

Trigonometry Assignment

Activity Summary

- In this activity, students will:
- ♦ Measure items in the school and record answers using trigonometry
 - ♦ Explore careers that focus on Numeracy skills



Prior Knowledge

- **Essential Skills** including all subcategories
- Basic Trigonometric Ratios
- Pythagorean Theorem
- Angle of inclination, angle of depression
- Solving problems involving one triangle to find a height, distance or angle
- Solving problems involving two triangles
- Measuring angles using a clinometer and transit (or transit-like device)

Teaching Planning Notes

- Review the assignment including prior learning required, assessment and evaluation tools
- Provide students with measuring tapes at least 10 m long and clinometers, transits or other devices that allow for measuring angles
- Set up 4 stations with required measurement tools and worksheets
- Provide a step ladder (preferably longer than 6 ft.) in the classroom
- Provide an extension ladder in the classroom, leaning it against the wall, marking the location on the floor where the feet should sit
- Label step ladder and extension ladder for students to avoid confusion
- To link this to the workplace effectively, the teacher should arrange for a surveyor to come to the class to describe the requirements of his/her job, show the tools used on the job and to discuss how the surveyor would solve the problems presented. If possible, the surveyor could demonstrate the calculation of one of the activities and the students could compare their results with the professional.

Note 1: Teachers may wish to link this activity more closely with other technical sectors that use surveying equipment (i.e. Horticulture and Landscape Design, Construction, etc.). Problems may easily be changed to reflect applications in these areas.

Assessment of Student Achievement

Task	Tool / Type
Stations 1-4 Worksheets	Off on a Tangent Activity Checklist (Formative)
Record Solutions to Measurement Problems	Off on a Tangent Do You Measure Up Rubric Stations 1-4 (Summative)
Guest Speaker	Off on a Tangent We Have a Visitor Activity Sheet (Formative)

Activity and Assessment Materials

- Activity Assignment Sheet
- Worksheets for Stations 1 through 4
- We Have a Visitor Activity Sheet
- Assignment Checklist
- Do You Measure Up? Rubric

FOCUS ON LEARNING

Essential Skills:

Reading Text

All Activities

Writing

Guest Speaker Follow-up

Numeracy

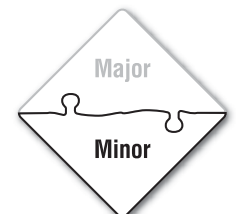
All Activities

Thinking Skills

Solving Problems

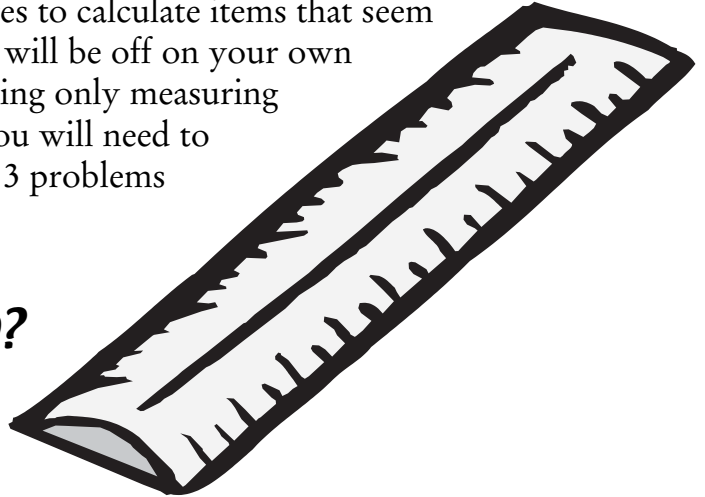
Working with Others

Solving Problems



Off on a Tangent

Trigonometry has been used throughout the ages to calculate items that seem immeasurable. Today, in groups of 2 or 3, you will be off on your own quest to measure various items in the school using only measuring tapes, meter sticks, clinometers and transits. You will need to complete four activities. Each activity has 2 or 3 problems that require the same tools to solve.



Task 1: Do You Measure Up?

- Station 1: Finding Heights
- Station 2: Finding Angles
- Station 3: Finding Distances
- Station 4: Finding It All

Step 1: Starting at one of the stations, select one problem sheet from the envelope and take the indicated measurement tools located at that station. For these activities, your group will have to determine how best to solve the problem using the measurement tools you have. After formulating a plan, take all necessary measurements, and draw a rough sketch of the situation recording the measurements that you made to solve the problem. Return to class, replace all measurement tools in the proper station and hand in the worksheet (with your names on it). Continue until you have completed the sheets from each station. When all stations are complete, collect all your worksheets from your teacher.

Step 2: Using your rough sketches, proceed to write out full solutions to all the problems in a neat, well-organized fashion, including labelled diagrams. Submit your solutions to the teacher. (Every student must complete this step.)

Task 2: Who Uses this Stuff Anyway?

Many professionals and skilled trades workers use the **Essential Skill** of Numeracy daily in their role. The **Essential Skill** of Numeracy includes the skills of measurement and calculation math, data analysis math, money math, scheduling or budgeting and accounting math and numerical estimation. Listen carefully to the guest speaker in order to record information as well as identify some keys to being successful in his/her job. Record all the information on the “We Have a Visitor” Activity Sheet.

Off on a Tangent

Station #1: Finding Heights

Materials Required

- 1 clinometer
- 1 measuring tape
- 1 meter stick
- Station 1 Worksheet
- Pencil or pen
- Hard surface to write on (e.g. clipboard or binder)

Completed

- returned to station
- returned to station
- returned to station
- returned to teacher



Problem 1A: Determine the height (in meters) of the school.

