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Spring 5-8-2020

### Remote Learning Assignment

Ryan Schneider

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## **Remote Instruction to Support the Learning of Trigonometry**

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EDI 575: Mathematics- Practicum Inclusive Adolescence Education  
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May 5<sup>th</sup>, 2020

### **Abstract**

The Remote Learning Lesson Plans were designed to continue learning during the COVID-19 Pandemic that plagued our country during Spring 2020. New York State (NYS) was under a state of emergency where an order to “Stay at Home” was put into action. As such, the school campuses were shut down and all instruction and learning moved to online. To support this continued learning, these lessons were designed to be primarily taught through an online platform NearPod. Additionally, we use a subscription to MathBits and personally created materials to support learning throughout all units. To support learning during the lessons, there are accompanied videos, notes, audio recordings, engaging activities, and assessments (both formal and informal). The assessments were created and designed to mirror the learning objectives for the lessons taught in this unit. The unit of study is Trigonometry. The topics studied include the Pythagorean Theorem, Trigonometric Ratios, Special Right Triangles, Angle of Elevation/Depression, Co-Functions, Law of Sines/Cosines, and the Area of Triangle. Since the class is a college prep course for graduating seniors that plan to attend college, the units are developed to deepen understanding. Most of this material was taught in their Geometry classes, but many students need a reminder of processes, theorems, and vocabulary to develop schematic memory. Although they are not required to pass an accompanied Regents exam, we still base our teachings off of NYS Next Generation Learning Standards. The lessons are intended to be covered over the span of 10 hours of engagement.

*Keywords:* Trigonometry, online learning, lessons, assessments

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## TASK 1: CONTEXT FOR LEARNING INFORMATION

Respond to the prompts below (no more than 4 single-spaced pages, including prompts) by typing your responses within the brackets following each prompt. Do not delete or alter the prompts. Pages exceeding the maximum will not be scored.

### About the School Where You Are Teaching

1. In what type of school do you teach? (Type an “X” next to the appropriate description; if “other” applies, provide a brief description.)

Middle school: \_\_\_\_\_

High school:  X \_\_\_\_\_

Other (please describe): \_\_\_\_\_

2. Where is the school where you are teaching located? (Type an “X” next to the appropriate description.)<sup>1</sup>

City: \_\_\_\_\_

Suburb: \_\_\_\_\_

Town:  X \_\_\_\_\_

Rural: \_\_\_\_\_

3. List any special features of your school or classroom setting (e.g., charter, co-teaching, themed magnet, remedial course, honors course) that will affect your teaching in this learning segment.

[ The district that I’m placed in is a K-12 school system consisting of three elementary schools (grades pre-k-1, 2-3, 4-5), one middle school (grades 6-8), and one high school (grades 9-12). The district consists of 3,246 students- 50.8% are male (1,649) and 49.2% are female (1,597). Of these 3,246 students, 81.6% are White (2,648), 8.4% are Hispanic or Latino (274), 4.8% are Multi-Racial (156), 3.6% are Black or African-American (117), and 1.4% are Asian or Native Hawaiian/Other Pacific Islander (44). Class sizes average between 19 and 26 students. With over 233 classroom teachers, the ratio of students to teachers is roughly 14:1 district-wide. The school that I am placed in consists of grades 9-12. In the high school, there are 1,082 students. Of those students, 51.7% are male (559) and 48.3% are female (523). Furthermore, of those 1,078 students, 83.1% are White (899), 7.4% are Hispanic or Latino (80), 4.5% are Black or African American (49), 3.5% are Multi-Racial (38), and 1.2% are Asian or Native Hawaiian/Other Pacific Islander (13). With over 82 classroom teachers, the ratio of students to teachers is roughly 13:1 school-wide.]

4. Describe any district, school, or cooperating teacher requirements or expectations that might affect your planning or delivery of instruction, such as required curricula, pacing plan, use of specific instructional strategies, or standardized tests.

[ Students in this district are intended to meet the NYS Common Core Standards of mathematic understanding and the accompanied NYS tests, meeting the levels of requirement for high school students, and challenging to meet the requirements of college level AP courses. For this course, there is no accompanied NYS test. Rather, the teacher decides a cumulative final of the units to their discretion (project, test, etc.). The school has student laptops given to them that

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<sup>1</sup> If you need guidance when making a selection, reference the NCES locale category definitions (<https://nces.ed.gov/surveys/ruraled/definitions.asp>) or consult with your placement school administrator.

they are encouraged to use in classes. In this class, no paper copies of any notes are distributed, but anything graded is distributed in paper form. The notes work as an organizer so that students can constantly refer to the same text to answer questions, rather than referring to different sections in a textbook in order to answer said questions. The teacher works through the designated notes, problems, and activities- giving students the chance to work both independent and cooperatively while sharing answers to the class. For every Unit Test, the students are allowed and encouraged to do test corrections where they have to do the following for each test: give every correct answer for questions they did not receive full credit for, have them explain either their mistakes or why the correct answer is actually correct, and they need to also pass the re-test before they can receive a third of the points back that they missed. If they fail the retest, they will receive a quarter of their points back. The corrections must be on a separate sheet of paper and must be done in either advisement or after school- the students may not take the tests home for any reason. The students are directed to strictly follow the Code of Conduct. If students don't comply, the administration is instructed to be involved and determines the punishment. All students are given access and encouraged to use resources such as calculators, compasses, straight edges, online programs, and other helpful resources. The students respond well to when they make personal connections to the material. This class is a refresher course of a lot of math units that they previously studied. So instead of having to teach them new concepts, we are more revisiting and giving them examples to further their retention. Therefore, the notes are usually considerably basic and are accompanied with multiple examples and engaging activities. They also benefit from a constant routine where they know how each unit is put together. Therefore, I have created my lessons to be the same format and style as best as I can to create a sense of comfortability.]

## About the Class Featured in this Learning Segment

1. What is the name of this course?

[College Prep Math 4]

2. What is the length of the course? (Type an "X" next to the appropriate description; if "other" applies, provide a brief description.)

One semester: \_\_\_\_\_

One year: \_\_\_x\_\_\_

Other (please describe):

[ ]

3. What is the class schedule (e.g., 50 minutes every day, 90 minutes every other day)?

[75 minutes every other day, in a four-day block schedule.]

4. Is there any ability grouping or tracking in mathematics? If so, please describe how it affects your class.

[The only grouping for this class is that all students have passed the following classes: Algebra 1, Geometry, and Algebra 2 (and, if a part of the curriculum, the associated Regents tests). Most of the time, these classes are filled with members of the Senior class. ]

5. Identify any textbook or instructional program you primarily use for mathematics instruction. If a textbook, please provide the title, publisher, and date of publication.

[No textbook is used in this course. The notes are on their OneNote and a program for an online graphing calculator is used called the TI Nspire CX Premium Teaching Software. The math department also has a subscription to MathBits Notebook- an online resource for lesson plans, activities, and projects for mathematical subjects. Along with this, they also frequently use

Teacherspayteachers.com. They also are encouraged to share and use materials from other units that may overlap.]

6. List other resources (e.g., electronic whiteboard, graphing calculators, online resources) you use for mathematics instruction in this class.

[I use a SmartTouch interactive TV/whiteboard in the front of the room for classroom instruction, accompanied with a wireless keyboard. All the blank copies of the notes are on the OneNote and Schoology. No paper notes are provided, but the students can print them off if they desire to do so. In OneNote, the students have the option of looking at my side of the notebook- showing them the filled in notes that we used in class (which is very helpful if anyone misses class or needs to use the notes again). Accompanied with these online resources/electronics, they have access to a plethora of other resources. These include graphing calculators (TI-Nspire CX), straight-edges, compasses, white boards, chalk boards, various writing utensils, various arts and crafts materials for projects, individual whiteboards, and a square-value number line where she puts all the values of every number 1-20 squared and the students can refer to this at any time to use during class. ]

### **About the Students in the Class Featured in this Learning Segment**

1. Grade-level composition (e.g., all seventh grade; 2 sophomores and 30 juniors):

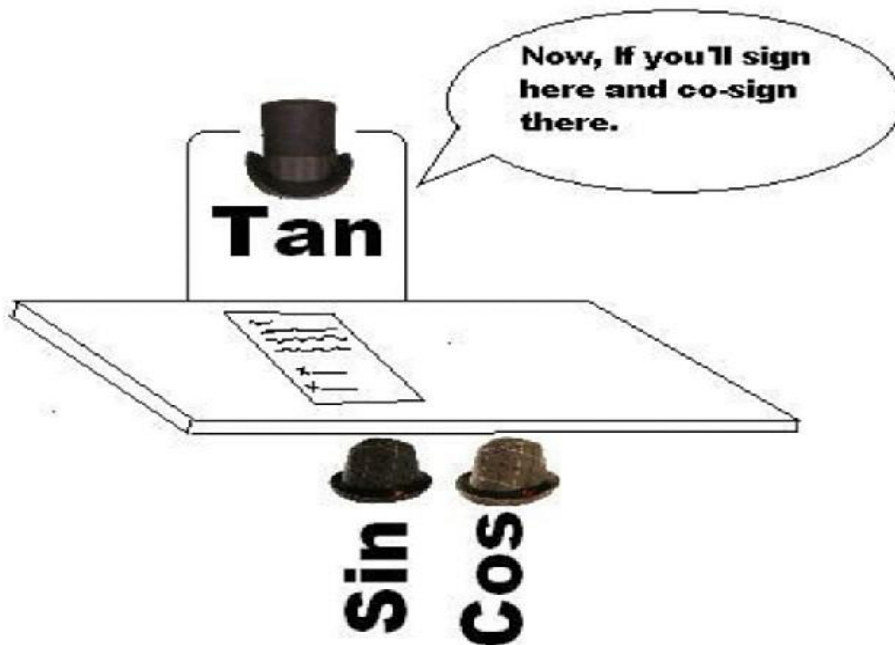
[15 seniors, 1 Junior]

2. Number of

- students in the class: 16
- males: 5 females: 11

# Trigonometry

Date	Topic
Week 1	Pythagorean Theorem, Sine, Cosine, and Tangent
	Special Right Triangles
Week 2	Angle of Elevation/Depression
	Geo-Caching
Week 3	Co-Functions
	Quiz
Week 4	Law of Sine/Cosine
	Area of Triangle
Week 5	Review (Choose Your Own Path)
	Unit Test





## Standards and Objectives

**Content Area/Subject and Grade:** College Prep

**Unit:** Trigonometry

- Lesson 1
  - Standards
    - **GEO-G.SRT8**- Use sine, cosine, tangent, the Pythagorean Theorem, and properties of special right triangles to solve right triangles in applied problems.
  - Learning Objectives- “Students will be able to...”
    - find missing sides of right triangles using the Pythagorean Theorem
    - find missing sides and angles of right triangles using trigonometric ratios
- Lesson 2
  - Standards
    - **GEO-G.SRT8**- Use sine, cosine, tangent, the Pythagorean Theorem, and properties of special right triangles to solve right triangles in applied problems.
  - Learning Objectives- “Students will be able to...”
    - Find the missing sides of a 30-60-90 right triangle using the appropriate reference triangle.
    - Find the missing sides of a 45-45-90 right triangle using the appropriate reference triangle.
- Lesson 3
  - Standards
    - **GEO-G.SRT8**- Use sine, cosine, tangent, the Pythagorean Theorem, and properties of special right triangles to solve right triangles in applied problems.
  - Learning Objectives- “Students will be able to...”
    - solve for unknown sides and/or angles of right triangles using angle of elevation and angle of depression.
- Lesson 4
  - Standards
    - **GEO-G.SRT8**- Use sine, cosine, tangent, the Pythagorean Theorem, and properties of special right triangles to solve right triangles in applied problems.
  - Learning Objectives- “Students will be able to...”
    - solve for unknown sides and/or angles of right triangles.
    - solve word problems that include angle of elevation/depression.
- Lesson 5
  - Standards
    - **GEO-G.SRT7**- Explain and use the relationship between the sine and cosine of complementary angles.
  - Learning Objectives- “Students will be able to...”
    - Identify the relationship between the two non-right angles in a right triangle.

