Greenview Secondary School

Lesson Plan

Name of Teacher : Lie Hui Min

Subject : Mathematics

Level / Stream : Sec 2 Express / Sec 3 Express

Topic : Applications of Trigonometry

Lesson Duration : 90 minutes (3 periods)

Prior Knowledge	:	Students are able to a) explain what trigonometric ratios of acute angles are, b) find the unknown sides in right-angled triangles, c) find the unknown angles in right-angled triangles, d) apply trigonometric ratios to solve problems in real-life contexts and e) **perform basic* programming using Microsoft Block Editor**.
Specific Instructional Objectives	:	At the end of the lesson, student will be able to a) identify the angle of elevation, b) **use Microsoft Block Editor (http://microbit.org/code/) to create a simple code** to measure angle of elevation using a micro:bit** and c) solve simple practical problems in two and three dimensions including those involving angles of elevation.
Lesson Approach / Pedagogy	:	Learning Experiences ▪ Learning Mathematics is more than just learning concepts and skills. Equally important are the cognitive and metacognitive process skills. These processes are learned through carefully constructed experiences. ▪ Students to have opportunities to discuss the use of trigonometric ratios in real life.
Teaching Resources	:	a) New Syllabus Mathematics Shinglee (Textbook) b) **Micro:bit Website (http://microbit.org/code/)** c) Mathematics Learning Experience Activity (Annex A) d) **Teacher Micro:bit Guide (Annex B)**

* Students attended a 1-hour lesson on the user-interface of MBE prior to Math lesson

** Use of micro:bit to measure real world data
Complexity of code depends on student's proficiency in programming

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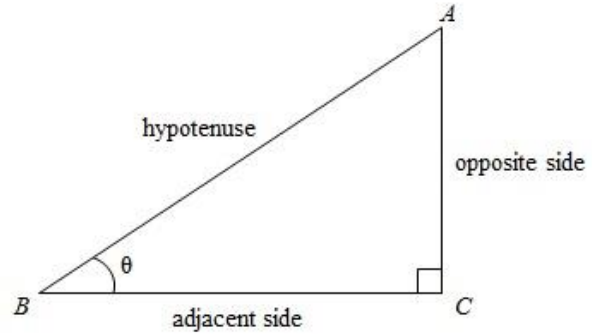
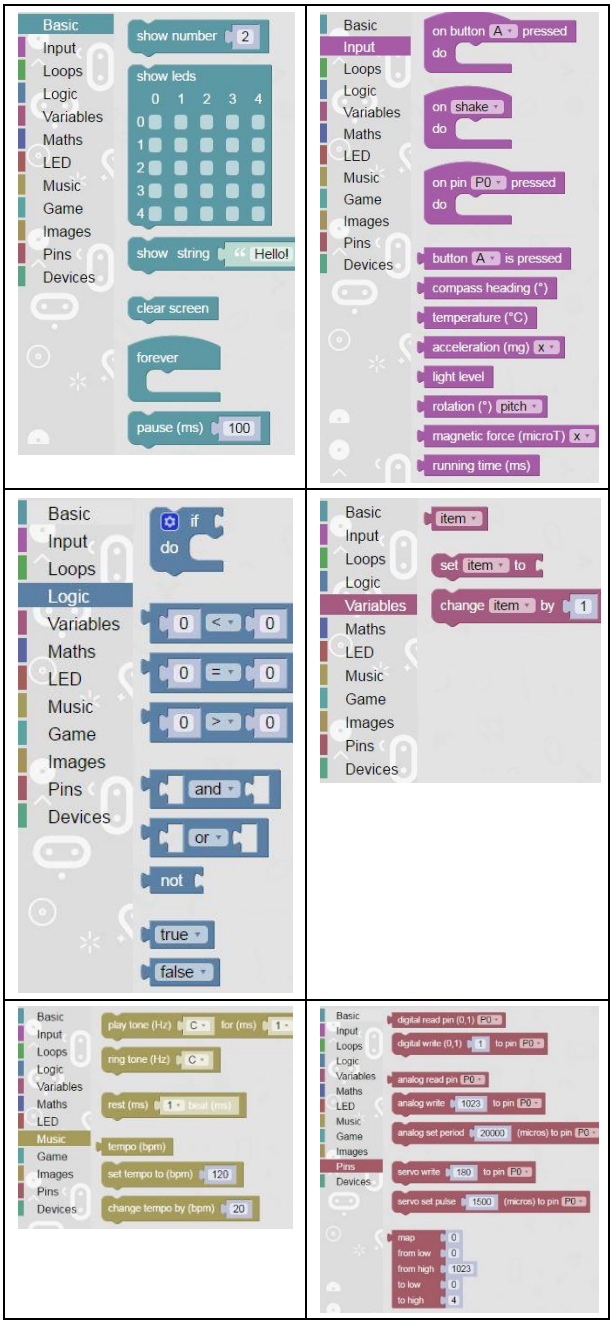
Duration	Instructional Procedure	Pedagogical Consideration
15 mins	**Lesson Introduction** ▪ Teacher does a short recap on trigonometric ratio of acute angles.  $\sin\theta = \frac{opp}{hypo}$, $\cos\theta = \frac{adj}{hypo}$, $\tan\theta = \frac{opp}{adj}$ ▪ Teacher shares the objectives of the lesson. At the end of the lesson, student will be able to a) identify the angle of elevation, b) use Microsoft Block Editor (http://microbit.org/code/) to create a simple code to measure angle of elevation using a micro:bit and c) solve simple practical problems in two and three dimensions including those involving angles of elevation. ▪ Teacher issues Mathematics Learning Experience Worksheet (Annex A) to the students and explains to students the procedures of the activities so as to achieve the objectives of the lesson.	Recap on Prior Knowledge ▪ The knowledge learners already have before they meet new information. Learners' understanding of a concept can be improved by activating their prior knowledge before learning new concepts.

