

Lesson 1: Tree Hardware

NUTSHELL

*In this classroom lesson, students are introduced to tree biology through a fun and active song. By playing **Build a Tree**, students learn the parts of a tree and the basic needs of a tree. Finally, students are exposed to the life stages (from germination to decomposition) of a tree as they act out and draw the life of an oak tree.*

ENDURING UNDERSTANDINGS

- A tree is a perennial plant (lives more than one growing season) with a well-defined woody stem, crown, and roots.
- Trees compete for nutrients, sunlight, space, and water.
- Trees have life stages that include germination, growth, maturity, reproduction, decline, and death.

ESSENTIAL QUESTIONS

- How does a tree's structure enable it to survive?
- How do trees interact with each other and their environment throughout their lives?

OBJECTIVES

Upon completion of this lesson, students will be able to:

- Recognize that trees live for more than one growing season.
- Label these tree parts: crown, trunk, and roots.
- Recall that trees need nutrients, sunlight, space, air, and water.
- Draw the tree life stages.

SUBJECT AREAS

Arts, Language Arts, Science

LESSON/ACTIVITY TIME

Total Lesson Time: 80 minutes

- Introduction.....15 minutes
- Activity 125 minutes
- Activity 215 minutes
- Activity 320 minutes
- Conclusion.....5 minutes

STANDARDS CONNECTIONS

Standards for this lesson can be viewed online at the LEAF website (www.leafprogram.org).

FIELD ENHANCEMENT CONNECTIONS

This lesson ties closely with **Field Enhancement 1, All About My Tree**.

BACKGROUND INFORMATION



A tree is defined as a perennial plant with a well-defined woody stem, crown, and roots. These features make trees distinct from other plants.

To be perennial, a plant must live more than one growing season. In early childhood education, students are often immersed in studies of seasonal change. A prominent seasonal change that is noted by children and adults alike is the falling of


leaves from deciduous trees. Coniferous trees also lose their needles, but not all at once (except for the tamarack, which is a conifer that does lose all of its leaves in the fall). The loss of leaves is not the death of a tree but rather an adaptation many trees have developed as a method of survival in harsh climates. Each spring, the miraculous awakening that takes place as trees leaf out amazes countless young children.

MATERIALS LIST





For Each Student

- Copy of Student Page  **1, Build a Tree**
- Copy of Student Page  **2, Oak-tree Life Stages**
- Crayons or markers
- Scissors
- Glue
- Hole punch
- Brass fastener
- One large sheet of paper (11" x 17")

For Every 3 to 4 Students

One Teacher Page  **3, Build a Tree Spinner**, copied on cardstock and assembled with a brass fastener.

For the Teacher

- Copy of Teacher Page  **1, Tree**
- Copy of Teacher Page  **2, Tree Needs**
- Copy of Teacher Pages script  **4A-B, The Acorn**
- Copy of Teacher Page Key  **5, Oak-tree Life Stages Key**

TEACHER PREPARATION

Write the *Leaves, Branches, Trunk, and Roots* song on chart paper or sentence strips. If necessary, include picture cues to assist non-reading students.

Beyond trees' perennial nature, their well-defined woody stem also sets them apart from other plants. We know this feature as the **trunk**. Coniferous and deciduous trees both have a relatively straight trunk, with branches growing outward from this main body. The trunk provides support for the branches and leaves. It also transports food and water between the leaves and roots.

VOCABULARY TERMS

Crown: The part of a tree with live branches and leaves.

Life Stages: The stages a tree goes through during its life (germination, growth, maturity, reproduction, decline, and death).

Nutrients: The things in the soil that a tree needs to live and grow.

Roots: The part of a tree that works underground to get water and nutrients for a tree to use.

Space: The area that a living thing needs to grow.

Trunk: The part of a tree that the crown grows on and connects the crown to the roots (often called the stem).

The leafy **crown** of a tree is where photosynthesis takes place. The leaves gather energy from sunlight and carbon dioxide from the air and then combine them with water. Photosynthesis is the process trees use to make sugars that are the "food" for tree growth. The food energy created by the leaves in the crown is stored in woody branches, the trunk, and roots.

A tree's unseen root system may have even more mass than the visible top portion of the tree. A tree's **roots** usually grow farther out than the branches and they lie just below the surface in the top 18 inches of the soil. Root systems consist of large, woody roots and huge numbers of small roots. The large roots serve as anchors to keep the tree standing, as energy storage for times when the tree isn't making sugars, and are the path for nutrients and water to reach the rest of the tree. The small roots that grow from the large roots are responsible for absorbing water and nutrients from the soil. Trees use **nutrients** (minerals) from the soil to build the materials that make up the tree. These nutrients allow the tree to survive, grow, and reproduce.

Sunlight is the form of energy that trees use to complete the process of photosynthesis. In order for a tree to convert carbon dioxide and water into sugars (and other carbohydrates), it needs energy from the sun.

Water is another key to photosynthesis. Water is also important to the tree for transportation of nutrients. It is water that makes up most of the tree's sap, and the sap carries nutrients and sugars.

Air around the tree and in the soil allows the exchange of oxygen and carbon dioxide that all parts of the tree need to grow.

Space seems to be the least tangible of the basic needs. It is important for students to know that trees cannot grow when they are crowded. Root systems need room to grow, as do branches, leaves, and trunks.

Although a touchy subject, **life stages** are very intriguing to young children. As enthralled as children are by new life (butterflies from cocoons and buds on trees), they also harbor similar wonders regarding other changes in life.

Just as in animal reproduction, two parts (male and female) need to be present to create new plant life. Some trees (monoecious) have both male and female parts present on the same tree. Others (dioecious) have male flowers on one tree and female flowers on another. Pollination of the female flower by the pollen from the male flower is physically carried out by a wide variety of vehicles. Wind, insects, birds, bats, and other methods can pollinate trees. Some seeds are dispersed in spring, while many seeds fall in autumn and winter, lying dormant until **germination** (when they sprout).

The seedling that emerged during germination will continue its life through **growth** and then on to **maturity**. A mature tree is capable of **reproduction**. A tree can be mature and reproductive for many years. Many trees live for generations of human life.