## Remote Instruction to Support the Learning of Trigonometry

- Utilize the co-function identity to solve for angle measurements.
- Lesson 6
  - Standards
    - **GEO-G.SRT7**- Explain and use the relationship between the sine and cosine of complementary angles.
    - **GEO-G.SRT8**- Use sine, cosine, tangent, the Pythagorean Theorem, and properties of special right triangles to solve right triangles in applied problems.
  - Learning Objectives- “Students will be able to...”
    - find missing sides of right triangles using the Pythagorean Theorem
    - find missing sides and angles of right triangles using trigonometric ratios
    - Find the missing sides of a 30-60-90 right triangle using the appropriate reference triangle.
    - Find the missing sides of a 45-45-90 right triangle using the appropriate reference triangle.
    - solve for unknown sides and/or angles of right triangles using angle of elevation and angle of depression.
    - solve word problems that include angle of elevation/depression.
    - Identify the relationship between the two non-right angles in a right triangle.
    - Utilize the co-function identity to solve for angle measurements.
- Lesson 7
  - Standards
    - **GEO-G.SRT11**- Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in non-right triangles.
  - Learning Objectives- “Students will be able to...”
    - Solve for missing sides and angles for non-right triangles using the Law Sines
    - Solve for missing sides and angles for non-right triangles using the Law Cosines
- Lesson 8
  - Standards
    - **GEO-G.SRT9**- Justify and apply the formula  $A = \frac{1}{2}ab \sin(C)$  to find the area of any triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.
  - Learning Objectives- “Students will be able to...”
    - Formulate the area of non-right triangles
    - Apply the area formula in order to solve for unknown sides and angles of non-right triangles.
- Lesson 9
  - Standards

- **GEO-G.SRT7**- Explain and use the relationship between the sine and cosine of complementary angles.
- **GEO-G.SRT8**- Use sine, cosine, tangent, the Pythagorean Theorem and properties of special right triangles to solve right triangles in applied problems.
- **GEO-G.SRT9**- Justify and apply the formula  $A = \frac{1}{2}ab \sin(C)$  to find the area of any triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.
- **GEO-G.SRT11**- Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles.
- Learning Objectives- “Students will be able to...”
  - find missing sides and angles of right triangles using the Pythagorean Theorem and trigonometric ratios.
  - Find the missing sides of a 30-60-90 right triangle using the appropriate reference triangle.
  - Find the missing sides of a 45-45-90 right triangle using the appropriate reference triangle.
  - solve for unknown sides and/or angles of right triangles using angle of elevation and angle of depression
  - solve for unknown sides and/or angles of right triangles.
  - solve word problems that include angle of elevation/depression.
  - Identify the relationship between the two non-right angles in a right triangle.
  - Utilize the co-function identity to solve for angle measurements.
  - Solve for missing sides and angles for non-right triangles using the Law Sines and the Law of Cosines.
  - Formulate the area of non-right triangles
  - Apply the area formula in order to solve for unknown sides and angles of non-right triangles.
- Lesson 10
  - Standards
    - **GEO-G.SRT7**- Explain and use the relationship between the sine and cosine of complementary angles.
    - **GEO-G.SRT8**- Use sine, cosine, tangent, the Pythagorean Theorem and properties of special right triangles to solve right triangles in applied problems.
    - **GEO-G.SRT9**- Justify and apply the formula  $A = \frac{1}{2}ab \sin(C)$  to find the area of any triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.
    - **GEO-G.SRT11**- Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles.
  - Learning Objectives- “Students will be able to...”
    - find missing sides and angles of right triangles using the Pythagorean Theorem and trigonometric ratios.

## Remote Instruction to Support the Learning of Trigonometry

- Find the missing sides of a 30-60-90 right triangle using the appropriate reference triangle.
  - Find the missing sides of a 45-45-90 right triangle using the appropriate reference triangle.
  - solve for unknown sides and/or angles of right triangles using angle of elevation and angle of depression.
  - solve word problems that include angle of elevation/depression.
  - Identify the relationship between the two non-right angles in a right triangle.
  - Utilize the co-function identity to solve for angle measurements.
  - Solve for missing sides and angles for non-right triangles using the Law Sines and the Law of Cosines.
  - Formulate the area of non-right triangles
  - Apply the area formula in order to solve for unknown sides and angles of non-right triangles.
- MathBits Subscription (Geo-Cache and Quiz)
    - **Username:** reflection
    - **Password:**801flip108

### **LESSON 1**

**Title of Lesson:** Sine, Cosine, Tangent, Pythagorean Theorem

**Standards:**

- **GEO-G.SRT8-** Use sine, cosine, tangent, the Pythagorean Theorem, and properties of special right triangles to solve right triangles in applied problems.

**Objectives:** Student will be able to:

- find missing sides of right triangles using the Pythagorean Theorem
- find missing sides of right triangles using trigonometric ratios
- find missing angles of right triangles using trigonometric ratios

**Materials and Resources:** Lenovo Thinkpad, OneNote, Nearpod (online website), scientific calculator, scrap paper (if necessary).

**Informal Assessment:** Trig HW

**Formal Assessment:** Trigonometric Unit Test

**Facilitator Guide:** This lesson is designed to be fully online. This lesson is designed on the platform of NearPod. The link to the lesson is in the student's OneNote and can also be accessed at the bottom of this lesson plan. For almost every slide, there's an audio recording providing instructions for that slide. These include directions, hints, and an overview of that slide. The collection of slides include learning objectives, definitions of the terms, processes needed to meet the learning objectives, step-by-step solutions, videos to support the learning, visuals, an/or general notes of what's going on and what I expect of them in that particular slide. Finally, a learning recap is provided at the end of the lesson that encompasses everything they learned into one slide. The students can log into their OneNote on their own time and work through each slide at their own rate. The informal assessments match up with the learning objectives and are measured twice.

**Link For Lesson:** <https://share.nearpod.com/PgWLTd0pG5>

**Agenda:**

- NearPod Pythagorean Theorem Lesson (30 minutes)
- Trig HW 1 (30 minutes)

**LESSON 2**

**Title of Lesson:** Special Right Triangles

**Standards:**

## Remote Instruction to Support the Learning of Trigonometry

- **GEO-G.SRT8**- Use sine, cosine, tangent, the Pythagorean Theorem, and properties of special right triangles to solve right triangles in applied problems.

**Objectives:** Students will be able:

- Find the missing sides of a 30-60-90 right triangle using the appropriate reference triangle.
- Find the missing sides of a 45-45-90 right triangle using the appropriate reference triangle.

**Materials and Resources:** Chromebook, OneNote, Nearpod (online website), scientific calculator, scrap paper (if necessary).

**Informal Assessment:** Trig HW 2

**Formal Assessment:** Trigonometric Unit Test

**Facilitator Guide:** This lesson is designed to be fully online. This lesson is designed on the platform of NearPod. The link to the lesson is in the student's OneNote and can also be accessed at the bottom of this lesson plan. For almost every slide, there's an audio recording providing instructions for that slide. These include directions, hints, and an overview of that slide. The collection of slides include learning objectives, definitions of the terms, processes needed to meet the learning objectives, step-by-step solutions, videos to support the learning, visuals, an/or general notes of what's going on and what I expect of them in that particular slide. Finally, a learning recap is provided at the end of the lesson that encompasses everything they learned into one slide. The students can log into their OneNote on their own time and work through each slide at their own rate. The informal assessments match up with the learning objectives and are measured twice.

**Link For Lesson:** <https://share.nearpod.com/n015YI1pG5>

**Agenda:**

- NearPod Special Right Triangles Lesson (30 minutes)
- Trig HW 2 (30 minutes)

## **LESSON 3**

**Title of Lesson:** Angle of Elevation/Depression

**Standards:**

- **GEO-G.SRT8**- Use sine, cosine, tangent, the Pythagorean Theorem, and properties of special right triangles to solve right triangles in applied problems.

**Objectives:** Students will be able to:

## Remote Instruction to Support the Learning of Trigonometry

- solve for unknown sides and/or angles of right triangles using angle of elevation.
- solve for unknown sides and/or angles of right triangles using angle of depression.

**Materials and Resources:** Lenovo Thinkpad, OneNote, Nearpod (online website), scientific calculator, scrap paper (if necessary).

**Informal Assessment:** Trig HW 3

**Formal Assessment:** Trigonometry Unit Test

**Facilitator Guide:** This lesson is designed to be fully online. This lesson is designed on the platform of NearPod. The link to the lesson is in the student's OneNote and can also be accessed at the bottom of this lesson plan. For almost every slide, there's an audio recording providing instructions for that slide. These include directions, hints, and an overview of that slide. The collection of slides include learning objectives, definitions of the terms, processes needed to meet the learning objectives, step-by-step solutions, videos to support the learning, visuals, an/or general notes of what's going on and what I expect of them in that particular slide. Finally, a learning recap is provided at the end of the lesson that encompasses everything they learned into one slide. The students can log into their OneNote on their own time and work through each slide at their own rate. The informal assessments match up with the learning objectives and are measured twice.

**Link For Lesson:** <https://share.nearpod.com/CXLKFvcWH5>

### **Agenda:**

- NearPod Angle of Elevation/Depression Lesson (30 minutes)
- Trig HW 3 (30 minutes)

## **LESSON 4**

**Title of Lesson:** Geo-Caching Day

### **Standards:**

- **GEO-G.SRT8-** Use sine, cosine, tangent, the Pythagorean Theorem, and properties of special right triangles to solve right triangles in applied problems.

**Objectives:** Students will be able to:

- solve for unknown sides and/or angles of right triangles.
- solve word problems that include angle of elevation/depression.

