TASK PLANNER

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| STUDENT NAME | Lily Truong |
| LEARNING AREA | Mathematics |
| TEACHER | Viedt |
| YEAR / SUBJECT | Stage 1 General Mathematics |
| TASK NAME | TOO TALL TO MEASURE |
| **DUE DATE** |  |

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| TASK DESCRIPTION |
| PURPOSE:To apply numerical trigonometry (right angled and non-right angled) in a variety of practical situations.TASK:To use methods of indirect measurement and the application of numerical trigonometry to find heights and lengths. You will be measuring angles and lengths outside and using these and your knowledge of trigonometry to find heights and lengths. |

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| **ASSESSMENT** |
| This task will be assessed using the Performance Standards.Students are encouraged to submit a completed draft of their work to Daymap DRAFT so that feedback can be provided.Students’ final copy will be submitted to Daymap FINAL and will be assessed in conjunction with TURNITIN software. |

*This Task Planner is available to students on Daymap*

Performance Standards for Stage 1 General Mathematics

| - | Concepts and Techniques | Reasoning and Communication |
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| A | Comprehensive knowledge and understanding of concepts and relationships.Highly effective selection and application of mathematical techniques and algorithms to find efficient and accurate solutions to routine and complex problems in a variety of contexts.Successful development and application of mathematical models to find concise and accurate solutions.Appropriate and effective use of electronic technology to find accurate solutions to routine and complex problems. | Comprehensive interpretation of mathematical results in the context of the problem.Drawing logical conclusions from mathematical results, with a comprehensive understanding of their reasonableness and limitations.Proficient and accurate use of appropriate mathematical notation, representations, and terminology.Highly effective communication of mathematical ideas and reasoning to develop logical and concise arguments.Formation and testing of appropriate predictions, using sound mathematical evidence. |
| B | Some depth of knowledge and understanding of concepts and relationships.Mostly effective selection and application of mathematical techniques and algorithms to find mostly accurate solutions to routine and some complex problems in a variety of contexts.Attempted development and successful application of mathematical models to find mostly accurate solutions.Mostly appropriate and effective use of electronic technology to find mostly accurate solutions to routine and some complex problems. | Mostly appropriate interpretation of mathematical results in the context of the problem.Drawing mostly logical conclusions from mathematical results, with some depth of understanding of their reasonableness and limitations.Mostly accurate use of appropriate mathematical notation, representations, and terminology.Mostly effective communication of mathematical ideas and reasoning to develop mostly logical arguments.Formation and testing of mostly appropriate predictions, using some mathematical evidence. |
| C | Generally competent knowledge and understanding of concepts and relationships.Generally effective selection and application of mathematical techniques and algorithms to find mostly accurate solutions to routine problems in different contexts.Application of mathematical models to find generally accurate solutions.Generally appropriate and effective use of electronic technology to find mostly accurate solutions to routine problems. | Generally appropriate interpretation of mathematical results in the context of the problem.Drawing some logical conclusions from mathematical results, with some understanding of their reasonableness and limitations.Generally appropriate use of mathematical notation, representations, and terminology, with reasonable accuracy.Generally effective communication of mathematical ideas and reasoning to develop some logical arguments.Formation of an appropriate prediction and some attempt to test it using mathematical evidence. |
| D | Basic knowledge and some understanding of concepts and relationships.Some selection and application of mathematical techniques and algorithms to find some accurate solutions to routine problems in context.Some application of mathematical models to find some accurate or partially accurate solutions.Some appropriate use of electronic technology to find some accurate solutions to routine problems. | Some interpretation of mathematical results.Drawing some conclusions from mathematical results, with some awareness of their reasonableness.Some appropriate use of mathematical notation, representations, and terminology, with some accuracy.Some communication of mathematical ideas, with attempted reasoning and/or arguments.Attempted formation of a prediction with limited attempt to test it using mathematical evidence. |
| E | Limited knowledge or understanding of concepts and relationships.Attempted selection and limited application of mathematical techniques or algorithms, with limited accuracy in solving routine problems.Attempted application of mathematical models, with limited accuracy.Attempted use of electronic technology, with limited accuracy in solving routine problems. | Limited interpretation of mathematical results.Limited understanding of the meaning of mathematical results, their reasonableness or limitations.Limited use of appropriate mathematical notation, representations, or terminology, with limited accuracy.Attempted communication of mathematical ideas, with limited reasoning.Limited attempt to form or test a prediction. |

STAGE 1 GENERAL MATHEMATICS

INVESTIGATION : **TOO TALL TO MEASURE**

Many things around us are too tall to measure directly. For example, tall trees, buildings. Widths can also be hard to measure if there are obstructions in the way.

In this folio task, you will be using methods of indirect measurement and the application of numerical trigonometry to find heights and/or widths. You will be measuring angles and lengths outside and using these and your knowledge of trigonometry to find heights and/or widths.

You will work collaboratively to gather the measurements outside and then individually prepare an investigation report. In a report form, you will test predictions, interpret and justify results, summarise, and draw conclusions. You are required to give appropriate explanations and arguments.

