

LessonTitle: Right Triangle Ratios (Trig)		Geo 8.3a
Utah State Core Standard and Indicators Geometry Standards 3-4 Process Standards 1-4		
Summary		
In this lesson, students use Geometer's Sketchpad to explore the patterns in trigonometric ratios and examine the ratios in similar triangles. A trig ratio recording sheet is provided below. A surveying lab is also included. In this lab, students create a hypsometer and use it to measure heights of buildings which would be difficult to measure otherwise.		
Enduring Understanding	Essential Questions	
Trigonometry is using the relationships between the sides and the angles of triangles to solve problems.	What is trigonometry? How does it help us?	
Skill Focus	Vocabulary Focus	
<ul style="list-style-type: none"> • Trig ratios • Using sine, cosine, and tangent to find missing measurements. 		
Assessment		
Materials		
Launch		
Explore		
<ul style="list-style-type: none"> • Is there a relationship among angle sizes and ratios of sides of a right triangle? What might they be? How could we describe them? • What are we talking about when we use the terms sine, cosine and tangent? • How can we use sine, cosine and tangent to solve problems? • What is the difference between an angle of elevation and an angle of depression? <p>"I love these sketchpad activities because once the students know how to use them they can just go and work in groups to complete the sketchpad assignments. This was a great lead into trig functions. I had them do this activity first and then taught the trig stuff. The students don't love these computer activities which is strange. I think they feel lost without being spoonfed the instructions and I usually make they figure it out by working together. I don't give a lot of hints- I just make sure everyone is on task."</p>		
Summarize		
Apply		

Directions: Please access the following activities from Exploring Geometry with Geometer's Sketchpad. They will give students valuable experience with the underlying concepts of similarity. They should be interchanged to achieve the maximum value.

- Trigonometric Ratios, pages 195-196,
- Modeling a Ladder Problem, pages 197-198

You might extend or insert the creation of the table of trig ratios (see below) within the trig ratios activity on pages 195-196. Have the students create a table for sine, cosine, and tangent, recording the ratios for every 5 degree change in angle measurement. It is good for students to realize that early mathematicians used trig tables instead of calculators. Then look at the patterns.

After students have worked through the understandings involved in trigonometric ratios, they should turn to textbooks or worksheets for practice solving problems involving the trig ratios

The surveying activity found below could be used as a follow-up or as an assessment.

Trigonometric Tables

Early mathematicians created trigonometric tables to help them solve problems involving trig ratios.

Use the right triangle you created in the trig ratio activity to find the ratios below.

Angle measure	Sine	Cosine	Tangent
10°			
20°			
30°			
40°			
50°			
60°			
70°			
80°			
90°			

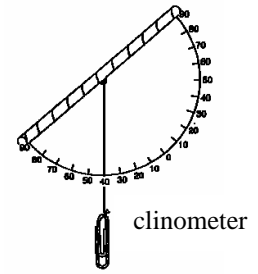
1) What patterns do you observe?

2) Look closely at the ratios you found for the complementary angles. What is the relationship between these values?

Explain why you think these relationships exist.

SURVEYING - A trig lab activity

Method: A device (hypometer) for measuring angles will be necessary for this activity. You will construct your own. The device is designed to measure angles as a means to compute the height of various objects in the school area. After you have collected your data trigonometric ratios, identities and laws will be used to calculate accurate heights for chosen objects.



Materials: You will need a meter stick or tape measure, a protractor, string, weight, straw, tape, and calculator.

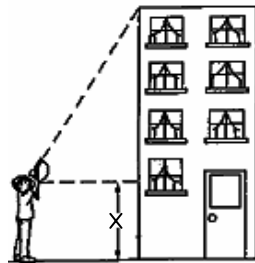
Report format: Your summary will consist of the following items in order:

- A. A table showing the measurements you made (all metric) and an illustration of the problem situation.
- B. The equations you used to calculate the desired heights.
- C. A scale drawing for each of the objects you measured. (use graph paper)
- D. A discussion of the possible sources of error in your calculations.

OBJECTS TO MEASURE:

- A. The flagpole in front of the school.
- B. A light pole
- C. The height of the building as measured near the front door
- D. The height of the basketball hoop in the gym.

ILLUSTRATION:



NOTE: Before you begin you would be wise to test your technique on the height of the classroom to see if your method is accurate.

GRADING SHEET

Name _____

On time	0					5
Complete	0	2	4	6	8	10
Scale drawings	0	1	2	3	4	5
Neatness	0	1	2	3	4	5
Accuracy	0	1	2	3	4	5

TOTAL: _____

Summary of heights:

Flagpole	_____
Building	_____
Light pole	_____
Basketball hoop	_____