**Materials and Resources:**

**Informal Assessment:** Geo-Cache worksheet “Trigonometry”

**Formal Assessment:** Trigonometric Unit Test

**Facilitator Guide:** In NearPod, click on the link for the Geo-Cache. With each slide there’s an audio recording of what I expect them to do in this activity. Furthermore, there is an instruction slide that reminds them of how to go about with this activity. I also created a “Hints” slide that I developed from watching one of these activities worked through in a different unit- feel free to add anything that you see fitting. These are important slides to have access to because they are needed to finish the assignment. As soon as they are logged in with the username and password, that was given to our district through the MathBits subscription (see end of “Standards and Objectives” for this information), they are more than welcome to go at their own pace. As they work through Geo-Caching, they are more than welcome to use their previous notes but are encouraged to use them as little as possible. Keeping yourself readily available for them to ask questions is extremely helpful for them. We set up zoom times and gave them my email in case they need help. One of the biggest mistakes I have seen in these types of problems is setting up the correct trigonometric ratio. So, it is important to remind them of the strategies we have taught them and to refer them to the previous resources and notes if they start to struggle.

To explain what a Geo-Cache is, it’s essentially an online scavenger hunt where you progress from one box to another and use the answers to derive a number that you add to the URL on the bottom of each page (which you put in the section at the end of the URL that is just a large underline). If all of your choices are right, and you did your math using those answers correctly as well, then the new URL should bring you to the next box. If there is a mistake in any of the previously stated processes, then it will lead you to a page that essentially says that you made a mistake and need to hit the back button to try it again. Although it says it on the sheet and in the instructions, remind them to keep track of each correct URL before they progress to the next box. This is a failsafe in case they need to go back to that box so that they don’t have to start from the beginning of the entire assignment. What will be collected is their Geo-Cache worksheet with their work on it, and the certification of completion. Everyone will hand in their own individual copy.

**Link For Lesson:** <https://share.nearpod.com/AqISO5B4H5>

**Agenda:**

- NearPod Geo-Caching Lesson (5 minutes)
- Geo-Caching Activity (55 minutes)



## **LESSON 5**

**Title of Lesson:** Co-Functions

**Standards:**

- **GEO-G.SRT7-** Explain and use the relationship between the sine and cosine of complementary angles.

**Objectives:** Students will be able to:

- Identify the relationship between the two non-right angles in a right triangle.
- Utilize the co-function identity to solve for angle measurements.

**Materials and Resources:** Lenovo Thinkpad, OneNote, Nearpod (online website), scientific calculator, scrap paper (if necessary).

**Informal Assessment:** Trig HW 5

**Formal Assessment:** Trigonometry Unit Test

**Facilitator Guide:** This lesson is designed to be fully online. This lesson is designed on the platform of NearPod. The link to the lesson is in the student's OneNote and can also be accessed at the bottom of this lesson plan. For almost every slide, there's an audio recording providing instructions for that slide. These include directions, hints, and an overview of that slide. The collection of slides include learning objectives, definitions of the terms, processes needed to meet the learning objectives, step-by-step solutions, videos to support the learning, visuals, an/or general notes of what's going on and what I expect of them in that particular slide. Finally, a learning recap is provided at the end of the lesson that encompasses everything they learned into one slide. The students can log into their OneNote on their own time and work through each slide at their own rate. The informal assessments match up with the learning objectives and are measured twice.

**Link For Lesson:** <https://share.nearpod.com/dIKV916pI5>

**Agenda:**

-NearPod Co-Functions Lesson (30 minutes)

-Trig HW 5 (30 minutes)

## **LESSON 6**

**Title of Lesson:** Trigonometry Quiz

**Standards:**

- **GEO-G.SRT7-** Explain and use the relationship between the sine and cosine of complementary angles.
- **GEO-G.SRT8-** Use sine, cosine, tangent, the Pythagorean Theorem, and properties of special right triangles to solve right triangles in applied problems.

**Objectives:**

- find missing sides of right triangles using the Pythagorean Theorem
- find missing sides of right triangles using trigonometric ratios
- find missing angles of right triangles using trigonometric ratios
- Find the missing sides of a 30-60-90 right triangle using the appropriate reference triangle.
- Find the missing sides of a 45-45-90 right triangle using the appropriate reference triangle.
- solve for unknown sides and/or angles of right triangles using angle of elevation.
- solve for unknown sides and/or angles of right triangles using angle of depression.
- solve for unknown sides and/or angles of right triangles.

## Remote Instruction to Support the Learning of Trigonometry

- solve word problems that include angle of elevation/depression.
- Identify the relationship between the two non-right angles in a right triangle.
- Utilize the co-function identity to solve for angle measurements.

**Materials and Resources:** Lenovo Thinkpad, Nearpod (online website), scientific calculator, scrap paper (if necessary)

**Informal Assessment:** MathBits Trigonometry Quiz

**Formal Assessment:** Trigonometric Unit Test

**Facilitator Guide:** For this lesson, they will be taking a quiz that is available from the MathBits subscription (see end of “Standards and Objectives” for the information to access the quiz). First, they will open up the NearPod lesson that describes the instructions. In this quick lesson, it will tell them exactly what the quiz will cover, how to access the quiz, what steps are necessary, and any hints about the online version. An important instruction to emphasize is that they will need to put the teacher’s email into the beginning when it asks for the teacher’s email. The reason for this is because when they finish taking the quiz, the results will be sent to that email. This makes it easier for the teacher to see how they did on the quiz and so that they can only do it once- as using another email could give them availability to take it many times. The hints page is very helpful and you add anything you deem necessary.

**Link For Lesson:** <https://share.nearpod.com/Cg00JwmDJ5>

**Link For Quiz:** <http://geometrybits.com/GeoGames/Quiz/Trig/index.html>

### **Agenda:**

-NearPod Quiz Lesson (10 minutes)

-MathBits Trigonometry Quiz (50 minutes)

## **LESSON 7**

**Title of Lesson:** Law of Sines/Cosines

**Standards:**

- **GEO-G.SRT11**- Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in non-right triangles.

**Objectives:** Students will be able to:

- Solve for missing sides and angles for non-right triangles using the Law Sines
- Solve for missing sides and angles for non-right triangles using the Law Cosines

**Materials and Resources:** Lenovo Thinkpad, OneNote, Nearpod (online website), scientific calculator, scrap paper (if necessary).

**Informal Assessment:** Trig HW 7

**Formal Assessment:** Trigonometric Unit Test

**Facilitator Guide:** This lesson is designed to be fully online. This lesson is designed on the platform of NearPod. The link to the lesson is in the student's OneNote and can also be accessed at the bottom of this lesson plan. For almost every slide, there's an audio recording providing instructions for that slide. These include directions, hints, and an overview of that slide. The collection of slides include learning objectives, definitions of the terms, processes needed to meet the learning objectives, step-by-step solutions, videos to support the learning, visuals, an/or general notes of what's going on and what I expect of them in that particular slide. Finally, a learning recap is provided at the end of the lesson that encompasses everything they learned into one slide. The students can log into their OneNote on their own time and work through each slide at their own rate. The informal assessments match up with the learning objectives and are measured twice.

**Link For Lesson:** <https://share.nearpod.com/luTH4dsVJ5>

**Agenda:**

- NearPod Law of Sines/Cosines Lesson (30 minutes)
- Trig HW 7 (30 minutes)

**LESSON 8**

**Title of Lesson:** Area of a Triangle

**Standards:**

- **GEO-G.SRT9-** Justify and apply the formula  $A = \frac{1}{2}ab \sin(C)$  to find the area of any triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.

**Objectives:** Students will be able to:

- Formulate the area of non-right triangles
- Apply the area formula in order to solve for unknown sides and angles of non-right triangles.

**Materials and Resources:** Lenovo Thinkpad, OneNote, Nearpod (online website), scientific calculator, scrap paper (if necessary).

**Informal Assessment:** Trig HW 8

**Formal Assessment:** Trigonometric Unit Test

**Facilitator Guide:** This lesson is designed to be fully online. This lesson is designed on the platform of NearPod. The link to the lesson is in the student's OneNote and can also be accessed at the bottom of this lesson plan. For almost every slide, there's an audio recording providing instructions for that slide. These include directions, hints, and an overview of that slide. The collection of slides includes learning objectives, definitions of the terms, processes needed to meet the learning objectives, step-by-step solutions, videos to support the learning, visuals, an/or general notes of what's going on and what I expect of them in that particular slide. Finally, a learning recap is provided at the end of the lesson that encompasses everything they learned into one slide. The students can log into their OneNote on their own time and work through each slide at their own rate. The informal assessments match up with the learning objectives and are measured twice.

**Link For Lesson:** <https://share.nearpod.com/HnCoVvtwL5>

**Agenda:**

- NearPod Area of a Triangle Lesson (30 minutes)
- Trig HW 8 (30 minutes)

**LESSON 9**

**Title of Lesson:** Review Day

**Standards:**

- **GEO-G.SRT7-** Explain and use the relationship between the sine and cosine of complementary angles.
- **GEO-G.SRT8-** Use sine, cosine, tangent, the Pythagorean Theorem and properties of special right triangles to solve right triangles in applied problems.
- **GEO-G.SRT9-** Justify and apply the formula  $A = \frac{1}{2}ab \sin C$  to find the area of any triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.
- **GEO-G.SRT11-** Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles.

**Objectives:**

- find missing sides of right triangles using the Pythagorean Theorem
- find missing sides of right triangles using trigonometric ratios
- find missing angles of right triangles using trigonometric ratios
- Find the missing sides of a 30-60-90 right triangle using the appropriate reference triangle.
- Find the missing sides of a 45-45-90 right triangle using the appropriate reference triangle.
- solve for unknown sides and/or angles of right triangles using angle of elevation.
- solve for unknown sides and/or angles of right triangles using angle of depression.
- solve for unknown sides and/or angles of right triangles.
- solve word problems that include angle of elevation/depression.
- Identify the relationship between the two non-right angles in a right triangle.
- Utilize the co-function identity to solve for angle measurements.
- Solve for missing sides and angles for non-right triangles using the Law Sines.
- Solve for missing sides and angles for non-right triangles using the Law Cosines.
- Formulate the area of non-right triangles
- Apply the area formula in order to solve for unknown sides and angles of non-right triangles.

**Materials and Resources:** Lenovo Thinkpad, OneNote, School-based email, scientific calculator, scrap paper (if necessary).

**Informal Assessment:** Choose Your Own Adventure

**Formal Assessment:** Trigonometric Unit Test

**Facilitator Guide:** This lesson is intended to be solely an online lesson. This is a review assignment, and the link is in their OneNote. The activity is set up through PowerPoint and the link provided will lead you there. As you open up the activity, you will notice that there's a slide and a thinner section on the right. The way to go from slide to slide is to click on the words in the thinner section on the right. The instructions will instruct them on how to follow along with this activity. After the instructions, each question will have a choice on which question they will do next. If they follow the instructions, it will instruct them on which question to go to next depending on the process they chose to solve said question with. After they work through to the end, they are welcome to go back and try different "adventures" in order to complete the task. The more paths they try, the more practice they will have with the material. Also in the OneNote is the link to the blank template for their work. For each question, they are directed to give the number they are working and are given space to work on said question. They are also given a coordinate plane for each question, but this is just in case they need it and not necessary to fill out for each question. Make sure that their work is neat and readable. If they need to, they can do work on a separate sheet of paper and transfer it to the box afterwards. Each blank template has enough room for two questions.

