

Trigonometric Measuring Project

General Information

Course: Math Academy 1

Chapter: four

Assigned: Wednesday, January 6

Due: Wednesday, January 13

Points: 30

Group Size: 1 to 3 people

Format: poster

Summary: Make a clinometer, and use it to measure the height of a tall object.

Bonus: Use the law of sines to measure the height of an object whose base you cannot reach.

Directions

1. Create a clinometer.
2. Choose a tall object outside that is in flat ground.
3. Standing several meters from the base of the object, measure the distance to the base (directly below the top), the distance from the ground to eye-level, and the angle of elevation from your eye to the top.
4. Mark the ground where you stood for the measurement.
5. Do steps 3 and 4 three additional times, standing a significantly different distance away from the base of the object each time.
6. Take a picture of the scene. Make sure the top and bottom of the object and all four ground marks are visible in the picture.
7. Making all lengths to scale, sketch the object being measured once, and draw four different right triangles using this object as one of the legs. Use a different color for each of the four hypotenuses. You can sketch on paper, or you can sketch directly on your photo if it is large enough and the perspective is to scale.
8. Using colors corresponding to the sketch, write and solve a trig equation to find the height in each of the four triangles. For each triangle, add in your height at eye level after solving.
9. Based on the average of your answers and on the similarity of your answers, estimate the true height of the object and comment on how precise this measurement seems to be.

[A] Content: ____ / 20

- 2 The criterion is clearly met.
- 1 The criterion is addressed to a meaningful but limited extent.
- 0 The criterion is not addressed in a meaningful way.

1 2

- The object is too tall to measure by hand.
- Four different angle measurements are made.
- All four triangles are sketched to scale.
- All four sketched triangles share the leg representing the object's height.
- Each triangle's color matches the work for it and is different from the other colors.
- All trig equations are shown and correct.
- All work is shown clearly and with correct notation.
- All calculations are correct.
- The final estimate is reasonable, based on the calculations as well as the actual object.
- The comment on precision is reasonable and considers the amount of variation between results.

[B] Presentation: ____ / 10

- 3 The project is impressive in this aspect, and it appears carefully planned and created.
- 2 The project is reasonable in this aspect.
- 1 The project looks like it was done in a hurry in this aspect.
- 0 The project is difficult to follow because of this aspect.

1 2 3

- The poster is neat.
- The poster is attractive.
- The poster uses color effectively.
- All directions are followed.

[C] Bonus: ____ / 0

- +5% This aspect is true to a meaningful but limited extent.
- +10% Your work is exemplary in this aspect.

5 10

- You show an understanding of the concepts explored.
- The goal has been achieved.
- The final product is impressive.