NOTE:

* Just doing the basics will obtain you a passing grade (C). You need to show a high level of understanding and ability to apply techniques in a variety of contexts for a higher grade than this.
* This is like 2 mini investigations so you need to explain the problem, the process, work through the mathematics BUT linking sections and explaining findings. Also discuss limitations and assumptions.

**SECTION 1: HEIGHT OF A SCHOOL BUILDING**

You need to determine the height of **one of the tallest school buildings or other**. (ie: back of maths/languages, end of new building). You need to be able to measure the angle of elevation to the top of the object using a school clinometer or a phone app to measure these angles (using a straw helps with viewing). You will also need a tape measure.

Method to determine the height of this building:

* Make a prediction of the height with justification.

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* Take measurements for angle and distance from a number of positions. Maybe take a few angle measurements for each and average these to reduce the error.

d

h

* Measure the height from which the angle was measured (*h*)
* Use right triangle trigonometry to calculate the height.
* Don’t forget the height from which the angle was measured.

While measuring, really think about where errors could occur and what you did to take these into cpnsideration.

You need to take measurements from **a number of different positions** and record them:

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| OBJECT | PREDICTED HEIGHT | DISTANCE FROM BASE | ANGLE OF ELEVATION |
|  |  | 4m  | 63.5 |
|  | 10m  | 5m | 62.4 |
| School building  |  | 6.5m | 48.1 |

Include a large, clearly labelled diagram for each case. Calculate the height for each set of measurements. These calculations must be set out clearly and correctly using INSERT EQUATION. Discuss in detail any reasons for inaccuracies, problems encountered, changes you would recommend. Limitations and assumptions. This is vital.

**SECTION 2 : SATELLITES OR HIGH UP**

The height of satellites can be found using trigonometry and taking simultaneous readings of the angle of elevation from different points. Consider the case of two satellite tracking stations 200 km apart that sight the satellite at different angles of elevation as illustrated below. The point C is vertically below the satellite S.

Explain the problem and work through the below.

* Find all the missing angles in the satellite scenario, showing clearly how you did this. Use these to find the HEIGHT of the satellite.
* Another method for finding the height is to use the formula $BC=\frac{200\tan(23)}{\left(\tan(55)-\tan(23)\right)}$ to help find HEIGHT. Use this to find $BC$ and height.
* This technique can be used to find the height of many objects that are difficult to measure, especially when there is an obstruction in the way. You are to apply this process in the field to a very tall object (building, tall tree, etc) by finding the angle of elevation from a position. Then measure a chosen distance (ie 20 m) closer to or further away from the object and again find the angle of elevation.

Discuss your findings. Do these seem valid? Discuss in detail any reasons for inaccuracies, problems encountered, changes you would recommend. Discuss some situations where you may be able to use this method.

**CONCLUSION (for whole investigation):**

Compare and contrast the processes and the situations in which each would be useful.

**POSSIBLE EXTENSION IDEAS**: (need to link ideas and discuss, do not just tack on at the end)

* Use the tan ratio in ∆BCS to find an expression for h in terms of *BC*.
* Use the tan ratio in ∆ACS to find an expression for *h* in terms of *BC*.
* Equating these expressions gives us $BC=\frac{200\tan(23)}{\left(\tan(55)-\tan(23)\right)}$ . Using the 2 expressions for h, show how the expression for BC was generated.

Folio Tasks: Report Writing Guidelines

**Specifications:**

* Each investigation report, excluding bibliography and appendices if used, must be a **maximum of 8 A4, single sided** pages, with **minimum font size 10**. Page reduction, such as 2 A4 pages reduced to fit on 1 A4 page, is **not** acceptable.

**Language Conventions**

* Written sections must include appropriate paragraphing and full sentences with correct grammar and structure.
* Whenever possible the use of “I”, “me”, “we” should be avoided.

 The Structure of a Mathematical Report

Introduction

This section describes what the investigation will be about. It should include:

* any background (set the scene) information relevant to the main focus of the investigation
* the aim/purpose of the investigation (including the definition of any key terms (mathematical and non-mathematical) relevant to the context of the problem)
* a description of how the investigation will be carried out

Mathematical Investigations & Analysis

This section contains all the data/information/calculations/results gathered or produced in the course of the investigation.

It includes:

* complete solutions to all set tasks set out in a clear and logical way
* appendices should only be used if there are extensive repetitive calculations and must be referenced appropriately)
* all results displayed appropriately and clearly (tables; graphs; diagrams)
* clear communication of all relevant information (including correct mathematical notation)
* interpretation and analysis of all results using complete sentences
* where applicable reference should be made to the reasonableness of the results (in terms of the context of the problem being investigated) and any possible limitations of the interpreted results/original problem.

Conclusion

This section includes:

* a summary of all the main findings
* a clear statement of the overall conclusion(s)/solution (relating directly back to the aim)
* an evaluation of the results and methods used, including a comment on (where applicable)
	+ any assumptions made and any possible limitations of the interpreted results
	+ how the investigation could be extended to provide further results
	+ what worked well and what didn’t (in terms of the process and calculations)
	+ any further investigations that could lead on from this one

Bibliography

* all sources used must be included and referenced appropriately.