

GEOMETRY

“Right Triangles, Trigonometry & Other Key Elements”

UNIT PROJECT

OBJECTIVE: Identify perfect squares, formulas involving quadratic equations including the quadratic formula and the Pythagorean Theorem, and apply right triangle theory and trigonometry to real situations.

This project is broken up into four modules that will need to be completed in and out of class. Two of the four modules will require you to use other students to help in your measurements while the other two modules will require just you! Through these four modules, you will experience the skills needed to be successful with using right triangle theory and trigonometry. *The project due date shall be the day before the unit exam (unless weather hampers our class time outside)!*

MODULE ONE-Perfect Squares, Pythagorean Theorem, and the Quadratic Formula (10 Points)

You are to memorize the first twenty perfect squares so you can recite them without notes or any help in 30 seconds or less. You will then need to recite the Pythagorean Theorem given a right triangle with legs of **a** and **b** and a hypotenuse of **c**. The quadratic formula will then need to be recited given $ax^2 + bx + c = 0$. Students may be asked at any time to perform their skills mastered.

SCORING

8 points-recitation of the first 20 perfect squares with no errors in time

1 point-recitation of the Pythagorean Theorem

1 point-recitation of the Quadratic Formula

MODULE TWO-Proving the Geometric Mean and the Pythagorean Theorem (15 Points)

Person A and Person B are standing on a flat surface near a flagpole with Base C. The top of the flagpole is given by Point D. The flagpole is perpendicular with the ground. Person A and Person B are standing such that the intersection of their angles of elevation to the top of the flagpole (Point D) is a combined right angle. You are given the following measurements in feet:

\overline{AC} (distance Person A is from the base of the flagpole (Point C): _____ (record the number I give you)

\overline{BC} (distance Person B is from the base of the flagpole (Point C): _____ (record the number I give you)

Draw and label a picture showing the given situation below.

Use the **geometric mean** to calculate the following distances in simplest radical form! (SHOW YOUR WORK!)

\overline{DC} (height of the flagpole)	\overline{AD} (distance from Person A to the top)	\overline{BD} (distance from Person B to the top)

Now use the **Pythagorean Theorem** to verify that each triangle is indeed a right triangle! (SHOW YOUR WORK!)

ΔACD	ΔBCD	ΔADB

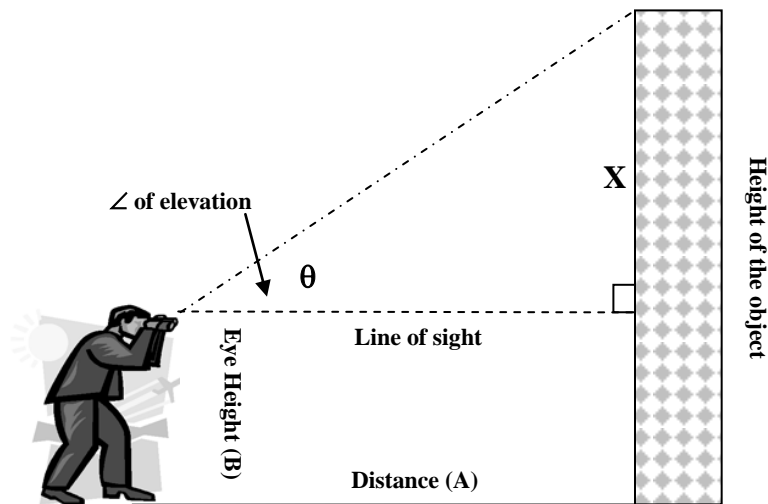
SCORING

- 3 points-correct drawing with labels of the given situation
- 2 point each (6 points total)-correct geometric mean with work in simplest form
- 2 points each (6 points total)-correct Pythagorean Theorem for each triangle

MODULE THREE-Using Trigonometry to Find Unknown Heights (10 Points)

Materials Needed: Clinometer (or other device), tape measure, calculator (or trig. tables), pencil

- #1 Stand a given whole number distance (in feet) from the object to be measured. The distance from you to the object to be measured should be level. RECORD THIS DISTANCE ON THE DIAGRAM BY **A**.
- #2 Have somebody measure the distance from the ground to your line of sight (eye height). Convert this distance to a decimal in feet to the nearest hundredth. RECORD THIS DISTANCE ON THE DIAGRAM BY **B**.
- #3 Using the clinometer (or other device), measure the angle from the your line of sight to the top of the object to be measured (angle of elevation). RECORD THIS ANGLE ON THE DIAGRAM AS θ .
- #4 Solve for X in the right triangle. RECORD THIS DISTANCE ON THE DIAGRAM BY **X**.
- #5 Add the length of X and B together. This is the height of the object. RECORD THIS HEIGHT IN THE BLANK!



OBJECT HEIGHT = _____ feet

Students I worked with on Module 3 included: _____

SCORING

5 points-all elements labeled and found in the diagram (1 point for each item found)

5 points-correct building height (1 point deducted for every 2 feet in error)

MODULE FOUR-Using an Angle of Elevation to Predict the Time of Day (15 Points)

Materials Needed: Protractor, shadow, sunset & sunrise times, calculator (or trig. tables), pencil

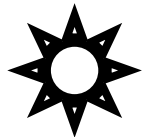
#1 Find the angle of elevation of the sun using any object's height and the length of the shadow the object is casting. You will not need to look into the sun for this and please don't! Draw a picture showing your measurements. Show your work as to how you found your angle of elevation.

What was the date and the exact time of the measurements taken? _____ on _____

#2 The sunrise time is _____. The sunset time is _____. (Use the Old Farmer's Almanac Web Page)
<http://www.almanac.com/sun/rise/zipcode/68310/>

#3 Determine the time of day by using the sunrise and sunset times and your angle of elevation. **SHOW YOUR WORK!!!**

#4 Using this information, develop a **formula** to approximate the time of day.



Students I worked with on Module 4 included: _____

SCORING

6 points-correct drawing (2 points) with labels of the measurements found (2 points) and correct angle of elevation with work (2 points)

3 points-approximate time of day found with appropriate calculations

3 points-correct method of finding the approximate time of day using simple trigonometry