Lesson Plan

Header:
Name:
Unit Title: Right Triangle Trig without the Unit Circle (Unit in 0078608627)
Lesson title: Solving Right Triangles
Duration of Lesson: 90 min.
Date:
Day Number:
Grade Level: 11th/12th

State Standards Addressed:

South Carolina Standard	Objectives/ Learning Goals
I.A.3 Know the definition of sine and cosine functions based on a right triangle and on a unit circle as a wrapping function.	Students will be able to define sine and cosine functions based on a right triangle
I.A.4 Evaluate all six trigonometric functions using the right triangle and wrapping function definitions.	Students will be able to solve for missing sides of a right triangle using the Pythagorean Theorem. Students will be able to determine all six trigonometric values of an angle, given the lengths of the sides of a right triangle.

Rationale/Goals of the Lesson

The purpose of this lesson is to introduce students to right triangle trigonometry without using the unit circle. Students have been using the unit circle to study trigonometry so far. They are also familiar with special right triangles (45-45-90 and 30-60-90) and some angle vocabulary. Today, they will use the Pythagorean Thm to find missing sides of right triangles and then use those side lengths to determine the 6 trigonometric ratios.

Materials Needed for the Lesson

Overhead and transparencies OR Promethean board, graphing calculators, handouts for each student, pencils, paper

How will problem solving be incorporated into the lesson?

Students will be finding the six trig ratios for several right triangles. However, before they are able to do so, they must determine the lengths of missing sides. In a later portion of this unit, students will use right triangle trigonometry to solve right triangles in applied problems.

How will the material in this lesson be connected to previously learned material and how does this lesson pave the way for future lessons?

Students have been learning about the unit circle (its parts, angles in degrees/radians, coordinates of points using x and y – not sin and cos) and angles (standard position, initial and terminal rays, co-terminal angles). Today students will learn about trig ratios using the right triangle. The trig relationships pertaining to the right triangle will help prepare students to learn the trig identities.

How will appropriate technology be incorporated into your instruction?

Throughout the lesson and homework time, the students will be allowed to use their calculators to check their algebraic calculations. The overhead projector/Promethean board will be used so all students can easily see the notes/examples.

Accommodations

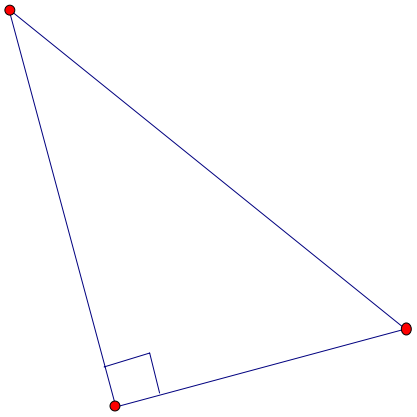
Depending on the disability, the student will be accommodated accordingly. Each point of instruction will be given both verbally and in writing. All students will have the opportunity to practice examples while the guidance of myself and my mentor teacher is available.

Instructional Procedure:

- Anticipatory Set/Set Induction:
  - Homework Review (10-15 min)
  - Quick warm-up (10-15 min including going over problems)

Warm-Up

1. On the following right triangle, label the: hypotenuse
   short leg
   long leg
   the right angle
   the vertices



State the <u>reciprocals</u> of the following:

2. $\frac{7}{8}$ 3. $\frac{a}{b}$ 4. $\frac{4}{3}$ 5. $\frac{opposite}{hypotenuse}$

$\frac{8}{7}$ $\frac{b}{a}$ $\frac{3}{4}$ $\frac{hypotenuse}{opposite}$

Evaluate and leave the answer in <u>exact</u> form:

3. $\frac{3}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{3\sqrt{2}}{2}$

Instructional Outline: (40 min)

Right Triangle Trigonometry

1. Pythagorean Theorem

a) $x^2 + y^2 = r^2$, where x and y are coordinates of a point on a circle and r is the radius of the circle.

Notes:

b) $a^2 + b^2 = c^2$, where a and b are legs and c is the hypotenuse of a right triangle, therefore:

c) $leg^2 + leg^2 = hypotenuse^2$

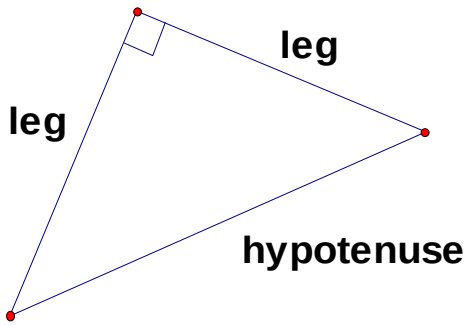
d) Example: Find the hypotenuse of a right triangle with legs measuring 6 inches and 8 inches.

