



Kansas Corn: The Corn Conundrum



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This lab is made possible with the support and content contributions of the Kansas Corn Commission.



Kansas Corn: The Corn Conundrum

Grade Level: Middle School and High School

Overview

Corn is a vital part of the Kansas economy and landscape. Understanding how corn is planted, grown, and harvested helps students comprehend the importance of this crop to the Midwest. As cities have grown, many people move away from an agricultural understanding, even though it is essential to their lives. In this activity, students will learn about the origins and types of corn. They will gain knowledge about its growth and development, where it is grown, and products made from it. Students will also get the chance to apply math concepts, interpret graphs and data, and dissect a corn plant.

Kansas College and Career Ready Standards

Science

- **LS1-5.** Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
- **LS 3-2.** Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.
- **ESS3-2.** Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.

Language Arts

- **RI.3.1.** Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.
- **RI.3.7.** Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).
- **W.3.2.** Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
- **SL.3.1.** Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher led) with diverse partners on Grade 3 topics and texts, building on others' ideas and expressing their own clearly.

Mathematics

- **HSN.Q.A.1.** Use units to understand problems and to guide the solution of multi-step problems.
- **HSN.Q.A.2.** Define appropriate quantities for the purpose of descriptive modeling.
- **HSN.Q.A.3.** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Learning Objectives

- Students will understand the history and origins of corn and its present-day applications.
- Students will recognize and be able to identify corn in various stages of growth.

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- Students will understand how corn goes from vegetative to reproductive stages.
- Students will be able to classify and label the major parts of the corn plant.
- Students will be able to determine the number of kernels in a bushel of corn, the number of corn plants in an acre, and even the equivalent of how many corn kernels make up the human body through quantitative measurements.
- Students will know how to interpret graphs, tables, infographics, and data involving all aspects of the corn industry.
- Students will learn how to determine the growth stage of a corn plant through dissection.
- Students will understand the process of planting corn and its stages until harvest.

Materials

- PowerPoint (available at kansascornstem.com)

Materials for Introduction to Corn:

- Introduction to Corn Student Sheets (pg. S1)
- Butcher paper
- Markers or colored pencils
- Timer (if you want groups to rotate at a certain time)
- Optional: [Kahoot: Explore Corn: Introduction to Corn](#) (available at kansascornstem.com)
 - This can be done at the end of the reading a graffiti notes activity.
 - Students will need computers or mobile devices if having students complete the Kahoot!

Materials for Corn Stages Video and Doodle Notes:

- Doodle Notes Worksheet (pg S2)
- Headphones (if you prefer to have them listen to it on their own)
- Corn Stage Growth Videos (<https://bit.ly/441GI7U> or available at kansascornstem.com)

Materials for Mathematics with Corn:

- Corn Kernel Math Worksheet (pg. S3–27)
- Minimum of six ears of corn
- Scale (reads at least two decimal places)
- At least 50 kernels
- See through container with enough kernels to fill that container
- Masking tape

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- Colored markers to mark seeds
- Ruler or tape measure
- Website and iBook: Abnormal Ears of Corn: <https://www.agronomy.k-state.edu/extension/cropproduction/corn/>

Materials for Breakout Box Activity

- Breakout Box
- Color code lock

Materials for Corn Plant Dissection

- Leaf Collar Method Student worksheet (pg. S8-S9)
- Corn Stage Growth Videos (<https://bit.ly/441GI7U> or available at kansascornstem.com)
- Knife
- Cutting board

Safety Considerations

- Students will be using a cutting utensil with a sharp edge to dissect corn. Show proper handling of the cutting utensil.

Background Information

Why is corn such a valuable crop? How does corn grow, pollinate, and produce kernels? What farming techniques are important to increase corn yield?

Corn is a grass, native to the Americas. Evidence in central Mexico suggests corn was used there about 9,000 years ago. Various Native American tribes shared their knowledge of corn, known as maize, with early European settlers, saving many from starvation. Early American colonists ground dried corn as meal for flour to use in porridge, cake, and bread. Sweet corn, served as “corn on the cob,” was not developed until the 1700s.

