranked #3 in the country in corn production and it is vital to our state's economy. Because of this, it is important to be familiar with an ear of corn and how a farmer applies math concepts to help with corn production.*

4. Conduct Activity
   a) Share corn statistics with the class (provided in Background Information) OR have students conduct research (internet, farm magazines, etc.) to come up with some additional information about corn.
   b) Explain they will be using field corn to do a calculation farmers regularly do, as well as some additional math applications.
   c) Divide students into groups of five. Hand out an ear of field corn to each student. Have students observe their ear of corn—noting size, shape, etc. Ask students to share observations. *Expected responses: they are all yellow, different sizes, different shapes, all have kernels, etc.*
   d) Explain that corn ears come in all sizes depending on factors throughout growth. Water, sunlight, soil nutrients, and other factors play a part in the number of kernels there are on an ear of corn.
   e) Pose question: Why is it important for a farmer to have an idea of how many kernels are on ears of corn in the field? *Answer: it creates yield estimations of the corn fields (how much will*

be harvested). By having estimates, farmers can determine how much corn can be stored on their farm, how much needs to go to the grain elevator, etc.

f)   Hand out "Corn Calculations" to each student.

g)   Have students record the number of complete kernel rows (around) on their ear of corn. *Note: an ear of corn will ALWAYS have an even number of rows on it, usually 14-18. If a student comes up with an odd number, have them re-count.* Record that number in the blank for #1.

h)   Next, students count the number of kernels per row (long). They will just count one row. Start at the bottom (big end) and go to the top (narrow end). Do not count the extreme butt or tip kernels but begin where you perceive there are complete "rings" of kernels around the cob. If kernel numbers are uneven among the rows of an ear, estimate an average value for kernel number per row. When students have that number record in blank in #2.

i)   To determine the average number of kernels per ear, multiply the number of rows by number of kernels long. Have students fill in those numbers in blanks in #2 and then place their answer in the final blank.

j)   When a farmer wants to estimate yields, he/she uses more than one ear. As a group, determine the average number of kernels for the group. Complete the calculations in #3.

k)   As a class, work through #4 together. To convert kernels to bushels for yield, a farmer needs to know approximately how many ears per acre. He/she does that by measuring a spot in the field 17.5 feet long (which is 1/1000th of an acre using 30" spaced corn rows.). Then, take an average number of the ears. Let's say the farmer found 32. Multiply 32 x 1000 (our sample is from 1/1000th) of an acre) to get 32,000, which is the overall ear population. To convert our numbers, multiply the average of all five ears by 32,000 (average ear population). This provides us the number of kernels of corn in one acre.

l)   Complete #5 as a class. Next, a farmer needs to convert the kernels per acre into bushels. A bushel of corn weighs about 56 pounds and contains between 75,000 and 90,000 kernels. For our calculations, we will use 90,000 kernels in a bushel. Take the kernels of corn in one acre (from #4) and divide by 90,000 to get the estimated bushels per acre.

m)   Have each group share their bushels per acre. Note if there were big differences or if most were similar. *Note: if you have varying sizes of ears of corn, that can affect the final numbers.*

n)   Explain to students there are other pieces of data that can be determined form each group's numbers and calculations. Have each group work together to complete #6.

o)   When groups are done, record each group's data calculations and lead discussion on results. Questions might include: Which group had the maximum number of kernels? Who had the minimum? Did any of the groups have a mode to record? What else do you notice?

p)   The process for #6 can be done as a whole class using the number of corn kernels from each ear of corn calculated by each of the groups. This will provide more data.

5.   Ask Follow Up Questions and Make the Connection to Agriculture
   •   What did we learn about the importance of knowing the number of kernels on an ear of corn?
       Farmers use that number to calculate (like students did) the estimated number of bushels per acre in a field.

   •   How did the numbers differ from group to group? How are they alike?
       Answers will vary based on numbers and data

- What did you learn that surprised you? Why?
  Answers will vary

- What can we share with others about what we learned today?
  Farmers need to collect data and use math in order to be efficient producers of crops. For corn, they need to know how to calculate the number of kernels per ear, take an average of a sample group, and convert kernels into bushels per acre so they get an estimate of corn yield for their fields.

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Corn Calculations

Name_____

Directions: Complete the information below by listening to instructions from your teacher and working with people in your group.

My Ear of Corn

1.   The number of rows (around) on my ear of corn _____

2.   The number of kernels long (one row) on my ear of corn _____

_____ X _____ = _____
Number of rows   Number of kernels long   average number of kernels on ear

The Corn in Our Group

3.   Average number of kernels for our group

_____ + _____ + _____ + _____ + _____ = _____
    1   2   3   4   5   Total kernels on all 5 ears

_____ ÷ _____ = _____
Total kernels on all 5 ears   number in group   Avg # kernels in our group

How Farmers Calculate

4.   To convert kernels to bushels for the yield, a farmer needs to know approximately how many ears of corn there are per acre. He/she does that by measuring a spot in the field 17.5 feet long (1/1000th of an acre using 30" wide corn rows) and takes an average number of the ears. Let's say the farmer found 32. Multiply 32 x 1000 (our sample is from 1/1000th of an acre to get 32,000, which is the overall average corn ear population.

To convert our numbers, multiply the average kernels from our group by 32,000.

_____ X _____32,000_____ = _____
Avg # kernels in group   avg ear population   kernels of corn in one acre

5. Next, the farmer needs to convert the number of kernels of corn in one acre into bushels. A bushel of corn weighs about 56 pounds and contains anywhere from 75,000 – 90,000 kernels. For our calculations, we will use 90,000 kernels in a bushel.

_____ ÷ ___90,000___ = _____
Kernels of corn in one acre   Approximate kernels   Estimated bushels per acre
(from #4)   in a bushel

Other calculations

6. Work together as a group to calculate the answers and record below. Use the definitions to help you know how to calculate.

   Maximum: the greatest number
   Minimum: the least number
   Mode: the number that occurs most often
   Median: the number in the middle when data is arranged in order from least to greatest
   Mean: the average of all numbers
   Range: the difference between the greatest and the least number

   Maximum _____

   Minimum _____

   Mode   _____

   Median   _____

   Mean   _____

   Range   _____