**Link For Review:** [Choose your own adventure \(review\).pptx](#)

**Link For Blank Template:** [Choose your own adventure review \(blank template\).docx](#)

**Agenda:**

- Choose Your Own Adventure (60 minutes)

## **LESSON 10**

**Title of Lesson:** Trigonometry Unit Test

**Standards:**

- **GEO-G.SRT7-** Explain and use the relationship between the sine and cosine of complementary angles.
- **GEO-G.SRT8-** Use sine, cosine, tangent, the Pythagorean Theorem and properties of special right triangles to solve right triangles in applied problems.
- **GEO-G.SRT9-** Justify and apply the formula  $A = \frac{1}{2}ab \sin(C)$  to find the area of any triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.
- **GEO-G.SRT11-** Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles.

**Objectives:**

- find missing sides of right triangles using the Pythagorean Theorem
- find missing sides of right triangles using trigonometric ratios
- find missing angles of right triangles using trigonometric ratios
- Find the missing sides of a 30-60-90 right triangle using the appropriate reference triangle.
- Find the missing sides of a 45-45-90 right triangle using the appropriate reference triangle.
- solve for unknown sides and/or angles of right triangles using angle of elevation.
- solve for unknown sides and/or angles of right triangles using angle of depression.
- solve for unknown sides and/or angles of right triangles.
- solve word problems that include angle of elevation/depression.
- Identify the relationship between the two non-right angles in a right triangle.
- Utilize the co-function identity to solve for angle measurements.
- Solve for missing sides and angles for non-right triangles using the Law Sines.
- Solve for missing sides and angles for non-right triangles using the Law Cosines.
- Formulate the area of non-right triangles
- Apply the area formula in order to solve for unknown sides and angles of non-right triangles.

**Materials and Resources:** Lenovo Thinkpad, OneNote, Nearpod, scientific calculator, scrap paper (if necessary).

**Informal Assessment:** n/a

**Formal Assessment:** Trigonometry Unit Test



## Remote Instruction to Support the Learning of Trigonometry

**Facilitator Guide:** For the final lesson in this unit, the students will be completing the formal assessment of the entire unit- the Trigonometry Unit Test. This assessment will be given to the students via their OneNote. This assessment covers every topic that we have studied in this unit and measures every learning objective once. The students are to work independently and without any notes from previous lessons. Once the students are done, they will send a copy of it to our emails to be graded.

**Link For Lesson:** (attached in Assessments and Keys)

**Agenda:**

- Trigonometry Unit Test (60 minutes)

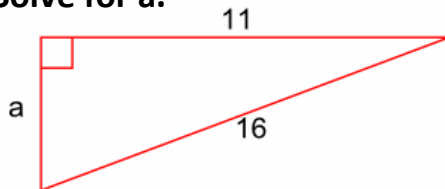
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Trig HW Day 1

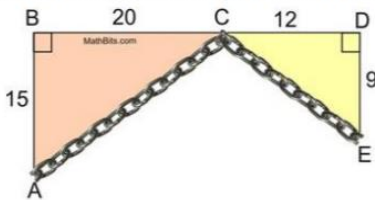
**For each question, round your answer to the nearest tenth.**

**Learning Target #1:** solve each missing side using Pythagorean Theorem.

a) Solve for a.

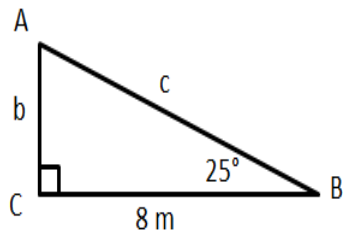


b) Find the total chain length from A to C to E.

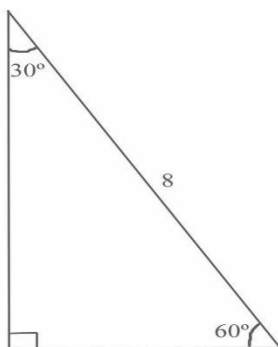


**Learning Target #2:** solve for each missing side using trigonometric ratios.

a) Solve for b and c.

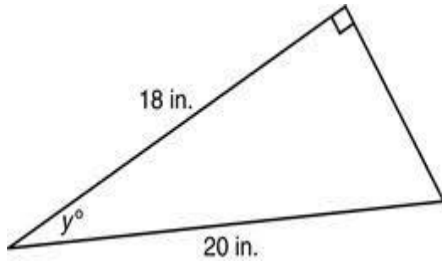


b) solve for the missing sides of this right triangle.

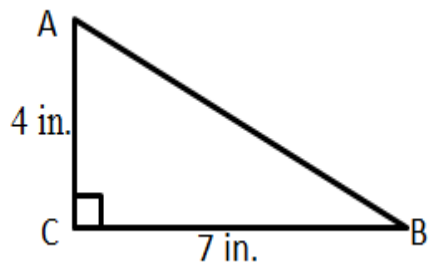


**Learning Target #3:** solve for all missing angles using trigonometric ratios.

a) Solve for  $y$ .



b) Solve for all missing angles in the right triangle.



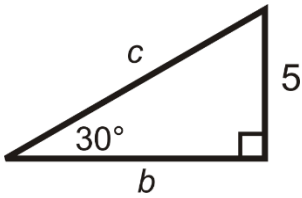
Name: \_\_\_\_\_

Trig HW Day 2

***For each question, leave your answer in simplest radical form.***

**Learning Target #1:** Find the missing sides of a 30-60-90 special right triangle using the correct reference triangle.

- a) Solve for  $c$  and  $b$ .



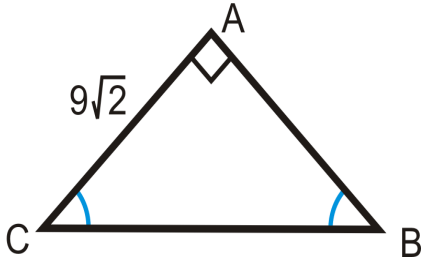
- b) If a 30-60-90 triangle has the longest side of length 30, what are the lengths of the other two legs?

- c) A cat is stuck in a tree! You see a ladder that is 10 feet long. You place the ladder a certain distance away so that the ladder and the ground make an angle of 30 degrees. In doing so, the top of the ladder is just high enough up the tree to reach the cat. Using special right triangles, find the distance from the base of the tree to the ladder and how high the cat is up the tree.

Remote Instruction to Support the Learning of Trigonometry

**Learning Target #2:** Find the missing sides of a 45-45-90 special right triangle using the correct reference triangle.

- a) Solve for the missing sides in this special right triangle.



- b) If a 45-45-90 special right triangle has one of the leg lengths of 30, find the length of the other leg and the hypotenuse. Explain why it's so easy to figure out the length of the other leg.

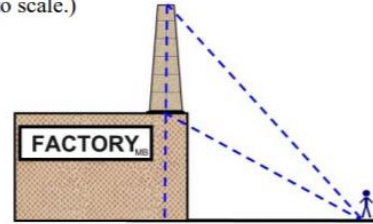
- c) That same pesky cat is stuck in a tree again! When you grab your 10-foot ladder, this time you need to put the ladder at a specific distance from the tree such that it makes an angle of 45 degrees with the ground. How high is the cat up the tree, and what's the distance between the base of the tree and the ladder?

Name: \_\_\_\_\_

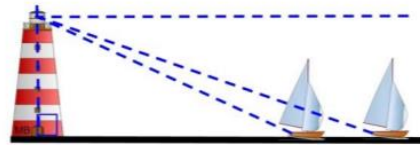
### Trig HW 3

*Directions:* Read carefully. Label the diagrams, set up the trigonometric equations, and show work. Be careful not to round until you have determined your final answer. (Diagrams are not to scale.)

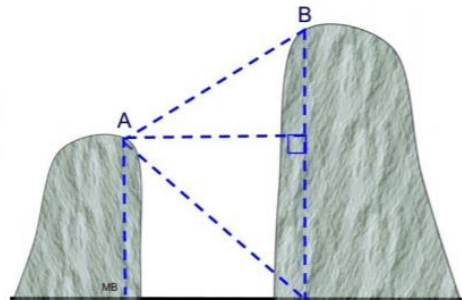
1. From a point on the ground 300 feet from the base of a factory, the angle of elevation of the top of the factory is  $38^\circ$ , and the angle of elevation of the top of the smokestack is  $52^\circ$ . Find the height of the smokestack to the *nearest foot*.



2. An observer from the top of a lighthouse 370 feet above sea level sees two sailboats in the water. The angles of depression to the boats are  $12^\circ$  and  $10^\circ$ . How far apart are the boats, to the *nearest foot*?



3. Two vertical cliffs are on opposite sides of a 90 foot wide river. From point A at the top of the shorter cliff, the angle of elevation of the top of the other cliff (B) is  $28^\circ$  and the angle of depression to the bottom is  $38^\circ$ . Find the height of each cliff, to the *nearest foot*.



Name \_\_\_\_\_

# Trigonometry

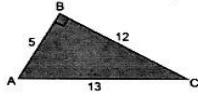
## GeoCaching Topic Series ANSWER Sheet

Show all work on this paper. There is a printable "Certificate" available when you find the last hidden box.

<http://GeometryBits.com/GeoGames/CA/TrigCache1.html>

**Box 1:**

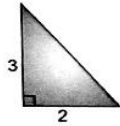
1.



Given: Right triangle  $ABC$  with sides as marked. Express the following trigonometry ratios as fractions:  
a)  $\sin A$     b)  $\cos A$     c)  $\tan C$

2. Using your calculator, find  $\sin 58^\circ$  to the nearest hundredth.

3.



Find the length of the hypotenuse of the triangle shown below, to the nearest tenth.

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**Box 2:**

1.

2.

3.

4.

**Box 3:**

1.

2.

3.

**Box 4:**

1.

2.

3.

**Box 6:**

1.

2.

3.

**Box 5:**

1.

2.

3.

**Box 7:** Complete this URL of the winning box!

[http://GeometryBits.com/GeoGames/CA/TR\\_\\_\\_\\_\\_](http://GeometryBits.com/GeoGames/CA/TR_____).html

Remember that there is a printable "Certificate".

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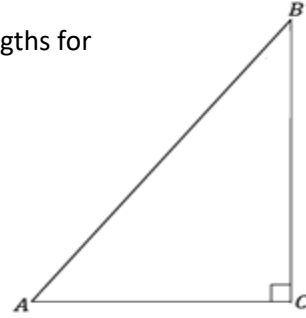
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Trig HW Day 5

**For each question, leave your answer in simplest radical form.**

**Learning Target #1:** Students will be able to identify the relationship between the two non-right angles in a right triangle.

- d) Using triangle ABC, fill out the chart with the correct side lengths for each trigonometric ratio.



Angle name	Sin $\theta$	Cos $\theta$	Tan $\theta$
A			
B			

- e) What patterns do you notice in the chart? Include sin, cos, and tan

- f) Which equation is always true?