Along with wheat and rice, corn is one of the world’s major grain crops. It is the largest grain crop grown in the United States. About 9 percent of all the corn is used to produce food for humans: corn meal, cooking oils, margarine, corn syrups, and sweeteners (fructose). About 64 percent of all corn is used for livestock feed.

Corn is harvested for either grain or silage, with most of the grain going to dairies, animal feeding operations, and poultry operations. Corncobs have been used in the manufacturing of nylon fibers as well as being a source for producing biodegradable plastics. Ethanol, made from corn, is a renewable fuel used in today’s cars.

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Corn is pollinated by wind and is typically planted in 30-inch rows. A single seed, or kernel, of corn may produce a plant that yields more than 600 kernels of corn per ear. Approximately 22,000 to 35,000 individual plants may be grown on an acre of land. Hybrid corn is developed to produce from one to two ears per plant. More than 80 million acres of the heartland are planted in corn each year. That's almost as big as 60 million football fields!

After corn is harvested, farmers begin to prepare the soil for the next season by mixing in nutrients, such as potassium and phosphorus, with some form of tillage (breaking up soil) to incorporate them. In the spring, farmers will do a light tillage pass to create smooth bedding for planting. When the ground temperature is ready (50°F and expected to rise), farmers will plant the corn seeds. Farmers will then add fertilizer, two inches deep and two inches to the side of the kernels to help the seeds get a healthy start. After the seed is planted, most farmers will spray a pre-emergent herbicide to prohibit weed growth. When seedlings emerge and grow, farmers will inject the soil with some form of nitrogen fertilizer before the V8 (eighth leaf development) stage. This spring fertilizer will allow for the plant to “green-up” and establish good photosynthetic activity through harvest.

Farmers will continue to scout the crop through maturity for any additional pests. Farmers will harvest the crop when it is ripe in the fall.

Classroom Discussion

Introduction of Corn

Length of Time for Classroom Teaching

- 20-25 minutes
- 30-35 minutes with use of Kahoot

Begin by using these classroom discussion questions to find out what students already know (or think they know) about corn and where it is grown. This discussion can be done with the entire class, small groups, or as bell work:

- Where is corn grown?
- Why is it grown there?
- How is corn grown?
- Are there specific stages that corn goes through when it grows?
- When can you harvest corn?
- How many ears of corn are there on one stalk?
- How many kernels of corn are found on each ear?
- How many corn plants can be grown on an acre of land?
- What types of corn are there?
- What products are made from corn?

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Once the discussion is finished, hand each student the Introduction to Corn article and instruct them to read it.

- Encourage students to highlight, in a specific color, important concepts they would like to further explore. Also, have students highlight, in a different color, important facts or take-a-ways from the world of corn. They should have at least 5-10 pieces of information/facts highlighted.
- Have students agree on one image that represents a fact from their sheets, ONLY 1 for the whole group. Hand each group a big sheet of butcher paper and a box of colored markers or pencils.
- When they are finished selecting and drawing their one group fact, they need to go to the butcher paper of another group. They will draw an image that represents a fact. They are not able to draw an image that is already on that paper representing a fact. For instance, if one group has a football field, representing the acres planted with corn, already on their paper, something else would have to be drawn. No Words!
- After giving enough time to complete this activity (about 15 minutes), ask each group to return to their butcher paper and write next to the images what fact from the reading that it relates to. Feel free to call on a few groups to share their graffiti notes with everyone.

Procedure for Instruction

Corn Stages Video and Doodle Notes

Length of Time for Classroom Teaching

- 30-45 minutes

Now that we know a little more basic information about corn, it is time to learn more about how it grows.