Problem 1B: Determine the height (in meters) of the Gym ceiling.

Problem 1C: Determine the maximum height (in feet and inches) reached by the step-ladder in the classroom without climbing up the ladder.

Off on a Tangent

Station #2: Finding Angles

Materials Required

- 1 measuring tape
- Station 2 Worksheet
- Pencil or pen
- Hard surface to write on (e.g. clipboard or binder)

Completed

- returned to station
- returned to teacher

Problem 2A: Determine the angle of inclination of any wheelchair ramp in the school. Indicate the location of the ramp.

Problem 2B: A ladder is leaning against the wall in the classroom, a certain distance from the wall. What angle is the ladder making with the wall?

Problem 2C: Determine the angle of depression from the second floor to the landing between the first and second floors.

Off on a Tangent

Station #3: Finding Distances

Materials Required

- 1 transit
- 1 measuring tape
- 2 meter sticks
- Station 3 Worksheet
- Pencil or pen
- Hard surface to write on (e.g. clipboard or binder)

Completed

- returned to station
- returned to station
- returned to station
- returned to teacher



Problem 3A: Determine the distance across the football field.
(in feet and inches)

Problem 3B: Determine the distance (in meters) from the portable nearest the school to the closest set of doors.

Problem 3C: Determine the distance (in meters) across the parking lot of the school.
Include a sketch of the parking lot, indicating which distance you are measuring.

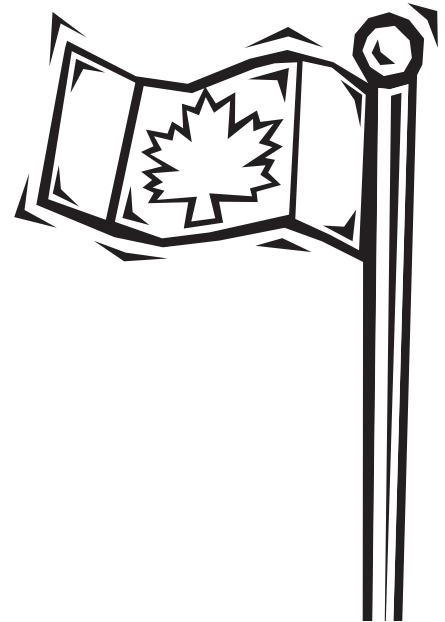
Off on a Tangent Station #4: Finding it All

Materials Required

- 1 transit
- 1 clinometer
- 1 measuring tape
- 2 meter sticks
- Station 4 Worksheet
- Pencil or pen
- Hard surface to write on (e.g. clipboard or binder)

Completed

- returned to station
- returned to station
- returned to station
- returned to station
- returned to teacher



Problem 4A: Determine the height (in meters) of the school's flagpole.

Problem 4B: Determine the height (in feet and inches) of the goal posts on the football field without stepping onto the field.

Problem 4C: Find a place in the school where you can stand and see both the top and bottom of an object above your head.

What is the object? _____

Where is the object? _____

Determine the height of the object you've selected.

Off on a Tangent Assignment Checklist

	WORKSHEETS RETURNED AFTER EACH STATION? <input checked="" type="checkbox"/>	PROBLEM SOLUTIONS COMPLETED? <input checked="" type="checkbox"/>
Station 1: Finding Heights	<input type="checkbox"/>	<input type="checkbox"/>
Station 2: Finding Angles	<input type="checkbox"/>	<input type="checkbox"/>
Station 3: Finding Distances	<input type="checkbox"/>	<input type="checkbox"/>
Station 4: Finding It All	<input type="checkbox"/>	<input type="checkbox"/>

Off on a Tangent Do You Measure Up? Rubric

(Stations 1-4 Worksheets and Problem Solutions)

CATEGORIES/ CRITERIA	LEVEL 1 (50-59%)	LEVEL 2 (60-69%)	LEVEL 3 (70-79%)	LEVEL 4 (80-100%)
<p>Knowledge and Understanding</p> <p>Completed measurements with accuracy using the primary trigonometric ratios and the Pythagorean Theorem</p> <p>Solved problems with mathematical accuracy in real life applications</p> <p>Understood the conversion of measurements between the imperial and metric systems</p>	Limited	Some	Considerable	Thorough
<p>Thinking</p> <p>Interpreted the problems correctly and created a graphical model of the situation</p>	Limited Effectiveness	Some Effectiveness	Considerable Effectiveness	High Degree of Effectiveness
<p>Communication</p> <p>Used correct mathematical symbols, labels, units and conventions</p>	Limited Effectiveness	Some Effectiveness	Considerable Effectiveness	High Degree of Effectiveness
<p>Application</p> <p>Selected the appropriate method to solve the problems</p>	Limited Effectiveness	Some Effectiveness	Considerable Effectiveness	High Degree of Effectiveness

Note: A student whose achievement is below Level 1 (50%) has not met the expectations for this assignment.

Off on a Tangent We Have a Visitor

Visitor's Name: _____

Company: _____

Occupation: _____

Length of time in the job: _____

Education required to do the job: _____

Does our guest use Numeracy in their job? _____

Complete the following chart.

NUMERACY SUB-CATEGORY	USED THIS IN THEIR JOB (Y/N)	EXAMPLE
Measurement and Calculation Math		
Data Analysis Math		
Money Math		
Scheduling or Budgeting and Accounting Math		
Numerical Estimation		

Off on a Tangent We Have a Visitor

List 3 additional *Essential Skills* required for success in this job. Explain how each is used.

1. _____

2. _____

3. _____

List any Technical skills that are required for this job.