Duration	Instructional Procedure	Pedagogical Consideration
30 mins	**Lesson Development 1** ▪ Students proceed to computer lab for their Task 1. ▪ Teacher gives a short recap and checks on the understanding of the students on the features of Microsoft Block Editor such as Basic, Input, Logic, Variables, Music and Pins.  ▪ Teacher issues a micro:bit set to each student.	Zone of Proximal Development (ZPD) by Vygotsky ▪ Students are allowed to work in pairs/groups for Task 1 and 2 where less competent students develop with help from more skillful peers.

	▪ Students proceed to program their codes to measure angle of elevation using a micro:bit in pairs/groups. ▪ Students who are more proficient in coding can be tasked to include additional features such as buzzers and LED bulbs in their codes. ▪ Upon completion, students input their codes in the micro:bit that is ready for use.	Differentiated Instruction ▪ Differentiated by Product (codes to include different features) for students whose readiness level is higher than others. ▪ Assuming sufficient data of students has been collected prior to lesson.
Duration	Instructional Procedure	Pedagogical Consideration
30 mins	**Lesson Development 2** ▪ Students proceed to parade square for their Task 2. ▪ Teacher briefs students on how to collect data such as using footsteps to measure distance. ▪ Students proceeds to identify a school building / flag pole and use their micro:bit to read the respective angle of elevation. ▪ Upon completion of data collection, students start to make calculations to estimate the height of the identified school building / flag pole.	Measurement of Real World Data ▪ Students are given opportunities to collect, examine and make sense of real-life data.
Duration	Instructional Procedure	Pedagogical Consideration
15 mins	**Lesson Closure** ▪ Students discuss their findings in pairs/groups and share their learning. Possible discussion points include a) the different codes each student creates, b) how to measure distance of *D* accurately, c) how to identify the angle of elevation, d) the reasons why the height of the building / flag pole may have slight differences for each set of calculations. ▪ Teacher selects students to present their findings and facilitates the learning process. ▪ Teacher issues homework to students for further consolidation of learning.	Consolidation of Learning ▪ Learning is reinforced as students discuss and bring about each other's ideas together to form their own understanding.

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Mathematics Learning Experience Activity

Applications of Trigonometry (Angle of Elevation)

Annex A

Name: _____ ( ) Date: _____

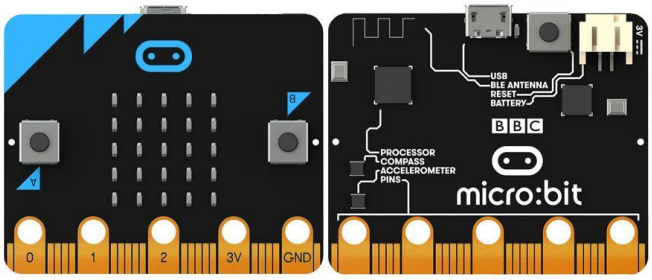
Class: Sec _____

Objective: To find the height of a school building / flag pole by measuring the angle of elevation with a micro:bit.

Tasks

When we look at an object that is higher than us, the angle that the line of sight makes with the horizontal is called the **angle of elevation**.

