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Barnyard Exploration

Background Knowledge

The world is made up of a multitude of living things, and in this lesson, students will explore the natural world around them and become more aware of the many plants and animals that inhabit the farm. You will be bringing the farm to the classroom by filling a large plastic tub with various items that might be found on the farm. See the "Materials" section for suggestions.

Pre-punch your paper bags by folding each bag in half and punching two holes by the fold. Then have students assemble their books by threading either yarn or pipe cleaners through the holes to create the binding for the books.

Standards of Learning

Science: 2.1, 3.1, 4.1
Language Arts: 2.2, 3.4, 4.4

Objective

Students will:

- Investigate an ecosystem
- Utilize descriptive vocabulary

Materials

- Large plastic container
- Soil or peat moss
- small shovels/trowels
  (you may also use plastic spoons)
- plastic bowls
- farm ecosystem items
  - Ex: leaves, artificial worms/insects/animals, sticks, pebbles, pine needles, seeds, tractor toys, plastic farm animals
- Paper lunch bags
- Hole punch
- Yarn or pipe cleaners
- Pre-printed descriptive word slips, sample attached

Procedure

1. Have your large plastic tub filled with soil and pre-loaded with various items for your farm ecosystem.

2. Pass out paper bag books and descriptive word slips. Have students glue a descriptive word onto each page in their book.

3. Have students take turns in small groups coming up to the discovery tub. Give them a chance to sift through it and see what is hidden. Have them find items in the tub to match the descriptive words in their book.

4. Students can either place their items in the sleeves in their books or draw a picture of the item on the correct page.

5. Use probing questions to create a conversation about items found on the farm and how each interacts with others.

6. Have students write a sentence about each item chosen, explaining its connection to the farm.

Variations

Instead of making paper bag books, you may also choose to have students collect 1-2 items from the ecosystem and then complete one of the attached graphic organizers. Included in the Appendix are Synonyms and Antonyms, Shape Hunt, Venn Diagram, and Concept Web.

Sample Descriptive Words

rough	smooth
living	non-living
hard	soft
dark	light
wide	thin
heavy	light
small	large
bright	dull
capital resource	natural resource
domesticated	wild

"What's on the Farm?" Classification

Background Knowledge

Use the farm and its surrounding environment to help students practice sorting and classifying objects. Possible pictures and classifications are:
PK/Kindergarten: living vs. nonliving; plant vs. animal
First Grade: body coverings, animal movement; wild vs. domesticated
Second Grade: natural, human, and capital resources
Third Grade: producers, consumers, and decomposers; predator vs. prey; herbivores, carnivores, and omnivores

Standards of Learning

Various adaptations of the lesson available for the following standards-
Science: K.6, 1.5, 3.5
Social Studies: 2.7

Objective

Students will:

- Sort and classify plants and animals found on the farm

Materials

- Shower curtain with farm scene drawn on it
- Pictures of plants and animals found on a farm, mounted on construction paper/cardstock and laminated
  - o Pictures available in Appendix

Procedure

1. Prior to beginning the lesson place the farm scene shower curtain on the floor and add all of the plants/animals that you will be using. Refer to the "Background Knowledge" above for guidance on various pictures and classifications to use.
2. Working in teams or pairs have students observe all of the pictures on the shower curtain then have each team collect a picture until the shower curtain is empty.
3. Tell them that you will now sort and classify the pictures that they have. You may choose to have the class brainstorm their own classifications or give them predefined ones.
4. Draw columns and headings on the board for the classification groups. Next have students take turns taping their pictures into the correct column.
5. You may then have students determine other ways to sort the pictures or create a large Venn diagram on the board.

Extension

In addition to sorting pictures, you may also use them to create a food/energy web.

Resource Round-up

Background Knowledge

Agricultural by-products are essential in the lives of modern Americans. However, many people overlook the link between by-products and their commodity of origin. This growing lack of knowledge leaves consumers unaware that much of what they use beyond food and fiber has an agricultural origin. For more background knowledge, see Commodity Facts and Product Matches on next page.

Procedure

1. Display pictures of plants and animals raised in Virginia.

2. Provide a bag of products which we use from the plants and animals. Ask students to match each crop with the appropriate plant picture. Next students should match the animal with the base product it is known for such as milk matches with the dairy cow. This is known as the raw commodity for both plants and animals.

3. Check for accuracy.

4. With the remaining items challenge students to use reasoning and deduction to correctly link the raw commodities and their by-products.

5. Discuss what new facts the class learned.

Extension

- Research other by-products from the plants and animals in the pictures

- Research a commodity grown in Virginia and develop a raw commodity and by-product chain.

Standards of Learning

Science: 3.10, 3.11, 4.9

Social Studies: 2.7

Objective

Students will:

- Identify and match plants and the crop produced
- Identify and match animals and the raw commodity produced
- Correlate plant and animal with the by-product/good

Materials

- Pictures (included in Appendix) of crops and animals that are among the top 20 in Virginia:
  - peanut, tomato, soybean, cotton, forestry (trees), dairy cow, chicken, sheep, corn, beef cattle, grape vines, apple trees, wheat, potato, pig
- Large bag such as a grocery bag
- Raw/Base Product Items:
  - Peanut
  - Tomato
  - Soybean
  - Cotton boll
  - Tree bark
  - Milk container
  - Egg
  - Wheat seeds
  - Grapes
  - Wool
  - Potato
  - Corn
  - Beef jerky
  - Apple
  - Bacon package
- By Products:
  - Grape jelly
  - Small piece of wood
  - Peanut butter (or wrapper)
  - Package of cheese
  - Ketchup
  - Container of chicken nuggets
  - Soy crayon or candle
  - Cotton fabric
  - Dollar bill
  - Rayon yarn
  - Yogurt container
  - Mayonnaise
  - Lotion
  - Lipstick
  - Box mashed potatoes
  - Corn cereal
  - Marshmallow or gelatin (Jello)
  - Apple juice box
  - Bread or box of pasta
  - Snickers bar (or wrapper)
  - Empty container of medicine/gelcaps

Commodity Facts and Product Matches

(note: some by-products may be correctly matched with more than one raw product)

Peanut Plant – Peanut – Peanut Butter, Snickers Bar: Virginia grows a special variety of nut called Virginia-Carolinas. These peanuts have the largest kernels and account for most of the peanuts roasted and processed in-the-shell. When shelled, the larger kernels are sold as snack peanuts, they are also used in Snickers bars. Virginias are grown mainly in southeastern Virginia and northeastern North Carolina. A peanut is actually an underground pea, or legume, rather than a true nut.

Tomato Plant – Tomato - Ketchup: Virginia ranks 3rd nationally in fresh market tomato production (tomatoes grown to be enjoyed whole, rather than those grown to be processed into other products). This salad staple is grown predominantly on the eastern half of the state as well as in greenhouses and hydroponically (without soil). Tomatoes are planted after the last frost and will produce fruit in 65 to 75 days. Tomatoes come in many sizes, shapes and colors.

Soybean Plant – Soybeans – Soy Crayons, Soy Candle, Mayonnaise: Soybeans are an incredibly versatile plant which can be used in a wide variety of application – from human consumption, such as in tofu, mayonnaise and chocolate to animal feed, as well as non-food uses such as inks, dyes, insecticides, car seat foam, candles and even crayons. Prang Fun Pro makes a crayon that is 85% soybean oil. It took a team of chemists and product developers two years to bring this unique crayon to consumers. One acre of soybeans can make 82,368 crayons. Soybeans are farmed throughout Virginia and are the state's top crop.

Cotton Plant – Cotton Boll – Fabric, Dollar Bill: Cotton is planted in rows during the spring; about two months later, flowers develop from the buds. When the flowers die and fall off, they leave behind pods called bolls. After the bolls ripen and break open, the cotton fibers emerge. After the cotton is picked, it is sent to the gin for the seeds to be removed (there are 5 cotton gins in Virginia) and goes through a long process of cleaning and sewing before it can be used to make blue jeans and other clothing items. In addition to fabric, cotton fibers are also used in paper money. Cotton's seeds and hulls are useful as well, cotton seeds may be used in cooking oil while the hulls are ground up and used in animal feed.

Tree – Bark – Wood, Rayon Yarn: More than 5,000 products are made from trees. One is rayon, a silk-like fabric that was the first manufactured fiber. It's made from cellulose acetate, which comes from wood pulp. The cellulose is dissolved by chemicals, forced through tiny holes in a metal spinneret, and then twisted into silky yarn.

Dairy Cow (Holstein) – Milk – Yogurt, Cheese: The most widely recognized dairy cow is the Holstein, which has black and white spots. The spots are similar to people's fingerprints in that no two cows have the same pattern of spots. Dairy cows tend to look more "boney" because all of their energy is going to make milk, whereas beef cattle tend to be bulkier. Dairy farmers milk their cows at least twice a day, every day. Most dairies used automated milking machines, some even use robotics to maximize efficiency and cow comfort. One cow produces 90 glasses of milk a day, and 200,000 in her lifetime. In fact, a cow's udder can hold 25-50 pounds of milk! Diary is Virginia's third largest agricultural commodity.

Chicken – Egg – Mayonnaise, Chicken Leg/Nuggets: There are several types of chickens grown in Virginia. Layers are grown to produce eggs. Broilers are raised to produce poultry products. It takes a chicken about 24 hours to produce one egg. It is very likely that the egg will be laid between 7 and 11 a.m. during the day. One chicken will lay approximately 250 eggs per year.

The color of a chicken egg is determined by the breeding and genetics of the hen and does not affect the quality of nutritional value of the egg. Very generally speaking, a brown hen will lay a brown egg while a white hen will lay a white egg. The nutritional value of an egg is determined by the diet of the bird not the color of the egg. The diet of the bird also determines how yellow the yolk will be. If you crack open your egg to discover a dark yellow yolk, the hen was probably fed green vegetables. A medium-yellow yolk would indicate a diet of corn and alfalfa while a light-yellow yolk could be the result of eating wheat and barley.

Labels on eggs-

Cage-free — These hens are free from the confines of a cage, but this does not necessarily mean they are raised outside. More often, they are free to roam a barn or warehouse, but their living conditions can vary widely.
Natural — Anyone can use the term "natural" to describe their eggs, so this does not denote anything specific.
Free-range — This means hens are free to roam the outdoors at some point, but there is no regulation specifying how long is necessary.
Certified Organic — Hens have some access to the outdoors and are fed an organic vegetarian diet that excludes any pesticides, animal by-products, or genetically modified foods.

Sheep – Wool – Lotion, Lipstick/Chapstick: Wool from sheep contains lanolin, which helps the wool repel water. During processing, the lanolin is removed from the wool for use as a moisturizer in many soaps, facial creams and lotions.

Corn Plant – Dent Corn – Biodegradable Packing Peanuts, Corn Mug, Corn Cereal: According to the National corn Growers Association, there is a use for every part of the cornstalk-husks, kernels, an even the water that kernels are processed in. The vast majority of corn grown in Virginia is field corn, which is grown for animal feed. This is different from the sweet corn variety that people enjoy. Corn is a very starchy plant; the starch can be used in biodegradable plastics like a coffee mug, diapers, and packing peanuts.

Beef Cow (picture is of a black angus) – Raw Beef – Beef Jerky, Marshmallow/Gelatin: Beef cattle are raised across Virginia. Beef products are used for a variety of purposes; in fact, 99% of each steer is able to be used in products for consumers. In addition to the obvious items such as steak and ground beef, beef byproducts are also found in food items such as Jello, marshmallows, gum, and even gummy bears. Leather comes from cattle as well which are key in the manufacturing of footballs, basketballs and baseball gloves.

Grape Vine – Grapes - Jelly: Virginia's grape production has grown significantly over the past decade. The state ranks 5th nationally in grape production. Virginia grapes are predominately used in the production of wine, however jelly is more child appropriate.

Apple Blossom (note the pollinator) – Apple – Apple Juice: Virginia growers produce an average of 8 to 10 million bushels of apples per year. Apple varieties grown in Virginia include Red Delicious, Fuji, and Granny Smith. The majority of apples in Virginia are grown in the Shenandoah Valley area.

Wheat Plant – Wheat Seeds – Bread, Pasta: Wheat is a versatile small grain. It can be grown in the fall or spring and is used for animal food or sold for human use in breads and cereals.

Pig – Bacon Package – Medicine Package: Pork is the most widely consumed meat in the world. In addition to bacon, sausage, and pork chops, there are many different byproducts that come from pigs. Gelcaps, insulin and even heart valves are a couple of the medical byproducts from pigs. Similar to cows, pig byproducts may also be used in gelatin and leather.

Potato Plant – Potato – Box of Mashed Potatoes/Hash Browns: Farmers in Virginia typically produce between 3,000 and 4,000 acres of potatoes. Growers in the state produce high-quality red, white, yellow and russet potatoes. A large number of Virginia potatoes are grown on the Eastern Shore.

Mapping Virginia Agriculture

Background Knowledge

Map skills are very important for your student to learn, not only for testing purposes but also for everyday life. A compass rose is a figure on a map used to display the layout of cardinal directions, north, south, east, and west. This is something you are going to want to point out to your students and ask them questions about. Coordinate planes are also something valuable for your students to know, not only for map skill but also for math. Your student should be able to locate a Virginia product, region, or river on the map just by following a designated horizontal and vertical line until they cross over one another. The rivers and lakes found in Virginia need to be pointed out to your students so that they know where they are located, which is mostly along the east coast. The Virginia regions from left to right are Appalachian Plateau, Valley and Ridge, Blue Ridge Mountains, Piedmont, and Coastal Plain, which are all something your students should know so make sure to have them on your map along with the rivers. There are numerous products grown and raised in Virginia that each have a designated area to grow in. For example, sheep are grown in the north and southwest of Virginia while soybeans are grown mainly along the east coast. This map of Virginia allows students to explore map skills and coordinate systems on a large-scale model. This activity can be adapted to cover a variety of map skills and geographic locations, and includes the whole class in the lesson.

Standards of Learning

Social Studies K.4, 1.4, 2.6, 3.5, VS.2, VS.10
Mathematics 6.11

Objective

Students will:

- Increase map skills by using coordinate points and symbols
- Identify important geographic features on a Virginia map
- Identify important Virginia resources

Materials

- Outline map of Virginia's five regions made into an overhead (found at http://www.pen.k12.va.us/VDOEInstructionsol.html#history)
- White or cream shower curtain
- Wide permanent markers
- Construction paper
- scissors
- glue
- Laminator or contact paper
- ruler
- Map of Virginia Agriculture (included in Appendix)

Procedure

1. Enlarge the outline map of Virginia's five regions using an overhead projector and trace it onto the shower curtain. Be sure to mark the borders for the five regions, draw in the rivers, and place a star at Richmond and Washington, D.C. but do not label anything.
2. Using a ruler, create a coordinator graph on top of the map. Determine the size of the grid squares based on the size of your map. Label the X (horizontal) axis with letters and the Y (vertical) axis with numbers.
3. Photocopy and enlarge the commodity symbols located in the map legend on the Map of Virginia Agriculture (distributed in workshop). Back these symbols with construction paper and laminate for durability.
4. At this point, you may choose to do one of the following:
   - Leave the map completely empty and have students place commodity symbols on the map using specific coordinate pairs
   - Place some of the symbols on the map and have students place the rest using coordinate pairs
   - Place all of the symbols on the map and have students provide you with the coordinate pairs for each symbol

Sample Questions for Mapping Virginia Agriculture

These questions will vary based on the grid you have placed over the map of Virginia.