- 1)  $\sin A = \sin B$
- 2)  $\cos A = \cos B$
- 3)  $\cos A = \sin C$
- 4)  $\sin A = \cos B$



Remote Instruction to Support the Learning of Trigonometry

**Learning Target #2:** Students will be able to utilize the co-function identity to solve for angle measurements.

a) Which is a value of  $x$  if  $\sin 60^\circ = \cos(x + 10)^\circ$ ?

- 1)  $10^\circ$
- 2)  $20^\circ$
- 3)  $50^\circ$
- 4)  $60^\circ$

b) If  $\cos(x + 30^\circ) = \sin x$ , a measure of angle  $x$  is

- 1)  $15^\circ$
- 2)  $30^\circ$
- 3)  $45^\circ$
- 4)  $60^\circ$

c) If  $\cos(2\theta + 16) = \sin(\theta + 11)$ , solve for  $\theta$ .

d) If  $\cos(\theta + 4) = \sin(3\theta + 2)$ , solve for  $\theta$ .

Name: \_\_\_\_\_

Trig HW Day 7

***For each question, round your answer to the nearest hundredth.***

**Learning Target #1:** Students will be able to solve for missing sides and angles for non-right triangles using the Law Sines.

a) In  $\triangle ABC$ ;  $a=20$ , angle  $A= 45$ , and angle  $B= 105$ . Find  $b$ .

b) The length of one side of a parallelogram is 14 and the length of the diagonal is 17. One angle of the parallelogram is 38 degrees. Find the length of the other side to the nearest hundredth.

**Learning Target #2:** Students will be able to solve for missing sides and angles for non-right triangles using the Law Cosines.

a) In  $\triangle XYZ$ ;  $x=8$ ,  $y=6$ ,  $z=9$ . Find the measure of angle  $X$ .

Remote Instruction to Support the Learning of Trigonometry

- b) The lengths of two sides of a parallelogram are 7 and 12. One angle of the parallelogram is 40 degrees. Find the length of the longer diagonal to the nearest tenth.

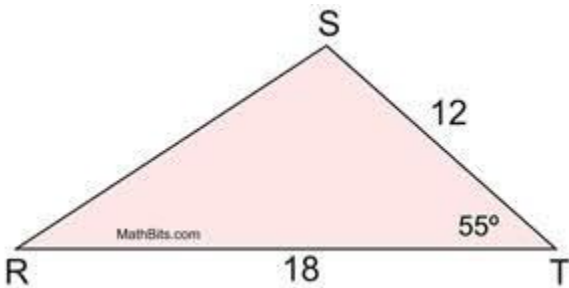
Name: \_\_\_\_\_

Trig HW Day 8

***For each question, round your answer to the nearest hundredth (unless instructed otherwise.)***

**Learning Target #1:** Students will be able to formulate the area of non-right triangles.

- 1) Find the area of the following triangle.



- 2) In triangle ABC,  $a = 9$ ,  $c = 17$ , angle  $B = 79$ , and angle  $A = 30$ . Find the area of triangle ABC.

**Learning Target #2:** Students will be able to apply the area formula in order to solve for unknown sides and angles of non-right triangles.

- 3) In  $\triangle PQR$ ,  $PQ = 9$  meters and  $PR = 12$  meters. If the area of the triangle is 32 sq. meters, find the measure of angle P to the nearest degree.

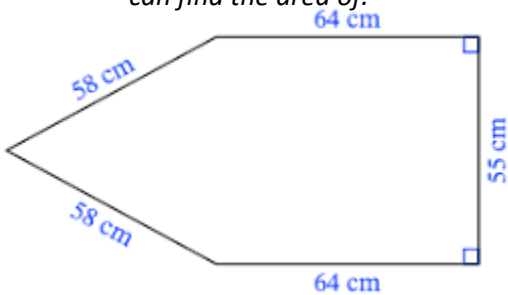
Remote Instruction to Support the Learning of Trigonometry

- 4) In  $\triangle ABC$ ,  $AB = 12$  meters, and  $AC = 27$  meters. If the area of the triangle is 84 sq. meters, find the measure of angle A to the nearest degree.

**Learning Target #3:** Students will be able to apply Heron's Formula to find the area of a triangle.

- 5) In  $\triangle ABC$ ;  $a=5$ ,  $b=11$ , and  $c= 12$ . Find the area of  $\triangle ABC$  using Heron's Formula.

- 6) Find the area of the following polygon (5-sided figure). *\*Hint: divide the polygon into figures that you can find the area of.*



Name: \_\_\_\_\_

**Write all your work in the space provided. Write clearly. Answers that aren't legible will lose credit.**

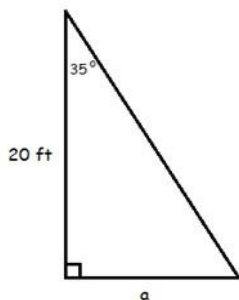
1) If  $\triangle ABC$  has side lengths of 51-68-85. Is it a right triangle? Support your answer.

2) In right triangle  $ABC$ ,  $m\angle C = 90^\circ$ . If  $\cos B = \frac{5}{13}$ , which function also equals  $\frac{5}{13}$ ?

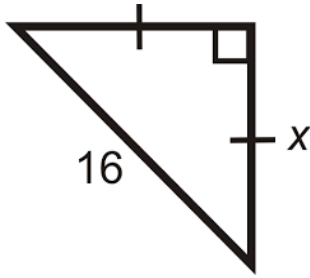
- 1)  $\tan A$
- 2)  $\tan B$
- 3)  $\sin A$
- 4)  $\sin B$

3) Find the area of a non-right triangle that has the side lengths of 12-14-17 using Heron's Formula. Round your answer to the nearest tenth.

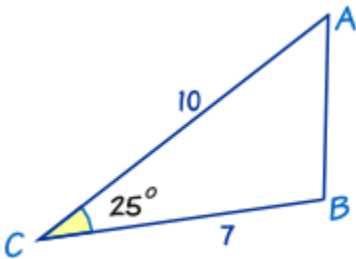
4) Using trigonometric ratios, solve for side  $a$ . Round your answer to the nearest whole number.



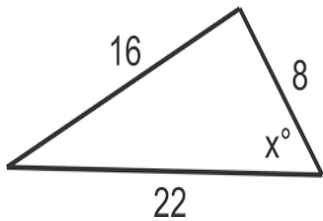
- 5) Find  $x$  in simplest radical form using special right triangles.



- 6) Find the area of the following triangle. Round your answer to the nearest hundredth.

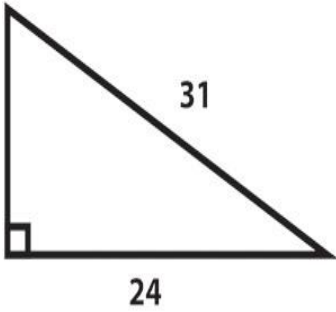


- 7) Find  $x$  to the nearest degree.



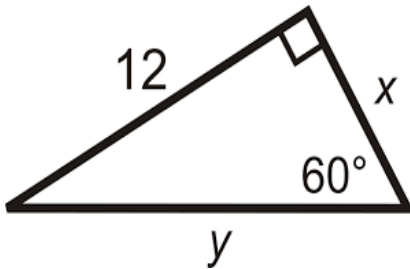
- 8) Chad is standing at the top of a building across the street from a jewelry store when he notices a robbery taking place at the jewelry store! The angle of depression formed by the top of his head and his line of sight to the robbery is  $11.3^\circ$ . If the building that Chad is standing on is 275.25 feet away from the front of the jewelry store, how high off the ground is Chad? Round your answer to the nearest hundredth.

9) Find the measure of all the angles in the following right triangle. Round all answer to the nearest tenth.



10) In  $\triangle XYZ$ ,  $XY = 22$  meters and  $XZ = 31$  meters. If the area of the triangle is 170.5 sq. meters, find the measure of angle X to the nearest degree.

11) Given the following triangle, solve for x and y to the nearest whole number using special right triangles.

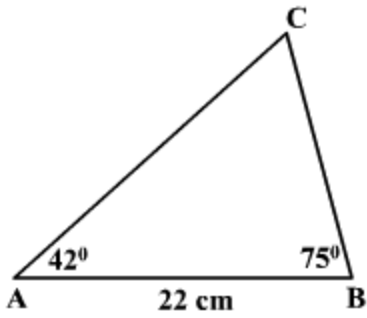


12) If  $\cos\left(\frac{35\theta}{4}\right) = \sin\left(\frac{5\theta}{4}\right)$ , solve for  $\theta$ .



Remote Instruction to Support the Learning of Trigonometry

13) Find the lengths of sides AC and CB. Round your answers to the nearest whole number.



14) From point  $P$  on the ground, the angle of elevation of an airplane is  $23^\circ$ . The altitude of the plane is 1200 meters. What is the distance from point  $P$  to the airplane, to the *nearest tenth* of a meter?

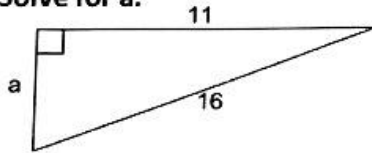
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Trig HW Day 1

**For each question, round your answer to the nearest tenth.**

**Learning Target #1: solve each missing side using Pythagorean Theorem.**

a) Solve for a.

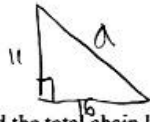


$$a^2 + b^2 = c^2$$

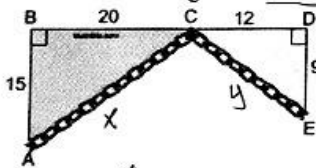
$$16^2 + 11^2 = c^2$$

$$256 + 121 = c^2$$

$$c = \sqrt{377} = 19.4 \sim$$



b) Find the total chain length from A to C to E.



$$15^2 + 20^2 = x^2$$

$$225 + 400 = x^2$$

$$\sqrt{625} = \sqrt{x^2}$$

$$x = 25$$

$$9^2 + 12^2 = y^2$$

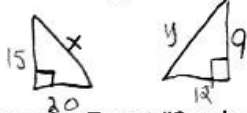
$$81 + 144 = y^2$$

$$\sqrt{225} = \sqrt{y^2}$$

$$y = 15$$

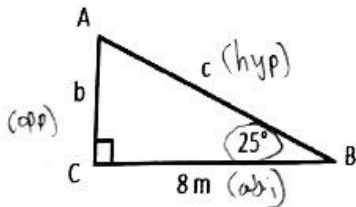
$$x + y = 25 + 15$$

$$= 40$$



**Learning Target #2: solve for each missing side using trigonometric ratios.**

a) Solve for b and c.



$$\tan 25 = \frac{b}{8}$$

$$b = 8 \tan 25$$

$$b = 3.7\text{ m}$$

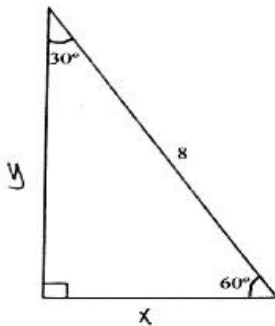
$$\cos 25 = \frac{8}{c}$$

$$c \cdot \cos 25 = 8$$

$$c = \frac{8}{\cos 25}$$

$$c = 8.8\text{ m}$$

b) solve for the missing sides of this right triangle.



$$\sin 60 = \frac{y}{8}$$

$$y = 8 \sin 60$$

$$y = 4\sqrt{3} \text{ or } 6.9$$

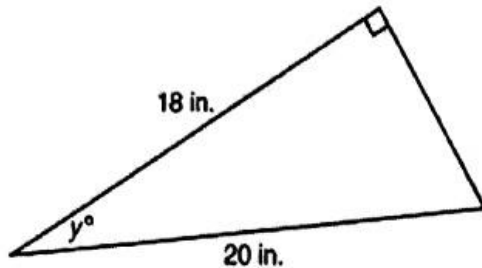
$$\cos 60 = \frac{x}{8}$$

$$x = 8 \cos 60$$

$$x = 4$$

**Learning Target #3:** solve for all missing angles using trigonometric ratios.

a) Solve for  $y$ .