- Hand out the Corn Stages Doodle Notes Worksheet to each student.
- Have students watch videos from the Corn Growth Stages YouTube playlist. Specifically play the “Corn Dissection” video and “Stages” video. Students can watch the video(s) independently and take notes or watch as a class. Watching as a whole class does allow time to pause and discuss.
- Start by discussing:
 - What do you already know about corn staging?
 - Why might corn staging be important to a farmer?
 - What kind of differences do you think you might notice in a corn plant that is at an earlier stage versus a later stage?
- Students can fill in their notes while adding color and highlighting important information in the video.
- These notes are a great tool for students to have in their interactive notebooks or lab journals and will be very beneficial to refer to when they are dissecting their corn plants later in the lab.

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Mathematics with Corn

Length of Time for Classroom Teaching

- 120 minutes

This lab activity will have students explore ears of corn while incorporating math concepts involving averages, conversions, accuracy, percent error, and quantity estimation.

- Handout the Corn Kernel Math worksheet to each student.
- Each group or station will need anywhere from three to six ears of corn, at least 50 loose corn kernels, and scales for getting the mass of the kernels.
- The teacher will need to determine the mass of a clear container, then fill it up with as many corn kernels as it can hold. The number of kernels in that container will need to be hand-counted.
- The teacher may want to think of a small prize for the student(s) or group that gets closest to the actual number of kernels in the container.
- When determining the number of corn plants per acre in Part 4, the teacher can use tape any length longer than 17.5 feet.
- The teacher will then use a colored marker to create a dot on the tape to represent a planted corn seed.
- The distance of the “seeds” can be anywhere from 6-12 inches apart. The teacher may make the following changes:
 - Alternatively, the teacher can place a piece of tape on the floor that is exactly 17.5 feet and the students can count how many steps it takes to walk that distance.
 - In addition, the teacher can place multiple lengths of tape with different seed spacing, ranging from 6-12 inches.
- K-State has published a PDF and an iBook (for iPads only). The title is Abnormal Ears of Corn and can be found under Publications with the following link: <https://www.agronomy.k-state.edu/extension/crop-production/corn/>

Breakout Box Activity

Length of Time for Classroom Teaching

- 45 minutes

The Breakout Box activity is intended to help the students learn more about corn with the use of a Mystery of Corn Reader. Once the students figure out the combination, they will receive the supplies for the corn dissection lab. Depending on the class schedule this breakout box activity can be used to finish up discussion for the day and introduce them to what will happen during the next class period. If you have enough time in your class period, this activity can lead right into the corn dissection lab.

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Setup

- Put corn plant dissection materials in a breakout box (knives, mats, lab sheets, etc.)
- Place hasp on the breakout box and add the multidirectional color lock. This lock will need to be set to the combination that matches the reader you plan for students to use. Feel free to mix the groups with middle and high school reader groups so they cannot easily share the combination.
- Give every group/student a reader (Reader #1 Could it be Corn?)
 - NOTE: There are middle and high school readers. The lock combinations are different because the readers are different.
- Place the clue on the board or have it printed out and placed on tables.
- Students will be using the reader to solve the color combination lock.
- Once they open the box they will have the supplies to complete their own corn stage dissection of a small and a large plant. This will be done as a group.

Middle School Breakout Activity

To unlock the breakout box lock, students will need a copy of the Middle School Reader #1 Could it be Corn?

Provide them the clue below on the projector or board in your classroom:

- A prize awaits, but for that you must read. Carefully, slow, so clues you won't miss. Like kernel parts and corn products; most definitely on the list. What's a barbeque without a plate? A fossil fuel can be made from corn, that would be great? Plastic from cornstarch...I'll need a fork for that feast. Sorry to be so cryptic. I hope you'll do well. When you finally solve it, don't you dare tell.

Lock Combination

Green, White, Blue, Red, Black

- The lock on the box is a color lock. They will use the reader and clue to find the correct 5 colors and insert them into the lock. When the lock comes off and the box opens, they will find tools and information for how to complete the corn dissection. You could sub out these tools for other Kansas Corn Lab Materials if you desire and feel that your students are ready or would benefit from completing the lab.

