

UDL Lesson Plan Template

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 Learning Domain: Geometry Grade: 10-12

UDL Applications Key: **Representation** **Engagement** **Expression**

Lesson Objective/s: The student will: 1. verify experimentally the properties of dilation of line segments and angles within triangles; 2. explain when dilating triangles the corresponding angles are equal while the corresponding sides are proportional; 3. prove that the interior angles of a triangle have the sum of 180 degrees; 4. use complementary angles to solve for unknown angle measurements in right triangles; 5. apply the Pythagorean Theorem to find lengths of sides of triangles; 6. apply Trigonometric Ratios (sin, cosine, & tangent) to find angle measurements and lengths of sides of a triangle; 7. simplify radicals to lowest terms; 8. solve real world problems using congruence and similarity criteria for triangles; and 9. use technology and various computer programs to demonstrate knowledge and understanding of mathematical concepts.

Pre-planning Activities : 1. Locate ramps, porches, and landings near school; 2. Prepare Measuring Packet which includes meter stick, tape measure, whiteboard protractor, tape, & envelope which includes cards with A, B, C (for angles) & a, b, c (for sides), legs (2), hypotenuse, opposite, & adjacent; 3. Locate extra ramp for Alternate Assessment; 4. Gather Scientific Calculators; 5. Locate computers with SketchUp downloaded; 6. Locate Resources: Nasco's Trigonometry Joke Worksheets by Christine A. Koers, BS, MS and Holt Geometry Book; 7. Locate popsicle sticks, cardboard, glue, and tape; and 8. Prepare Pre/Post Test & Quiz

Assessment/s: Pre Test, Vocabulary with Technology (Blabberize), Ramp Measurement Activities, Book Work, Worksheet Puzzles, Quiz, Alternate Assessment (Ramp Measurement), Final Ramp Project (Sketchup or Popsicle Sticks), & Post Test

Lesson Element	Procedures	Time	What is the teacher doing?	What are the students doing?	Materials
	State Standards Correlation: M.2HS.STP 1, 2, 3, 5, 8, 10, 11, & 12				