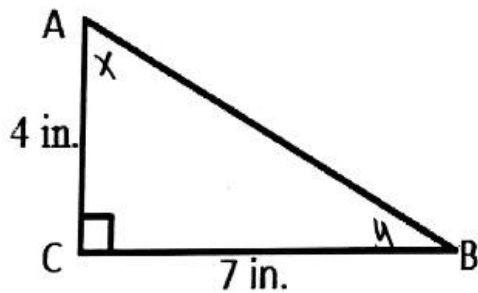
$$\cos y = \frac{18}{20}$$

$$y = \cos^{-1}\left(\frac{18}{20}\right)$$

$$y = 25.8^\circ$$



b) Solve for all missing angles in the right triangle.



$$\tan y = \frac{4}{7}$$

$$y = \tan^{-1}\left(\frac{4}{7}\right)$$

$$y = 29.7^\circ$$

$$\tan x = \frac{7}{4}$$

$$x = \tan^{-1}\left(\frac{7}{4}\right)$$

$$x = 60.3^\circ$$

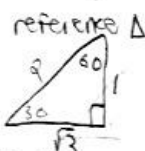
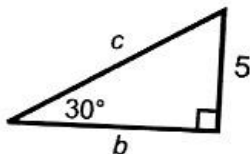
Name: key

Trig HW Day 2

**For each question, leave your answer in simplest radical form.**

**Learning Target #1:** Find the missing sides of a 30-60-90 special right triangle using the correct reference triangle.

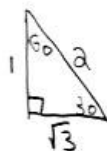
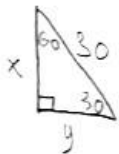
a) Solve for c and b.



$5 = 1$  or  $\frac{5}{1}$  or  $5$

$b = 5 \cdot \sqrt{3}$  or  $5\sqrt{3}$   
 $c = 5 \cdot 2$  or  $10$

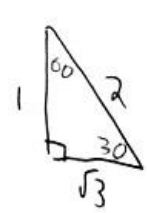
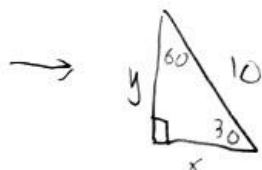
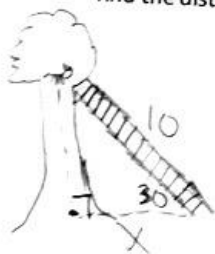
b) If a 30-60-90 triangle has the longest side of length 30, what are the lengths of the other two legs?



$30 = 2$  or  $\frac{30}{2}$  or  $15$

$x = 15 \cdot 1 = 15$   
 $y = 15 \cdot \sqrt{3} = 15\sqrt{3}$

c) A cat is stuck in a tree! You see a ladder that is 10 feet long. You place the ladder a certain distance away so that the ladder and the ground make an angle of 30 degrees. In doing so, the top of the ladder is just high enough up the tree to reach the cat. Using special right triangles, find the distance from the base of the tree to the ladder and how high the cat is up the tree.

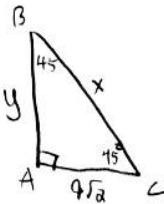
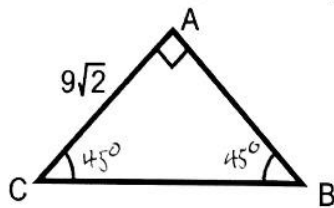


$10 = 2$  or  $\frac{10}{2}$  or  $5$

$x = 5 \cdot \sqrt{3} = 5\sqrt{3}$  feet  
 $y = 5 \cdot 1 = 5$  feet

**Learning Target #2:** Find the missing sides of a 45-45-90 special right triangle using the correct reference triangle.

- a) Solve for the missing sides in this special right triangle.

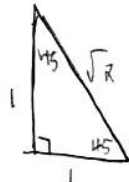


$4\sqrt{2}:1$  or  $4\sqrt{2}$

$$y = 1 \cdot 4\sqrt{2} = 4\sqrt{2}$$

$$x = \sqrt{2} \cdot 4\sqrt{2} = 4 \cdot 2 = 8$$

- b) If a 45-45-90 special right triangle has one of the leg lengths of 30, find the length of the other leg and the hypotenuse. Explain why it's so easy to figure out the length of the other leg.

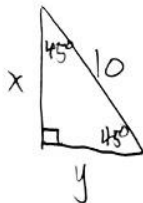
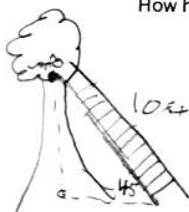


$30:1$  or  $30$

$$x = 30 \cdot 1 = 30$$

$$y = 30 \cdot \sqrt{2} = 30\sqrt{2}$$

- c) That same pesky cat is stuck in a tree again! When you grab your 10-foot ladder, this time you need to put the ladder at a specific distance from the tree such that it makes an angle of 45 degrees with the ground. How high is the cat up the tree, and what's the distance between the base of the tree and the ladder?



$10:\sqrt{2}$  or  $\frac{10}{\sqrt{2}} = \frac{10\sqrt{2}}{2} = 5\sqrt{2}$

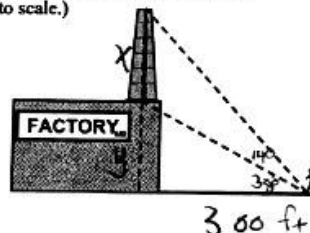
$$x = 1 \cdot 5\sqrt{2} = 5\sqrt{2} = y$$

Name: Key

Trigonometry Day 2

Directions: Read carefully. Label the diagrams, set up the trigonometric equations, and show work. Be careful not to round until you have determined your final answer. (Diagrams are not to scale.)

1. From a point on the ground 300 feet from the base of a factory, the angle of elevation of the top of the factory is  $38^\circ$ , and the angle of elevation of the top of the smokestack is  $52^\circ$ . Find the height of the smokestack to the nearest foot.



$$\tan 38^\circ = \frac{y}{300} \quad \tan 52^\circ = \frac{x+y}{300}$$

$$y = 300 (\tan 38^\circ)$$

$$y = 234 \text{ ft}$$

$$x+y = (\tan 52^\circ)(300)$$

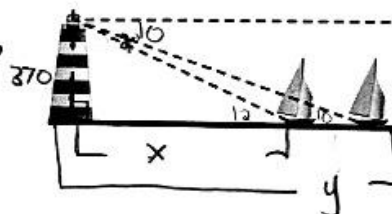
$$x+y = 384$$

$$x+234 = 384$$

$$x = 150 \text{ ft}$$

$$= \boxed{150 \text{ ft}}$$

2. An observer from the top of a lighthouse 370 feet above sea level sees two sailboats in the water. The angles of depression to the boats are  $12^\circ$  and  $10^\circ$ . How far apart are the boats, to the nearest foot?



$$\tan 12^\circ = \frac{370}{x}$$

$$x = \frac{370}{\tan 12^\circ}$$

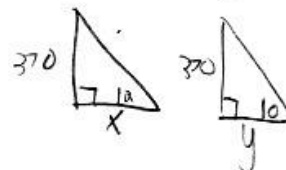
$$x = 1,741$$

$$\tan 10^\circ = \frac{370}{y}$$

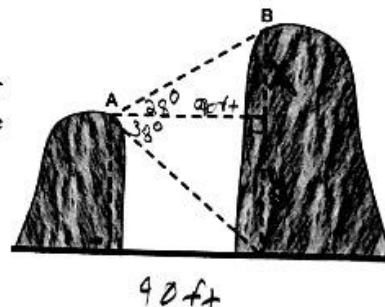
$$y = \frac{370}{\tan 10^\circ}$$

$$y = 2,098 \text{ ft}$$

$$y - x = 2,098 - 1,741 = \boxed{357 \text{ ft}}$$



3. Two vertical cliffs are on opposite sides of a 90 foot wide river. From point A at the top of the shorter cliff, the angle of elevation of the top of the other cliff (B) is  $28^\circ$  and the angle of depression to the bottom is  $38^\circ$ . Find the height of each cliff, to the nearest foot.



$$\tan 28^\circ = \frac{x}{90}$$

$$\tan 38^\circ = \frac{y}{90}$$

$$90 \tan 28^\circ = x \quad 90 \tan 38^\circ = y$$

$$x = 48 \text{ ft}$$

$$y = 70 \text{ ft}$$

$$x+y = 70+48 = \underline{118 \text{ ft}}$$

$$\boxed{\text{cliff B} = 70 \text{ ft}}$$

$$\boxed{\text{cliff A} = 48 \text{ ft}}$$

Name Key

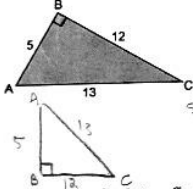
# Trigonometry

GeoCaching Topic Series ANSWER Sheet

Show all work on this paper. There is a printable "Certificate" available when you find the last hidden box.  
<http://GeometryBits.com/GeoGames/CA/TrigCache1.html>

**Box 1:**

1.



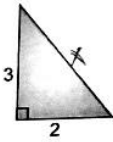
Given: Right triangle ABC with sides as marked. Express the following trigonometry ratios as fractions:

a)  $\sin A = \frac{12}{13}$     b)  $\cos A = \frac{5}{13}$     c)  $\tan C = \frac{5}{12}$

2. Using your calculator, find  $\sin 58^\circ$  to the nearest hundredth.

$\sin 58 = 0.85$

3.



Find the length of the hypotenuse of the triangle shown below, to the nearest tenth.