Reflection Questions

(These can be used to make sure that students interacted with the material from the reader)

- What are the four parts of a corn kernel? Starch, Germ, Starch and Gluten, Hull and Fiber
- Name three products that are made from corn? Answers will vary
- The majority of corn by products are made from/or have what kind of corn in them? Dent Corn
- What is the fossil fuel that can be created from corn? Ethanol
- Describe a renewable resource and a bioplastic? Answers will vary

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High School Breakout Box Activity

To unlock the breakout box lock students will need a copy of the HS History of Corn Reader. Provide them the clue below on the projector or board in your classroom:

- A prize awaits, but for that you must read. Carefully, slow, so clues you won't miss like kernel parts and fuel; most definitely on the list. What's a barbeque without a plate? What's a sugar with yeast? Play without the y...I'll need a fork for that feast. Sorry to be so cryptic. I hope you'll do well. When you finally solve it, don't you dare tell.

Lock Combination

Green, Red, Blue, Black, Orange

- The lock on the box is a color lock. They will use the reader and clue to find the correct 5 colors and insert them into the lock. When the lock comes off and the box opens, they will find tools and information for how to complete the corn dissection. You could sub out these tools for other Kansas Corn Lab Materials if you desire and feel that your students are ready or would benefit from completing the lab.

Reflection Questions

(These can be used to make sure that students interacted with the material from the reader)

- What are the four parts of a corn kernel? Starch, Germ, Starch and Gluten, Hull and Fiber
- One bushel of corn can produce how many gallons of ethanol? 3 Gallons of Ethanol
- The majority of corn by products are made from/or have what kind of corn in them? Dent Corn
- What is the process of breaking down the starch in corn into simple sugars and then feeding those sugars yeast? Fermentation
- What does PLA stand for? Polylactic Acid Plastic

Corn Plant Dissection

Length of Time for Classroom Teaching

- Leaf Collar Dissection Method Lesson (45 minutes)

Once the students have completed the breakout box activity the students can stay in their own groups, or you can divide them into new groups of three to five students.

- Students will be working with cutting utensils for this portion.
- Hand out the Leaf Collar Method Student worksheet (pg. S8-S9)
- Give the students 5-10 minutes to read the background information and directions.
- Show the Growth Stages playlist on YouTube that covers the determination of corn growth stages.

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Specifically play the “Stages” and “Critical Stages” videos. <https://bit.ly/441GI7U>

- Students will use a knife and cutting board to carefully split the stalk of a corn plant in half, vertically, and down to the roots.
- Remember, the first four nodes are often indistinguishable within the crown. Refer to the Doodle Notes from the previous activity and the “Corn Dissection” video as a reminder.
- Count the number of nodes to determine the vegetative stage that the corn plant is in.
- Compare the nodes counted within the stalk to the number of leaf collars found on the outside of the plant.
- Have students complete the reflections section individually or as a group before coming together as a class to discuss.

Reflection Questions

By the end of this section, students should be able to answer the following.

- How do we know when we have a fully developed leaf stage? A collar has been formed.
- Why is it important for a farmer to know the development stages their corn plants are in? At various stages of growth corn plants will need inputs such as fertilizer, water, etc.
- Why do we have to split the stalks instead of using the collar method? As the plant gets larger not all leaves are present to help identify the location of every collar. Splitting the stalk helps identify the collars.

Science and Agriculture Careers

- Crop adjuster
- Data processor
- Extension agent
- Grain buyer
- Geospatial analytics specialist
- Precision agriculture specialist
- Climate change analyst
- Ecologist
- Environmental engineer
- Environmental scientist
- Nutrient manager
- Pest control advisor
- Produce inspector
- Irrigation specialist
- Aerial applicator

To learn more about agriculture careers, visit agexplorer.com. You can also find career profiles at kscorn.com.

Sources

- Resources adapted with permission from Ohio Corn and Wheat, <http://ohiocorneducation.org/>
 - Introduction to Corn Article, <http://ohiocorneducation.org/curriculum/growing-ohio>

Introduction to Corn

Why is corn such a valuable crop? How does corn grow, pollinate, and produce kernels? What farming techniques are important to increase corn yield?

