**Shadows Project: GRASP**

**GOAL:** Measure the Washington Monument using two different methods, and determine which method is the most reliable.

**ROLE:** Future Research Council

**AUDIENCE:** Survivors, Inc.

**SCENARIO:** With the apocalypse looming, an entrepreneur is gathering Engineers from across the world to help form a group to sustain human existence in case they are survivors of an apocalyptic disaster. They expect that all technology will be lost, and they will need to use critical engineering and mathematical thinking in order to survive and rebuild.

**PERFORMANCE:** As the lead engineer, it is your job to establish a method for measuring heights of surviving cliffs, buildings, and monuments. You will be given a small list of supplies, and your goal will be to determine which method is the most reliable in measuring the height of monuments in Washington DC. In order to determine this, you will need to create a procedure for each method, create a data recording sheet for each plan, execute your plan, and present a convincing argument in support of your preferred method. In order to measure the height, you will have the following tools.

Tools:

-String – 1 meter

-Paper ruler – 30 cm

-Camera

Since the Future Research Council is investing in your final expedition, they require that you meet all of the intermediate checkpoints in order to complete the final voyage. If your team has not met the required checkpoints, they will not partake in the final voyage.

**Standards:**

G-SRT.5. Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

G-MG.1. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).

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| Project Rubric | | | | | |
| Category | 1 | 2 | | 3 | 4 |
| Procedure Plan | -Key Steps missing | -Two methods outlined  -Clearly drawn, labeled diagrams  -All measurements to be taken are labeled in a step  -Plan accounts for strategies to measure longs distances | | -Two methods outlined  -Clearly drawn, labeled diagrams  -All measurements to be taken are labeled in a step  -Plan accounts for strategies to measure longs distances  -Plan accounts for at least two data trials for each measurement | Two methods outlined  -Clearly drawn, labeled diagrams  -All measurements to be taken are labeled in a step  -Plan accounts for strategies to measure longs distances  -Plan accounts for multiple data trials  -Plan accounts for four or more data trials for each measurement |
| Data Collection Sheet | -Unclear layout  -Limited space for multiple entries. | -Clear layout  -Clearly labeled spaces for data entry | | -Clear layout  -Clearly labeled spaces for data entry  -Clear space provided for multiple data entry and average calculations | Clear layout  -Clearly labeled spaces for data entry  -Clear space provided for multiple data entry and average calculations  -Space provided for recording observations, possibly errors in measurement |
| Execution of Plan – Day of Trip | -Did not execute plan effectively  -Off task at multiple times, redirected by teacher several times  -Any poor behavior that is not up to the expectations of EL Haynes. | Executed some of the plan, worked most of the time  -Off task at times, redirected by teacher at least once  - Highest behavior expectations, strong representative of the EL Haynes community | | Executed plan, fully engaged in work with group, on task at all times  -Highest behavior expectations, strong representative of the EL Haynes community | Executed plan, fully engaged in work with group, on task at all times  -Highest behavior expectations, strong representative of the EL Haynes community  -Exemplary representation of EL Haynes community |
| Presentation of Results | --Video, Screencast, Prezi, Poster, or Power Point that clearly shows many but is missing some of  -procedure  -data  -process (photos and/or video)  -Explanation of best method | -Video, Screencast, Prezi, Poster, or Power Point that clearly shows  -procedure  -data  -process (photos and/or video)  - complete explanation w/all most of unit vocab  -Needs more edits | | -Video, Screencast, Prezi, Poster, or Power Point that clearly shows  -procedure  -data  -process (photos and/or video)  - complete explanation w/all unit vocab  -Edited final product | -Video, Screencast, or Prezi, that clearly shows  -procedure  -data  -process (photos and/or video)  -complete explanation w/all unit vocab + 5 terms from previous units  -Edited, professional, high quality final product |
| Peer Evaluation | Poor contributor, did little to help the group. | Contributing member of the group, did not participate fully at all times, was not always a team player | | Strong member in the group, worked well with group mates, contributed their fair share at all times | Leader in the group, worked well with group mates, contributed their fair share at all times, held group to high standards and pushed their thinking |
| Total Project Grade | | |  | | |
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| Work Hard Rubric | | | | | |
| Day One Mini Lab | Not on Task  -Completed little of the work  -Poor Behavior | On task most of the time  -Completed most of the work  -Excellent Behavior | | On task at all times  -Strong work ethic  -Completed all work  -Excellent Behavior | -On task at all times  -Strong work ethic – brainstormed challenges w/little help from teacher  -Completed all work  -Excellent Behavior |
| Procedure Edits | Not on Task  -Completed little of the work  -Poor Behavior | On task most of the time  -Completed most of the work  -Excellent Behavior | | On task at all times  -Strong work ethic  -Completed all work  -Excellent Behavior | -On task at all times  -Strong work ethic – brainstormed challenges w/little help from teacher  -Completed all work  -Excellent Behavior |
| Day Two Mini Lab | Not on Task  -Completed little of the work  -Poor Behavior | On task most of the time  -Completed most of the work  -Excellent Behavior | | On task at all times  -Strong work ethic  -Completed all work  -Excellent Behavior | -On task at all times  -Strong work ethic – brainstormed challenges w/little help from teacher  -Completed all work  -Excellent Behavior |
| Writing/Explaining Class Activity | Not on Task  -Completed little of the work  -Poor Behavior | On task most of the time  -Completed most of the work  -Excellent Behavior | | On task at all times  -Strong work ethic  -Completed all work  -Excellent Behavior | -On task at all times  -Strong work ethic – brainstormed challenges w/little help from teacher  -Completed all work  -Excellent Behavior |
| Project Timeliness | Late by more than 3 days, submitted and formatted incorrectly | Late by less than 3 days, submitted and formatted correctly | | On time, submitted and formatted correctly | On time, submitted and formatted correctly |
| Total Project Work Hard Grade | | |  | | |