- Place the symbol for corn at (G, 11).
- At what coordinate pair would I find turkeys?
- What river flows between (R, 5) and (S,5)?
- What American Indian Language group lived in the region located at (A,2)?
- What coordinate pair is located south of (K,9)?
- Place a pumpkin at the coordinate pair located two spaces north and one space west of (N,12).
- Give me a coordinate pair that sits along the Fall Line.
- What neighboring state would be to the west of (D,11)?
  various commodities raised throughout the state

Extension

- Create handouts of the map grid of Virginia. Provide each student with a copy of the map grid. Group students in pairs. Have them place a triangle on a coordinate of their choice. Students can then play a version of battleship using their map grid.
- Have students research and report on the various commodities raised throughout the state.
- Visit AgInTheClass.org for our interactive Virginia map that includes videos for each region detailing climate, geography, soil and commodities.

Virginia Picnic Blanket

Background Knowledge

Many favorite picnic foods are made with items that are grown or raised in Virginia. In fact, the chicken in your chicken salad ranks as Virginia's top agricultural commodity (product). Many poultry farms are found in the Piedmont region of Virginia. Additionally, Virginia farmers produce apples; the wheat for your pasta salad; vegetables such as peppers, tomatoes, and potatoes; dairy products; pork for ham biscuits; even the cotton for your picnic blanket.

Standards of Learning

Science K.1, K.2, K.4, 1.1, 2.1
English K.2, K.3, 1.1, 1.2, 2.1, 2.2

Objective

Students will:

- determine questions required to make an accurate classification and prediction
- make predictions based on the categorization and description of an object
- utilize descriptive vocabulary in writing

Materials

- Artificial or real fruits, vegetables, and animals Use Virginia products such as apples, pumpkins, potatoes, corn, grapes, green beans, wheat, peanuts, eggs, chickens, cows, hogs, turkeys
- A thin fabric such as a fabric table cloth

Procedure

1. Before students enter the classroom place 6-8 fruits and vegetables on a tabletop and cover with a thin cloth. Hint: It helps to number each item with a post-it on top of the cloth.
2. Divide the class into 4-5 groups. Then ask for 6-8 volunteers (one per object under the blanket).
3. The volunteers will take turns peeking under the blanket at their object. The rest of the class cannot see what is underneath.
4. Each group is allowed to ask 4-5 yes-or-no questions to try and determine the object under the blanket. Groups will take turns asking questions. The group that can accurately name the object wins.
   - Sample questions: Is it red? Can it be eaten? Does it grow under the ground? Is it a vegetable?
5. After all items have been accurately determined, place them on top of the blanket and explain that each of these items are grown or raised in Virginia.
6. Writing Activity
   - Option One: Have students choose one of the items to draw on their paper and then write adjectives to describe it.
   - Option Two: Have students write a descriptive paragraph about a picnic and their favorite picnic foods.

Extension

Have your own Virginia picnic in class – bring in real food items like the ones that were under the blanket and have a tasting party.

Ag Tag Game

Background Knowledge

Agriculture is Virginia's largest industry by far. Advances in agricultural productivity have led to abundant and affordable food and fiber throughout most of the developed world. The diversity of Virginia agriculture affords you many different potential pictures to use with this lesson.

In this activity, students wear "Ag Tags" on their back with pictures of agricultural products. Other students write adjectives describing the pictures, and students must guess the identity of their "mystery product." This activity is a wonderful opportunity for students to expand their use of adjectives while learning more about Virginia agriculture.

Standards of Learning

English K.1, 1.1, 2.1, 2.2, 2.3, 3.1, 4.1, 5.1

Objective

Students will:

- Expand listening, speaking, and written vocabulary
- Use descriptive words and adjectives
- Build prewriting skills to generate ideas

Materials

- Pictures relating to agriculture
- Nametags (hanging name badges)
- Large post-it notes

Procedure

1. Construct nametags prior to doing the activity with students.
   - Insert an agriculture related picture into each hanging name badge
   - Cover the picture with a large post-it note.
2. Hand out the nametags and instruct the participants not to look at their picture.
3. Tell the participants to place the nametag around their neck so the picture is on their back.
4. Ask the participants to walk around the room and have others look at their picture and write (or say) a descriptive phrase or word on the post-it that gives a clue as to what is pictured.
5. After time is called, tell the participants to take off and read the post-it and try to guess their picture.
6. After guessing, tell the participants to look at their nametag to see if they guessed correctly.
7. Discuss how the pictures relate to agriculture and why agriculture is important to us.

Suggested Pictures

- Wildlife (snakes, groundhogs, squirrels, birds, etc.)
- Farm animals (cows, chickens, pigs, horses, etc.)
- Crops (corn, peanuts, pumpkins, apples, soybeans, tobacco, etc.)
- Forestry (soil, trees, etc.)
- Farming/gardening equipment (tractors, shovels, calculators, etc.)
- Products (milk, eggs, cheese, etc.)
- Careers (large animal veterinarian, scientist, mechanic, etc.)

Extension

- This game can be adapted to fit any unit of study. Simply change out the pictures to match the topic being studied.
- Have students take the adjectives / adverbs given to them during the game and write a descriptive paragraph about the item in the picture, incorporating the adjectives / adverbs on their tag.

Apple Earth

Background Knowledge

How much of the Earth's land is available to feed, clothe, and fuel the world's population? Explore this question as well as the importance of soil as a natural resource in "Apple Earth."

Farmers are keenly aware of the importance of soil and its value as a natural resource. Thus, they may adopt one or several ways to protect the soil. Examples include conservation tillage, wind breaks, contour farming, and crop rotation. As the population increases, vital cropland is being covered and lost from production. Thus, today's farmers must find ways to be more efficient and produce more food on less land, especially as it is projected that the world's population will reach 9 billion by 2050. In the 1960s, one farmer supplied food for 25.8 persons in the U.S. and abroad. Today, even as the population increases but the number of farms decreases, one farmer supplies food for 155 people in the U.S. and abroad. Modern technology that creates farming efficiency is crucial to generating a food supply to sustain the growing world.

Standards of Learning

Science 1.1, 1.8, 3.1, 3.7, 3.9, 3.10, 4.1, 4.9
Social Studies 2.7

Objective

Students will:

- Understand that natural resources are limited
- Discuss the importance of managing natural resources
- Identify the effects of humans and weather on land

Materials

- An apple
- A knife

An apple can also be a great way to demonstrate to your students the concept of fractions. For example, as you cut the apple it is important to point out that you are left with two halves and the halves make a whole. One half is ½ of the whole apple and the same for the other half. Then when you cut the halves once you are left with 4 fourths of the apple. The 4 fourths make up the whole and a fourth can also be written as ¼. This cycle continues as you continue to cut the apple.

Procedure

1. Cut the apple into four equal parts and do the following:
   - Remove three parts –

   These three parts represent the portion of the earth covered by water.
   Locate the Earth's oceans on a map.
   - The part that is left, one-fourth of the earth, represents land.

2. Cut the remaining portion (quarter) in half lengthwise and do the following:
   - Remove one part –

   This half represents areas of Earth where plants we eat can't grow because the climate is too hot or cold.
   What places are too hot? (identify major deserts)
   What places are too cold? (identify the poles and places where the ground is frozen)

3. Cut the remaining portion crosswise into four equal parts and do the following:
   - Remove three parts –
     These three parts represent land that is too rocky or steep, too marshy, or where something has already been built.
     The fourth part – only 1/32 of the earth – represents the land that can be used for growing crops to sustain more than seven billion people and all of the billions of animals in their care.

4. Ask students if we can grow plants all the way into the core of the earth. Once they have identified that this is not a possibility, discuss what part of the earth we do use for planting and growing crops (topsoil on the crust of the earth).

5. Peel the skin off of the remaining section and do the following:
   - Show the skin –
     This tiny piece of the apple represents the topsoil – the part of the earth where plants grow. This small amount of soil is important for growing all of the food needed to feed all of the people and animals on our planet.

6. Discuss the importance of soil conservation and ways that erosion can be prevented.

Water Cycle in a Bag

Background Knowledge

Water is used by many people in many ways. But people are not the only ones who need water; it is also critical resource for crops and animals. The earth, however, has a limited amount of water. The water that the earth has constantly keeps going around and around and around in a cycle. This is called the water cycle, which is made up of five steps: sunlight, condensation, precipitation, evaporation, and accumulation. The sunlight is important because it gives the water cycle the energy it needs to keep going around and around. The sunlight starts the cycle. Evaporation happens when the sunlight heats up the water from the lakes, rivers, and oceans and turns it into vapor or steam. This water leaves the lakes and rivers and goes up into the air. Condensation happens when the water in the air as vapor gets cold and changes back into a liquid for rain or a solid for snow. Clouds are formed during condensation and when the cloud lets the rain or snow go precipitation happens. The cloud is not able to hold the water anymore because so much has condensed so the water falls back to earth. As the water falls to the earth it collects in various lakes, rivers, streams, and oceans in a process called accumulation. Some of the water will remain on the ground and soak into the earth for plants to use. Now that the water is back in the rivers and lakes the cycle can start all over again.

Because water is so important for farmers there are several things that they can do to conserve it and keep it clean. For example, they might utilize watering systems that put water directly at the plants' roots – this allows more water to get straight to the plant instead of evaporating. They may also employ vegetative or conservation buffers, which are trees or grasses that are planted in between fields and waterways. These act as a barrier, helping keep pollutants out of the water. Additionally, cover crops are a way that farmers take care of the land and water. Cover crops, such as rye grass or clover, protect the soil from wind and water erosion. Additionally, cover crops help keep nutrients in the soil and out of the waterways.

Standards of Learning

Science: K.1, K.3, 1.1, 1.3, 2.1, 2.3, 3.1, 3.9, 3.11
Language Arts: 2.10, 2.11, 3.9

Objective

Students will:

- Correctly identify and label the steps of the water cycle.

Materials

- sandwich size plastic bags
- various colored permanent markers
- small aquarium rocks (optional)
- water
- picture of water cycle (located in Appendix)

Procedure

1. Hand out the picture of the water cycle to your students.
2. It is best to explain the water cycle to them first and go over it as a class before your students complete the activity.
3. Make sure students have access to permanent markers.
4. Now hand out a plastic bag to each of your students.
5. Tell them to place the picture of the water cycle inside the bag and close the bag.

6. Using the permanent markers, have your students trace over the picture including the numbers.

7. After they trace everything, they remove the picture from the bag.

8. Next have students number 1-5 on a sheet of paper. Have them correctly identify the numbers from the water cycle picture with the steps of the water cycle.

9. Make sure to remind them that the water cycle steps need to be in order.

10. Instruct your students to add 2 tablespoons of aquarium rocks to the bottom of their bag.

11. Next they need to add ¼ cup of water to their bag.

12. Lastly, using wide, clear packing tape, affix the bag to a window in direct sunlight.

13. Explain to your students how they will be able to watch the water cycle work as the sunlight heats up the water in the bag.

Extension

- Challenge students to brainstorm ways in which farmers need water.
- Research the effects of severe drought.

Discover an Acre

Background Knowledge

The purpose of this activity is to provide students with a concrete and visual example of area and perimeter. Further, it will give examples of real-world applications for these math concepts in the context of designing and laying out a garden. In this lesson students will use one foot square pieces of construction paper to "plant" their garden. This is similar to a popular school garden layout – the Square Foot Garden. Square Foot Gardens are popular among classes and schools because each class or student can be assigned their own square within which to plant and harvest. It is also an optimal size for a child to use.

Standards of Learning
Math: 3.8, 4.7, 5.8

Objective

Students will:

- Investigate perimeter and area using 12 inch squares to model a garden
- Measure the perimeter and area of a given space

Materials

- 12" ruler
- 12" x 12" construction paper (at least one square per student)

As mentioned in the Extension portion of this lesson, different plants can be planted within each square foot. Some will be planted one plant per foot, while others can be planted as 4, 9, or 16 per foot. The number of plants per square foot is dependent upon how large the plant gets. Because plants need sunlight, soil, water, and space to grow, planting too many in a square would cause them to not have adequate access to these growing requirements.

Popular plants to grow in a square foot garden are –

- One plant per square foot (12 inches apart): peppers, "patio" (dwarf bush) tomatoes, potatoes, broccoli, cabbage, cauliflower, kale, head lettuce, New Zealand spinach, peppers, peanuts, potatoes, large sunflowers
- Four plants per square foot (6 inches apart): leaf lettuce, parsley, Swiss chard, sweet corn (small varieties), mustard greens, basil, coriander, dill, parsnips, shallots, small sunflowers, turnips
- Nine plants per square foot (4 inches apart): bush beans, spinach, leeks, anise, chervil, corn salad (mâche), mustard greens, nasturtiums
- Sixteen plants per square foot (3 inches apart): carrots, beets, radishes, onions, cumin, garden cress

Procedure

1. As a class, brainstorm the units we use to measure various things. Examples: an eraser – centimeter; length of a pencil – inch; height of a door – yards; etc.

2. Ask the children how we would measure the amount of space or surface that a large object would cover (the yards of our houses, the field a farmer would plant a crop on, the land our school sits on, etc.) *Direct students to think about an acre, which is approximately 43,000 square feet.

3. Discuss measuring area and inform the students that we often use square feet to measure area.

4. Show students what a square foot looks like by drawing a square on the board that measures 1 foot on all four sides.

5. Tell the children that today they are going to be planting a garden.

6. Give each student several 12" x 12" pieces of construction paper. Explain each piece of paper is a square foot. It measures 1 foot x 1 foot. The area of one piece of paper is one square foot.

7. Clear a space in the classroom or go to a room such as the cafeteria where students will be able to lay all of the squares on the floor and view them.

8. Ask the students to place each square on the floor one at a time to create their garden. The field can be any shape but each square must touch at least one side of another square.

9. When all the squares are laid down, tell students that you now want to construct a fence around your garden. What do you need to know about the garden to know how many fencing supplies to purchase?

    a. To answer this question students need to determine the perimeter of their garden by counting the outside edges. Bring in circulars from stores that sell landscaping materials, ask them how much the fencing supplies would cost. Is this the most cost effective shape for the garden? Point out that you will save money by having the smallest possible perimeter.

    b. Next, find the area by counting the squares.