Eventually a tree will move into its life stage called **decline**. Decline can be a result of old age or some other factor like disease, insect damage, or storm damage. The decline in the health of a tree will lead, some day, to the **death** of that tree. A dead tree is still a part of the nutrient cycle. A dead tree contributes to other plant, animal, and insect life, as the tree's remains **decompose** and are recycled into the soil.

PROCEDURE

Introduction - Tree Parts Song

1. Begin by singing Head, Shoulders, Knees, and Toes with the class. This children's favorite is sure to get them energized and ready to listen to what you have to say.

For the actions in this song, students touch part of their body each time it is named.

2. Tell them that you are going to change the song's words and have them written down for the students to follow along. Explain that this song is now going to be called Leaves, Branches, Trunk, and Roots.
3. To model the motion for leaves, slowly wave your arms in a rainbow motion above your head. Allow students to guess what you are trying to make. Explain that this will be what their body should do whenever they hear the word "leaves" in the song.

*Head, shoulders, knees, and toes,
knees and toes.*

*Head, shoulders, knees, and toes,
knees and toes.*

Eyes and ears and mouth and nose.

*Head, shoulders, knees, and toes,
knees and toes.*

*Leaves, branches, trunk, and roots,
trunk and roots.*

*Leaves, branches, trunk, and roots,
trunk and roots.*


Leaves and branches and trunk and roots.

*Leaves, branches, trunk, and roots,
trunk and roots.*

- Next, extend your arms in a T-shaped manner to make two solid “branches.” Again, ask students if they know what you are trying to make.
- Follow the same procedure showing them “trunk” (stand still, straight, and tall with your arms at your sides) and “roots” (spread your feet wide apart).
- Explain to students that you’ll be going slowly at first, watching to see if they know these four parts of a tree: leaves, branches, trunk, and roots. After you are certain that the group can do all four motions with reasonable ease, tell them that you are going to make it a little more challenging by speeding up. Invite them to help you sing the song a time or two more. Vary the speed with your group’s ability.

NOTE: You will be singing a version of this song again in the conclusion of the lesson. Words learned in Activities 1 and 2 will be added in that version.

Activity 1 - Tree Parts and Tree Needs

- Instruct students to sit down so you can introduce the next activity. Hold up Teacher Page  1, **Tree**. Tell students that you will be asking for volunteers to come up and identify each of the four tree parts that they just sang about. (*Leaves and branches [crown], trunk, roots.*)
- Ask for a volunteer to point out the roots on the tree. After your helper has pointed out the roots, ask the class if anyone knows what the job of tree roots is. (*Gather nutrients, keep the tree standing, store energy.*) Ask if they are important for the tree. (*You bet!*) Ask if all trees have roots, or just certain trees. (*All trees have roots.*)
- Ask for a volunteer to find the trunk on the tree. Introduce the term “stem” to the class as another way to describe the tree’s trunk. Ask them if they have seen other plants with stems. (*A classroom plant, flowers outside.*) Remind them that a tree is a plant, too. Explain to them that to be a tree, one thing that a plant needs is a strong, woody stem, which we call its trunk. Ask the class if anyone knows the job of the trunk. (*Support the crown, transport nutrients and water.*) Ask if a trunk is important. (*Yes!*) Ask if all trees have trunks. (*Yes; although they may come in different shapes and sizes, all trees have a trunk.*)
- Ask for a volunteer to find the tree’s branches, and then the tree’s leaves. Introduce the term “crown” as the top part of a tree, including its branches and leaves. Explain that just as a king wears a crown on top of his head, a tree would not be a tree without a crown on top. Ask students if they know the job of the crown. (*Leaves collect energy from the sun and use it to make food for the tree. Branches support the leaves.*) Ask if the crown is important to the tree. (*A tree cannot get food anywhere else!*) Ask if all trees have a crown. (*Yes, but they do not all look the same. A pine tree crown looks different than a maple tree crown.*)

5. Take out Teacher Page 🍷**2, Tree Needs**. Ask students to tell you what each of the symbols is and explain what they stand for as they name them. Pot (space), raindrops (water), soil (nutrients), and sun (sunlight). Tell students there is one more need with no picture on the page. Trees need air to live too. It is not in the picture because air is found everywhere. Explain that all plants, including trees, need all five of these things to live and grow. Tell the class that they are going to play a game called Build a Tree, and their trees need all of these things in order to complete the game.
 6. Show Student Page ✍️**1, Build a Tree**. Explain that they will color the picture of the tree and the pictures of the things that trees need. When they are done coloring, they should follow the dotted lines to cut out the tree. They will also cut out the things the tree needs. After your explanations are complete, distribute the student pages and allow the class time to work.
- ### Activity 2 - Build a Tree
1. Have the students sit down in a circle so that you can explain the rules of the Build a Tree game. Students should have their tree parts and tree needs colored and cut out from Activity 1. Explain that their job in this game is to assemble a tree and make sure the tree has all of the things it needs to survive. Ask if anyone can help you remember what it is that trees need to survive. (*Sunlight, water, space, air, and nutrients.*) Without all five of these, trees just wouldn't make it. They need sunlight, water, space, air, and nutrients just as much as they need a trunk, roots, or crown!
 2. Show students a completed spinner made from Teacher Page 🍷**3, Build a Tree Spinner**. Tell them that all of the parts they have colored and cut are present somewhere on the spinner. Explain that they will be playing in a group of three to four friends who will all be building trees together. Each group will have a spinner. The person in the group chosen to go first will spin the spinner once. Take an example spin for explanation purposes, and ask a student to identify what your spinner is pointing to. Pick out the corresponding part and show the class how you will then place that part on their large piece of paper. Explain to students that there is one extra spot on the spinner. Show the class the "?" spot, and explain that if the spinner lands on this spot on their turn, they can pick any part that they need from their pile. Tell the class that they will go around the circle until all of them have all the parts they need for their trees.
 3. Assign students to the groups that they will be playing with. Each student should keep pieces in front to create his or her tree picture. Play the Build a Tree game one or more times as you choose. During the final game, have students glue the pieces down on the 11" x 17" piece of paper as they get them. (Be careful to leave room for all tree parts and needs. They will need to go in the correct order, i.e., roots on the bottom, trunk in the middle, and crown on top.)
 4. Following the completion of the Build a Tree game, allow students to further illustrate their newly "planted" trees. Remind them that they should color in air all around their tree. Let them show off their work to the class before sending it home, or display it in the room for all to see!

