**Title:** Discovering heights in real life situations, and applying the trig ratios.

**Teacher:** Janet Warren (Outlook High School)

**Grade/Subject:** Workplace & Apprenticeship Math 10

**Outcomes:** WA 10.8 – Demonstrate an understanding of primary trigonometric ratios (sine, cosine and tangent).

**Summary:**

\* The way this assignment is formatted, it is meant to be outside measuring inaccessibly tall objects. This may not necessarily be the best choice for winter time. Also, there is a portion where the iPad is required to rest on the ground… adaptations may need to be made if there is snow on the ground. Measure from chest height, but then that additional height calculation will need to be taken into account in their work.

The students already had a very good understanding of the primary trig ratios and how to use them, as they had already taken Foundations and Pre-Calculus 10. We did a quick review of sine, cosine and tangent. If I had a group of students who were unfamiliar with the ratios, I would take a day or two to introduce the ratios. A good understanding of the trig ratios is necessary for them to be able to do a good job with this assignment.

Since we were using apps on the iPad, I took a good 20-30 minutes to explain the logistics behind how to hold the iPad, etc. in order to get accurate measurements with the Tape Measure app and the Clinometer app.

**\* The Clinometer app was $3.49 and the Tape Measure App is $1.49. I wasn’t able to find a free Clinometer app that used the camera.**

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|  | **Clinometer + bubble level + slope finder (3 in 1)****By Peter Breitling** |
|  | **Endless Tape Measure****By RealityCap** |
|  | Explain Everything ™By MorrisCooke |

**21 CC Goals:**

* Develop Critical Thinking – analyze measurements and equations
* Develop Collaboration – working in groups of three to acquire accurate calculations and measurements
* Develop Creativity – using software to creatively present their findings from the assignment.

**Evidence:**

Students had fun getting outside and using technology to use the trigonometric ratios in real life situations. The measuring app is a little bit finicky, so getting some practice with it to be able to tell the students how best to use it is a suggestion.

**Workplace & Apprenticeship 10 – Warren**

**Applications of Trigonometry Assignment**

**Introduction**

How would you find the height of a tree? You could climb to the top to measure it, but that would not be either safe or practical. How can we measure the height of clouds, airplanes or other highly inaccessible objects? Airports measure the clouds for pilots to let them know at what altitude they should fly. In this activity you will measure the heights of various objects using a clinometer app and trigonometric ratios.

**Clinometer & Measuring**

To do this assignment the “old fashioned” way, we would have built a clinometer using a straw attached to the bottom of a protractor, string, and a small washer tied to the string. We would have also used a tape measure to find out how far away from an object we were standing.

For this assignment we are using the power of technology! Each of the iPad we will be using has two apps on it that we will use instead.

**Measuring Distances**

Use the “Tape Measure” app to measure how far away from the object you are finding the height of (be sure to follow the tips that I’ve given you to ensure as accurate a measure as possible). Be sure one of your group members marks the starting position from where you began walking. This will be the spot you need to return to, to measure your angle of elevation. Record the distance at which you are from the object in your table.

Next, using the “Clinometer” app, measure the angle from where you are standing to the top of the object you are finding the height of. Be sure to put the iPad on the ground for this step. Record this angle in your table.

**Documentation**

Be sure to record all of your measurements in the table provided. Also use your phone/iPod to take pictures of you and your group members standing at the point where you are measuring the angle of elevation (since there are three groups members, there should be one picture of each of you 🡪 one for each object you are measuring).

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| --- | --- | --- | --- |
| **Object you are Measuring** | **Angle of Elevation (measured using the clinometer app)** | **Distance From base (measured in m 🡪 measured using the tape measure app)** | **Height of Object (Show all of your work in the space provided)****(You will also be required to solve the rest of the triangle later)** |
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**Final Product:**

You will upload your photos to the “Explain Everything” app. Create a cover page in the app that has the title of this assignment, along with your group member’s names. Take a moment to make it look nice… decorate it a little bit!

Each photo should be placed on its own page. Using the writing tools available, and the voice record option, explain how you found the height of your object using the trig ratios. After you have explained finding the height, you **MUST** continue and **solve the entire triangle.**

You will export your finished movie to Mrs. Warren’s google drive account (come see me when you are ready to do this, and I will log in for you).

**Analysis**

Hand in a short write-up about what you thought worked well with this assignment, and what didn’t work well.