**Lesson Plan**

**COSMOS EDUCATIONAL TOOLKIT: LESSON NAME: How to use trigonometry in real life?**

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| **Grade/ Grade Band**: *11* | **Topic:** *Finding a location using Trig* | **Lesson #** *1* **in a series of** *4* **lessons** |
| **Brief Lesson Description**: *Learning how to find a location using triangulation. Triangulation is defined as tracing and measurement of a series or network of triangles in order to determine the distances and relative positions of points over a territory. Students will explore a scavenger hunt with clues. They will discover the need to use the Law of Sines (LOS) and Cosines (LOC) to determine information from one triangle to another. This would lead to a clue that would lead to the location of the final objective.*  |
| **Specific Learning Outcomes:** *The essential element that students will know after the lesson will be the ability to associate trigonometry with a real world application.*  |
| **Narrative / Background Information**  |
| **Prior Student Knowledge Required:** *Having a strong background in algebra which would aid the students. Spatial understanding that would aid in a sketch the scenario in addition, students should have experience solving real world problems with finding missing pieces of a triangle utilizing law of sines and cosines.*  |
| **Problem Solving Practices (Ex: Standards for Mathematical Practice):** *[CCSS.MATH.CONTENT.HSG.SRT.D.11](http://www.corestandards.org/Math/Content/HSG/SRT/D/11/)**(+) Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).* | **Main Content Ideas:** *Students will learn through inquiry and discovery that the math concepts they are learning have real applications. Civil engineers use a technique called triangulation to determine distance. Today civil engineers have better equipment that aids in this calculation.* | **Possible Multidisciplinary Concepts:** *The usage of LOC/LOS have an endless amount of applications. It is mainly used when you don’t have a simple right triangle. It opens the ability to calculate a multitude of options. Some may include: vehicle traveling, ship travel, animal/human movement...* |
| **Possible Preconceptions/Misconceptions:** *Students may have the preconception of another math lesson with just working through some math problems. The students won’t realize that they are making their own math problems while having to solve it for more clues to finish the puzzle. Essentially they are “escaping the room” a popular interactive game.* |
| **LESSON PLAN – 5-E Model**  |
| **ENGAGE: Opening Activity – Access Prior Learning / Stimulate Interest / Generate Questions:** **Option #1 (without the use of the tool kit)****Day 1: Scavenger Hunt. Which group will complete all the tasks first.**1. Students will count from 1 - 8. After we will have 8 groups of 4.
2. The 1st QR Code will be presented to the class. Students will have to use their phones to get the first clue.
3. Groups will find all relevant information which will lead to clue #2.
4. Clue #2 will be another QR code on the same sheet which leads to a Caesar Cipher.
5. The Caesar Cipher leads to what floor the go to. Once on either 1st through 5th floor they will get clue #3 near the elevator which is told to them after the cipher.
6. Students will complete a mathematical task whereby the main goal in the task will be to find the area of a triangle. This is there next key.
7. Students will find the locker number behind the poster of the rolling stones cover. They will have to figure this part out which is given in clue #3.
8. Students will find the locker and connect the value from the area of the triangle with opening the lock.
9. Inside the locker will be a balloon with a message on it saying that the clue lies within.
10. Another mathematical task will lead them back to the classroom.
11. At the classroom there will be another QR code on the outside of the class which will give them congratulations message that they complete the activity.

**Option #2 (using tools from the tool kit)****Day 1: Treasure hunt using your team.**Students will use a microphone and an access point to discover the distance from set points.1. This lesson will begin similar to option #1 above.
2. The change in option #1 will be at clue #3. Students will use the walkie talkies to communicate with an access point and have to calculate the distance based upon how much power they have.
3. Students will use triangularization to find the length of EA.
4. This will lead to the location of a QR code/clue somewhere on the floor that they are located on.
5. This will then continue with option #1 whereby finding a locker and continuing on the quest.

Students will determine the distance from AC, AB & CB. After students find those lengths, they will find all relevant information associated with triangle DCB and EDB.   |
| **EXPLORE: Lesson Description – Materials Needed / Probing or Clarifying Questions:** * *Possible Transmission devices: Computer program and COSMOS equipment.*
* *Other equipment may be used.*
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| **EXPLAIN: Concepts Explained and Vocabulary Defined:** **Key Vocabulary:**  |
| **ELABORATE: Applications and Extensions:** *An extension would venture into some of the other examples that were shared above in the multidisciplinary concept section.* |
| **EVALUATE:** **Formative Monitoring (Questioning / Discussion):** **Summative Assessment (Quiz / Project / Report):**  |
| **Elaborate Further / Reflect: Enrichment:**  |