Activity 3 - Tree Life Stages

1. Ask students to spread out and find a comfortable spot on the floor so that they have their own space. Explain that they will be listening to you read about a tree's life. Tell the class that all living things have life stages, even people! Ask students to name some stages in their life. (*Birth, growth, maturity, reproduction, death.*) Allow answers that may not fit the strict definition, but could be considered milestones. (*Getting a driver's license, high school graduation, marriage, etc.*) Explain that today they get to have a break from living a human life and get to act out the life of a tree instead.
2. Read Teacher Pages script 📖 **4A-B, The Acorn**, to take students on a journey from germination, through several seasons of growth, to maturity and reproduction, to decline, then on to death and decomposition. All actions for students to do are within parentheses in bold typeface. Read the story and allow students to act out various portions of the tree's life as they listen.
3. After you have read the story and reviewed the stages of life, tell the class you would like them to draw some pictures. Remind them that they acted as the oak in many different stages of its life as it grew and changed (germination, growth, maturity and reproduction, decline, and death and decomposition). Tell them they need to draw pictures to go with the story. Show them Student Page 📄 **2, Oak-tree Life Stages**. Point out the first box and tell them to start there and follow the arrows around. Tell them that you will be looking to see who can remember and draw the oak-tree life stages with the most detail. Pass out one sheet to each student, and ask them to find their spots and begin working. (See Teacher Page Key 📖 **5, Oak-tree Life Stages Key**, to help you assess student drawings.)
4. After students have finished their oak-tree life stages drawings, partner them and allow them to share their pictures. If possible, collect these pictures and display them.

Conclusion - Tree Parts and Needs Review

Review by singing and acting out Leaves, Branches, Trunk, and Roots. This time insert the basic needs of the tree into the middle part of the song. Allow a student of your choice to point to the written words to the song at a pace of his or her choice.

*Leaves, branches, trunk, and roots,
trunk and roots.*

*Leaves, branches, trunk, and roots,
trunk and roots.*

Leaves and branches and trunk and roots.

*Leaves, branches, trunk, and roots,
trunk and roots.*

CAREERS

The career profile in this lesson is about Joe Hoffman, Urban Forestry Technician Instructor and Arborist, Midstate Technical College, and is found on page 23. A careers lesson that uses this information begins on page 80.

SUMMATIVE ASSESSMENT

Have students draw a picture of a tree during their favorite time in its life stages. Post the pictures on a bulletin board.

NOTES

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SOURCES

Forest Trees of Wisconsin [Brochure]. (1990). Madison, WI: Wisconsin Department of Natural Resources - Bureau of Forestry. PUBL-FR-053 90 REV.

Miller, G. T. (1991). *Environmental Science — Sustaining the Earth*. Belmont, CA: Wadsworth Publishing Company.

Young, R. A., & Giese, R. L. (1990). *Introduction to Forest Science*. New York: John Wiley & Sons.

NOTES

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Career Profile

Joe Hoffman, Arborist

This is Joe Hoffman. Joe is an arborist. You might see Joe working on the trees in people's yards. Since a tree in someone's yard is very important to them for shade, animals, and just to look at, arborists do lots of things to keep those trees healthy. They might climb up into the tree (but only with lots of safety equipment on) and cut off branches that are broken or sick or that might fall on someone on the ground. Joe might also try to help trees that are sick because of a disease or an insect. Sometimes Joe has to cut down a tree that is unhealthy or unsafe. It's a lot of hard work!

In order for Joe to become an arborist, he went to college. He still goes to meetings to learn new ideas from other arborists. He also has had other outside jobs when he was growing up that helped him get used to the outside work. He did some farm work and helped with taking care of a cemetery.

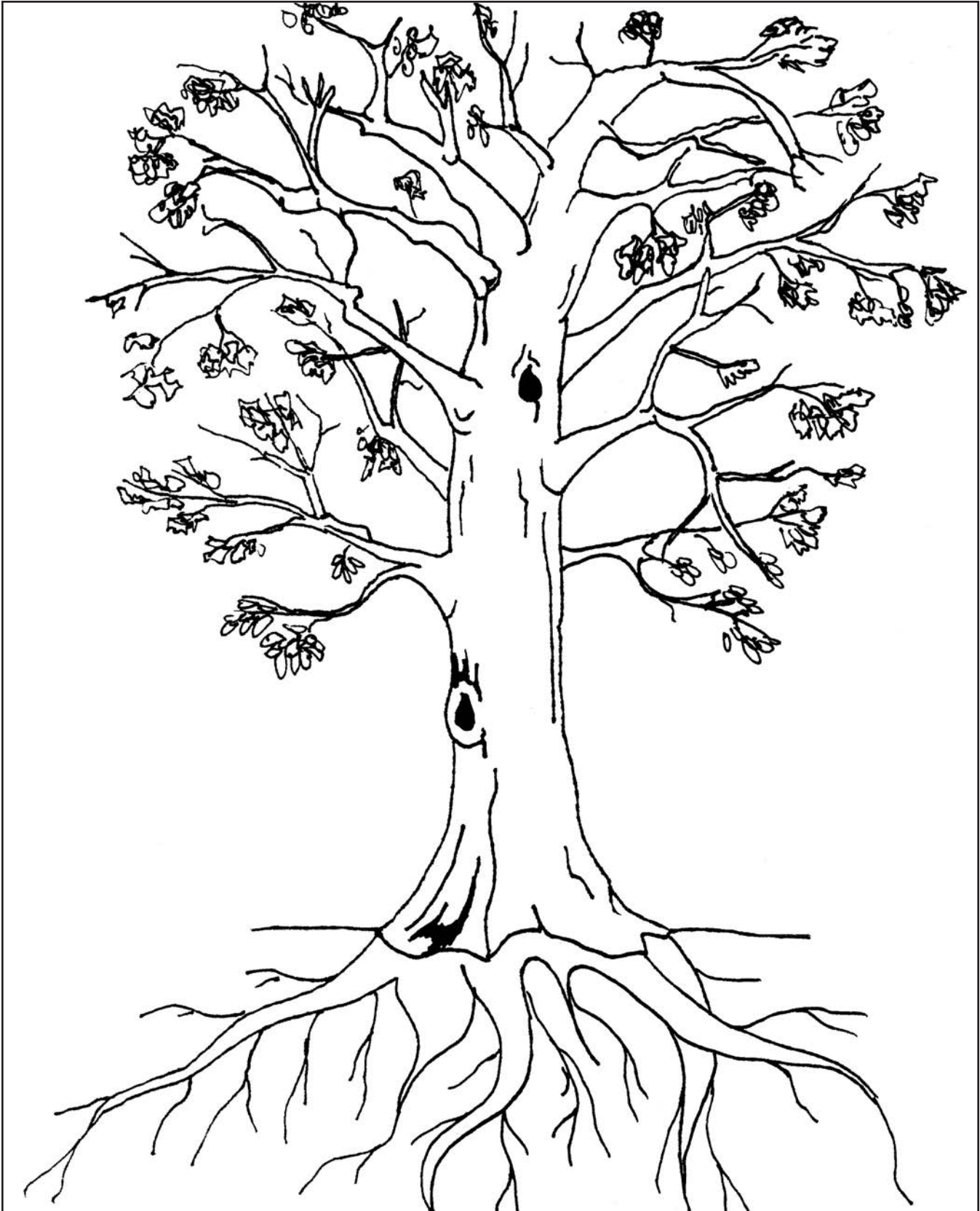
Joe says his favorite part of his job is working with people. He does admit that it is nice to take care of a young tree and watch it grow into a healthy tree that will be there even longer than he will.