$a^2 + b^2 = c^2$   
 $2^2 + 3^2 = c^2$   
 $4 + 9 = c^2$   
 $13 = c^2$   
 $c = \sqrt{13} = 3.6$

$(\frac{12}{13} + \frac{5}{13} + \frac{5}{13}) \cdot (0.85 + 3.6)$   
 $\times 15,600 =$   
 $119705$

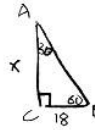
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**Box 2:**

1.  $\sin 38 = \frac{x}{24}$   
 $x = 24 \sin 38$   
 $x = 14.8$

2.  $\cos 40 = \frac{24}{x}$   
 $x = \frac{24}{\cos 40}$   
 $x = 31.3$

3.  $\tan 21 = \frac{x}{8}$   
 $8 \tan 21 = x$   
 $x = 3.1$

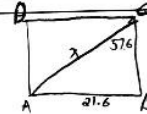


4. a)  $\frac{2x}{3} = \frac{90}{3} \Rightarrow x = 30$   
 b)  $\tan 60 = \frac{x}{18}$   
 $x = 18 \tan 60$   
 $x = 31.2$

34776

**Box 3:**

1.  $\sin 57 = \frac{21.6}{x}$   
 $x = \frac{21.6}{\sin 57}$   
 $x = 25.8$

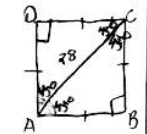


2.  $\tan 18 = \frac{7.5}{x}$   
 $x = \frac{7.5}{\tan 18}$   
 $x = 23.1$



3. 19.8

$\frac{28\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}}{\sqrt{2}} \cdot x$   
 $\frac{28\sqrt{2}}{2} = 14\sqrt{2}$



$(25.8)(23.1)(19.8) = 11,800.404 \Rightarrow 11,800$

**Box 4:**

1.  $\sin^{-1}(\frac{6}{9}) = A \Rightarrow A = 42^\circ$

2.  $\cos x = \frac{10}{15}$   
 $\cos^{-1}(\frac{10}{15}) = x \Rightarrow x = 48^\circ$

3.  $x = 45^\circ$

$142^2 + 48^2 + 45^2 = 6,093$

**Box 5:**

1.  $\sin 62 = \frac{x}{15} \Rightarrow x = 15 \sin 62$   
 $x = 13 \text{ ft}$

2.  $\tan 32 = \frac{1.2}{x}$   
 $x \tan 32 = 1.2$   
 $x = 1.9 \text{ ft}$

3.  $\cos 40 = \frac{x}{14}$   
 $x = 14 \cos 40$   
 $x = 10.7 \text{ ft}$

$(13 \times 10) + (10^2 \times 1.9) + (10^3 \times 10.7) =$   
 $11020$

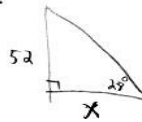
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**Box 6:**

1.  $\tan 44 = \frac{x}{22}$   
 $22 \tan 44 = x$   
 $x = 21 \text{ ft}$

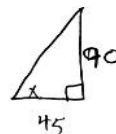


2.  $\tan 28 = \frac{52}{x}$   
 $x = \frac{52}{\tan 28}$   
 $x = 98 \text{ ft}$



3.  $\tan x = \frac{90}{45}$   
 $\tan^{-1}(2) = x$   
 $x = 63^\circ$

$21^2 + 99^2 = 63^2$   
 $= 259672$



**Box 7:** Complete this URL of the winning box!

<http://GeometryBits.com/GeoGames/CA?TR> \_\_\_\_\_ .html

Remember that there is a printable "Certificate".

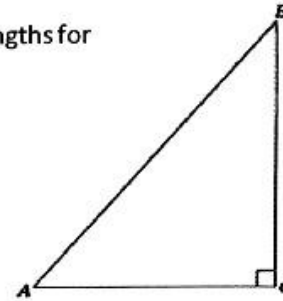
Name: Key

Trig HW Day 5

**For each question, leave your answer in simplest radical form.**

**Learning Target #1:** Students will be able to identify the relationship between the two non-right angles in a right triangle.

- a) Using triangle ABC, fill out the chart with the correct side lengths for each trigonometric ratio.



Angle name	Sin $\theta$	Cos $\theta$	Tan $\theta$
A	$\frac{BC}{AB}$	$\frac{AC}{AB}$	$\frac{BC}{AC}$
B	$\frac{AC}{AB}$	$\frac{BC}{AB}$	$\frac{AC}{BC}$

- b) What patterns do you notice in the chart? Include sin, cos, and tan

$$\sin A = \cos B$$

$$\cos A = \sin B$$

$$\tan A = \frac{1}{\tan B}$$

- c) Which equation is always true?

- 1)  $\sin A = \sin B$
- 2)  $\cos A = \cos B$
- 3)  $\cos A = \sin C$
- 4)  $\sin A = \cos B$



**Learning Target #2:** Students will be able to utilize the co-function identity to solve for angle measurements.

a) Which is a value of  $x$  if  $\sin 60^\circ = \cos(x + 10)^\circ$ ?

1)  $10^\circ$   
 2)  $20^\circ$   
 3)  $50^\circ$   
 4)  $60^\circ$

$$60 + x + 10 = 90$$

$$70 + x = 90$$

$$x = 10$$

b) If  $\cos(x + 30^\circ) = \sin x$ , a measure of angle  $x$  is

1)  $15^\circ$   
 2)  $30^\circ$   
 3)  $45^\circ$   
 4)  $60^\circ$

$$x + 30 + x = 90$$

$$2x + 30 = 90$$

$$2x = 60$$

$$x = 30$$

c) If  $\cos(2\theta + 16) = \sin(\theta + 11)$ , solve for  $\theta$ .

$$2\theta + 16 + \theta + 11 = 90$$

$$3\theta + 27 = 90$$

$$\frac{3\theta}{3} = \frac{63}{3}$$

$$\boxed{\theta = 21}$$

d) If  $\cos(\theta + 4) = \sin(3\theta + 2)$ , solve for  $\theta$ .

$$\theta + 4 + 3\theta + 2 = 90$$

$$4\theta + 6 = 90$$

$$\frac{4\theta}{4} = \frac{84}{4}$$

$$\boxed{\theta = 21}$$

Name: Key

Trig HW Day 7

**For each question, round your answer to the nearest hundredth.**

**Learning Target #1:** Students will be able to solve for missing sides and angles for non-right triangles using the Law Sines.

a) In  $\triangle ABC$ ;  $a=20$ , angle  $A=45$ , and angle  $B=105$ . Find  $b$ .

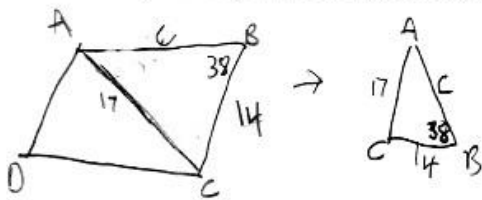
$$\frac{\sin A}{a} = \frac{\sin B}{b}$$

$$\frac{\sin 45}{20} = \frac{\sin 105}{b}$$

$$\frac{b \sin 45}{\sin 105} = \frac{20 \sin 105}{\sin 45}$$

$$b = 27.32$$

b) The length of one side of a parallelogram is 14 and the length of the diagonal is 17. One angle of the parallelogram is 38 degrees. Find the length of the other side to the nearest hundredth.



$$180 - 38 - 30.47 = 111.53$$

$$\frac{\sin 38}{17} = \frac{\sin A}{14}$$

$$14 \sin 38 = 17 \sin A$$

$$\frac{14 \sin 38}{17} = \sin A$$

$$A = 30.47$$

$$\frac{\sin(30.47)}{14} = \frac{\sin(111.53)}{c}$$

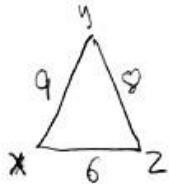
$$c \sin(30.47) = 14 \sin(111.53)$$

$$c = \frac{14 \sin(111.53)}{\sin(30.47)}$$

$$c = 25.68$$

**Learning Target #2:** Students will be able to solve for missing sides and angles for non-right triangles using the Law Cosines.

a) In  $\triangle XYZ$ ;  $x=8$ ,  $y=6$ ,  $z=9$ . Find the measure of angle  $X$ .



$$x^2 = y^2 + z^2 - 2yz \cos X$$

$$8^2 = 6^2 + 9^2 - 2(54) \cos X$$

$$64 = 36 + 81 - 108 \cos X$$

$$64 = 117 - 108 \cos X$$

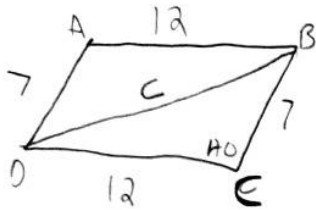
$$-53 = -108 \cos X$$

$$\frac{-53}{-108} = \frac{-108 \cos X}{-108}$$

$$\cos X = \frac{53}{108}$$

$$X = 60.61^\circ$$

- b) The lengths of two sides of a parallelogram are 7 and 12. One angle of the parallelogram is 40 degrees. Find the length of the longer diagonal to the nearest tenth.



$$\begin{aligned}c^2 &= a^2 + b^2 - 2ab \cos C \\c^2 &= 12^2 + 7^2 - 2(12)(7) \cos 40 \\c^2 &= 144 + 49 - 168 \cos 40 \\c^2 &= 193 - 168 \cos 40\end{aligned}$$

$$c = 8.02$$

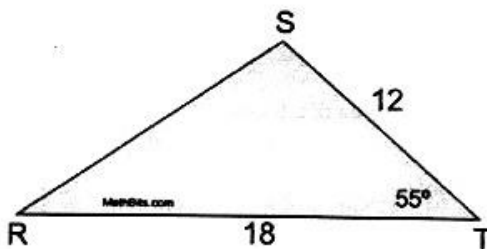
Name: Key

Trig HW Day 8

**For each question, round your answer to the nearest hundredth.**

**Learning Target #1:** Students will be able to formulate the area of non-right triangles.

- 1) Find the area of the following triangle.



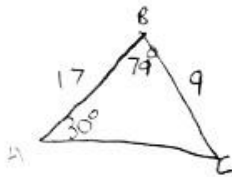
$$A = \frac{1}{2} ab \sin C$$

$$A = \frac{1}{2} (18)(12) \sin(55)$$

$$A = 108 \sin 55$$

$$A = 88.47$$

- 2) In triangle ABC,  $a = 9$ ,  $c = 17$ , angle  $B = 79$ , and angle  $A = 30$ . Find the area of triangle ABC.



$$A = \frac{1}{2} ac \sin B$$

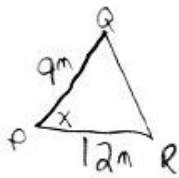
$$A = \frac{1}{2} (9)(17) \sin 79$$

$$A = 76.5 \sin 79$$

$$A = 75.09$$

**Learning Target #2:** Students will be able to apply the area formula in order to solve for unknown sides and angles of non-right triangles.

