Indirect Measurement MYP Assessment

While it is simple to measure small objects and distances, creative methods must be applied to measuring extremely large objects or distances. Examples include measuring the apex of a rocket trajectory or approximating the circumference of the Earth. This assessment will require you to perform such a measurement.

Assessment Task:

1. Students will outline a brief history of using trigonometry to make measurements and discuss how an indirect measurement could be made. This should be about two paragraphs long. A shared Google form completed by all students in class will provide this outline, which will be refined by individual students in an assigned Google document.

2. Students will decide on two or three experiments to actually perform during class time. The write-up for at least one of these experiments should be written up in their assigned Google document.

3. Students will construct and practice using the tools necessary to perform the indirect measurement. Students should make constructions that show similar triangles for the experiment, and embed them in their Google document.

4. Students will collect data from their designed experiments (measuring flagpoles, rocket launch, etc.)

5. Students will finish their report by writing the results of at least one of these experiments, along with the mathematical reasoning and processes involved.

6. Advanced students may choose another indirect measurement project to perform independently.

AOIs: Human Ingenuity, Approaches to Learning MYP Criteria: Criterion A, B, C

Math - Problem Solving : Indirect Measurement

Teacher Name: **Mr. Eifler**

CATEGORY	4 - Advanced (7-8)	3 - Proficient (5-6)	2 - Partially Proficient (3-4)	1 Unsatisfactory (1-2)
Mathematical Reasoning	Uses complex and refined mathematical reasoning.	Uses effective mathematical reasoning	Some evidence of mathematical reasoning.	Little evidence of mathematical reasoning.
Communication	Ideas and conclusion are clearly stated and supported by the evidence from the experiment.	Ideas and conclusion are stated and mostly supported by the evidence, with limited exceptions.	Ideas and conclusion are stated but loosely supported by the evidence.	Ideas and conclusion are difficult to analyze and marginally supported by the evidence.
Patterns in Similar Triangles	Clearly shows understanding that all similar right triangles have the same trigonometric ratios.	Mostly shows understanding that all similar right triangles have the same trigonometric ratios.	Shows some understanding that all similar right triangles have the same trigonometric ratios	Shows limited understanding that all similar right triangles have the same trigonometric ratios
Mathematical Terminology and Notation	Correct terminology and notation are always used, making it easy to understand what was done.	Correct terminology and notation are usually used, making it fairly easy to understand what was done.	Correct terminology and notation are used, but it is sometimes not easy to understand what was done.	There is little use, or a lot of inappropriate use, of terminology and notation.

Required Reading: (Insert name) measuring the circumference of the Earth using shadows at different locations at the same time of day. Surveying introduction. Measuring rocket trajectory (October Sky?)

Assessment Task 1: Determining Rocket Trajectory Apex. Students will experiment with rocket launches during a class block using clinometers to measure height. Collect data from several rocket launches.

Assessment Task 2: Estimating Distance Using Trigonometry/Similar Triangles. During a class block, students will use simple surveying methods to estimate either the circumference of the Earth (reproduce the Greek measurement). (Need to work this out).

1. Students will use background reading to brainstorm methods for indirect measurement and write their hypothesis as part of their project report.

2. Students will construct and practice using clinometers outside (e.g. flagpole measurement).

3. Students will use software and paper-and-pencil models (similar triangles in geogebra – dilations) to practice calculations for the trajectory apex and circumference. They will create a template for recording measurements and assign roles for the experiment.

4. Students will collect data from rocket launches and surveying data in a class block outside.

5. Students will use data from rocket launches (individual students will use different data to insure individual results) to calculate height of the launch and circumference of the Earth (or other surveying objective).

6. Students will write a report summarizing the measurement process used (including time researching, building tools, practicing calculations, collecting data, and making conclusions). Students should compare results with another student to verify accuracy.

7. Advanced students may choose another indirect measurement project to perform independently.

AOIs: Human Ingenuity, Approaches to Learning

MYP Criteria: Criterion A, B, C

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