Joe is also a teacher. He works for Midstate Technical College teaching other people how to take care of trees. If you want to teach other people like Joe does, you'll need to go to school and then work with other experienced arborists for a long time first. Teachers have to know a lot about their subject.

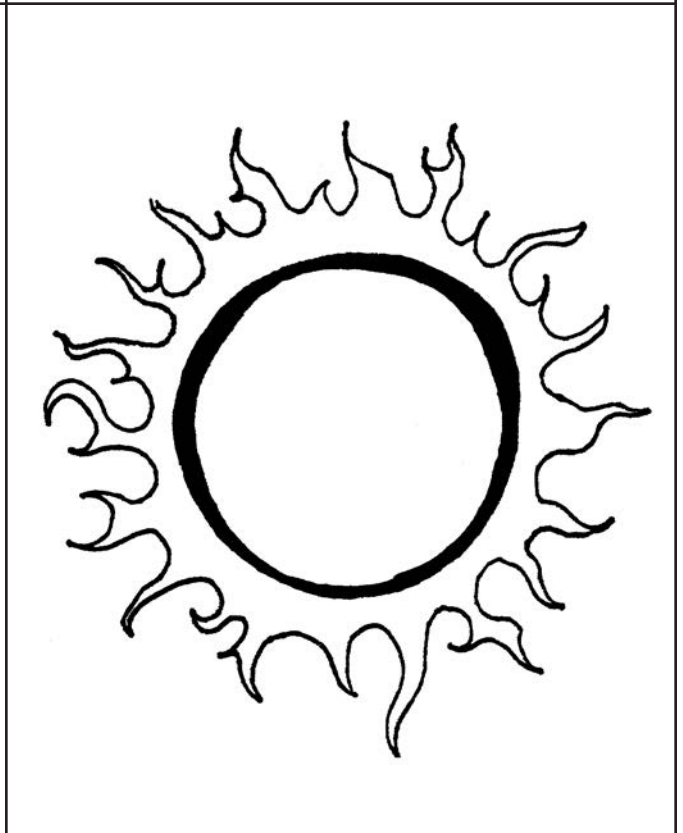
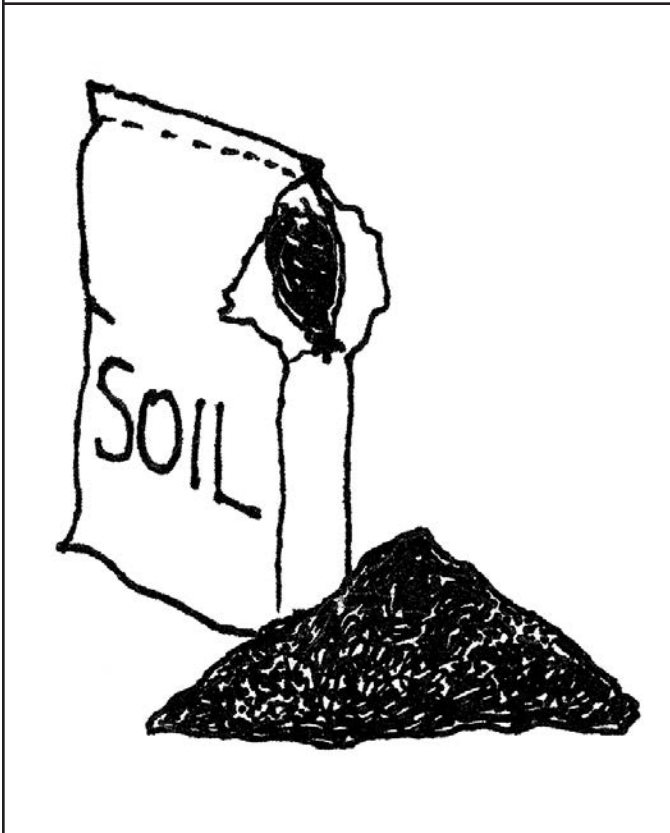
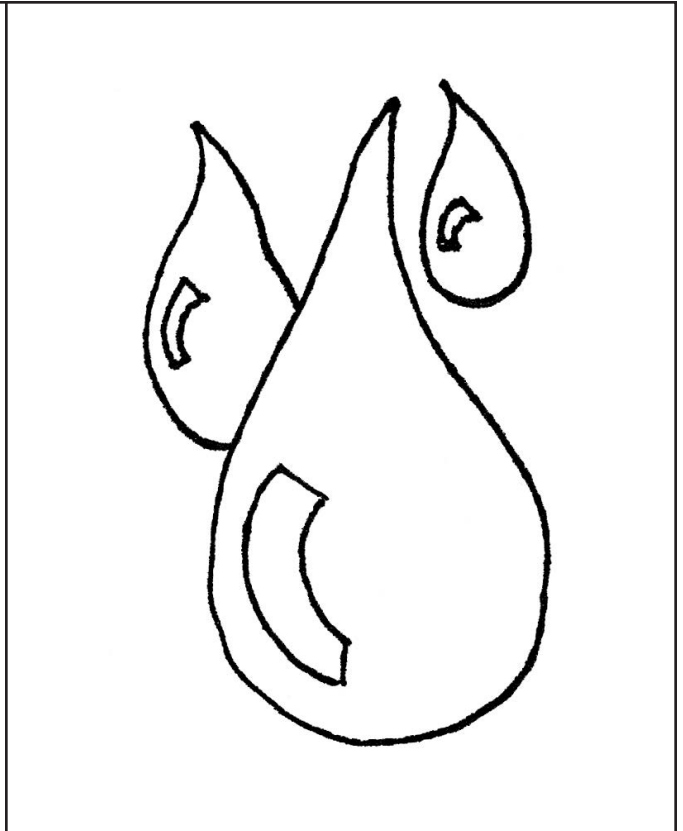
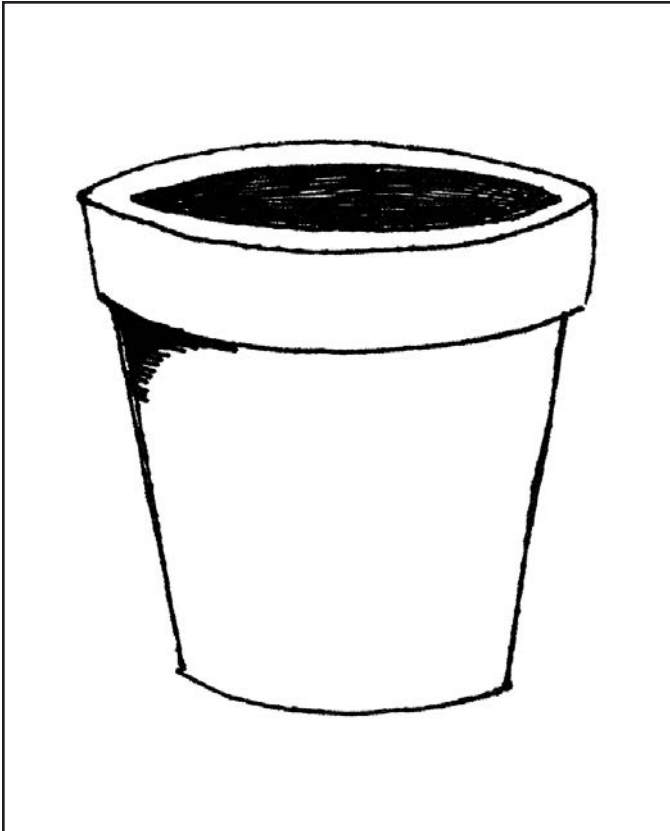