10. Collect the squares and have the students create a new garden (different shape). Again calculate the area and perimeter of the garden. *This will show students that while the perimeter may change, area does not change simply because the shape changes.

Extension

- Copy seed packet pictures from www.edhumeseeds.com and place on the square feet construction paper squares. Write under the seed packet how many of the given seed can be planted per square foot.
    - Use real seeds or colored cotton balls and have students "plant" according to the planting recommendations. Discuss why different plants have different planting recommendations.
    - Have children sort their field crops according to the parts of the plant they are or by how many seeds can be planted per square foot.
    - Incorporate multiplication word problems – Example: I have 4 square feet and want to plant parsnips. If I can plant 4 parsnip seeds per square foot, how many parsnip seeds can I plant?

- Design, plant, and grow a square foot garden.

- Take students outside with the 12" x 12" pieces of construction paper to find square footage and/or perimeter of common objects such as a sidewalk, door, window, a picnic tabletop, a seesaw, or a parking space.

These Farms Measure Up:
Become an Agricultural Engineer

Background Knowledge

An engineer is someone who uses math and science to solve a problem. An agricultural engineer applies these concepts to the farm. They might design farm machines (such as a new tractor or tool) or facilities (such as chicken house or milking parlor) to maximize the efficiency of the farm.

Standards of Learning

Math: 3.9, 4.7, 5.8

Materials

- 2 pieces 11x17 white paper (one for the blue print and one for the 3-D model)
- Construction paper
- Rulers
- Pencils
- Scissors
- Glue

Procedure

You will apply what you have learned about measurement and perimeter to design a farm for your assigned livestock. Each animal will have a different set of needs and requirements in order to be kept most comfortable. There may be more than one correct way to create the requirements.

You will work in a group to design your blueprint first on a piece of construction paper by measuring and then drawing the lines for your fences, enclosures, and other features.

Next you will use construction paper to create your own 3-D farm model. Each group will complete one model.

Farms will be inspected by the Farm Safety Inspector to be sure that you have followed the appropriate specifications.

Extension/Adaptions

- You may bring in toy farm animals or toy fencing for students to include in their models.
- Directions can be modified to include other math concepts such as radius/circumference. For example, the cows' water trough could be directed to made with a radius of 5 centimeters.
- You may choose to convert the measurements to standard (rather than the metric that was used).
- This project can be done individually, in pairs or groups. There is generally more than one way to design each enclosure which makes it interesting when the different groups demonstrate various ways of designing their farms.

These Farms Measure Up:
Become an Agricultural Engineer (cont.)

Group 1: Dairy Cows

Farm Requirements:

Dairy cows spend a lot of time in the field grazing. In fact, they spend about 6 hours a day eating both the grass in the pasture and the feed provided by the farmer. In order to keep both the dairy herd and the nearby streams and waterways healthy, you need to construct a fence to keep the cows out of the waterways.

The fence must have a perimeter of 130 centimeters.

Because you have fenced the cows out of the stream you need to provide them with a watering trough where they can have access to plenty of fresh water throughout the day. Dairy cows drink 25-50 gallons of water each day!

The watering trough must have a perimeter of 20 centimeters.

Dairy cows are milked at least twice a day, every day. The building where they are milked is called the milking parlor. Most milking parlors are automated, some are even robotic! You will need to construct a milking parlor so that the cows can be milked.

The perimeter of the milking parlor must be 60 centimeters.

Group 2: Equine (Horses)

Farm Requirements:
Horses love to eat short, juicy grass. They also eat hay (which is dried grass), especially in the winter or in their stable. Some horse owners might also supplement their horse's diet with barley, oats, or other types of feed. In a field, horses might spend most of their day grazing. To keep them from wandering off you need to build a fence around pasture.

The perimeter of the fence must be 100 centimeters

Horses typically have a stable where their grooming equipment might be kept. Horses should be groomed frequently with a comb, brush and hoof pick (which removes dirt, stones, and other objects from the feet). The horse owner might also keep the horse's saddle and blankets in the stable.

The perimeter of the stable must be 60 centimeters.

In addition to being used for storage, most stables have stalls for each horse. A horse might sleep in his stall (although horses generally sleep standing up!) or go there to be protected from bad weather. There are 3 horses on your farm and each needs their own stall in the stable.

Each stall must have a perimeter of 24 centimeters.

Group 3: Chickens

Farm Requirements:
The majority of chickens raised in Virginia and the nation are raised in climate-controlled barns, called houses, designed to maximize the chicken's health and welfare by providing a balanced diet, clean water, comfortable bedding, and fresh air. On many farms a computer monitors the temperature and air in the chicken house and automatically adjusts to keep the birds comfortable. This information can also be delivered straight to the farmer's phone. Your farm will have two chicken houses on it.

The perimeter of each chicken house must be 80 centimeters.

Chicken houses have automated feeders and water dispensers located throughout them. This provides the chickens with access to nutritionally balanced food and fresh water. Place a feeder as well as a water dispenser in each chicken house.

The perimeter of each feeder must be 12 centimeters and the perimeter of each water dispenser must be 8 centimeters.

Rooting for Math

Background Knowledge

Plants use roots to obtain essential nutrients from soil. Without the thin stringy fibers, flowers and plants would not survive. Farmers rely on healthy soil and strong roots to keep their crops alive until they are ready to harvest. Roots begin forming during germination and continue to grow while the plant grows.

Option One of this activity can teach students the parts of the plant and the importance of roots while learning prime factorization. Factors of a multiple can be broken down until only prime numbers. Students get a visual representation of how a number can be broken down into factor families, and eventually only prime factors, using roots shooting from the stem of a flower.

Option Two of this activity can be used to teach either simple equations or fact families.

Standards of Learning

Math: Dependent upon option selected.

Objective

Option One:

Students will:

- Identify and describe the characteristics of prime and composite numbers

Option Two:

Students will:

- Identify correct equations to equal a given number
- Generate equations for a given number/fact family.

Materials

- Construction paper of every color
- Brown yarn or craft sticks
- Markers
- Scissors
- Tape or glue
- Worksheet for Option One (see Appendix)

Procedure – Option 1

1. Discuss with students how to complete prime factorization. Explain that prime numbers can be multiplied together to make composite numbers. Prime factorization breaks down a composite number until you reach the prime factors that make it composite (18 = 2 X 3 X 3).

2. Use the attached worksheet to review prime factorization with your students. Make sure they understand that once a factor cannot be divided into two factors, except 1 and itself, it is a prime number.

3. Remind the students to circle the prime numbers in the factorization trees so they can determine the prime factorization for the composite numbers they are practicing with.

4. After everyone has demonstrated a clear understanding of prime factorization, and their "trees" have been approved, ask them to choose one composite number to use for their Flowering Factorization activity.

5. Provide all of the supplies listed above.

6. Ask the students to cut out the center of a flower and write their composite number on it. Give them time to make their flower petals, stem, and leaves.

7. Once everyone has made their flowers, have the students write on white squares of construction paper the factorization of their composite number. Make sure the students include all of the steps, and not just the prime numbers. They need to demonstrate how they reached the prime numbers.

8. Ask the students to attach the factors appropriately, matching the practice they completed on the scratch paper.

9. On the prime numbers, draw a worm, bee, ant, or other garden critter to indicate the final factors of the prime factorization.

10. Hang up the flowers around the room.

Procedure – Option 2

1. To teach fact families, begin with three flowers and place the fact family numbers within the blossoms. Construct the roots with equations that belong in the fact family.

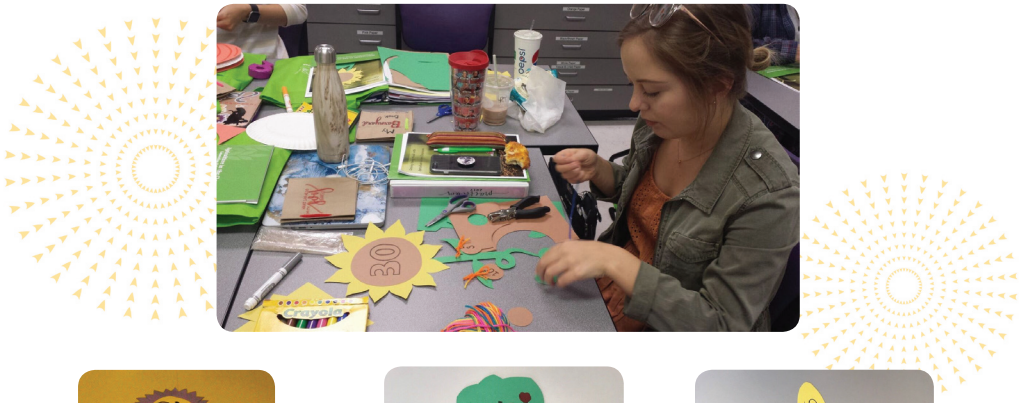
2. Rather than building off of each number in the root, as with Option One, you will have several different root strings coming from the plant, each with an equation that belongs in the fact family. See samples below.

3. You may further simplify the activity by using one number (rather than 3 for a fact family) in the flower and having students create roots with equations that equal that number. On the stem of the plant write an "=" sign. See samples below.

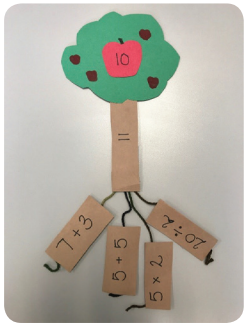
Extension/Adaptions

- Smaller versions of this activity can be done using tooth picks. You can assign certain characteristics of composite number and students must provide an example, such as "This composite number has 2 prime numbers (21)." Or, "Show me 3 different ways you can find the prime numbers for the number 36 (starting factors: 2x18, 3x12, or 6x6)."

- Students could also complete this activity using root vegetables. Discuss the structure of a plant, specifically the cells.



Option 1



Option 2

My Little Greenhouse

Background Knowledge

Greenhouses are able grow plants, such as ornamentals (plants grown and used for decoration) and vegetables, all year long because they stay warm inside. Some greenhouses use electric heat, while others harness the sun's warmth. Greenhouses have many windows, which allow the sunlight in and then trap it, so that it stays warm. In Virginia, bedding plants are the most commonly produced greenhouse item. In addition to bedding plants and perennials, growers may plant vegetables to be used as transplants or for consumption. Many growers will start their seeds in greenhouses and then move them to the fields when the weather is warm enough. The most common vegetable grown for consumption in a greenhouse is the tomato.

Standards of Learning

Science: K.7, K.9, 2.4, 2.8, 3.4, 3.8, 4.4

Objective

Students will be able to:

- identify plant needs for germination

Materials

- template, attached
- cotton balls
- spray bottle with water
- seeds
- crayons, markers
- tape
- sandwich-size plastic baggie

Procedure

1. Review with students the necessary conditions for seed germination – air, water, warmth.
2. Tell students that many plants need warm weather to grow and mature – such as tomatoes. How do we get these vegetables in the winter, when it's too cold to grow them outside? They are either grown in warmer locations and then shipped to us, or they can be grown in greenhouses, which are able to keep a warm, controlled climate. Use the background knowledge above to discuss how this works.
3. Students will now make their own mini-greenhouses.
4. Pass out supplies.
5. Have students color and cut out their greenhouses. Cut along the dotted lines of the greenhouse to make a window.
6. Take about 5 cotton balls and lightly spray with water.
7. Place cotton balls along the bottom of the baggie.
8. Place a seed in the middle of each cotton ball. You may choose to use different seeds if you would like to compare/contrast plant growth.
9. Seal the baggie and tape behind the greenhouse.
10. Place greenhouses in a location where seed growth can be observed – such as in a window or on a bulletin board.
11. Have students observe and report seed growth each day.

Extension

- After germination, seeds can be transplanted to containers to continue growing.
- Have students choose different variables to measure – such as type of seed, growing medium, or location. Chart the results.

How Does Your Garden Grow?

Background Knowledge

Seeds vary greatly in germination rate, amount of time needed for plant maturity, and growing conditions. Some seeds, like radishes, only need 4-6 weeks to grow to maturity, while corn and soybeans require several months. The purpose of this activity is to provide students with an opportunity to observe the germination process.

Germination is when the seed sprouts and begins to grow. It is important for your students to know that it starts right when there is a bud present from the seed. Explain to your students that their sprout will need a while to grow and that every plant is different in the amount it takes for them to get to maturity. Ask them what their plant will need to grow. All plants need water, light, temperature, time, soil (nutrients), oxygen, and space to grow to full maturity.

Standards of Learning

Science: 1.4, 2.4, 4.4

Objective

Students will

- Investigate the germination of seeds

Materials

- Scissors
- Crayons/markers
- Cotton balls
- Water
- Seeds
- Tape
- Snack size, zip-top plastic baggies

Procedure

1. Pass out garden template and allow students to color their garden. Cut out the rectangular window in the middle of the template.
2. Use a spray bottle to wet a cotton ball for each type of seed that you will be planting. Place 2-3 seeds on each cotton ball.
3. Place the cotton balls with seeds inside the snack sized baggie
4. Tape the bag behind the cut-out window so that the cotton balls and seeds are visible.
5. Observe your seeds and track their germination and growth.
6. Display by hanging in a classroom window.

Extension

Tape a piece of graph paper behind the baggie to use when tracking the growth rate of the seeds.

Use your seedlings to jump start your own school garden. See below for tips and planting suggestions.

The crops listed below are cool season crops and do well in the spring and early fall.

Size listed is for mature size. Most of the crops can be harvested before they are at their mature size and served as "baby vegetables," especially lettuce and spinach.

Vegetable crops need at least six hours of sunlight/day.

These vegetables can be grown in the ground, raised beds or in large containers.

Crop	Days to Harvest	Size	Comment
Beets	50-70	2-3" diameter	Harvest small outer leaves to use in salads.
Broccoli	50-65*	6-7" across	Side shoots may be harvested after main head is removed.
Cauliflower	55-80*	6-8" across	Tie leaves over head when head is 2-3" across.
Lettuce	45-60	4-6" tall	Harvest outer leaves first. Hot weather causes bitterness.
Peas	55-85	3" pods	Harvest when seeds are plump in the pod.
Radish	25-45	1/2"-1 1/2	Harvest before they become too large.
Spinach	45-60	6-8" tall	Can be harvested smaller. Eat cooked or raw.
Turnip	45-70	2-3" diameter	Greens can also be cooked and eaten.

*From transplants

Seed Buddy

Background Knowledge

You may choose to punch the holes in the jewelers' bags and cut the string before beginning this activity.

Seeds vary greatly in germination rate, amount of time needed for plant maturity, and growing conditions. Some seeds, like radishes, only need 4-6 weeks to grow to maturity, while corn and soybeans require several months. The purpose of this activity is to provide students with an opportunity to observe the germination process.

