

The Pyramids

Major Topic: Trigonometry & Pythagorean Theorem

Length of Unit: 3 -90 minute classes

Unit Summary: Students will use a familiar area (preferably, on school campus) using a telephone pole and three trees to construct a pyramid using right triangle & 3-D surface/lateral area and volume concepts. They will also research a pyramid to present.

Understanding Goals: Students will determine the measurements of a triangular pyramid to be constructed on campus from the bases of three trees and a telephone pole.

Essential Questions:

- What formulas will be used to calculate height & slant height of the pole/pyramid?
- What formulas will be used to calculate area & perimeter of triangular base formed by 3 trees?
- What formulas will be used to calculate Volume, Surface Area, & Lateral Area of Pyramid?
- What tools are needed to gather measurements?

Student Objectives:

Students will be able to:

- G.8 The student will solve real-world problems involving right triangles by using the Pythagorean Theorem and its converse, properties of special right triangles, and right triangle trigonometry.
- G.13 The student will use formulas for surface area and volume of three-dimensional objects to solve real-world problems.
- G.14 The student will use similar geometric objects in two- or three-dimensions to
 - a) compare ratios between side lengths, perimeters, areas, and volumes;
 - b) determine how changes in one or more dimensions of an object affect area and/or volume of the object;
 - c) determine how changes in area and/or volume of an object affect one or more dimensions of the object; and
 - d) solve real-world problems about similar geometric objects.

Differentiation: Students will work in collaborative groups. Those with disabilities and other special needs will benefit from their partners while still contributing to the renovation plan.

Blooms Taxonomy	21 st Century Skills
Creating Evaluating Analyzing Applying Understanding Remembering	Critical Thinking Problem Solving Communication Collaboration Information & Media Contextual Learning Global/Multicultural Research

Performance Tasks:

Students will:

- Measure the ground distance from the power line pole to the land wire.
- Measure the angle of elevation the land wire creates with the ground.
- Calculate the height of the pole and the length of the land wire.
- Imagine the pole being uprooted and placed in the center of the triangle created by 3 trees, thus forming the vertices of a triangular pyramid.
- Calculate the volume, surface area, and lateral area of the pyramid.

Evidence of formative assessment:

The groups will be assessed through class participation and teacher observations.

Evidence of Summative Assessment:

The groups will be assessed during their presentation using a rubric (attached).

Technology

Hardware	Software
Computers Internet Connection Projection System Interactive White Board Calculators	Multimedia Word Processing Internet Web Browser

Resources from the web:

Search engines for research

Supplies:

- Meter sticks
- Clinometers
- Projector
- Computer
- Internet

Vocabulary:

trigonometry, Pythagorean theorem, perimeter, area, lateral area, surface area, volume, square units, cubic units

Lesson 1: (1- 90 minute class)

- Present the idea of constructing a triangular pyramid outside of the classroom using a power line pole and the base of 3 trees in a triangular configuration.
- The goal is to calculate the volume, surface area, and lateral area of the pyramid.
- Groups will discuss the formulas used in volume, surface area, and lateral area of triangular pyramids and determine what measurements (and tools) are needed to perform the desired calculations.

Lesson 2: (1-90 minute class)

- Review right triangles (specifically trigonometry & the Pythagorean Theorem). Hint that a right triangle is created in the center of the pyramid and these concepts should be used in determining the height of the pole/pyramid as well as the slant height measurement of the pyramid.
- Students will use clinometers and meter sticks to obtain the measurements they need to calculate the volume, surface area, and lateral area of the pyramid.

Lesson 3: (1-90 minute class)

- Groups will gather to organize their data and make calculations with their measurements.
- Groups will also research and select a real-world global pyramid and present their calculations of our constructed pyramid in comparison to the real-world pyramid of their choice.

Grading Rubric

Category	Possible Points	Earned Points
Day 1		
Correct V, SA, LA formulas	5	
Appropriate tools listed	5	
Day 2		
Correct measurements in right triangle	4	
Appropriate Height Calculation	10	
Appropriate Hypotenuse/Slant Height Calculation	10	
Correct measurements in triangular base	4	
Appropriate perimeter of base calculation	10	
Appropriate area of base calculation	10	
Day 3		
Correct V, SA, LA calculations	30	
Selection of real-world global pyramid	2	
Presentation & organization of calculated data. (product)	5	
Presentation of research & 5 facts. (product)	5	
TOTAL	100	