Corn is a grass, native to the Americas. Evidence in central Mexico suggests corn was used there about 9,000 years ago. Various Native American tribes shared their knowledge of corn, known as maize, with early European settlers, saving many from starvation. Early American colonists ground dried corn as meal for flour to use in porridge, cake, and bread. Sweet corn, served as “corn on the cob,” was not developed until the 1700s.

Along with wheat and rice, corn is one of the world’s major grain crops. It is the largest grain crop grown in the United States. About 9 percent of all the corn is used to produce food for humans: corn meal, cooking oils, margarine, corn syrups, and sweeteners (fructose). About 64 percent of all corn is used for livestock feed.

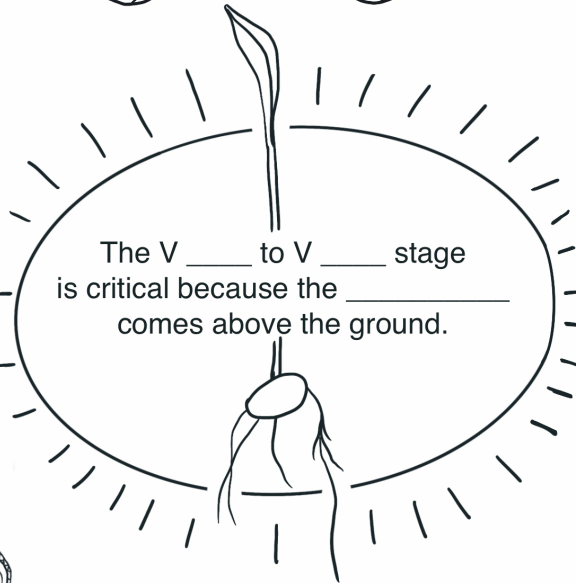
Corn is harvested for either grain or silage, with most of the grain going to dairies, animal feeding operations, and poultry operations. Corncobs have been used in the manufacturing of nylon fibers as well as being a source for producing biodegradable plastics. Ethanol, made from corn, is a renewable fuel used in today’s cars.

Corn is pollinated by wind and is typically planted in 30-inch rows. A single seed, or kernel, of corn may produce a plant that yields more than 600 kernels of corn per ear. Approximately 22,000 to 35,000 individual plants may be grown on an acre of land. Hybrid corn is developed to produce from one to two ears per plant. More than 80 million acres of the heartland are planted in corn each year. That’s almost as big as 60 million football fields!

After corn is harvested, farmers begin to prepare the soil for the next season by mixing in nutrients, such as potassium and phosphorus, with some form of tillage (breaking up soil) to incorporate them. In the spring, farmers will do a light tillage pass to create smooth bedding for planting. When the ground temperature is ready (50°F and expected to rise), farmers will plant the corn seeds. Farmers will then add fertilizer, two inches deep and two inches to the side of the kernels to help the seeds get a healthy start. After the seed is planted, most farmers will spray a pre-emergent herbicide to prohibit weed growth. When seedlings emerge and grow, farmers will inject the soil with some form of nitrogen fertilizer before the V8 (eighth leaf development) stage. This spring fertilizer will allow for the plant to “green-up” and establish good photosynthetic activity through harvest.

Farmers will continue to scout the crop through maturity for any additional pests. Farmers will harvest the crop when it is ripe in the fall.