Day One Mini Lab

Goal: Establish a Procedure and Data recording for Option A and Option B of measuring heights.

During this mini lab, you will work to Establish a Procedure and Data recording plan by practicing calculating the height of a chair. You will use your knowledge of similar triangles and measurement to calculate this height. In the process, you will develop a procedure that can be replicated on the Natinal Mall to calculate the height of the monuments.

During this lab, you will complete calculations and take notes on a sheet of paper that will be turned in at the end of class. Additionally, you will create a rough draft of your procedure and data sheet on Google Docs – typed and submitted by the end of the period.

Both of these documents need to be typed and created on Google Docs. Title the document as follows

“Shadows.Procedure.Data.FirstName.FirstName.FirstName” where First Name is the name of each of the group members.

Keys to a strong procedure plan:

-Labeled, detailed diagram

-List of variables

-List of unknowns

-If something needs to be measured, there is a step indicating that

-If calculations need to be made, there is a step indicating that

Keys to a strong Data Sheet

-Space is provided for taking all key measurements – and measurements are labeled

-When applicable, there is space for taking multiple measurements, and calculating an average

-Space is provided for calculations

Day Two – Group Writing Prompt

Individually, each person needs to put into words the following

1. How can you use shadows t measure the height of an object.
2. How do you know the triangles are similar? What theorem can you use to prove this?

Vocabulary Words to Include: Indirect measurement. Corresponding. Congruent. Angles. Similar. Proportion. Ratio. Sunlight. Shadow.

Day Three – Edit Procedure

Goal: Take the feedback and edit your procedure plan and data sheets so they are ready for a test run outside. These will be printed out to use on Monday for our second mini lab.

Day Four – Mini Lab

Goal: Use your procedures and data sheet to measure the height of EL Haynes and/or tree in the field behind the school.

The biggest challenge today will be to determine what the challenges are for each method of measurement, and .