Lesson Setup & Lesson Opening	Teacher begins Ramp Unit by saying, “We are going to begin our next unit which is the Ramp Unit. This unit will take several days to complete. In this unit you, the student, just become employed as a Safety Manager for a company whose job is to inspect ramps to see if the ramps meet ADA requirements and also, to fix ramps that do not meet these requirements. You have no experience in this job area so you will have to go through a training course to learn all aspects of the job. Then, you will have to complete a job assignment. You, as the new employee, need to work hard in the training session so that you can perform your job to remain employed with this company. Each day you will learn new aspects of how to perform your job. Do your best. Let’s see who gets to remain employed as a Safety Manager with the company!”	5 min	Inspiring the students with the opening speech and discussion	Listening and discussing	Opening Ramp Unit Speech
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Lesson Body	Teacher Input “Welcome to your first training module, Module #1-(Vocabulary) . You will need to Google the following terms to find three facts about each term. You may also use the Holt Geometry book as a resource. You will then use the computer website Blabberize , to share the three facts about one term of your choice. The terms are: Pythagorean Theorem, Pythagorean Triples, Similar Triangles, Transformations, Dilations, Right Triangles, Special Right Triangles, ADA-Ramp Construction Requirements, and Scale Factor.” Display the terms and show the video about Blabberize from	Module 1: 90 - 135 min.	All Modules: Present directions, Demonstrate with examples,	All Modules: Listening to instructions, Asking questions, Participating in note taking	Module1: List of terms, Computers, (Students will need to complete log
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	<p>www.blabberize.com.</p> <p>“For Module 2-(Measuring Ramps), you will be divided into groups. Each group will pick up their Measuring Packet. All the tools needed to measure are in this packet. Employees will need to label the ramp parts with the indicated cards, measure the legs using tape measure in inches, and measure the other two angles in the right triangle with the protractor. We as a whole group will do one ramp as an example using volunteers.” The boss (teacher) will label parts of the ramp with employee assistance to model what needs to be done for the other ramps. “Employees will now need to get with their group, label, and measure the parts of the ramp. Record your results. Each group will rotate to each of the four remaining ramps.” After this is completed, small groups will come back to one large group. Each employee will be given an index card and scissors. “Each of you will need to draw a large right triangle on your card and cut it out. Now, tear the two angles off that are not the right angle. Can these angles be placed together to make a straight line/angle? How many degrees are in a straight line/angle? So, we have now proved that the angles of a triangle add to be 180 degrees. In a right triangle, what will be the measures of the angles? Yes, one will be 90. What will the other two add to be? Yes, they will add to be 90, so these angles that add to be 90 are what type of angles? Yes, they are Complementary Angles. Now, review your data for each ramp to make sure that the angles add to be 90 degrees.”</p> <p>“Now we are ready to complete Module 3-(Applying the Pythagorean Theorem to Find Lengths of Sides of Triangles). What is the Pythagorean Theorem? Yes, that is correct.” Display the Pythagorean Theorem on the board. Do examples with employees. Boss will model and self-talk how to complete examples. “Now, you will find the length of your ramp according to your measurements.”</p> <p>“Module 4-(ADA Ramp Requirements) will be completed next. In Module 1, what did you find the ADA requirements to be? Yes, the maximum slope is 1:12, the maximum height is 30 inches, and the minimum width is 36 inches.” Display these on the board. “One divided by 12 gives us .083. So, we must conclude that a ramp will not meet ADA slope requirements if the slope is not smaller than .083. Employees now need to check the slope requirement of your ramps to see if ADA requirements are met.” Boss will display b/a. This is the rise over run. “Employees also need to check to see if the ramp meets the height and width requirements. Record your results and tell if requirements are met or not. Support your decision.”</p> <p>“We are now ready to complete Module 5-(Applying Trigonometric Ratios to Find Lengths of Sides and Angle Measures of a Triangle).” Display the basic trig ratios of sin, cosine, and tangent on the board. Boss will demonstrate how to label the parts of the triangle. Label and explain where the hypotenuse will always be. Show how to find the opposite side and then label the adjacent side. Do added examples with the employee’s assistance. Boss will demonstrate examples of how to use the sin, cosine, and tangent ratios to find side lengths and angle measures. Leave answers in</p>	<p>Module 2: 90 min.</p> <p>Module 3: 30 min.</p> <p>Module 4: 30 min.</p> <p>Module 5: 235 min.</p>	<p>Lead discussion, Provide guided practice, Circulate around work site, Monitor if students need help, Provide small group or individual reteach instruction as needed</p>	<p>and guided practice by writing and calculating, Discussing with peers, Complete given tasks</p> <p>Module 2: Labeling ramp parts, Measuring, Recording, Sketching, Cutting, Manipulating pieces of triangle</p> <p>Module 3: Calculating</p> <p>Module 4: Calculating</p> <p>Module 5: Calculating</p>	<p>in information for Blabberize to save their work), Microphones, Geometry book</p> <p>Module 2: Envelope of cards, Tape measurers, Protractors, Ramps, Index cards, Scissors</p> <p>Module 3: Module 2’s data, Calculators</p> <p>Module 4: Module 2’s data, Calculators</p> <p>Module 5: Holt Geometry book, Joke Worksheets p. 12 & 13</p>
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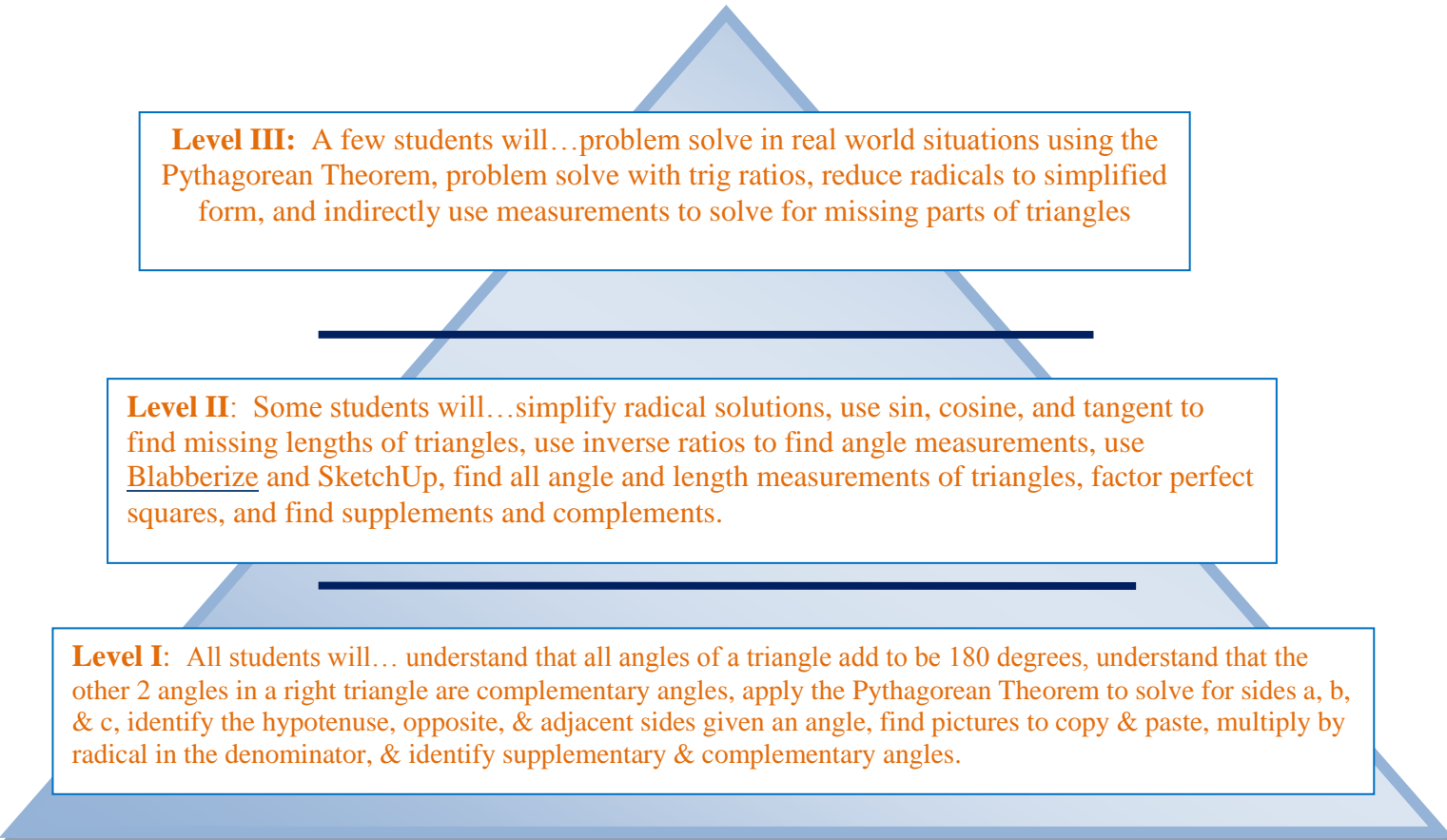
	<p>simplest radical form. “Are there any questions? Employees will now need to complete three assignments. These are pages 12 & 13- Joke Worksheet, pages 529 & 530 #3-43 in the Holt Geometry Book, and pages 16 & 17 –Joke Worksheet. After these assignments are done, each employee will complete a Trigonometric Ratio Quiz.”</p> <p>“Great work! You have made it to your final module. This is Module 6-(The Ramp Project). In this module, you will have a choice of how you want to demonstrate the skills that you have learned. You may either use the computer program, SketchUp, popsicle sticks, or cardboard to build a scale model of a ramp that meets ADA Ramp Requirements for a porch.” Boss will demonstrate and show students how to use Sketch Up. Employees will now make their choice of what to use to build their scale model. Put out all supplies. “All supplies are on the table for you to use or you may get out a computer. When this module is complete, you will take your Final Test. You may begin your project.”</p> <p>“For the Final Test, you have an option to demonstrate your knowledge with a paper test or by actually measuring a ramp and answering questions. It is your option.” Give the Final Test.</p> <p>Guided Practice This is listed within the Lesson Body. What the teacher says is in quotes and teacher actions are given in statements.</p> <p>*Also included in Module 2, but not scripted, was proving triangles have an interior angle sum of 180° through the manipulation of a square with a diagonal drawn, using the square’s parallel lines, recognizing alternate interior angle and reflective sides, triangle transformation of cutting the square into two congruent triangles, and concluding one triangle is half of the square’s interior sum of 360°.</p> <p>*Also included in Module 3, but not scripted, was Pythagorean Triples.</p> <p>*Also included between Module 4 and 5, but not scripted, was the properties of dilation of a line segment is longer or shorter in ratio given by the scale factor. Dilations of a triangle have pairs of corresponding angles equal and corresponding pair of sides are proportional.</p> <p>*Also included in Module 5, but not scripted, was an explanation of the relationship of the sine and the cosine of complementary angles.</p>	<p>Module 6: 90-135 min.</p>		<p>Module 6: Constructing ramp</p>	<p>and p.15 & 16, Trigonometric Ratio Quiz, scientific calculators</p> <p>Module 6: Computers with SketchUp downloads, Popsicle sticks, Glue, Cardboard, Tape, Final Test, Scientific Calculator</p>
<p>Extended Practice</p>	<p>Activity 1: Create a ramp that requires two levels.</p>	<p>Activity 1: 135</p>	<p>Same as all modules</p>	<p>Activity 1: Constructing, Calculating</p>	<p>Computers with SketchUp</p>