Germination is when the seed sprouts and begins to grow. It is important for your students to know that it starts right when there is a bud present from the seed. Explain to your students that their sprout will need a while to grow and that every plant is different in the amount it takes for them to get to maturity. Ask them what their plant will need to grow. All plants need water, light, temperature, time, soil (nutrients), oxygen, and space to grow to full maturity. However, it is important to note that the seeds do not need all of these things to sprout but they will need them to grow to maturity. The process that their plant is going to go through is also something that should be talked about and monitored for a few weeks. All plants go through about the same cycle of sprout, growth, flower, and fruit.

Standards of Learning

Science K.1, K.7, K.9, 1.1, 1.4, 2.1, 2.4, 2.8, 3.1, 3.8, 4.1, 4.4

Objective

Students will

- Investigate the germination of seeds
- Investigate plant needs

Materials

- Seeds, any type will work
- Small baggie (jewelry size – one per student)
- Cotton balls (one per student)
- Yarn cut to "necklace size" or pipe cleaners for bracelets (recommended)
- Hole punch
- Water

Procedure

1. Define the term germination. " To sprout or begin to grow"
2. Show the class a variety of seeds and brainstorm what a seed needs to germinate.
3. Instruct the children that they will be conducting an experiment to see which things from their brainstorming list a seed actually needs to germinate.
4. Provide each student with a small baggie. Punch a hole at the top of a small baggie, above the zipper.
5. Wet a cotton ball and squeeze out the excess.
6. Place the cotton ball inside the small baggie.
7. Place two seeds on the dampened cotton ball.
8. Tie a string through the hole punched in the top of the small baggie.

9. Using the string and baggie like a necklace, place the baggie under your shirt.

10. The seed should soon swell up from moisture and germinate in about 3-5 days.

11. Over the next 3-5 days make observations and record in a science journal.

12. Have students raise right hand and repeat the pledge.

Pledge

I, (state your name), promise to care for my seed buddy day and night. I will keep him close to my heart. I will carry him with me at all times.

Extension

Tape a piece of graph paper behind the baggie to use when tracking the growth rate of the seeds.

Germination Journal

Background Knowledge

Seed packets are readily available and inexpensive. Planting seeds with students has long been a favorite activity for teachers and students the paper packets are often left out of the equation. With a little effort these packets can be transformed into booklets useful for a number of activities. Seed journals can serve as poetry books, a place for a new story, a log book, or event place to create word problems.

Standards of Learning

Science: 1.4, 4.4
Language Arts: 2.11, 3.9, 4.7

Objective

Students will be able to:

- Describe the growth of a plant from a seed
- Observe and record data from a germination experiment

Materials

- Seed packets
- Paper
- Scissors
- Stapler
- Markers

Procedure

1. Provide each student with a packet of seeds. This activity works best when seed packets are paper rather than see through plastic.
2. Cut open the top of packet. Remove seeds.
3. Cut open the bottom and right side of packet. The open packet will form a book cover.
4. Provide each student with a 8 ½ by 11 piece of paper.
5. Fold paper in half horizontally. Fold in half vertically. Open the paper and cut on the folds.
6. Stack the four pieces of paper and fold in half to form a book.
7. Insert book pages into seed packet book cover. Staple in the center.
8. Use book to record the steps of the germination process.

Extension

• Use the journal to write a garden story.

• Journals can be used to write a lab from the garden.

Biodegradable Plastics

Background Knowledge

Corn is a versatile crop. It is grown in every county in Virginia. It not only is used for food but also for manufacturing. Today corn has over 200 different uses in manufacturing. Corn is used in cosmetics, crayons, wallpaper, leather, firecrackers, paper manufacturing, paper board, and pharmaceuticals. Another way corn is used is in packaging-think of all those packing peanuts. Some packing peanuts are made up of a biodegradable starch-based material that is renewable and easily dissolves in water.

Standards of Learning

Science 6.1, 6.6, 6.7, 6.9, LS.4, LS.12

Math 6.9

Objective

The student will:

- provide examples of the states of matter and explain that corn may be used as a renewable resource.

Materials

- Cornstarch
- Water
- Corn Oil
- Zip-lock baggies (quart size)
- Measuring spoons
- Dropper
- Food coloring

Procedure

1. Place tablespoon of cornstarch in a plastic zip-lock bag.
2. Add 2 drops of corn oil to cornstarch.
3. Add 1 tablespoon of water to the mixture.
4. Mix cornstarch, corn oil, and water in plastic bag by rubbing the outside with your fingers.
5. Add 2 drops of food coloring and mix again.
6. Place the bag in a microwave oven on high for 20-25 seconds.
7. Do not completely seal the bag. Careful, it is hot!

Extension

- Have students record their observations as the plastic is hardening (include the day it was made and the next day.) Has the consistency changed?
- Have students place their "homemade plastic in water." How long does it take to disintegrate?
- Have students research other products made with corn (ex; corn syrup used in Coke, ethanol used in gasohol.)
- Have student discuss the life cycle and the parts of a corn plant.
- Have students discuss natural resources. What are the advantages of using renewable resources?

Butter Lab

Background Knowledge

Milk fresh from the cow has both cream and milk mixed together. The cream is less dense than the milk, so the cream rises to the top where it can be skimmed off. The milk left behind after the cream is skimmed off is called skim or fat-free milk. Whole milk that you might buy in the grocery store is homogenized to keep the milk and cream mixed together.

Butter is a dairy product made when cream is churned to separate the buttermilk from the butterfat. Churning the cream forces the fat globules to slam into one another. If they hit each other with enough force, they will stick together, the fat collection becoming bigger and bigger with each extra globule. After enough churning, the fat globules form a chunk of butter. What remains is a watery liquid with small butter grains floating in it. This is called "buttermilk" and is drained off and saved for other purposes. The butter is pressed and kneaded into a solid mass to remove any remaining pockets of buttermilk or water. Butter remains a solid when refrigerated, but softens to a spreadable consistency at room temperature, and melts to a thin liquid consistency at 32–35 °C.

Standards of Learning

Science: K.1, 1.1, 2.1, 3.1, 4.1, 5.1, 5.4

Objective

The student will conduct an experiment to observe the chemical reaction and changes in property as milk is turned into butter.

Materials

- Heavy whipping cream (room temperature)
- Measuring cup or teaspoon
- Marbles
- Small (2oz) baby food jar with lid (or plastic salad dressing container with lid)
- Timer
- Science notebook or recording sheet

Procedure

1. Organize students into groups. Provide each group with 2 small jars, one marble, a scale, measuring cup and timer.

2. Each group will begin by measuring 1 ounce (one fluid ounce equals 6 teaspoons) of cream into their jar.

3. After checking to see that the jars are sealed tightly, the groups will start their timers and begin shaking their jars. Group members may take turns shaking and you may want to play music to encourage their movement. While they are shaking remind students to be observing the properties of the contents of their jar. What does it sound and look like at the beginning, middle, and end?

4. The jar's contents will go through 3 stages – beginning as a liquid, then becoming a solid as the fat and milk solids stick together, lastly the solution will separate into a liquid and a solid, with the butter on the bottom and the buttermilk on top.

5. They should stop their timers and record the time when they have solid butter at the bottom of the jar and buttermilk on top.

6. Next tell them you will be adding a marble to the next trial as an agitator. Have them form hypotheses on whether this will affect the time it takes for the cream to become butter. Repeat the steps above and record their observations and findings.

7. You may choose to provide crackers to taste their freshly made butter.

Extension

- Have students compare and contrast how butter was made before modern technology to how butter is made today.

- Create a lab book detailing the scientific process. Identify a hypothesis, materials, procedure, results, and conclusion.

References

Lesson adapted from Oklahoma Agriculture in the Classroom.

Pumpkin Life Cycle Chain

Background Knowledge

There are flowering/non-flowering plants and edible/non-edible plants that are grown in Virginia. The pumpkin plant serves as both a flowering and edible plant, which is important for your students to know when categorizing. A pumpkin plant starts with a seed, then the roots sprout underground, the leaves sprout from the soil, the flowers blossom, and the fruit or pumpkin comes last. Students create their own model of the pumpkin lifecycle, and explore the parts of a plant in this hands-on activity. Pumpkins are important agricultural products that are grown on the east coast of Virginia.

Standards of Learning

Science K.7, K.9, 1.4, 2.4, 2.8, 3.8, 4.4, 4.9

Objective

Students will

- Create a model of the life cycle of a pumpkin plant
- Identify the stages in the lifecycle of a pumpkin
- Identify the parts of a pumpkin plant

Materials

- Pumpkin parts patterns (handout provided)
- Orange paper plates (1 per student)
- Half of a white paper plate (1 per student)
- Crayons/markers
- Green yarn (1 piece – arm's length – per student)
- Tape
- Stapler
- Scissors
- Brown squares of construction paper

Procedure

1. Show the students a pumpkin and ask them to identify it.

2. As a class, generate a list of things the students know about pumpkins.

   **Help them generate ideas using the following questions:

   a) During what season do we see a lot of pumpkins?
   b) How do we use pumpkins?
   c) How does a pumpkin grow?
   d) Where can we get pumpkins?

3. As a class, create a timeline for the growth of a pumpkin (seed, roots/stem, leaf, flower, fruit, mature pumpkin).

4. Tell them that they will be making a model of the life cycle of a pumpkin today.

5. Hand out the life cycle template and have students colors the pieces with the correct colors: seed- brown; roots/stem – green, leaf- green; flower- yellow, smaller pumpkin- green.

6. Sequence the pieces by placing them on their desks in the correct order: seed, root, leaf, blossom, small pumpkin

7. Hand out two orange paper plates and half plates. Staple the half plate to the back of the orange plate to create a pocket.

8. Tell the students that the large orange plates represent the final phase in the pumpkin life cycle – the mature pumpkin.

9. Hand out one piece of green yarn to each student.

10. Tape the life cycle steps to the yarn in the correct order.

11. Attach the yarn to the orange plate by stapling or taping the end with the green pumpkin to the pocket.

12. Staple or tape the brown construction paper square to the top of the orange plate to create a stem.

13. After all the pumpkin cycle models are completed, tell the students to place all the parts in the open space between the two plates.

14. Demonstrate to the students how this model shows the life cycle of a pumpkin plant:

a) Pull out the seed - pumpkin plants begin as seeds
b) Pull out the roots/stem – from the seed comes the roots and a stem
c) Pull out the leaf – leaves grow from the stem of the plant
d) Pull out the flower – flowers blossom from the stem
e) Pull out the small green pumpkin – from the flower a smaller green pumpkin emerges
f) Point to the plates – finally, the small green pumpkin matures into the nice orange pumpkins we know

15. Finally, review the many ways we use pumpkins today and allow the children to decorate their orange pumpkins to show one way in which we use pumpkins.

Apple Life Cycle Chain

Background Knowledge

Virginia growers produce an average of 8 to 10 million bushels of apples per year. Apple varieties grown in Virginia include Red Delicious, Fuji, and Granny Smith. The majority of apples in Virginia are grown in the Shenandoah Valley area.

Standards of Learning

Science: K.7, K.9, 2.4, 3.4, 3.8, 4.4

Objective

Students will be able to:

- create a model showing the stages of apple growth
- identify the steps in the life cycle of an apple

Materials

- Apples by Gail Gibbons (you may substitute another book on apples)
- red, green, or yellow paper plates (one per student)
- white paper plates (cut in half, one half per student)
- staplers
- tape
- crayons/markers
- scissors
- yarn (approximately one yard per student)
- template, attached

Procedure

1. Begin the lesson by asking students to brainstorm all of the products they enjoy which involve apples.
2. Next, read Apples (or another book on apples) aloud to students.
3. Ask students to identify the steps involved in apple growth. Write these on the board and put them in the correct order.
4. Now tell students that they are going to create a model for the life cycle of an apple.
5. Pass out one red paper plate and one half white paper plate to each student, as well as templates, yarn, and art supplies.
6. Staple the half plate to the back of the red plate, forming a pocket.
7. Color the template images (seed, tree, blossom, bee, and apple).
8. Cut out images and label them.
9. Place them in order on the desk.
10. Attach them in order to the yarn using tape or stapler.
11. Attach the yarn to the half plate by stapling the end closest to the apple. The seed should be the farthest away.
12. Place the chain in the pocket. Have students get into pairs and then take turns pulling each step out and explaining that stage to their partner.

Extension

"An apple a day keeps the doctor away." Have students research the nutritional value of apples to support this well-known phrase.

References

Lesson adapted from Illinois Agriculture in the Classroom.

A Bee's Life

Background Knowledge

A bee's life cycle has several distinct stages. Three days after the queen lays her eggs in the hive, the egg hatches into a larva. The larva is fed "bee bread," a mixture of honey and pollen. Next, the larva spins a cocoon in the hive. Within the cocoon the larva turns into a pupa, this takes four days. Lastly, the bee grows into an adult and leaves the comb.

Pollination is the transfer of pollen from the male flower part to the female flower part. The male part is called the anther and contains the pollen grains. The female part is called the pistil and contains the stigma, which is sticky to collect the pollen grains. Pollination must occur in order for flowering plants to reproduce. Pollen grains can be transferred by wind, water, bees, butterflies, other insects, birds, and bats. Bees are attracted to fragrant flowers and the nectar and pollen in these flowers. The bee stops at a flower to suck the nectar and the pollen grains get stuck to the bee's body. Then, when the bee moves to another flower, the pollen grains are transferred from the first flower to the second. The second flower is then pollinated.

Insects are needed to pollinate a variety of fruits, vegetables, and legumes. Common products include tomatoes, onions, blueberries, cherries, pears, sunflowers, pumpkins, broccoli, carrots, squash, cucumbers, lettuce, potatoes, oranges, lemons, limes, mustard seed, vanilla, sugar, almonds, watermelon, and apples. In fact, about one-third of the human diet is derived directly or indirectly from insect-pollinated plants. About 80% of theses are pollinated by bees. Within Virginia about 80 of Virginia's most popular crops, valued at about $80 million, rely on pollinators.

Standards of Learning

Science: 2.4, 3.8, 4.4

Objective

Students will be able to:

- correctly order the steps in a bee's life
- demonstrate understanding of new vocabulary
- understand the importance of bees in plant pollination

Materials

- yellow construction paper
- life cycle cards, attached
- scissors
- glue sticks
- black markers
- Down on the Farm: Bees by Sally Morgan (you may substitute another book on bees)

Procedure

1. Begin by asking students what bees have to do with food? Point out that bees play an important role in the pollination of many fruits and vegetables that they like to eat.

2. Next, read aloud Down on the Farm: Bees. Note how the bee changes at different points in its life cycle. This is called a "metamorphosis."