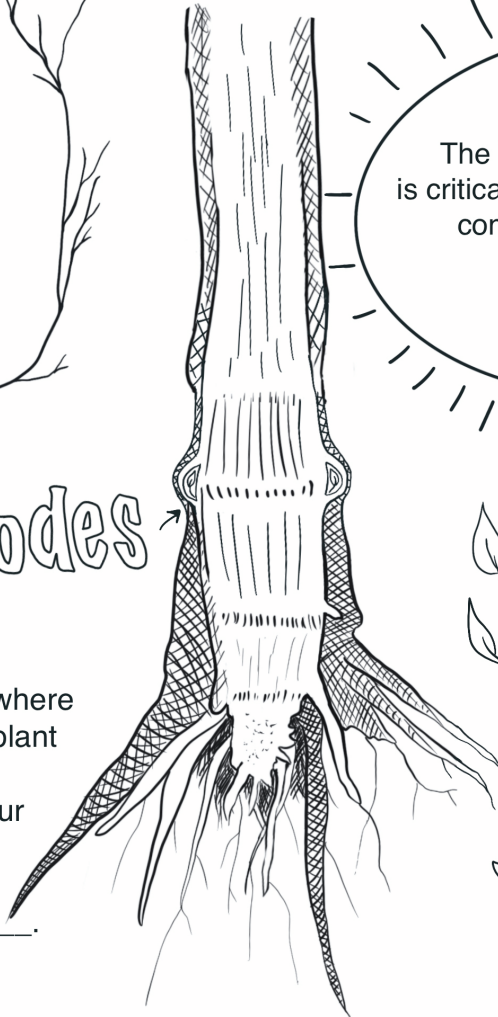
Corn Staging



Rings = Nodes

_____ show where new growth on a corn plant can come from.
IN the human body our nodes might be in our _____ and our _____.

Younger plants still have leaves near the _____.
That changes after a plant reaches stage _____.



VE	V1	V3	V7	V10	VT	R1	▲	R6
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Corn Kernel Math

Directions: In this assignment, you will explore multiple ears of corn. From them, you will count the number of rows and kernels found on each ear of corn. You will then use the average mass of a kernel to determine how many kernels are in a container - without having to count every single one! Lastly, you will then find out how many kernels of corn are in a bushel. The weight of a bushel of corn can be found on the internet or somewhere on these pages.

Part 1: Explore an Ear of Corn

1. You have multiple ears of corn at your station.
2. For each ear of corn, count the number of rows and record them below:

Ear 1: _____ Ear 3: _____ Ear 5: _____
 Ear 2: _____ Ear 4: _____ Ear 6: _____

1 lb = 453.592 g

- Do they have the same number of rows? _____
 - Is it an even or an odd number of rows? _____
3. Find the total number of kernels in each ear of corn by doing the following calculation: count how many kernels are in one row and then multiply by the number of rows. Show your work in the spaces provided.

Ear 1:	Ear 4:
Ear 2:	Ear 5:
Ear 3:	Ear 6:

4. Find the average number of kernels for an ear of corn – this will be called Multiplied Kernels:

average number of kernels = $(\text{Total \# of Kernels}) / (\text{\# of Ears of Corn}) = \text{_____} = \text{_____}$

5. Then, actually count the total number of kernels on the ear of corn – this will be called Actual Kernels:

actual average number of kernels = $(\text{Actual \# of Kernels}) / (\text{\# of Ears of Corn}) = \text{_____} = \text{_____}$

6. Determine the percent error between Multiplied Kernels (from #4) and Actual Kernels (from #5).

% Error = $((\text{Actual \# of Kernels}) - (\text{\# of Multiplied Kernels})) / ((\text{Actual \# of Kernels})) \times 100\% = \text{_____} = \text{_____}$

Part 2: How Many Kernels are in a Container?

1. Your teacher has a container filled with corn kernels. You and your group are to determine how many kernels are in the container without counting. You will be using mass to determine the number of kernels.
2. Your teacher has the mass of the empty container. Find the total mass of the kernels and the container by placing it on a scale. Use this mass and subtract out the mass of the empty container to find the mass of the kernels inside the container. Show your work inside the table.

Mass of Kernels and Container	Mass of Empty Container	Total Mass of Kernels in Container

3. Determine how many kernels of corn are in the container by finding the average mass of a corn kernel and dividing that average kernel mass into the total mass of the kernels in the container.

56 lbs.