This is Joe high up in a tree with his safety equipment on.

TREE



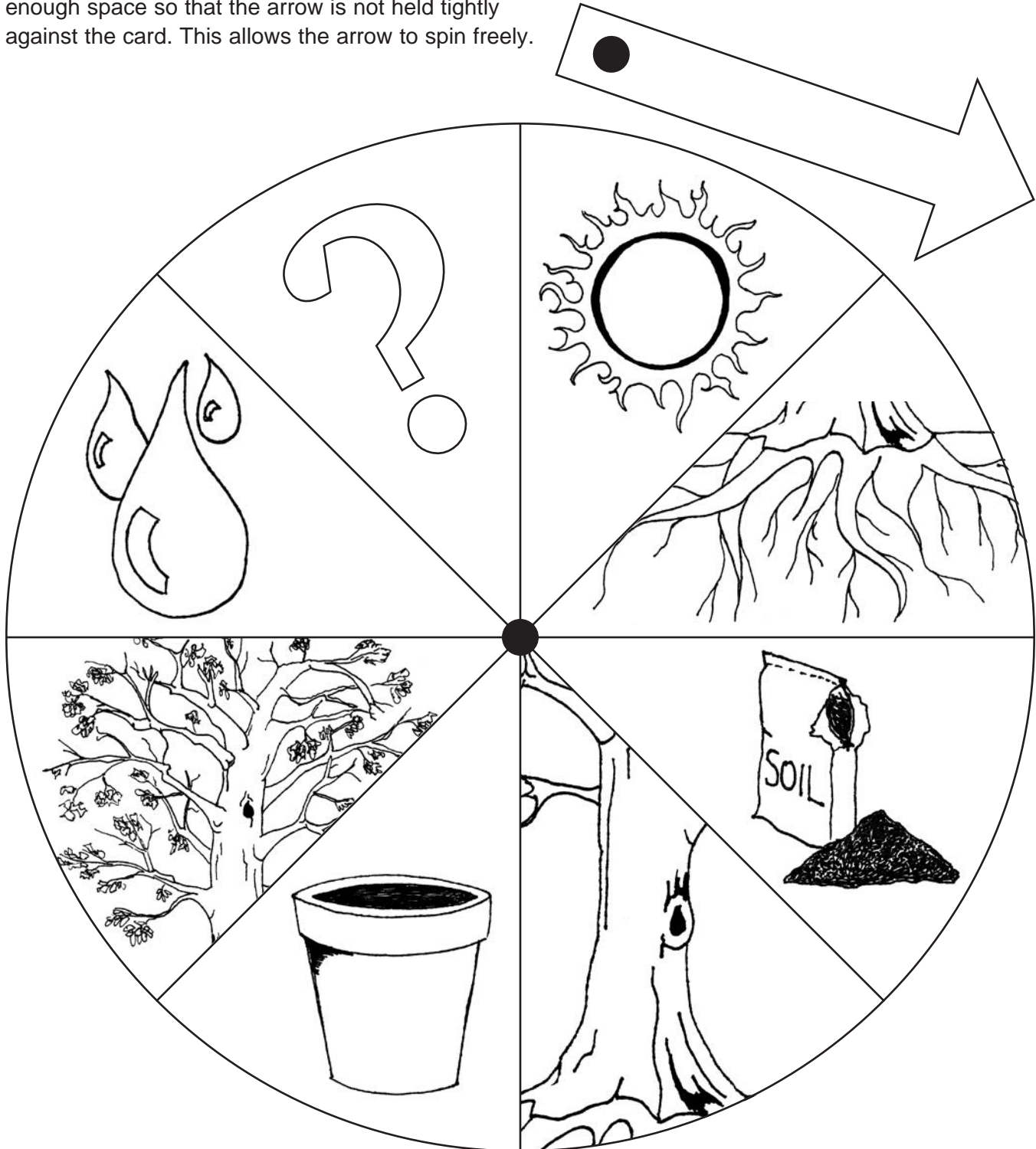
TREE NEEDS



BUILD A TREE SPINNER

Spinner Assembly Instructions

Photocopy this page on cardstock rather than regular copy paper. Cut out the picture card and arrow. Use a paper punch to punch out the circle on the arrow. Punch a hole in the center of the picture card as well. Fasten the arrow to the card using a brass fastener. When you bend the fastener, leave enough space so that the arrow is not held tightly against the card. This allows the arrow to spin freely.



THE ACORN

In a breezy but quiet backyard, not too far from here, an acorn blew from a tall oak tree and landed in the grass. **(Stand tall and wave your branches like a tall oak tree.)**

After lying in the grass for what seemed like a very long time, the acorn noticed that he wasn't alone. Other acorns had fallen from the huge oak, and they were scattered beneath the tree, too. The acorn saw things happening to the other acorns. Four acorns had disappeared after a loud, windy machine rolled by. Three acorns had been carried away by a squirrel. Two acorns had been pushed deep into the soil by walking feet. Another acorn had a large crack around the outside coat. Our acorn felt very lucky to be safe and whole. **(Curl up very tightly on the ground like an acorn.)**

But after an enjoyable morning shower and some late afternoon sun, the acorn discovered that he had a crack in his coat, too. He didn't feel broken. No feet had squished the acorn. No squirrels had disturbed his time in the grass. Out of the crack in his coat stretched thin roots. Soon, the roots found soil and he noticed a green stem with a small leaf attached. The acorn had gone through germination and was no longer an acorn. He was a seedling! **(Move up to your knees and stretch both arms overhead.)**

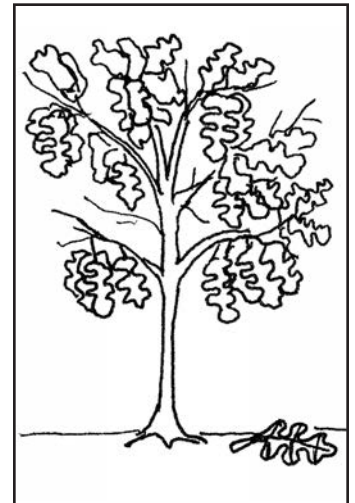


The little seedling kept growing. From his new height, he could see that the other acorns had also turned into seedlings. The seedling was