3. Give each student a piece of yellow construction paper. Fold it in half vertically (hotdog style) and cut out the shape of a bee.

4. Pass out life cycle steps, have students cut them out and sequence them in the correct order and glue to the inside of the bee.

5. Write the following vocabulary words on the board: "egg, larva, pupa, bee, pollinate." Have them write the correct vocabulary word underneath each stage.

6. Above the circles, have them write the word "metamorphosis."

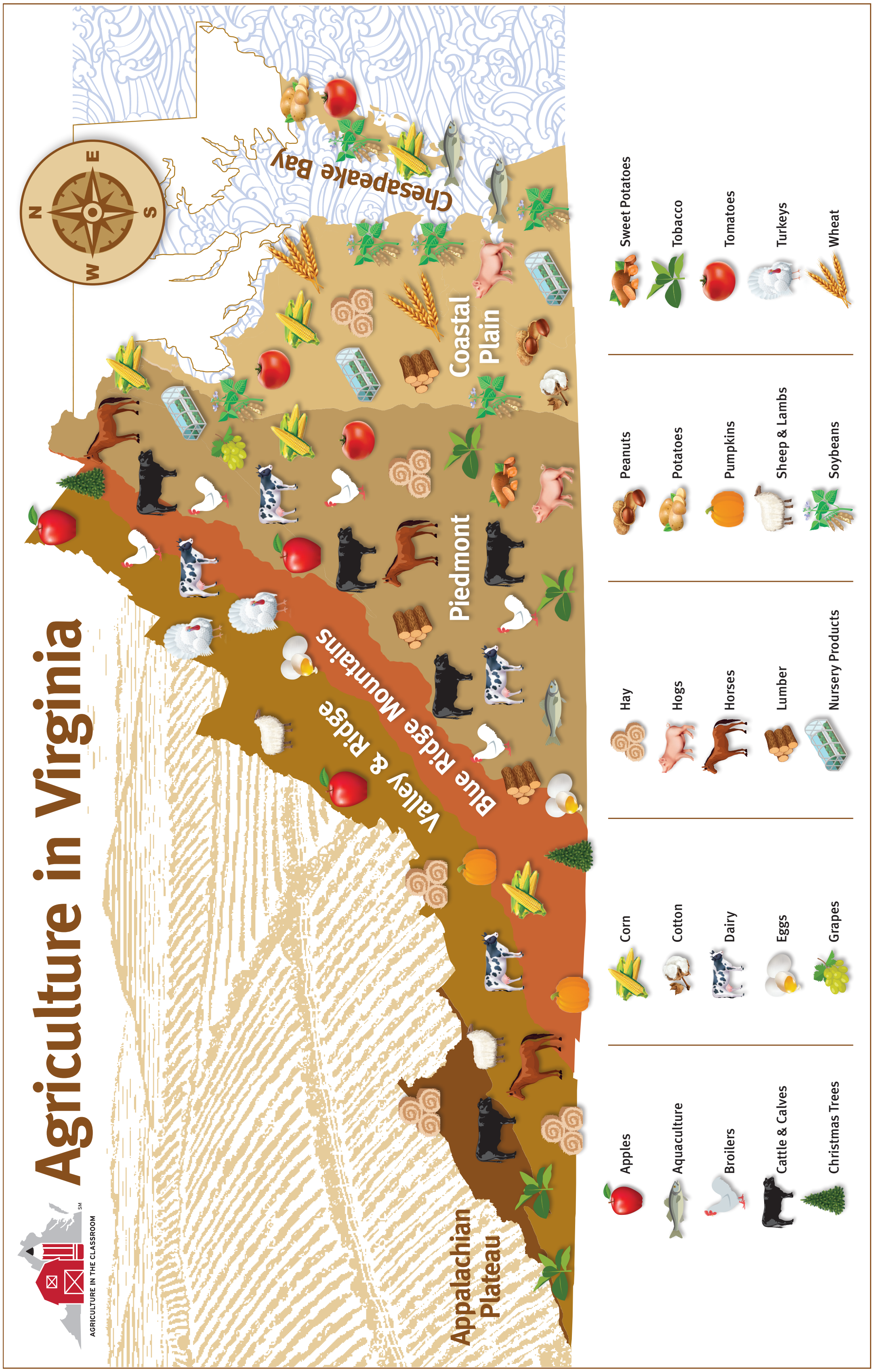
7. Use the left-over white paper to cut out a wing to glue on the bee.

8. You can also use a black pipe cleaner for the antenna.

Extension

Create a bee buffet! Have students design picnic collages with pictures of foods that are pollinated by bees.

Appendix


Agriculture in Virginia
AGRICULTURE IN THE CLASSROOM
N
E
S
W
Chesapeake Bay
Coastal Plain
Piedmont
Blue Ridge Mountains
Valley & Ridge
Appalachian Plateau
Apples
Aquaculture
Broilers
Cattle & Calves
Christmas Trees
Corn
Cotton
Dairy
Eggs
Grapes
Hay
Hogs
Horses
Lumber
Nursery Products
Peanuts
Potatoes
Pumpkins
Sheep & Lambs
Soybeans
Sweet Potatoes
Tobacco
Tomatoes
Turkeys
Wheat

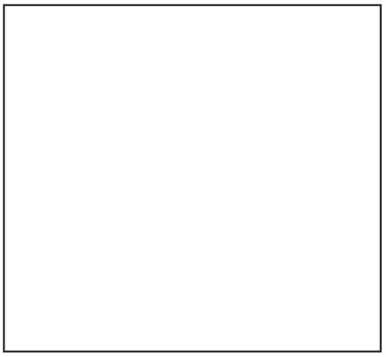
Barnyard Exploration: Synonyms and Antonyms

rough	smooth
living	non-living
hard	soft
dark	light
wide	thin
heavy	light
small	large
bright	dull
capital resource	natural resource
domesticated	wild

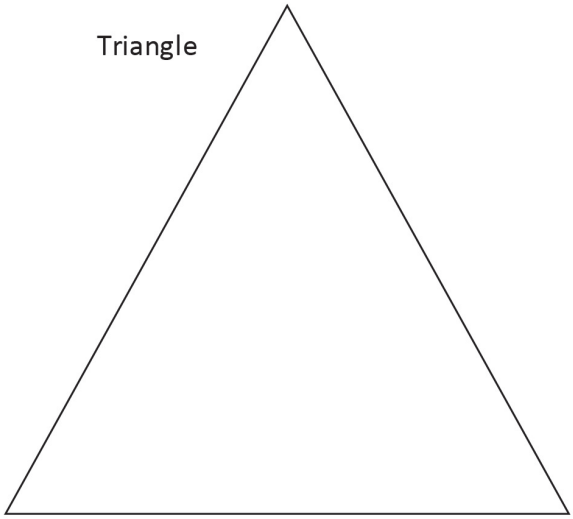
Barnyard Exploration: Shape Hunt

Directions: Find objects that represent the following shapes and geometric figures. Draw a picture of your object within the shapes below.