- Find the total mass of each number of the kernel(s) – 1, 5, 10, 20 and 50 kernels.
- Calculate the average mass of a kernel for each set = (Total mass of Kernels)/(# of Kernels)
- Take the average mass of the kernel found in 10(b) and divide it into the Total Mass of the Kernels in the Container (Total mass of kernels in container)/(Average mass of a kernel) this equals the number of kernels in the container.
- Get the actual number of kernels in the container from your teacher.
- Calculate the percent error for each kernel number ((Actual # of Kernels) - (Exp # of Kernels))/((Actual # of Kernels)) x 100%

# of Kernels	1	5	10	20	50
Total Mass of Kernel(s)					
Average Mass per Kernel					
Total Mass of Kernels in Container					
Number of Kernels in Container					
Actual Number of Kernels in the Container (From Teacher)					
Percent Error					

Part 3: How Many Kernels of Corn are in a Bushel?

1. Using the table above, find the Average Mass per Kernel that has the smallest Percent Error.
 - Place that value in the table below.
2. Use the internet to find how many grams are in a pound.
3. Multiply the number of grams in a pound by the number of pounds in a bushel.
 - This is the number of grams in a bushel.
4. To find out how many kernels are in a bushel, divide the number of grams in a bushel by the average mass per kernel.

12 in. = 1 foot

Average Mass per Kernel in grams	Grams in 1 Pound	Grams in a Bushel	Number of Kernels in a Bushel

Part 4: Estimating the Number of Corn Plants per Acre of Land (6-12")

1. You will be estimating the number of corn plants in an acre of land based on the planting of 30-inch rows.
2. The teacher has placed multiple strips of tape down on the ground with spaced-out colored dots. These colored dots represent where a corn seed has been planted.
3. You will be counting the number of seeds for a distance of 17.5 feet. You will not be using a meter or yard stick for this distance. You will be using your feet.
4. Determine the number of inches in 17.5 feet by multiplying it by the number of inches in one foot. This conversion can be found somewhere on this paper or on the internet. Enter that number in the table below.
5. Using a ruler, determine the length of your foot in inches with your shoes on. We don't want smelly feet. Place that number in the table below.
6. Then determine how many of your feet equal 17.5 feet by dividing the Number of Inches in 17.5 Feet (#4) by the Your Foot in Inches (#5).
7. This is how many steps you will take along the taped seed row. Make sure to place one step directly in front of the other as you walk down the length of the seed row.
8. Determine the number of Corn Kernels in 17.5 Feet.
9. Calculate the number of corn seeds per acre by multiplying the Number of Corn Kernels in 17.5 Feet (#8) by 1,000.

Inches in 17.5 Feet	Your Foot in inches	How Many of Your Feet in 17.5 Feet	Number of Corn Kernels in 17.5 Feet	Number of Corn Seeds per Acre (x 1,000)

Questions

- Which number of kernels (1, 5, 10, 20, 50) came the closest to the Actual Number of Kernels? _____
- Which number of kernels had the highest percent error? _____
Explain why that number of kernels would give you the greatest error.
- Using the internet, what is the average number of kernels for an ear of corn? _____
How does the average number of kernels you calculated compare to what you found?
- The average number of bushels per acre of corn in America is 176.4. How many kernels of corn are in the average American acre? Show your work below.
- Using the number of corn plants you found in Part 4, how many kernels of corn will be in that acre? Show your work below.
- The average human body contains 18% carbon. From that amount, the average percentage of carbon that comes from corn is 70% due to the many products that are derived from corn in our diet. We will find out how much carbon in your body comes from corn and then determine how many corn kernels you are!
- How much do you or the average student weigh (in pounds): _____ lbs
- Convert that into grams (remember 1 lb = 453.592 g): _____ g
- Multiply your weight in grams by 0.18. This is how much carbon is in your body: _____ g
- Multiply the carbon in your body by 0.70. The weight of carbon that comes from corn: _____ g

11. Divide the amount of carbon that comes from corn by your most accurate average mass per kernel found in Part 2 from above. This is the number of corn kernels that make up your body!

You are made up of _____ kernels of corn!

How many bushels of corn are you? _____ bushels of corn!

Leaf Collar Method Student Worksheet

What can the corn plant tell the farmer?