$(6)^2 + (8)^2 = hypotenuse^2$

$36 + 64 = hypotenuse^2$

$100 = hypotenuse^2$

$10 = hypotenuse$



2. Angle Names

a) θ (Theta)

b) α (Alpha)

c) β (Beta)

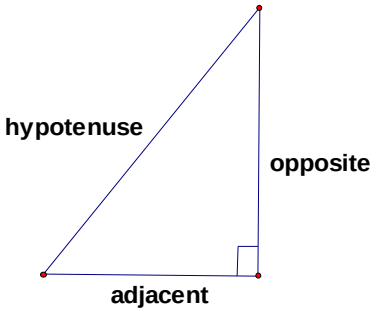
d) Just like x, y, and z are symbols used to represent variables, θ , α , and β are symbols used to represent angles.

e) These symbols come from the Greek alphabet

3. **Trig Ratios** (according to the placement of the acute angle θ)

a) **Basic:** Shorthand:

- sine θ = $\frac{\text{opposite}}{\text{hypotenuse}}$ $\sin\theta$
- cosine θ = $\frac{\text{adjacent}}{\text{hypotenuse}}$ $\cos\theta$
- tangent θ = $\frac{\text{opposite}}{\text{adjacent}}$ $\tan\theta$



b) **Reciprocals:** Shorthand:

- cosecant θ = $\frac{\text{hypotenuse}}{\text{opposite}}$ $\csc\theta$
- secant θ = $\frac{\text{hypotenuse}}{\text{adjacent}}$ $\sec\theta$
- cotangent θ = $\frac{\text{adjacent}}{\text{opposite}}$ $\cot\theta$

4. Note: When finding trigonometric ratios, you should always rationalize the denominator (rewrite so that there is not a radical in the denominator).

5. Using a Calculator to Find Trigonometric Ratios

a) sin(88°)= b) cos(4.2)= c) tan(108°)=

d) csc(.7π)= e) sec(46°)= d) cot(3.9)=

TABLE 1 Values of the trigonometric ratios for special angles

θ in degrees	θ in radians	$\sin\theta$	$\cos\theta$	$\tan\theta$	$\csc\theta$	$\sec\theta$	$\cot\theta$
30°	$\frac{\pi}{6}$	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{3}}{3}$	2	$\frac{2\sqrt{3}}{3}$	$\sqrt{3}$
45°	$\frac{\pi}{4}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{2}}{2}$	1	$\sqrt{2}$	$\sqrt{2}$	1
60°	$\frac{\pi}{3}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$\sqrt{3}$	$\frac{2\sqrt{3}}{3}$	2	$\frac{\sqrt{3}}{3}$

Did you know? Trigonometry is used in fields such as video game design, astronomy, navigation, and map-making to name a few. Map-makers use trig to help minimize distortions of distance in flat maps.

Examples and Non-Examples:

- See RightTriangleTrigChart

Review/Closure (20 min)

- Review important points in the lesson/Answer any questions that remain.
- Do Trigonometry Crossword/Finish Right Triangle Trig Chart in pairs. Hand in crossword. Take Right Triangle Trig chart home to help with homework.
- Assign homework.

Homework: pp. 489 # 1 – 13 odd, 17, 29-32 all in 053438541

Procedural and Higher Order Questions:

1. If there is a missing side length on a right triangle, what would you use to find the missing length? - Pythagorean Thm
2. What is the relationship between cosine and secant? - They are reciprocals

Evaluation/Assessment of Student Learning

Throughout the lesson, I will be asking the students questions and listening to their feedback. If I see very puzzled looks when I explain a concept, I will try to explain it in a different way that may make more sense. While students are working on the assignment, I will move around the room watching them work and answering questions. Students will turn in the crossword today and the trig. Chart during the next class for a classwork grade. I can use this information as a formative assessment. This section will also be on the next quiz and on the unit test.

Self Assessment and Revision:

During the course of the lesson, I will need to pay attention to the clock and to my students to see if I am giving them too much information at once. I will also take notes on the lesson after I give it and answer the following questions:
What went well and why?

What didn't go so well and why?

If I were to re-teach this lesson, this is how I would change it.