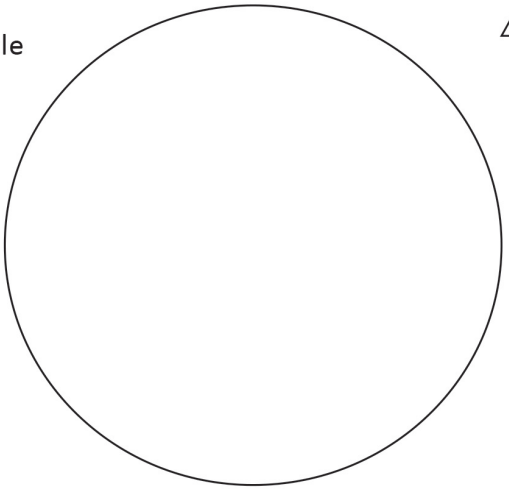
Square



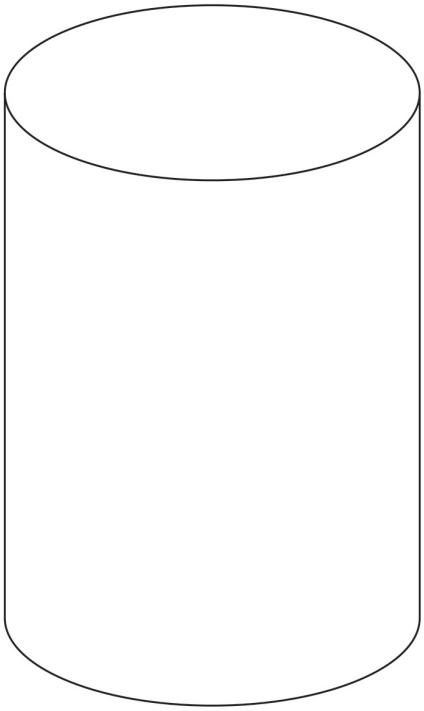
Triangle



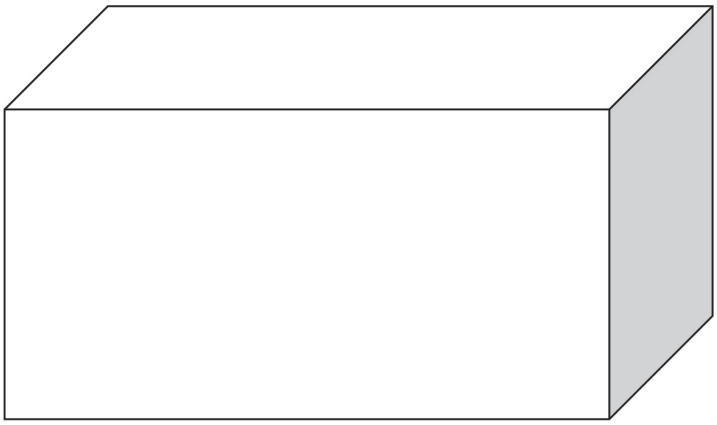
Circle



Cylinder

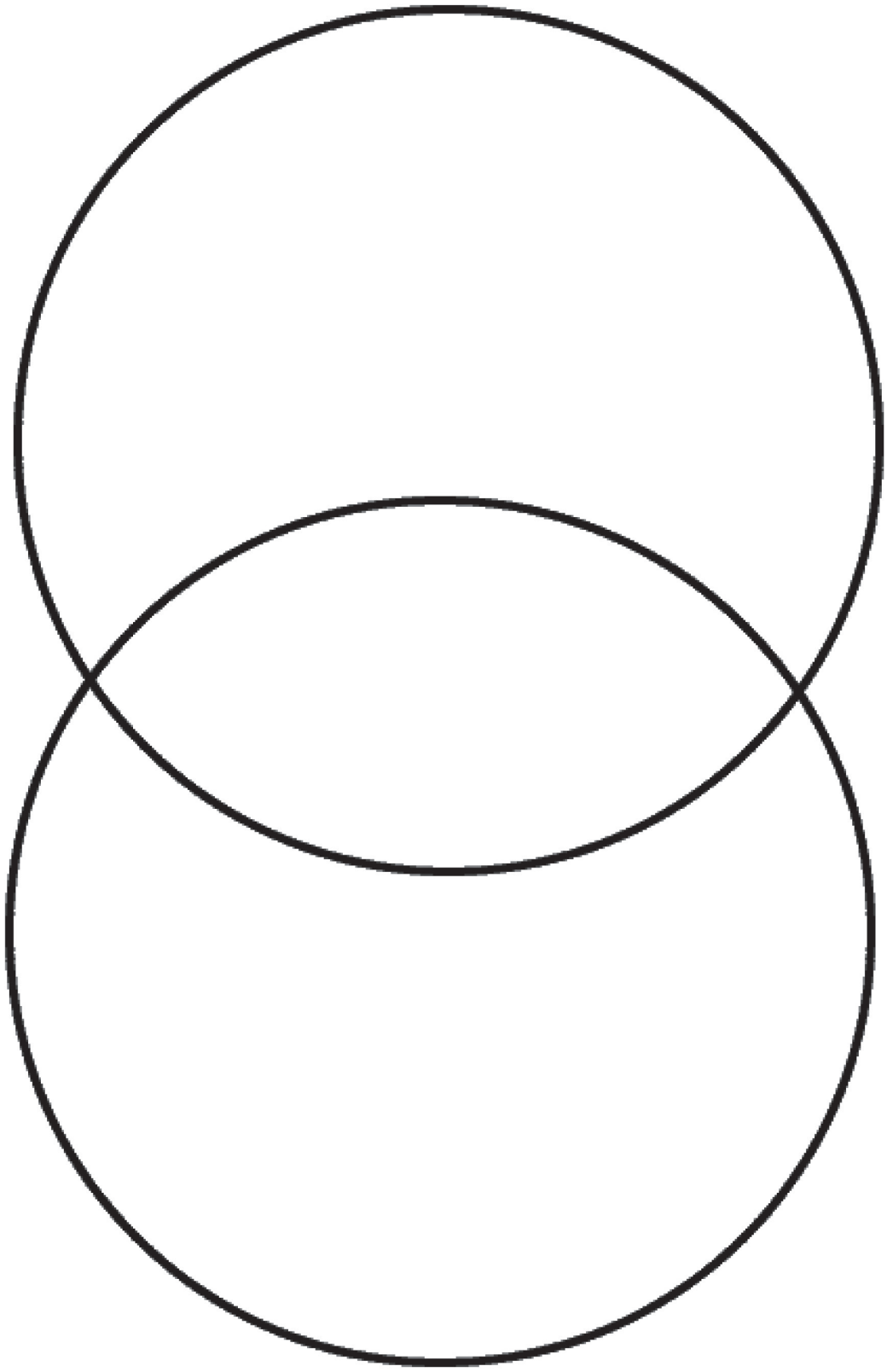


Rectangular Cube

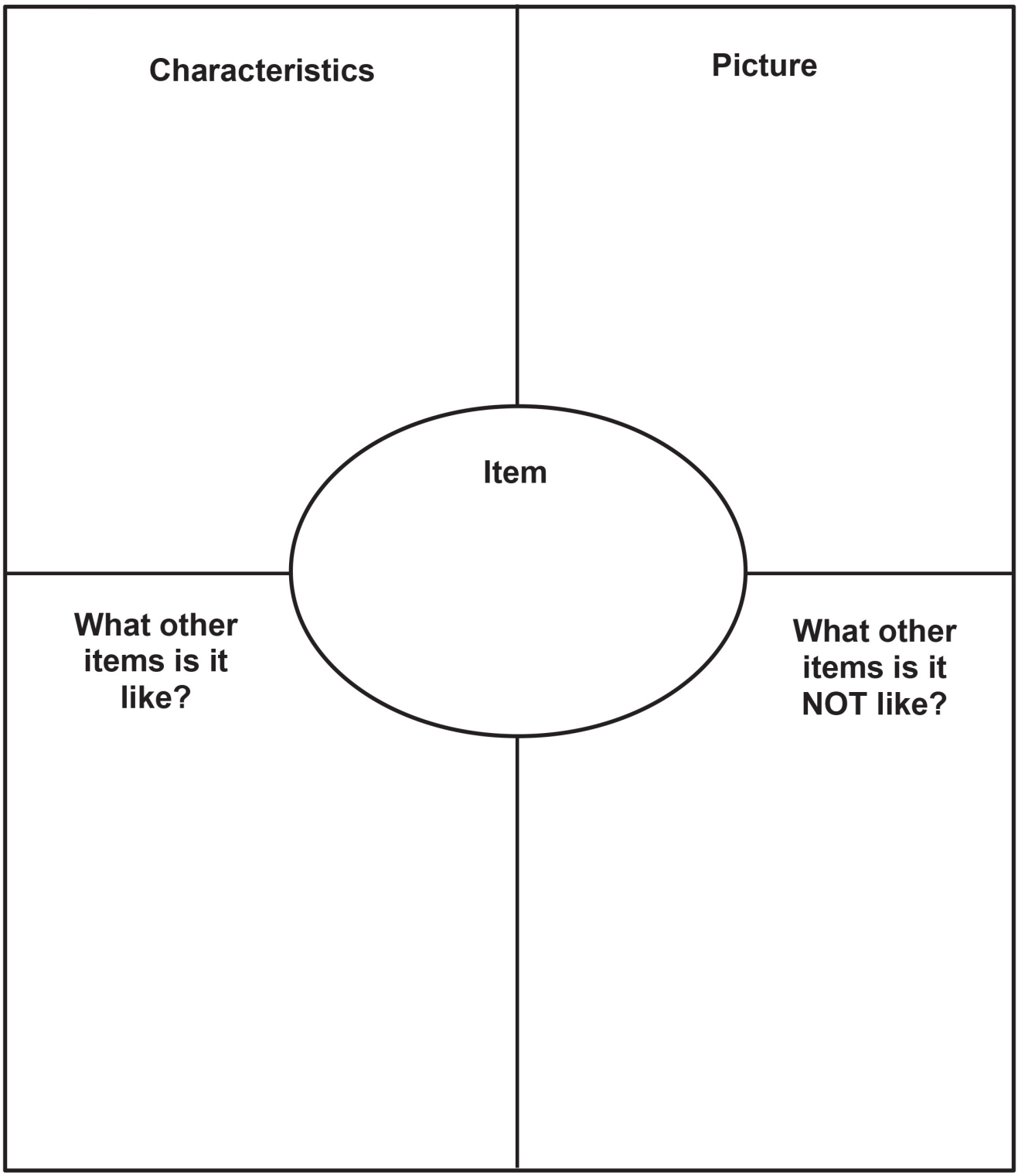


Barnyard Exploration: Venn Diagram

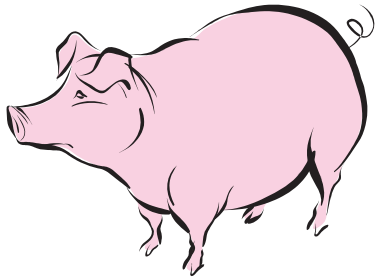
Directions: Choose 2 items from the box to compare and contrast.

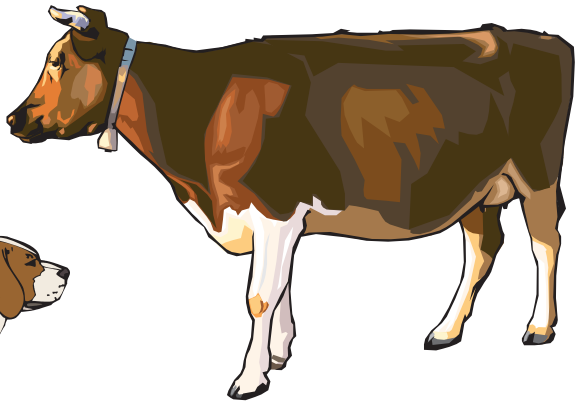


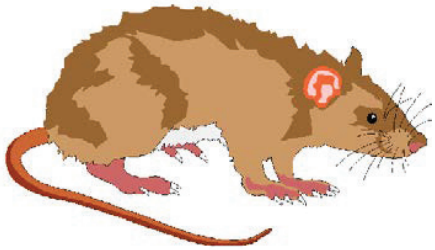
Barnyard Exploration: Concept Web

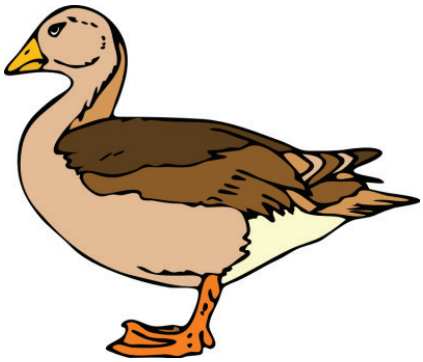


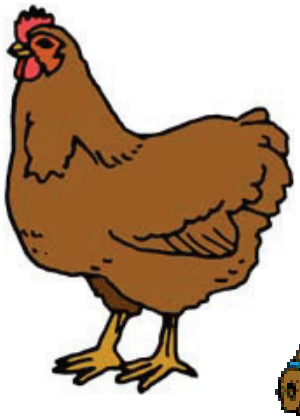
What's on the Farm Classification Pictures

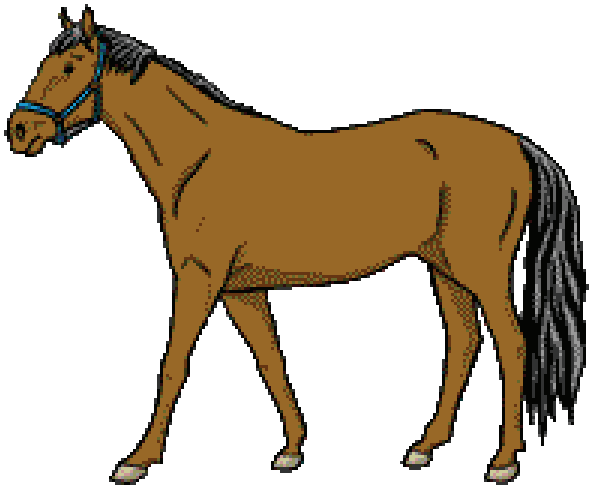


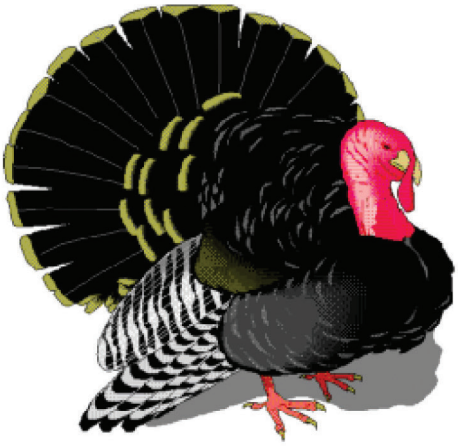










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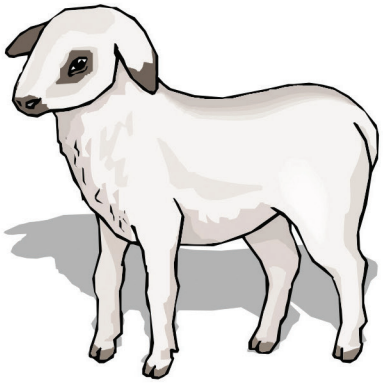
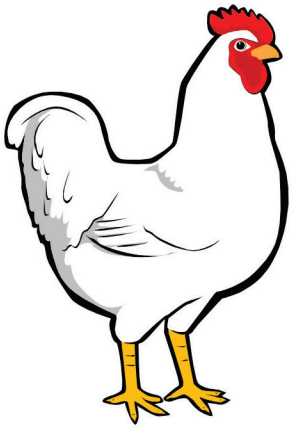


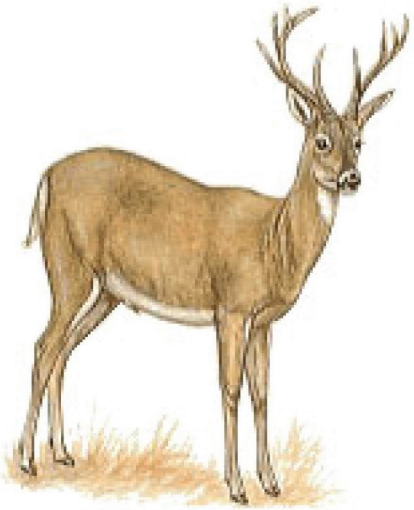



Loblolly Pine
Pinus taeda
Copyright © Robert O'Brien


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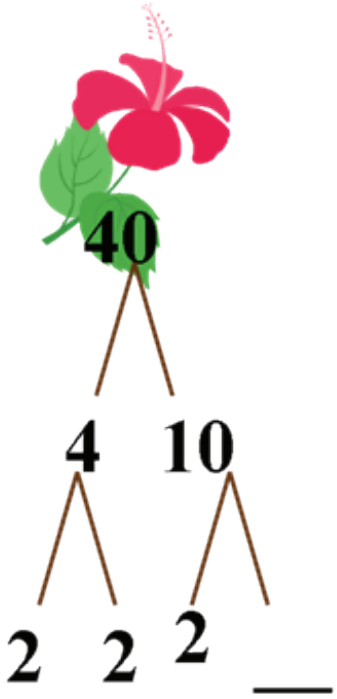
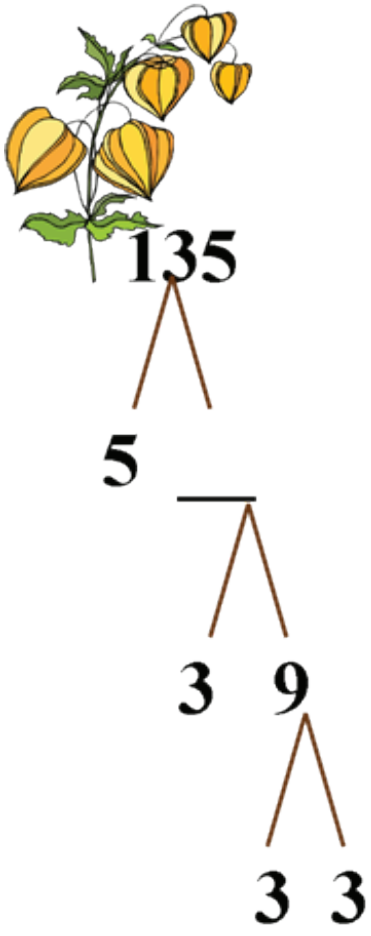
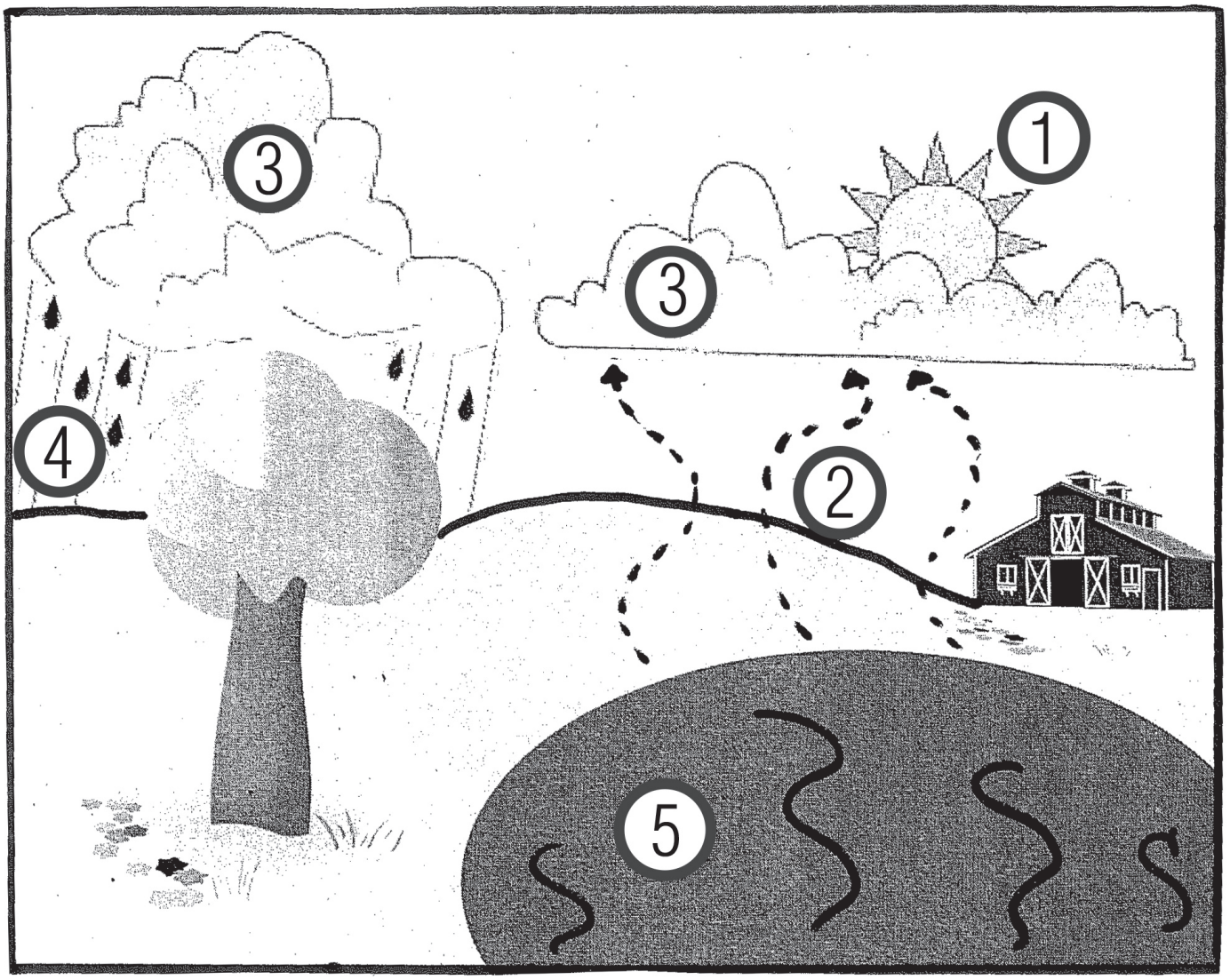