- 3) In  $\Delta PQR$ ,  $PQ = 9$  meters and  $PR = 12$  meters. If the area of the triangle is 32 sq. meters, find the measure of angle P to the nearest degree.



$$A = 32 \text{ m}^2$$

$$32 = \frac{1}{2} (9)(12) \sin X$$

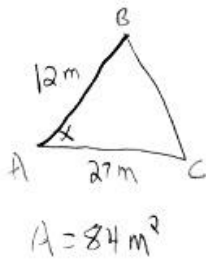
$$\frac{32}{54} = \frac{54 \sin X}{54}$$

$$\frac{32}{54} = \sin X$$

$$X = \sin^{-1} \left( \frac{32}{54} \right)$$

$$X = 36^\circ$$

- 4) In  $\triangle ABC$ ,  $AB = 12$  meters, and  $AC = 27$  meters. If the area of the triangle is  $84$  sq. meters, find the measure of angle  $A$  to the nearest degree.



$$84 = \frac{1}{2}(12)(27) \sin X$$

$$84 = 162 \sin X$$

$$\frac{84}{162} = \sin X$$

$$X = \sin^{-1}\left(\frac{84}{162}\right)$$

$$X = 31^\circ$$

**Learning Target #3:** Students will be able to apply Heron's Formula to find the area of a triangle.

- 5) In  $\triangle ABC$ ;  $a=5$ ,  $b=11$ , and  $c= 12$ . Find the area of  $\triangle ABC$  using Heron's Formula.



$$s = \frac{a+b+c}{2}$$

$$s = \frac{5+11+12}{2}$$

$$s = \frac{28}{2}$$

$$s = 14$$

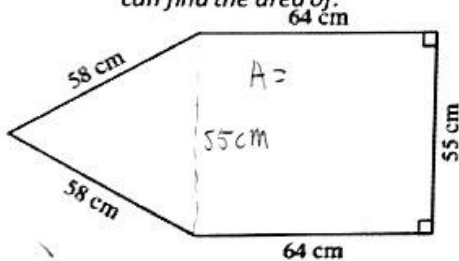
$$A = \sqrt{s(s-a)(s-b)(s-c)}$$

$$A = \sqrt{14(14-5)(14-11)(14-12)}$$

$$A = \sqrt{(14)(9)(3)(2)}$$

$$A = \sqrt{756} = 6\sqrt{21} = \boxed{27.50}$$

- 6) Find the area of the following polygon (5-sided figure). \*Hint: divide the polygon into figures that you can find the area of.



$$A_D = 64 \text{ cm} \cdot 55 \text{ cm} = 3,520 \text{ cm}^2$$

$$s = \frac{58+58+55}{2} = 85.5 \text{ cm}$$

$$A_\Delta = \sqrt{(85.5)(30.5)(27.5)(27.5)}$$

$$A_\Delta = \sqrt{1,972,110.9375} = 1,404.32 \text{ cm}^2$$

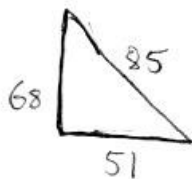
$$A_{\text{pentagon}} = A_D + A_\Delta$$

$$A_{\text{pentagon}} = 3,520 \text{ cm}^2 + 1,404.32 \text{ cm}^2 = \boxed{4,924.32 \text{ cm}^2}$$

Name: Key

~~For each question, round your answer to the nearest hundredth.~~

- 1) If  $\triangle ABC$  has side lengths of 51-68-85. Is it a right triangle? Support your answer.



$$a^2 + b^2 = c^2$$

$$58^2 + 51^2 = 85^2$$

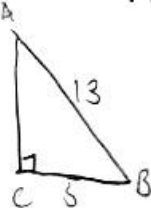
$$4,624 + 2,601 = 7,225$$

$$7,225 = 7,225$$

Yes; according to the Pythag. thm

- 2) In right triangle  $ABC$ ,  $m\angle C = 90^\circ$ . If  $\cos B = \frac{5}{13}$ , which function also equals  $\frac{5}{13}$ ?

- 1)  $\tan A$
- 2)  $\tan B$
- 3)  $\sin A$
- 4)  $\sin B$



- 3) Find the area of a non-right triangle that has the side lengths of 12-14-17 using Heron's Formula. Round your answer to the nearest tenth.



$$s = \frac{12 + 14 + 17}{2}$$

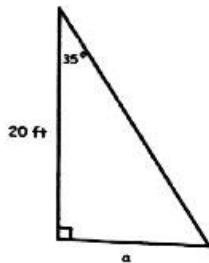
$$s = \frac{43}{2} = 21.5$$

$$A = \sqrt{(21.5)(4.5)(7.5)(14.5)}$$

$$A = \sqrt{6,893.4375}$$

$$A = 83.0 \text{ units squared}$$

- 4) Using trigonometric ratios, solve for side  $a$ . Round your answer to the nearest whole number.

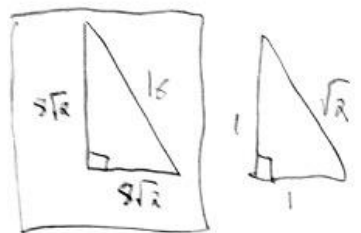
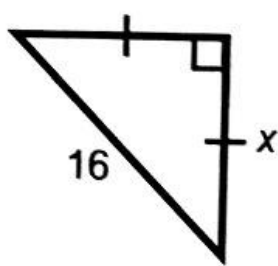


$$\tan 35 = \frac{a}{20}$$

$$a = 20 \tan 35$$

$$a = 14 \text{ ft}$$

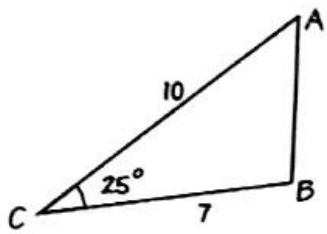
5) Find  $x$  in simplest radical form using special right triangles.



$$\frac{16}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{16\sqrt{2}}{2} = 8\sqrt{2}$$

$$x = 1 \cdot 8\sqrt{2} = 8\sqrt{2}$$

6) Find the area of the following triangle. Round your answer to the nearest hundredth.

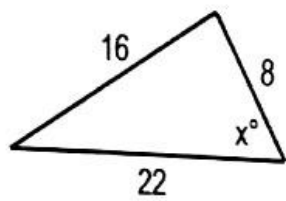


$$A = \frac{1}{2}(10)(7) \sin 25$$

$$A = 35 \sin 25$$

$$A = 14.79$$

7) Find  $x$  to the nearest degree.



$$16^2 = a^2 + b^2 - 2(ab) \sin X$$

$$256 = 484 + 64 - 352 \sin X$$

$$256 = 548 - 352 \sin X$$

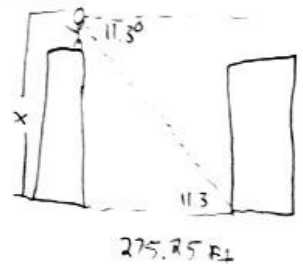
$$-292 = -352 \sin X$$

$$\sin X = \frac{242}{352}$$

$$X = \sin^{-1}\left(\frac{242}{352}\right)$$

$$X = 56^\circ$$

8) Chad is standing at the top of a building across the street from a jewelry store when he notices a robbery taking place at the jewelry store! The angle of depression formed by the top of his head and his line of sight to the robbery is 11.3 degrees. If the building that Chad is standing on is 275.25 feet away from the front of the jewelry store, how high off the ground is Chad? Round your answer to the nearest hundredth.

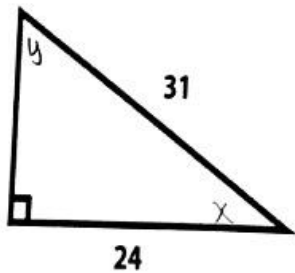


$$\tan 11.3 = \frac{x}{275.25}$$

$$x = 275.25(\tan 11.3)$$

$$x = 55.00 \text{ ft}$$

- 9) Find the measure of all the angles in the following right triangle. Round all answer to the nearest tenth.



$$\cos X = \frac{24}{31}$$

$$X = \cos^{-1}\left(\frac{24}{31}\right)$$

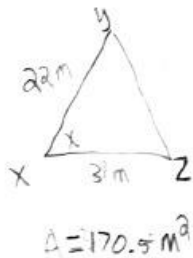
$$X = 39.3^\circ$$

$$180 = X + y + 90$$

$$90 = 39.3 + y$$

$$y = 50.7^\circ$$

- 10) In  $\triangle XYZ$ ,  $XY = 22$  meters and  $XZ = 31$  meters. If the area of the triangle is ~~170.5~~ <sup>170.5</sup> sq. meters, find the measure of angle X to the nearest degree.



$$170.5 = \frac{1}{2}(22)(31)\sin X$$

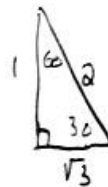
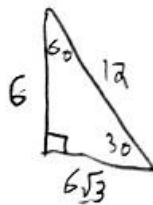
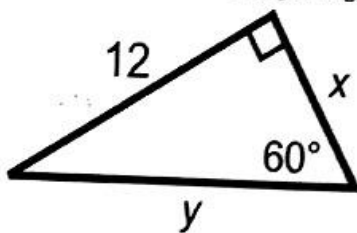
$$170.5 = 341\sin X$$

$$\sin X = \frac{170.5}{341}$$

$$X = \sin^{-1}\left(\frac{1}{2}\right)$$

$$X = 30^\circ$$

- 11) Given the following triangle, solve for x and y to the nearest whole number using special right triangles.



$$\frac{12}{2} = 6$$

$$1 \cdot 6 = 6$$

$$\sqrt{3} \cdot 6 = 6\sqrt{3}$$

- 12) If  $\cos\left(\frac{35\theta}{4}\right) = \sin\left(\frac{5\theta}{4}\right)$ , solve for  $\theta$ .

$$\frac{35\theta}{4} + \frac{5\theta}{4} = 90$$

$$\frac{40\theta}{4} = 90$$

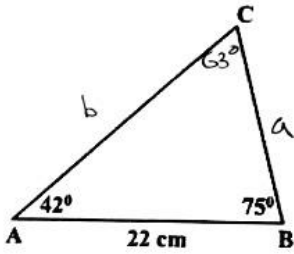
$$\frac{40\theta}{4} = 90$$

$$\theta = 9$$



Remote Instruction to Support the Learning of Trigonometry

13) Find the lengths of sides AC and CB. Round your answers to the nearest whole number.



$$180 - 75 - 42 = 63^\circ$$

$$\frac{\sin 63}{22} = \frac{\sin 75}{b}$$

$$b \sin 63 = 22 \sin 75$$

$$b = \frac{22 \sin 75}{\sin 63}$$

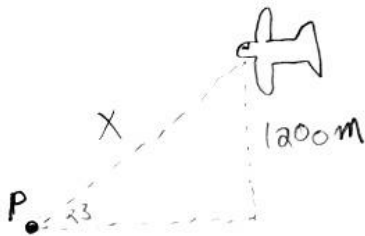
$$b = 24 \text{ cm} = AC$$

$$\frac{\sin 63}{22} = \frac{\sin 42}{a}$$

$$\frac{a \sin 63}{\sin 63} = \frac{22 \sin 42}{\sin 63}$$

$$a = 17 \text{ cm} = CB$$

14) From point P on the ground, the angle of elevation of an airplane is  $23^\circ$ . The altitude of the plane is 1200 meters. What is the distance from point P to the airplane, to the nearest tenth of a meter?



$$\sin 23 = \frac{1200}{X}$$

$$X \sin 23 = 1200$$

$$X = \frac{1200}{\sin 23}$$

$$X = 3,071.2 \text{ m}$$

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