



# Frog Garden Party!

## Toads and Triangles in the Math Garden

### Grade 4

#### Standards

MCC.4.G.1, 4.G.2, 4.G.3  
GPS.S4L1 a, c, d  
GPS.HE 4.5 e  
NGSS.4.LS1.D, 4.LS1.A

#### Time

2 45 minute sessions over 2 days

#### Supplies (per student)

##### For “cootie catchers”

- copy of Cootie Catcher Pattern
- scissors

##### For triangle hunt

- copy of Triangle Hunt Lab Report
- folded “cootie catchers”
- clipboard and pencil
- protractor with ruler
- journal

##### For frog pennant banners

- fabric or paper
- scissors
- twine or string
- tape

##### For toad abode

- recycled plastic or clay pot or wood
- clippers, scissors to cut pot- optional

#### Garden Connection

Students will make a frog and toad habitat to provide organic pest control for the garden and harvest any previously planted fruits to eat at a frog garden party.

#### Overview

4th grade students will explore geometry and frogs in the garden by going on a triangle hunt to find, measure and sketch angles, rays, triangles, parallel and perpendicular lines. Students will create a garden habitat that attracts frogs and toads, hold a triangle-themed party to welcome frogs and toads, and select healthy triangular snacks.

#### Engaging Students

##### Triangle Hunt

Students will make origami “cootie catchers” to observe lines of symmetry in folded paper and “catch” triangle and other math facts for future reference. Then they will take their “cootie catchers” outside to the garden and search for real-world geometric figures including angles, rays, lines, right triangles.

#### Exploration

##### Miniature pennant banners

Students demonstrate ability to recognize, measure and draw right triangles by creating festive, frog-sized pennant-banners for the garden party.

##### Triangle Snacks

Students brainstorm and choose healthy snacks for human and toad guests at the garden party, including garden-grown and triangular-shaped foods.

#### Explanation

Students will be able to articulate what makes a right triangle, tell about types of angles, describe a healthy snack, explain why frogs and toads are good for the garden, how to attract toads, and imitate the call of a frog or toad.

#### Environmental Stewardship

Students will design and make a Toad Abode that provides a suitable habitat. Students will also monitor frogs and collect data in a citizen science project.

#### Evaluation

A rubric and lab report are included to assist in assessing student proficiency.

## Standards

### Georgia Performance Standards in Science

#### Life Science

S4L1. Students will describe the roles of organisms and the flow of energy within an ecosystem.

- a. Identify the roles of producers, consumers, and decomposers in a community.
- c. Predict how changes in the environment would affect a community (ecosystem) of organisms.

### Next Generation Science Standards

Core Idea LS2: Ecosystems: Interactions, Energy and Dynamics

LS2.A : Interdependent Relationships in Ecosystems

LS2.C : Ecosystem Dynamics, Functioning and Resilience

### Georgia Performance Standards in Health

HE4.5: Students will demonstrate the ability to use decision-making skills to enhance health.

- e. Determine a healthy choice when making a decision.

### Common Core / Georgia Performance Standards in Math

**Measurement and Data 4.MD** Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.

MCC4.MD.5 Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement:

- a. An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through  $\frac{1}{360}$  of a circle is called a “one-degree angle,” and can be used to measure angles.
- b. An angle that turns through  $n$  one-degree angles is said to have an angle measure of  $n$  degrees.

MCC4.MD.6 Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.

**Geometry 4.G** Draw and identify lines and angles, and classify shapes by properties of their lines and angles.

MCC4.G.1 Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.

MCC4.G.2 Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.

MCC4.G.3 Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.