turning into quite the little oak tree. He now had three leaves! It probably didn't look like much compared to the giant oak, but he was very proud just the same! **(Look around at other seedlings you see growing and wave your little branches to show off your new leaves.)**

As the days got shorter and cooler, the leaves began to fall from the mature oak tree and land all around the smaller tree. Autumn was here, and many trees were beginning to lose their leaves. The tree wasn't worried. He knew he wasn't dying when his leaves fell. It was just another change as he continued to grow. **(Slowly flutter your hands down toward the ground, losing your leaves for the winter.)**

Winter followed autumn, and soon, spring danced into the air. When the snow was gone, the little oak saw that he was the only seedling to survive the cold winter and hungry neighborhood bunnies. Still, he was happy and proud of his growth and fresh spring buds on his tiny branches.



(Stretch your branches and check out your new buds.)

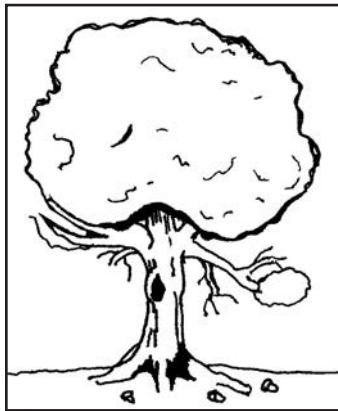
Spring continued to warm, and summer quickly followed. Summer brought its warm sun, just as spring had brought its cool rain. Thanks to the sun and rain, the little tree continued to grow. **(Crouch up on your feet, standing a little taller.)**

The tree stretched taller and taller.

THE ACORN

Another year passed and another and another. He no longer worried that feet would step on him. He knew the squirrel could no longer carry him away. He had deep roots, a strong trunk, and a thick crown of branches and leaves. **(Stand all the way up.)**

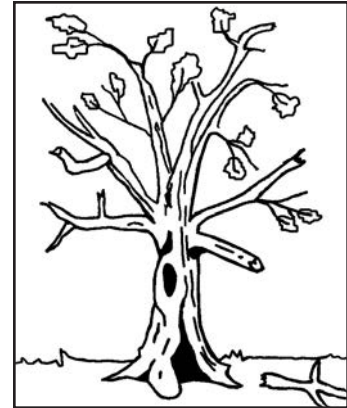
The wind of a storm pushed down the mighty oak whom he had fallen from as an acorn. The young tree knew he would miss the shade the big tree had given on hot summer days, but he also knew that he would now have enough space to grow and become a very big tree. **(Stretch your branches high up in the air, becoming the big oak in the yard.)**



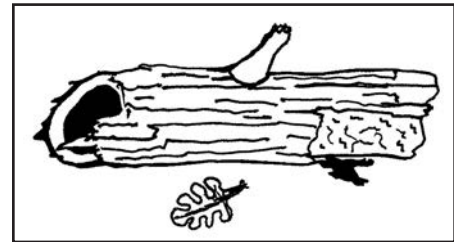
Years passed, and the tree began to grow acorns of his own. He wasn't worried when they fell off, since he knew that was where he had come from. He wished them well and continued to grow himself. **(Pretend to drop your acorns off into the yard below.)**