	<p>Activity 2: As a whole group, measure all the ramps for accuracy as an inspection-just the height and the hypotenuse. Have employees to calculate acute angles and base leg. Calculate the percent of accuracy with their measurements.</p> <p>Activity 3: Compute the cost to build ramps from the above modules or activity. Compute interest on loans using different rates from local banks.</p> <p>Activity 4: Bring in guest speakers; construction workers, inspectors, loan officers. If possible, video-chat with guest speakers while they are at work so they can give tour of their work site.</p> <p>*Another way to extend this activity would be to work with the Building Construction Class to make small models of ramps, possibly make a training video, or using slope while building roofs.</p>	<p>min.</p> <p>Activity 2: 90 min.</p> <p>Activity 3: 90 min.</p> <p>Activity 4: 30 min. per guest</p>		<p>Activity 2: Measuring, Calculating</p> <p>Activity 3: Calculating, Researching cost of materials</p> <p>Activity 4: Listening, Viewing, and Discussing</p>	<p>downloads, Popsicle sticks, Glue, Cardboard, Tape, Final Test, Scientific Calculator</p> <p>Activity 2: Tape measurers, Calculators</p> <p>Activity 3: Calculators, Interest rates from local banks, Computers</p> <p>Activity 4: Smart phone or computer with video-chat capabilities, Projector, Guests</p>
Lesson Closing	<p>“This completes the Ramp Unit. All the scores from your modules and the Final Test will be averaged to see if you will remain a Safety Supervisor for this company.”</p>	<p>1 min.</p>		<p>Listening</p>	<p>Ramp Unit Closure Statement</p>