Background:

Vegetative (V) stages are determined by the total number of leaves with visible collars (e.g., a plant with three visible leaf collars is at V3). A collar is the off white band at the base of the leaf blade where it extends away from the stalk. A new leaf appears every three to four days with good growing conditions until tasseling. As the plant grows, lower leaves are lost. These leaves must be counted; otherwise, the development stage will be misidentified. Split stalks to accurately determine the leaf stage. Each leaf is attached to a single node, and nodes are visible as lines across the split stalk. The first four nodes are usually indistinguishable within the crown. The 5th node is about 1/2 inch above the area that contains the first nodes. The node corresponding with the uppermost leaf, with a visible collar, defines the vegetative stage. This knowledge is important because it helps the farmer determine any inputs that might be necessary to add to his crop, as well as the crop's potential yield. Corn needs little fertilizer boost until V5, but requires a large nitrogen intake to promote yield from V8 until VT (tasseling). It is important to side dress (inject between corn rows) nitrogen before the V8 stage. This allows the plant to maximize its photosynthetic potential. Ear length is determined between the V12 and VT vegetative stages. Tassel emergence occurs from V17 to V22, depending upon the corn variety.

Procedure for Lesson:

1. Use a knife and cutting board to carefully split the stalk of a corn plant in half, vertically, down to the roots.
2. Remembering that the first four nodes are often indistinguishable within the crown, count the number of nodes to determine the vegetative stage that the corn plant is in.
3. Compare the nodes counted within the stalk to the number of leaf collars found on the outside of the plant.

Leaf Collar Method Student Worksheet Continued

Reflection

1. Why is it necessary to split the stalk to accurately determine what vegetative stage the corn plant is in?

2. How do the internal nodes compare to the external leaf collars found in/on the plant?

3. How can determining the vegetative stage of the corn plant help the farmer determine when to input fertilizers and predict the ear length?

Corn Staging

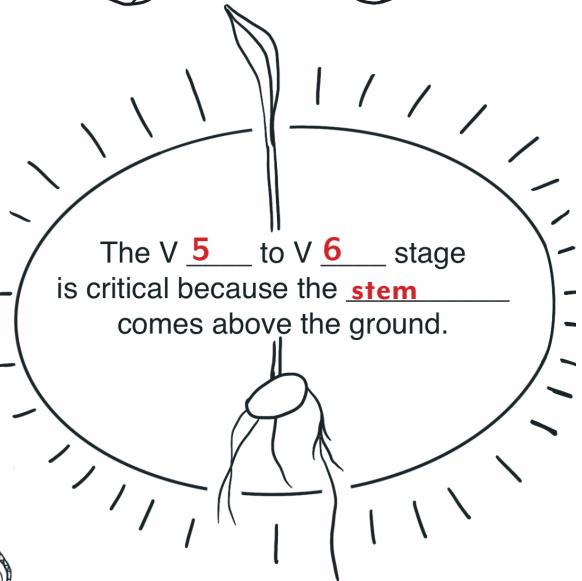
Determining growth of plant



WHAT IS IT?



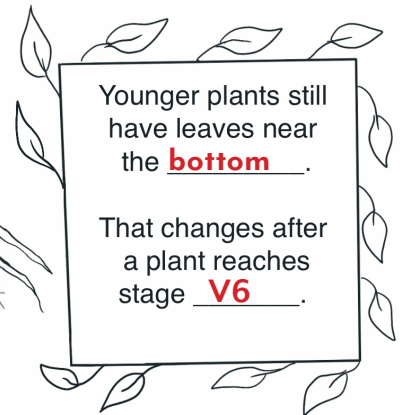
How corn grows.
Two stages:
vegetative &
reproductive.



The V **5** to V **6** stage is critical because the **stem** comes above the ground.

Rings = Nodes

Nodes show where new growth on a corn plant can come from.
IN the human body our nodes might be in our **hips** and our **shoulders**.



Younger plants still have leaves near the **bottom**.

That changes after a plant reaches stage **V6**.



VE	V1	V3	V7	V10	VT	R1	▲	R6
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