The tree continued to stand through many seasons and many years until he grew old and very large. The tree had dropped many acorns onto the grass below over the years. Some of them were nice looking little oaks by now. The oak noticed that he had very few leaves on his branches. Insects had begun to make homes in his trunk, and mushrooms had begun to grow on some of his branches. **(Look down at the nice little oaks that grew from your acorns and the mushrooms growing on your trunk and branches.)**

More years passed, and the tree grew no leaves at all. The tree still felt very alive, though, with many new creatures living in his limbs. One year, strong winds pushed the tree over. New plants soon grew up in the space the big tree left and used the tree for shelter and for nutrients. The tree felt like a grandpa, helping new and different plants and animals to live and grow. **(Gently lay yourself down, stretched out on the floor to rest.)**



The tree had come from a tree, falling as an acorn from his branches. It had grown from a small seedling into a large tree that had acorns on his own branches. It had fallen



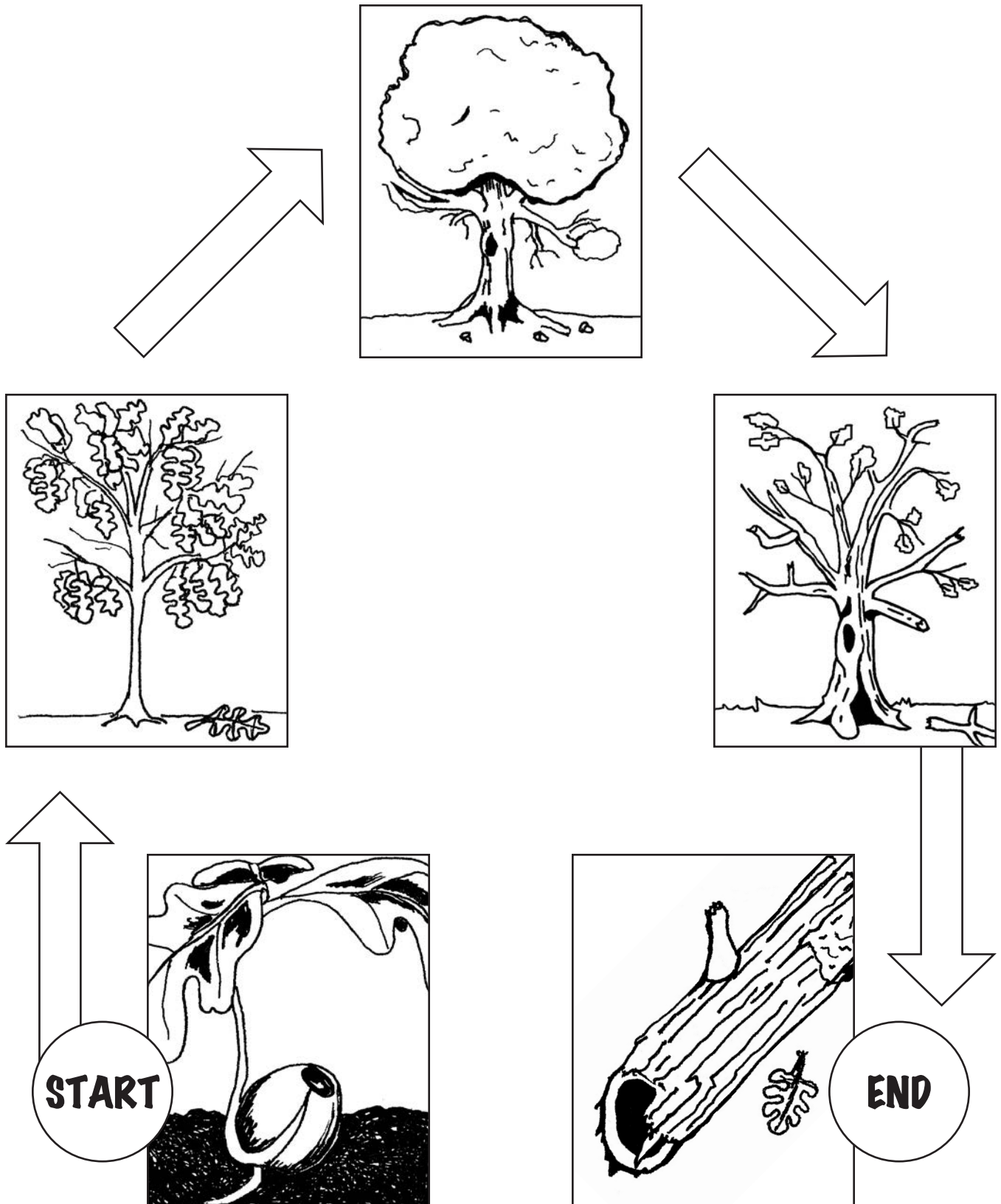
and, in this stage of the tree's life, he would slowly pass on his energy to new trees, maybe even some little oak!