### Next Generation Science Standards

4.LS1.A: Structure and Function

Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (4-LS1-1)

4.LS1.D: Information Processing

Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal’s brain. Animals are able to use their perceptions and memories to guide their actions. (4-LS1-2)

### Background Information

Triangle Basics: <http://www.mathsisfun.com/triangle.html>

Backyard Houses for Toads:

<http://www.nwf.org/News-and-Magazines/National-Wildlife/Gardening/Archives/2006/Backyard-Houses-for-Toads.aspx>

### Teacher Preparation

Assemble supplies needed for the lesson. Ask students or garden stores for used / recycled plastic or clay flower pots. Request that parents send in triangular-shaped snacks for the frog garden party (cheese, fruit, veggies cut in triangles)

## PROCEDURES FOR LESSON ACTIVITIES

Explain the premise of the lesson: to create a suitable habitat for frogs and toads that will encourage them to live in the school garden, and to hold a triangle-themed garden party to welcome frogs to the garden. Ask why a toad might be a better solution than pesticides, for controlling the population of insect-eating fruits and vegetables in the garden. (Residual pesticides in and on food are not healthy for humans to eat). Also tell students that the theme of the garden party will be triangles. Introduce Triangle Basics <http://www.mathsisfun.com/tri-angle.html>, if the class does not have this background knowledge.

### Cootie Catchers

- Provide each student with a copy of the printed cootie catcher provided with this lesson.
- Follow directions for folding the cootie catcher, if needed:  
<http://www.billybear4kids.com/holidays/ChineseNewYear/CootieCatcher.shtml>
- Students should label the math figures that appear on the cootie catchers, from the accompanying word bank.
- As students are folding, unfolding and refolding their papers, ask if they recognize any lines of symmetry (on either side of which is a matching shape).
- Ask whether people, animals and plants also have lines of symmetry. (People and most animals are bilaterally symmetrical. However, plants are radially symmetrical, as is a circle).

### Triangle Hunting (in the garden)

- Distribute Triangle Hunt Lab Reports. Clipboards and pencils will also be useful outside.
- Tell students to take their completed cootie catchers outside with them to use as a reference, while they are looking for triangles in the garden.
- Students will use a protractor to measure angles and confirm the types of figures they find.

### Miniature pennant banners

- Challenge students to make small right triangles to string on festive, frog-sized pennant-banners for the party.
- Provide string or yarn, tape, and fabric scraps or colored paper.

### Triangle Snacks

- Ask the class to brainstorm snacks for human and toad guests at the garden party, including garden-grown and triangular-shaped foods. Sort the list of possible for student snacks into healthy and not-so-healthy columns.
  - Challenge the class to develop criteria for distinguishing healthy from unhealthy eating.
  - Note that frogs and toads eat mosquitoes and insects often considered garden pests, so help keep an organic garden pesticide-free.
  - If students are going to assist in cutting garden-grown fruits and veggies into triangular shapes, ask grocery store bakeries to provide the free, plastic serrated cake servers they give away with cakes. These work well for cutting veggies instead of knives. Also they are triangular in shape.

### Debriefing

Ask students to reflect on what they learned during the Triangle Hunt and guide the discussion to include the following: Properties of triangles

- All triangles have 3 sides and angles that, when added together, total 180 degrees.
- Right triangles have a 90 degree angle
- Right triangles are found in corners.
- Geometric shapes can have more than one line of symmetry; most animals have bilateral symmetry.

### Choosing healthy party refreshments

- It is healthy to eat five 1-cup fruit and/or vegetable servings a day.
- Fresh fruits and vegetables are healthiest to eat when they are plain, unadulterated, unprocessed.
- Children will choose to eat healthy food, especially if all options given are healthy.

## Exploration

### Engineering Design Challenge: Frog-Friendly Garden Habitat

Ask students to discuss reasons for attracting frogs and toads to the school's chemical-free garden.

- Toads help the garden with pest removal (1 toad can eat 10,000 insects in a season, per USDA).
- The garden can help toad and frogs survive. Amphibians are in decline due to loss of habitat, disease, and pesticides.
- Tips for creating frog-friendly habitat – and a Schoolyard Wildlife Habitat - are available from National Wildlife Federation: <http://www.nwf.org/How-to-Help/Garden-for-Wildlife/Gardening-Tips/How-to-Attract-Frogs-Toads-and-Other-Amphibians.aspx>

Divide the class into small groups (teams of four)

Challenge teams of students create a frog-friendly garden habitats that meet the following criteria:

