



Lesson 3: Frog Garden Party! Toads and Triangles in the Math Garden

Grade

4

Standards

Math Common Core MCC 4.G.1, 4.G.2, 4.G.3
GPS Science S4L1 a, c, d
GPS Health HE 4.5 e

Time

approx 1.5 - 2 hours over 1 or 2 days

Supplies

(per student)

For fly (cootie) catchers

- (recycled) paper
- markers

For triangle hunt

- completed fly catcher
- ruler
- protractor
- journal

For frog banners

- fabric or paper
- scissors
- twine
- tape

For frog juice

- variety of fruit juices
- measuring cup
- paper cup
- recipe card

For toad abode

- plastic flower pot
- clippers, scissors
- acrylic paint, brushes

(per class)

- school garden

Overview

4th grade students will explore geometry and frogs in the garden.

What they will learn

- Types of triangles
- Right triangles
- Measuring angles
- Lines of symmetry
- Drawing triangles
- Role of toad as a consumer
- Changes in environment, community
- Measuring liquid volume
- Health and nutrition

How they will learn it

- Making a garden banner
- Squaring a garden frame
- Finding triangles in garden
- Making fly (cootie) catchers
- Decorating a toad abode
- Make a toad abode in garden
- Introduce toads to eat “pests”
- Creating a recipe for Frog Juice
- Triangle garden party snacks

Essential / Guiding Question

How can I recognize, measure and create angles and triangles in the garden?
How can I attract toads to the garden, so they will help control unwanted pests?

Engaging Students

Fly (cootie) catchers

Students will make fly (cootie) catchers to observe lines of symmetry and “catch” triangle facts for future reference.

Exploration

In preparation for hosting a garden party for frogs, students will. . .

Triangle hunting

Use completed fly catchers to look for triangles in the garden; measure angles and side lengths to confirm what types of triangles are found; sketch and label the triangles.

Miniature pennant banners

Demonstrate their ability to recognize, measure and draw different types of triangles by creating festive, frog-sized pennant-banners for the garden party.

Frog Juice

Measure and record liquid volumes of different ingredients, while inventing their own special tasty and healthy “frog juice” to drink at the party.

Triangle Snacks

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 triangle, tell about triangle types, and describe a healthy snack.

Environmental Stewardship

Students will use what they learned about triangles and toads to design, create and decorate a Toad Abode that features every type of triangle (equilateral, isosceles, scalene, obtuse, acute, right) and provides a suitable habitat. Students may also become part of the FrogWatchUSA citizen science efforts, and collect data to contribute.

Evaluation

Students will demonstrate mastery of triangles by labeling all types on their toad abode.

CONTEXT FOR LESSON ACTIVITIES

Standards

Georgia Performance Standards: 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

Health Ed GPS

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: Math

Measurement and Data 4.MD

Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.

MCC4.MD.2 Use the four operations to solve word problems involving . . . liquid volumes. . . Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.

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.

MCC4.MD.7 Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems, e.g., by using an equation with a symbol for the unknown angle 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.

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>

FrogWatch USA citizen science program: <http://www.aza.org/become-a-frogwatch-volunteer/>

Teacher Preparation

Assemble supplies needed for the lesson. Ask students or a garden store for used plastic flower pots.

PROCEDURES FOR LESSON ACTIVITIES

Explain the premise of the lesson: to hold a garden party for frogs and toads that will encourage them to live in the school garden. Ask why a toad might be a better solution than pesticides, for controlling the population of insects 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/triangle.html>, if the class does not have this background knowledge.

Fly (cootie) Catchers

- Provide each student with a piece of paper. (If the paper is $8\frac{1}{2}$ " x 11", students should fold a corner to the opposite side, making a square, and cut off the excess.
- Follow directions for making a cootie catcher <http://www.billybear4kids.com/holidays/ChineseNewYear/CootieCatcher.shtml>, if needed: 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).
- <http://www.billybear4kids.com/holidays/ChineseNewYear/CootieCatcher.shtml>
- 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

- Tell students to use completed fly catchers to look for triangles in the garden.
- Students will use a protractor to measure angles and side lengths, to confirm what types of triangles are found.
- Students will sketch and label the triangles.

Design Challenge: Miniature pennant banners

- Challenge students to use every type of triangle when creating a festive, frog-sized pennant-banners for the party.
- Provide twine, tape , fabric scraps or colored paper, and markers (to label triangles).

Design Challenge: Frog Juice

- Provide an assortment of juices, graduated measuring cups, paper cups.
- Challenge students to measure and record liquid volumes of different ingredients, while inventing their own special tasty and healthy “frog juice” to drink at the party. The recipe may be copied on a recipe card.

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 possibilities into healthy and not-so-healthy columns.
- Challenge the class to develop criteria for distinguishing healthy from unhealthy eating.

Debriefing

Ask students to reflect on what they learned in this lesson and guide the discussion to include the following:

Properties of triangles

- All triangles have 3 sides and angles that total 180 degrees.
- Scalene triangles have no equal angles; isosceles have two equal angles; equilaterals have three equal angles.
- Right triangles have a 90 degree angle
- Right triangles can be useful.
- Geometric shapes can have more than one line of symmetry; most animals have bilateral symmetry.

Reasons for attracting frogs and toads to the (organic) garden

- Toads help the garden with organic pest removal (1 toad can eat 10,000 insects in a season, per USDA).
- The garden can help toads (toad and frog populations are in decline due to loss of habitat, disease, pesticides).

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 can choose to eat healthy food.

Extension

The 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 Hunt in the Garden

Name: _____

Date: _____ Location: _____

Hunt for triangles in the schoolyard, measure their angles and sides, sketch each type, label its measurements, and tell where you found it. You may sketch a third "imagined" side opposite an angle with a dotted line, to create a triangle that does not physically exist.

Right

Obtuse

Acute





Isosceles

Scalene

Equilateral

Assessment for (Lesson Plan Title)

Student Name(s): _____ Date: _____

Level of Mastery →	 Mastered task @ 90%+ accuracy: 5 pts	 Mastered task @ 85% accuracy: 4 pts	 Mastered task @ 80% accuracy: 3 pts	 More learning needed	TOTAL POINTS
↓ Benchmark or Performance Measure					
Triangle facts caught in cootie (fly) catchers	Student drew and correctly labeled right, acute, obtuse, scalene, isosceles, and equilateral triangles for reference, in cootie catcher	Student participated without a lot of accuracy	n/a	No attempt	
Triangle Hunt in the Garden	Correctly identifies several types of triangles by measuring angles with protractors and sides with rulers.	Triangles incomplete or in error.	n/a	No attempt	
Frog-Scale Miniature Party Banners	Correctly draws triangles and labels angles and side lengths. Makes pennant banner featuring each type of triangle	Creates a banner with some triangle shapes, but not all; or triangles are incorrectly labeled.	n/a	No attempt	
Frog Juice Frog Party Food	Creates a recipe by measuring and combining different types of juices, to taste. Selects healthy triangular shaped food for snacks.	Creates fruit juice blend without measuring.	n/a	No attempt	
Toad Abode	Creates a mini-habitat in the garden that depicts every type of triangle, and attracts toads that will help eat garden pests. Student may also choose to join FrogWatch and contribute data to national database to protect frogs	Mini-habitat created for toads, but all triangles not depicted on it.	n/a	No attempt	
TOTAL in LAST BOX →					_ /25 pts