Use this space to make your own prime factorization flower.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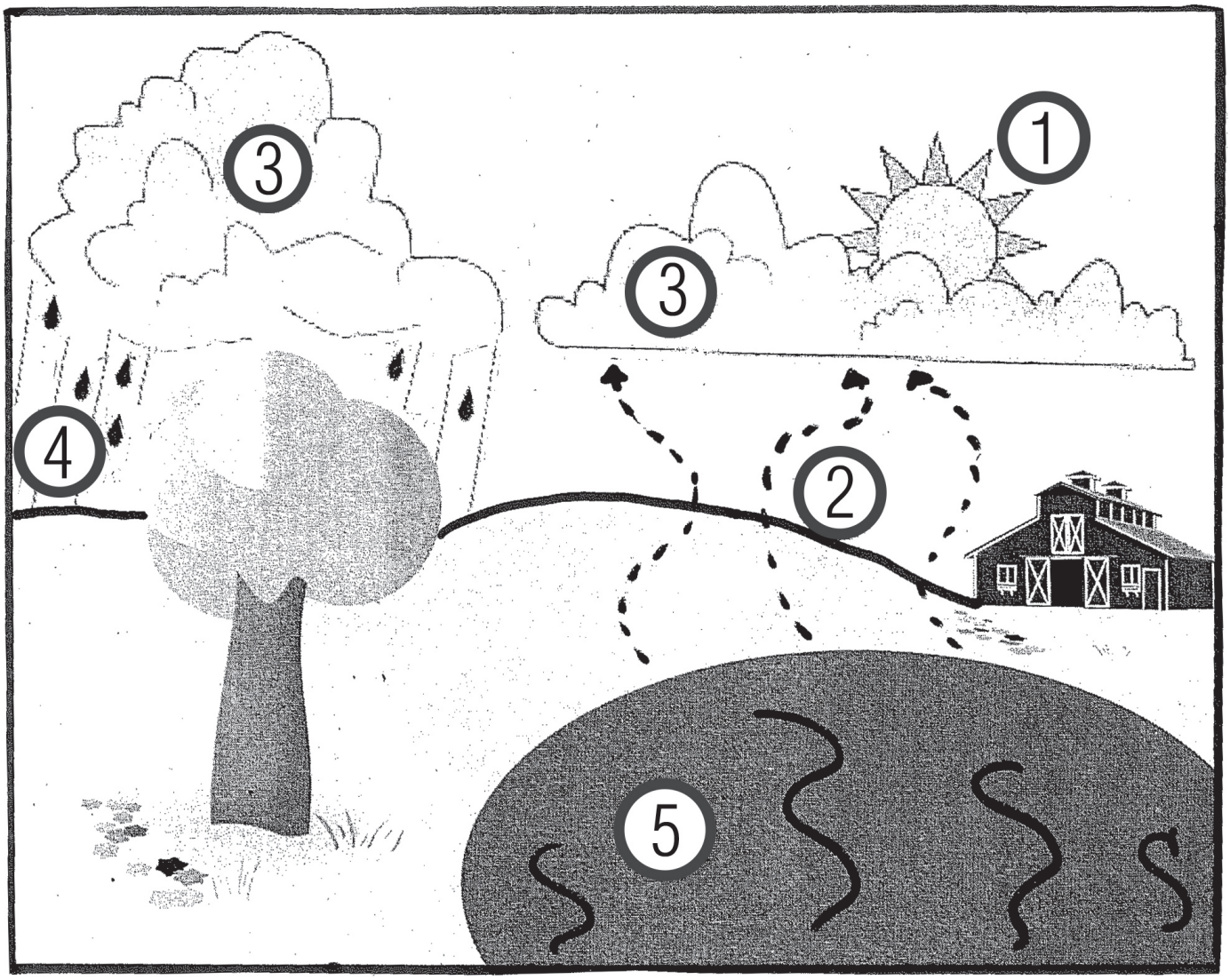
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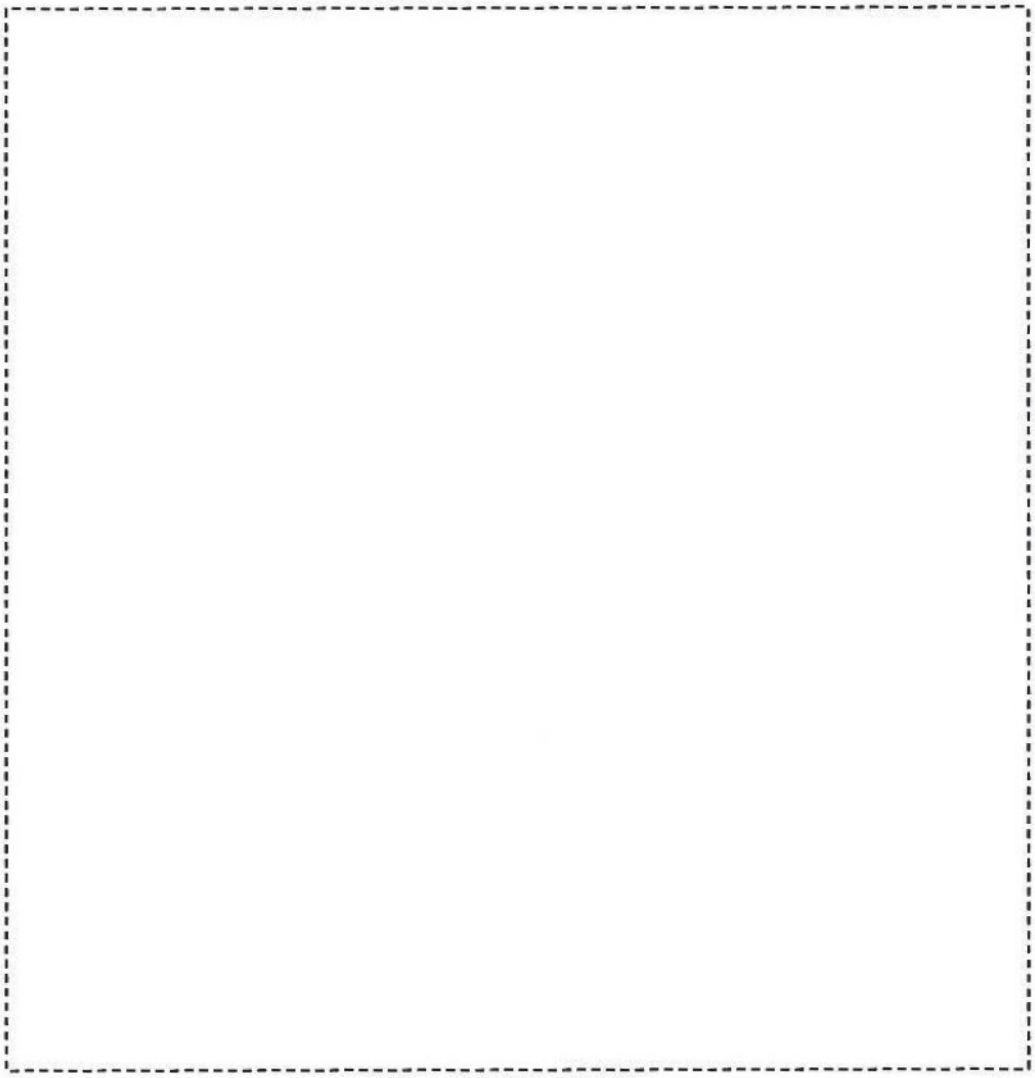
My Little Greenhouse

Name: _____ Date Planted: _____



My Little Greenhouse

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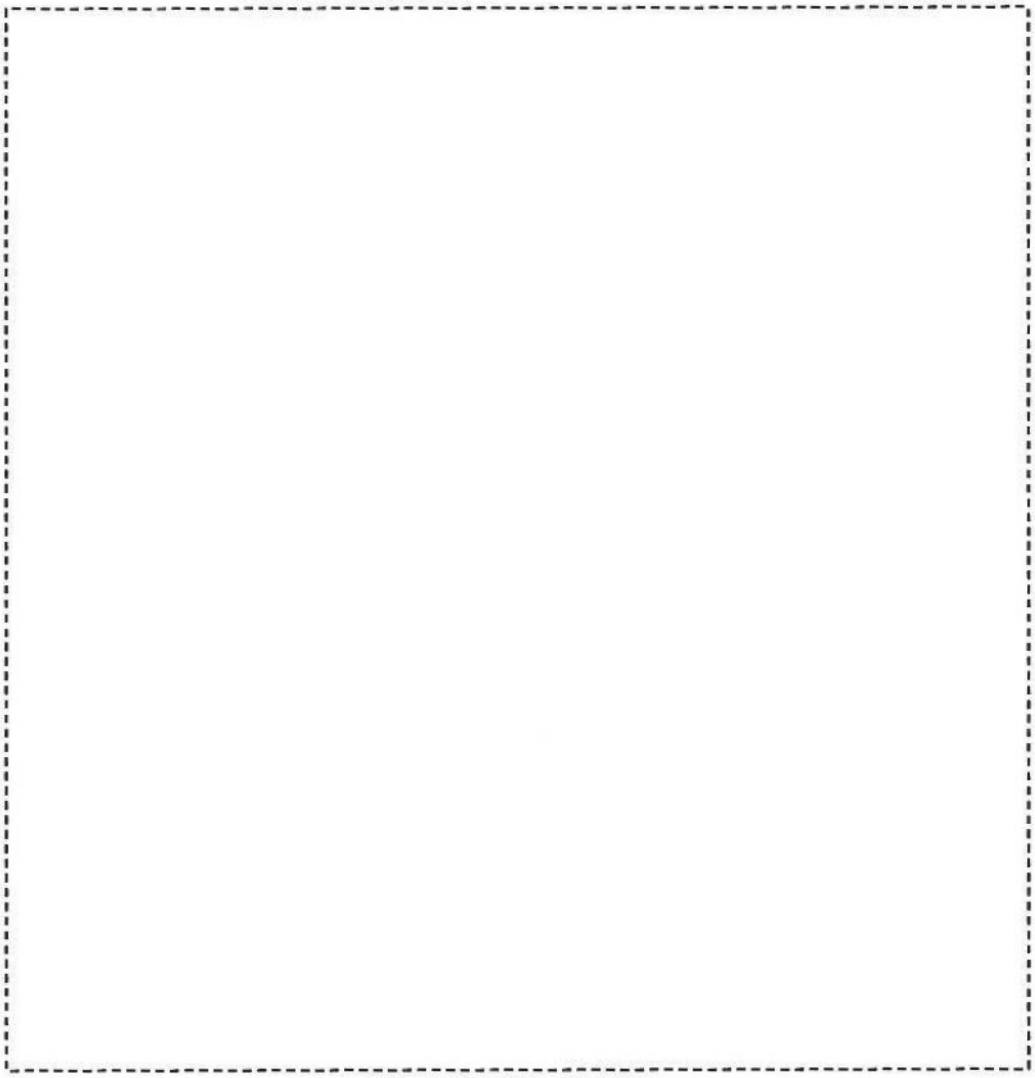
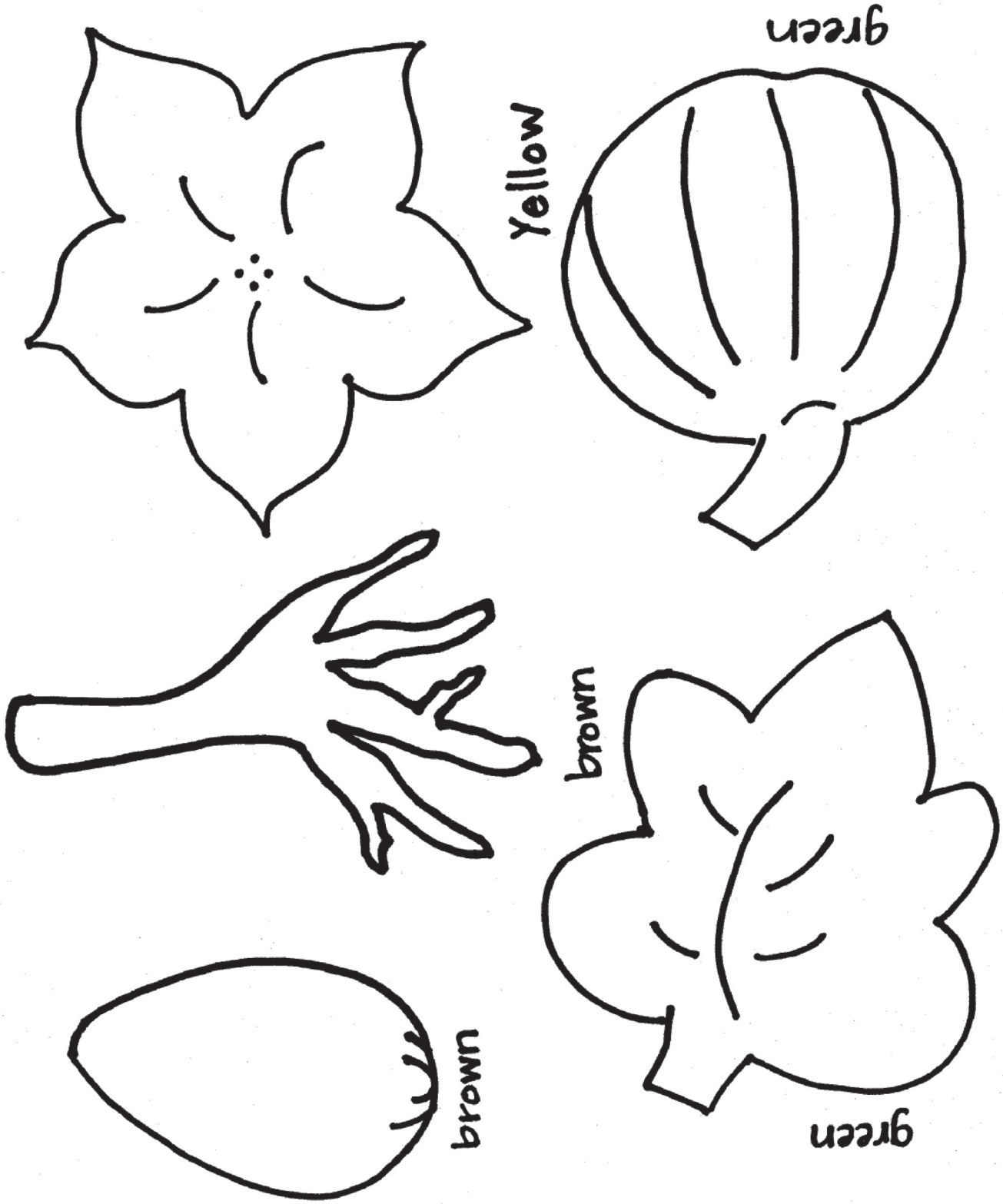



How Does Your Garden Grow?