- include a frog shelter that . . .
  - is made of natural or recycled materials (such as branches, broken clay pots, or used plastic pots)
  - provides shade and hiding place
  - offers easy access to soil (no floor) because frogs and toads like to dig
  - decorated with right triangles
- source of water nearby (such as pond, creek, or saucer of water)
- located in area with damp soils
- near vegetation such as garden or natural area

## Explanation

Students should be able to articulate at least one reason why it would be good to attract frogs and toads to the garden (to provide habitat for vulnerable species, or to provide the garden with pest-eating critters). Student should also be able to deliver a frog call and identify the particular species. In addition, students should be able to name each math figure in their cootie catchers and identify a real-life example in the garden for each, including rays, intersecting lines, parallel lines, perpendicular lines, circles, right angles, acute angles, obtuse angles, and right triangles.

## Environmental Stewardship

### Citizen Science: Frog and Toad Monitoring and Data Reporting

Students can learn more about frog habitat, vocalizations and sensory perception at the following web sites. Provide students with access to internet-connected computers or spotlight selected info for the class, via smartboard

- Award-winning Frogland web site/ songs: <http://allaboutfrogs.org/weird/general/songs.html>
- Frog hearing and communication: [http://en.wikipedia.org/wiki/Frog\\_hearing\\_and\\_communication](http://en.wikipedia.org/wiki/Frog_hearing_and_communication)
- Seychelle frogs use their mouths to hear: <http://guardianlv.com/2013/09/tiny-frog-swallows-sound/>
- Exploratorium Frog exhibit: <http://www.exploratorium.edu/frogs/>
- How Frogs Work: <http://animals.howstuffworks.com/amphibians/frog.htm>

Consider monitoring frogs and contributing data to a national citizen science research project. There are some challenges associated with monitoring. Frog habitats, mating season and the time of day that frogs vocalize do not necessarily coincide with school hours and locations. However, the effort in itself is valuable.

- USGS offers free recordings as well as monitoring protocols and opportunities to submit data through the North American Amphibian Monitoring Program: <https://www.pwrc.usgs.gov/naamp/>
- Free Frog Call Recordings

The Frog Call Quiz web site from USGS' North American Amphibian Monitoring Program can be customized to identify the calls of frog and toad species, for any eastern state: <https://www.pwrc.usgs.gov/frogquiz/>

Or use the LookUp feature to select frogs and toads by species name:

<https://www.pwrc.usgs.gov/frogquiz/index.cfm?fuseaction=main.lookup>

- Georgia Adopt a Stream Amphibian Monitoring Program

Students can learn the sounds that frogs and toads in Georgia make with the new "Calls of the Wild - Vocalizations of Georgia's Frogs" Compact Disk produced by the Georgia Department of Natural Resources, Wildlife Resources Division (DNR/WRD). This CD presents the calls of all 31 species in Georgia. Informative narration is provided for each individual species and a booklet loaded with information including natural history, range maps, and physical

characteristics of each species accompanies the CD. Copies of "Calls of the Wild" are available for \$14.84 (including taxes and shipping) from GA DNR/WRD, Nongame Wildlife & Natural Heritage Section, 116 Rum Creek Drive, Forsyth, GA 31029, ATTN: Georgia's "Calls of the Wild" CD, or for more information call 478-994-1438. Prices are as follows: \$15.36 (includes GA sales tax and shipping charges) for GA residents or \$14.84 (includes shipping charges) for non-GA residents. To order online, go to: <http://www.georgiawildlife.com/node/682>

- California Amphibian Monitoring

Protocols for monitoring various species in California are provided on the California Department of Fish and Wildlife web site: [https://www.dfg.ca.gov/wildlife/nongame/survey\\_monitor.html](https://www.dfg.ca.gov/wildlife/nongame/survey_monitor.html)

- New York Amphibian Monitoring

Frog and toad monitoring in New York is done in conjunction with the North American Amphibian Monitoring Program (NAAMP). For information, check out the New York Department of Environmental Conservation web site: <http://www.dec.ny.gov/animals/50247.html>

- Amphibian Monitoring in Other States

Students in other states can monitor amphibians through state programs or the USGS' North American Amphibian Monitoring Program: <https://www.pwrc.usgs.gov/naamp/>