Tree Parts & Needs Review

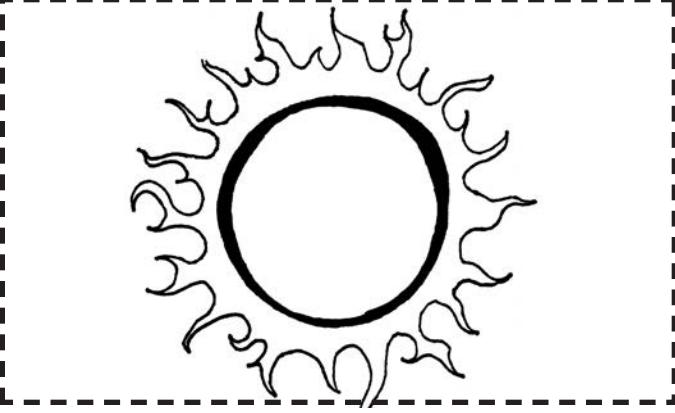
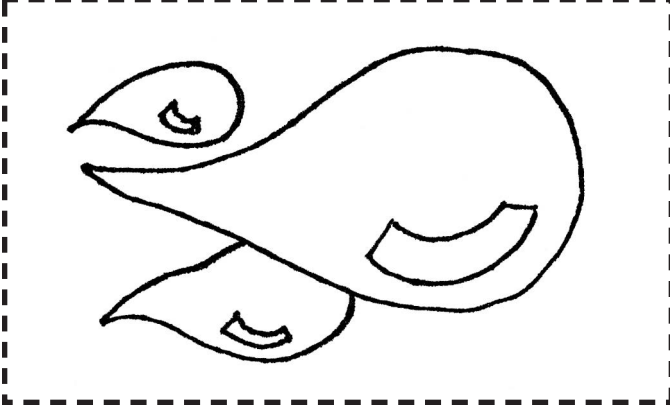
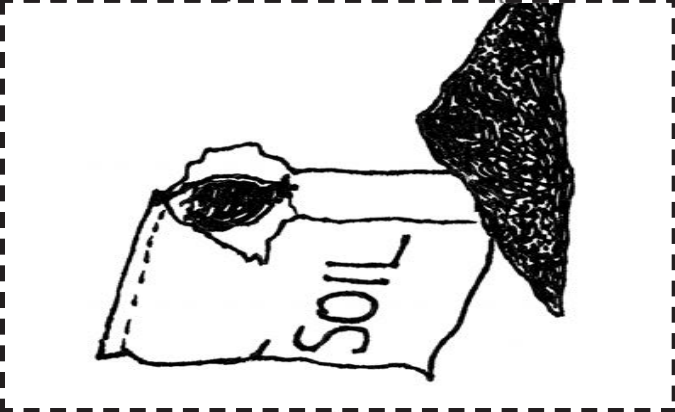
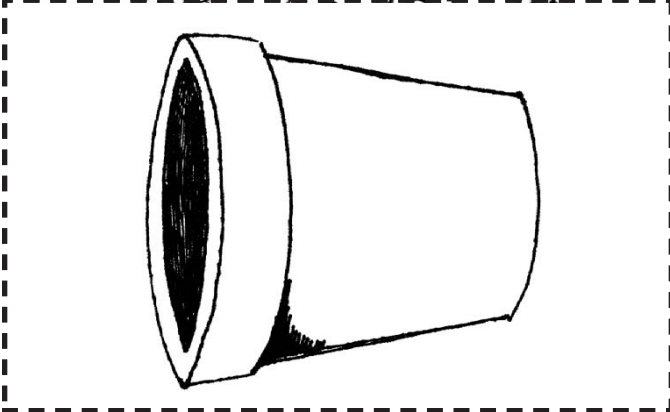
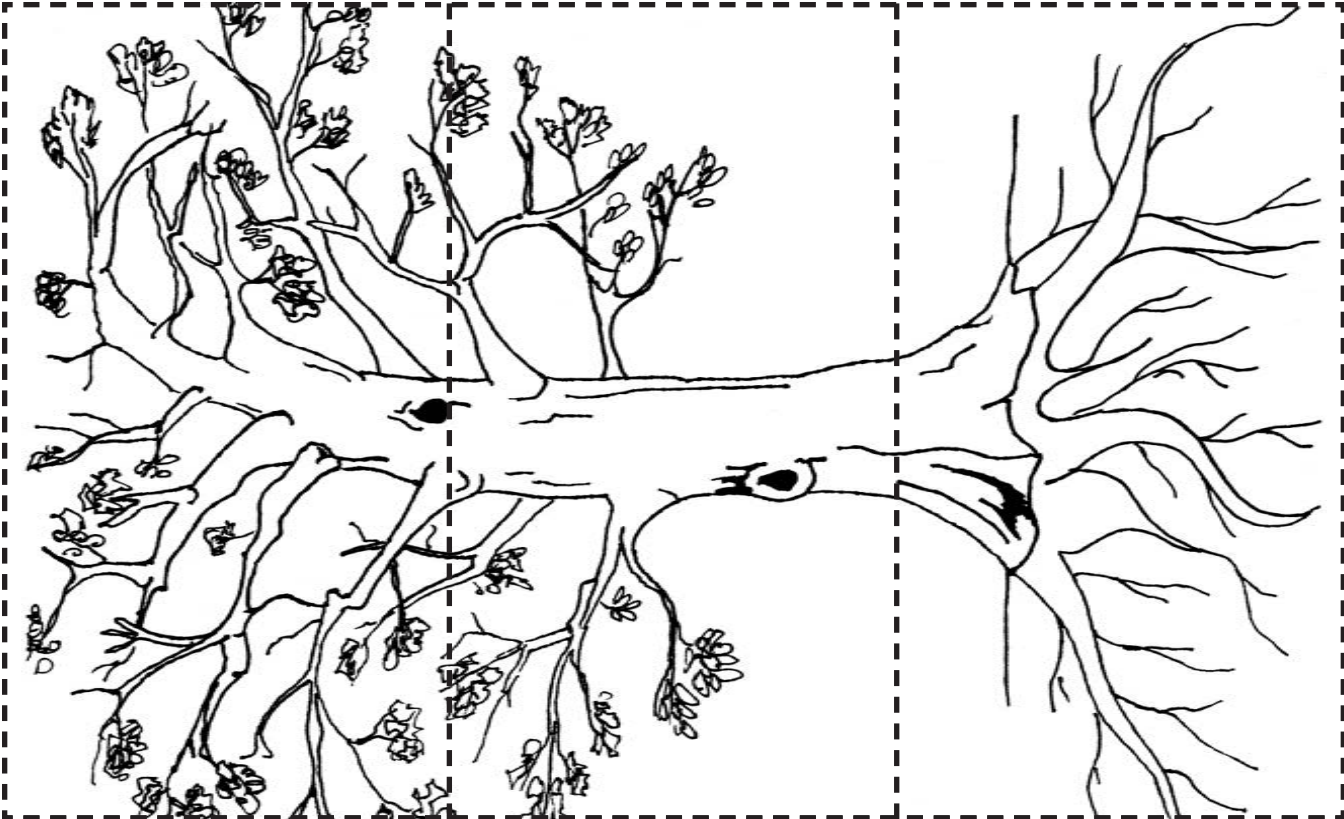
Before moving on to the lesson conclusion, invite your students to review the life stages with you by practicing these key phases:

- Germination of the acorn
- Growth of the young tree
- Reproduction by the mature tree
- Decline of the tree
- Death and decomposition of the tree

OAK-TREE LIFE STAGES KEY 🌳🔑



BUILD A TREE



OAK-TREE LIFE STAGES