How Does Your Garden Grow?


green
Yellow
brown
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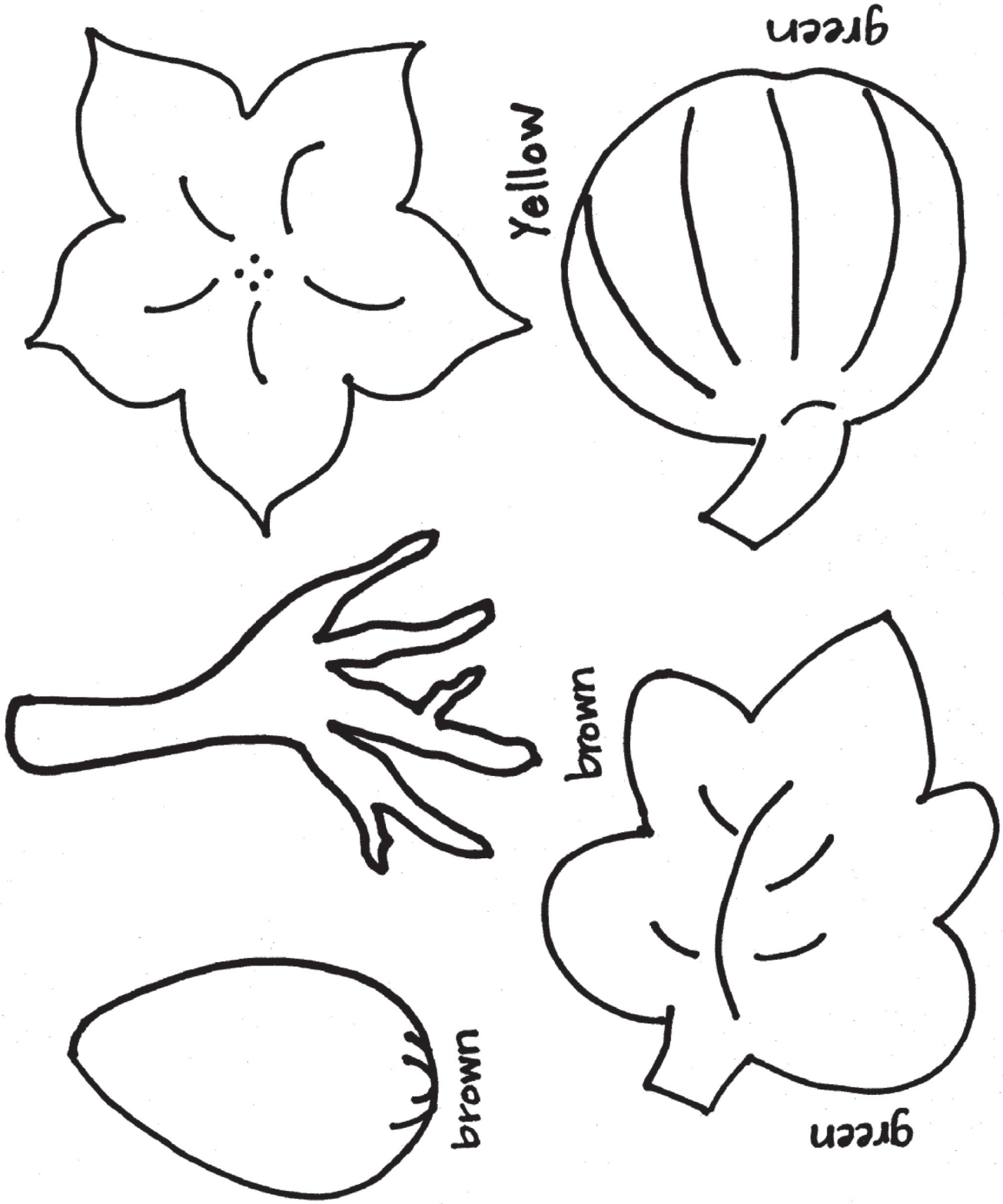
green


green
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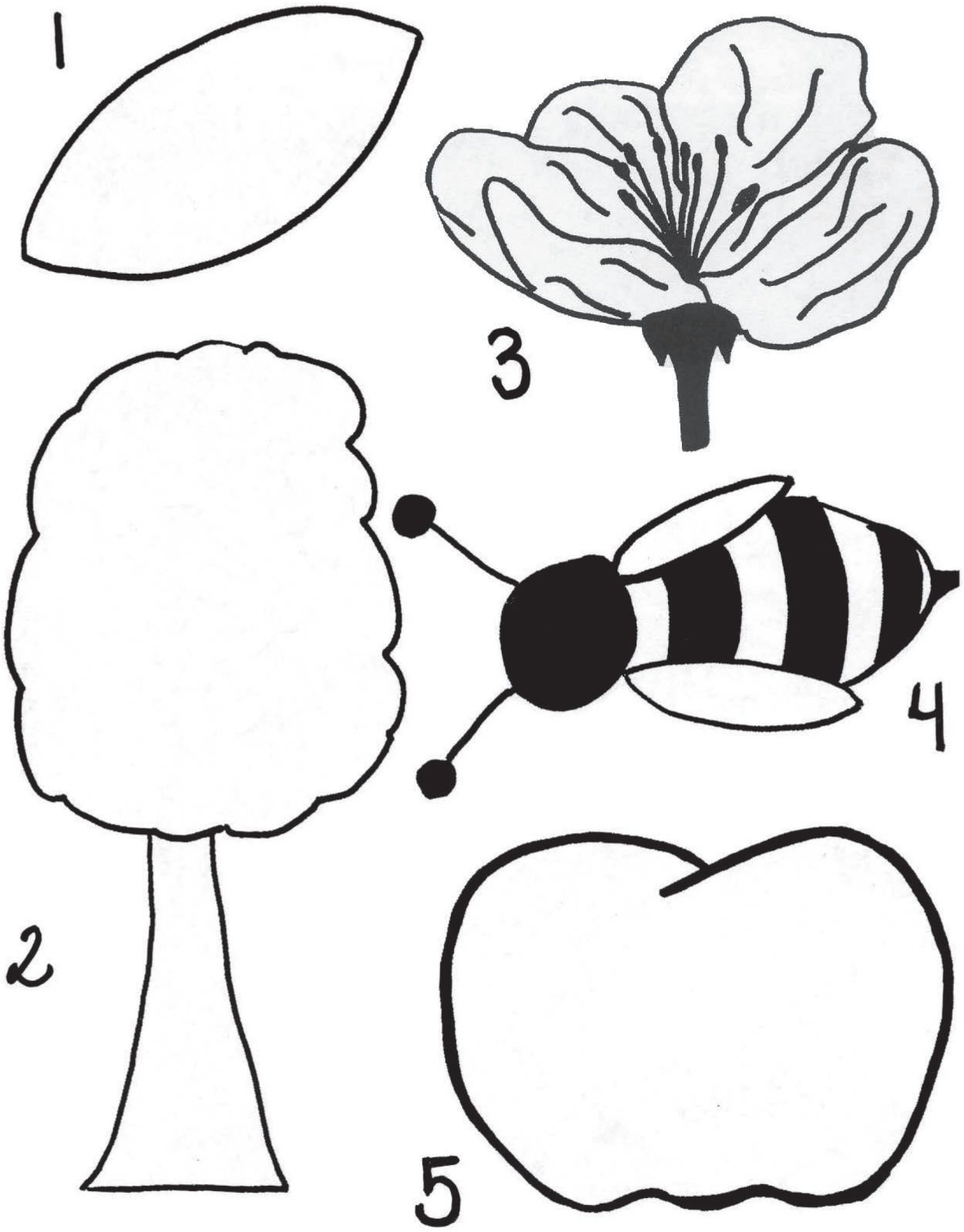
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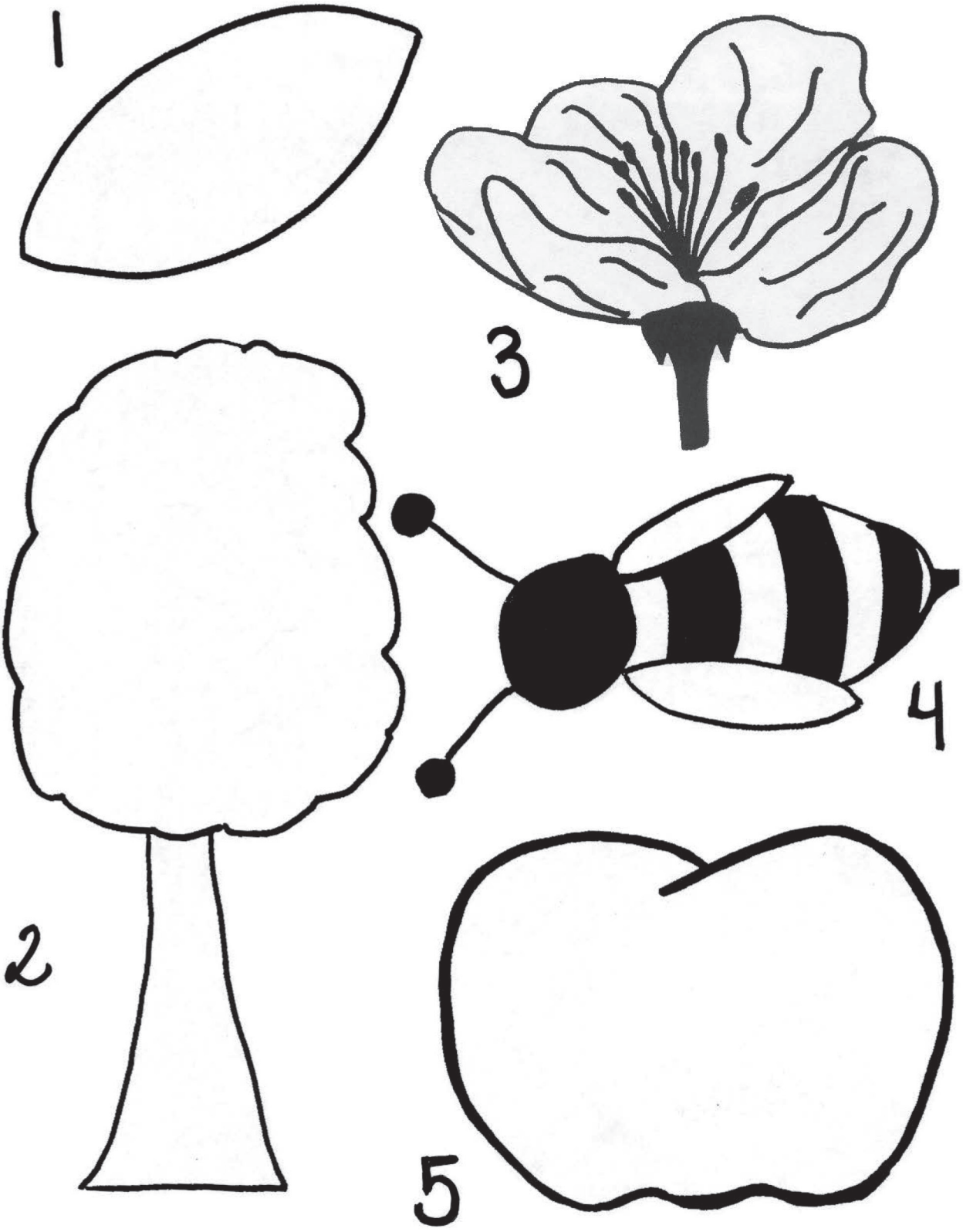
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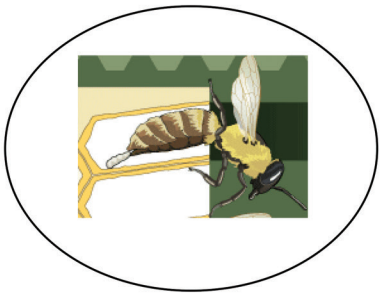
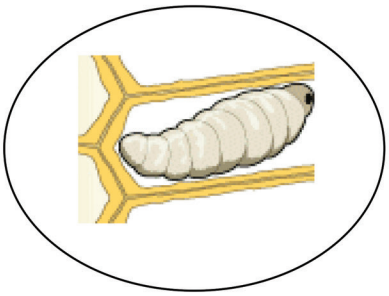
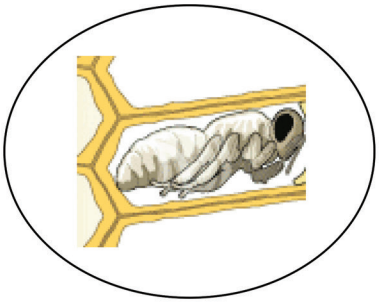
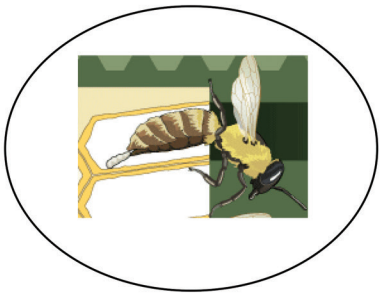
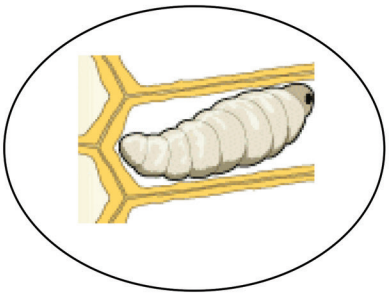


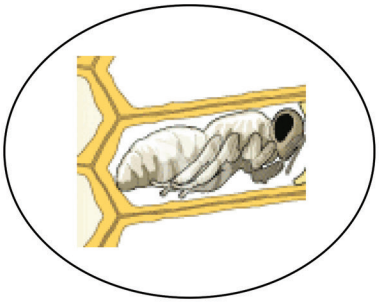




Use this space to draw and cut out your bee's wing.







Use this space to draw and cut out your bee's wing.

Have You Ever ?

Directions: Mingle with your neighbors to see who has done the most in relation to agriculture. Simply ask your neighbor "Have you ever ____?" If they have, get their signature in the box. **Any given neighbor may not sign more than twice!** Once you have your boxes filled—or when time runs out—read over the list and place a star beside the things you've done. Have fun!

Milked a cow or goat	Collected eggs from a hen house	Dug potatoes	Planted a vegetable garden
Visited a Virginia vineyard	Driven a tractor	Lived or worked on a farm	Saved and planted seed from the garden
Visited a farm	Ridden a horse	Sheared a sheep	Made butter
Visited a produce stand/farmers' market	Visited a fish farm	Made pickles	Made a compost pile
Worked in the agriculture industry	Been fishing and caught a fish	Visited a Christmas tree farm	Stomped grapes
Collected honey from a hive	Made ice cream	Made salsa	Eaten a soybean
Cut grass	Petted a pig	Planted flowers	Planted a tree
Made jam or jelly	Used a rototiller	Touched a cotton boll	Picked apples
Picked and shucked corn from the garden	Visited a greenhouse	Been on a hayride	Picked pumpkins
Picked strawberries	Cooked in your classroom	Taught about agriculture in your classroom	Seen an alpaca

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