- Frog Watch USA

This National Wildlife Federation program requires extensive training to recognize frog and toad calls but charges \$75 for online training if there is not a local zoo or aquarium that offers instruction,: <http://www.aza.org/become-a-frogwatch-volunteer/>

### Raising Classroom Tadpoles or Frogs

It is not advisable to purchase tadpoles from science supply houses, as they are highly unlikely to be native species. Releasing non-native frogs in your schoolyard can endanger native populations due to the spread of diseases. If your state allows collection of local tadpoles and it is feasible to release mature frogs in the same area, it may be feasible to raise a local species in the classroom. Please read this information from Amphibian Ark to determine if appropriate: <http://www.amphibianark.org/pdf/Husbandry/Tadpole%20care%20sheet%20with%20guidelines.pdf>

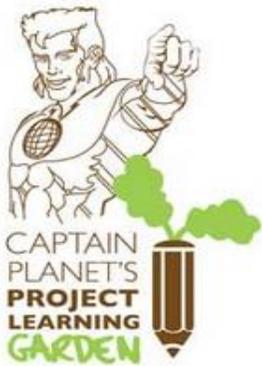
## **Extensions: Triangle Related**

### Makin a Delta Kite

Making a delta kite can be a great lesson extension if used to reinforce measuring angles and classifying triangles. Students use inexpensive common items to create their own Delta wing kites. Simple directions with photos are available at: <http://www.my-best-kite.com/how-to-build-a-delta-kite-s.html>

Supplies for each delta kite

- 30 lb. kite string
- 2-ply trash bag (lg)
- electrical tape
- ruler
- (2) 70 cm (32") 5mm dowels
- (2) 80 cm (36") 5mm dowels



# Triangle Scavenger Hunt in the Garden

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Hunt for triangles in the schoolyard, measure their angles and sides, sketch and label them, and tell where they were found. You may sketch a third "imagined" side opposite an angle, using a dotted line, to create a triangle that does not physically exist.

**Geometric Figure**

**Real Item Found**

**Sketches of Items found in Garden**

Right Triangle

\_\_\_\_\_

Obtuse angle

\_\_\_\_\_

Acute angle

\_\_\_\_\_

Parallel lines

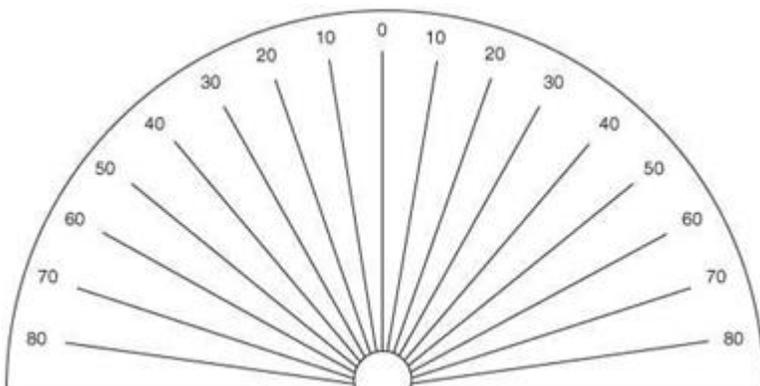
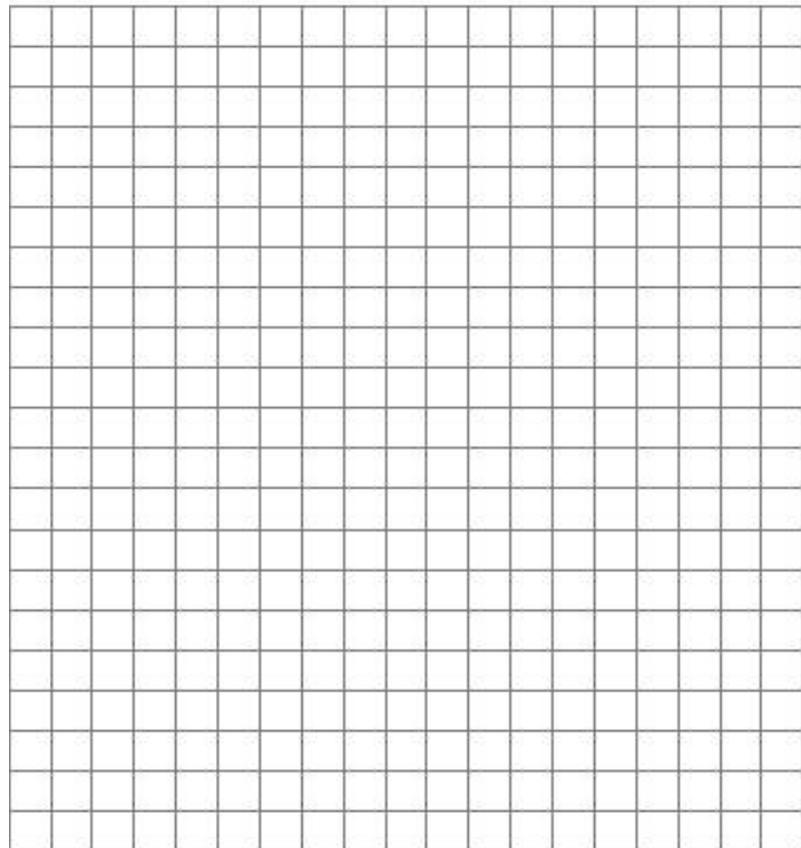
\_\_\_\_\_