Possible Learner Barriers:	Possible Solutions
Measuring angles with a protractor.	<ul style="list-style-type: none"> -Direct Instruction/Pre-teach: Practice with 3-D angles in class. Choose 5 angles. -Use mathplayground.com-Align Angles or Measuring Angles. -Use bbc.co.uk/bitesize website for measuring angles and side lengths. -Use an Angle Level which is a small tool that can be found at a hardware store.
Measuring in inches with a tape measure.	<ul style="list-style-type: none"> -Direct Instruction/Pre-teach: Students will measure objects in the classroom and also lines on the board. -Use Digital Tapes that use an infrared beam.
Reading geometric symbols for line segments and angles.	<ul style="list-style-type: none"> -Direct Instruction/Pre-teach: Practice with 5 questions on the board. -Use the Math Symbols Poster located in the classroom.
The internet could not be working a day that it was needed.	<ul style="list-style-type: none"> -Use textbooks. -Use cellphones.

Possible UDL Applications for Extension	
Representation	<ul style="list-style-type: none"> -Present visually on the ramp with cards taped to it. -Present directions orally. -Use both auditory and visual aids in direct instruction. -For movement, went outside to measure ramps.

Engagement	<ul style="list-style-type: none">-Peer Groups-Students will be grouped so that all individual student strengths could be utilized.-Hands-on activity-using ramps and tools to measure with.-Use of technology to demonstrate knowledge.-Relating unit to real world employment.-Relating unit to real life situation such as building ramps for a handicapped family member.
Expression	<ul style="list-style-type: none">-Joke Worksheets so students can have immediate feedback to see if doing problems correctly.-Physically measuring ramps and labeling parts.-Computer programs-<u>Blabberize</u> and SketchUp.-Tactile-3D model out of popsicle sticks or cardboard.-Traditional-paper/pencil test



Level III: A few students will...problem solve in real world situations using the Pythagorean Theorem, problem solve with trig ratios, reduce radicals to simplified form, and indirectly use measurements to solve for missing parts of triangles

Level II: Some students will...simplify radical solutions, use sin, cosine, and tangent to find missing lengths of triangles, use inverse ratios to find angle measurements, use Blabberize and SketchUp, find all angle and length measurements of triangles, factor perfect squares, and find supplements and complements.

Level I: All students will... understand that all angles of a triangle add to be 180 degrees, understand that the other 2 angles in a right triangle are complementary angles, apply the Pythagorean Theorem to solve for sides a, b, & c, identify the hypotenuse, opposite, & adjacent sides given an angle, find pictures to copy & paste, multiply by radical in the denominator, & identify supplementary & complementary angles.