Perpendicular lines

\_\_\_\_\_

Right angle

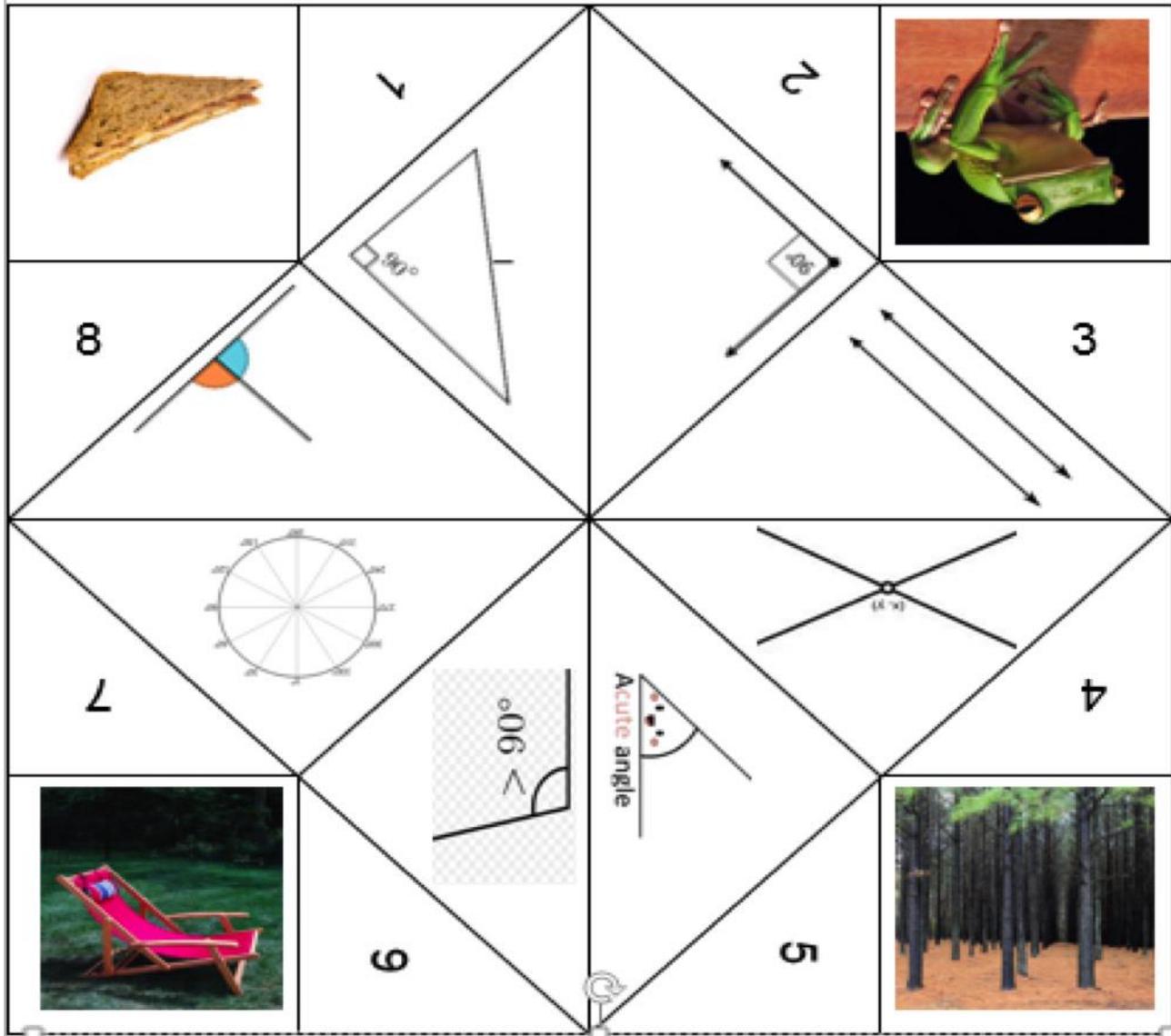
\_\_\_\_\_



Use this modified protractor to estimate angles (courtesy NSTA)

# Cootie Catcher

## Toads and Triangles in the Math Garden



1. Cut off directions and area outside cootie catcher square
2. Fold square in half and in half again
3. Open out, turn over so top is blank and fold each corner into the middle
4. Turn over and repeat
5. Turn over so you can see the pictures (images courtesy of Wikipedia)
6. Slide your thumb and your finger behind 2 of the pictures and press together so they bend round and touch
7. Turn over and repeat with the thumb and finger of the other hand for the other two pictures
8. Write the name of each math figure displayed in cootie catcher.
9. Take cootie catcher outside to hunt for math figures.

[www.downloadablecootiecatchers.wordpress.com](http://www.downloadablecootiecatchers.wordpress.com)

**Vocabulary Bank for Labeling Cootie Catcher:** acute angle, obtuse angle, right angle, right triangle, parallel lines, perpendicular lines, intersecting lines, 360 degrees of rays (a circle)

# Assessment of Frog Garden Party: Toads and Triangles

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Level of Mastery  Benchmark or Performance Measure	Emerging    1 point	Competent    4 points	Proficient    5 points	Total Points
<b>Triangle Facts Caught in Cootie Catcher</b>	Student participated without completion: only some of figures accurately labeled.	Student correctly labeled at least 75% of figures.	Student drew and correctly labeled right, acute, obtuse, angles and right triangles, parallel lines, perpendicular lines and rays for reference, in cootie catcher	
<b>Triangle Hunt in the Garden</b>	Right triangles incorrectly identified.	Student identified at least 75% of figure on Triangle Hunt Lab Report form.	Correctly identifies all figures on Report form.	
<b>Frog---Scale Miniature Party Banners</b>	Creates a banner with some triangle shapes but not all right triangles	n/a	Creates pennant banner featuring right triangles	
<b>Healthy Triangular Snacks</b>	Student taste-tests one healthy food	n/a	Student selects more than one healthy triangular shaped food for snacks.	
<b>Toad Abode</b>	Toad abode meets at least one design criterion	Toad abode meets two design criteria.	Toad abode meets all design criteria: damp soils, no floor, shade, triangle décor, natural or recycled materials, source of water nearby, vegetation nearby	
<b>Frog Calling and Info</b>	Student can deliver a frog call but not identify a particular species and cannot explain usefulness of garden to frogs (habitat) or frog to garden (pest control)	Student can deliver a frog call and identify a particular species and can explain usefulness of garden to frogs (habitat) or frog to garden (pest control)	Student can deliver a frog call and identify the particular species and can explain usefulness of garden to frogs (habitat) and frog to garden (pest control)	