Task 1 (In the computer lab)



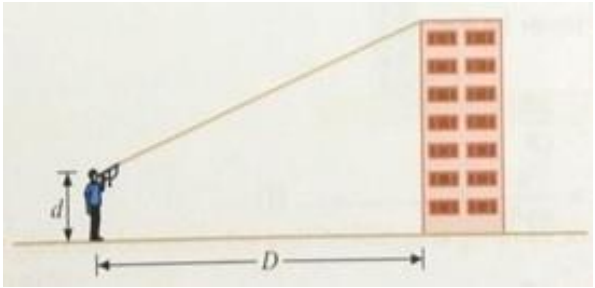
a) Access the website http://microbit.org/code/.

b) Click on Let's Code for Microsoft Block Editor.

c) Create a code to read angle of elevation using a micro:bit.

d) Input your code to your micro:bit.

Task 2 (At the Parade Square)



a) Find a school building / flag pole that can be observed from the parade square.

b) Measure the height, *d* m, of your micro:bit from the ground.

c) Measure the horizontal distance, *D* m, from the foot of the school building / flag pole to where the micro:bit is.

d) Read the angle of elevation from the micro:bit.

e) Estimate the height of the school building / flag pole from the readings.

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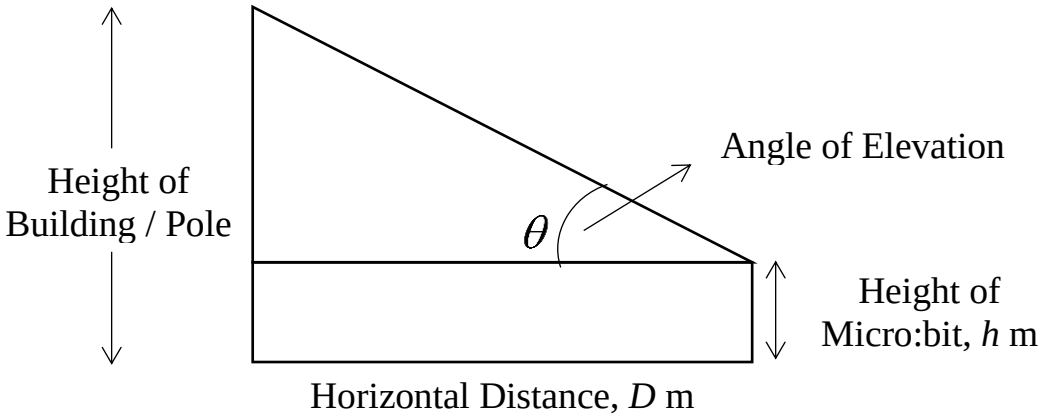

Height of Micro:bit, h m =				
Number of Foot Steps	**Horizontal Distance D m**	**Angle of Elevation θ**	**Working**	**Height of Building / Pole**
20				
30				
40				
50				
60				

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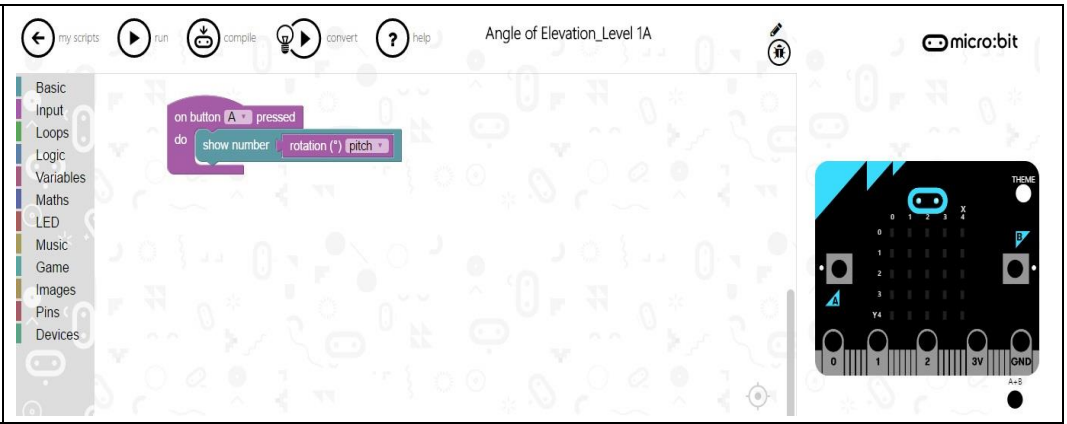
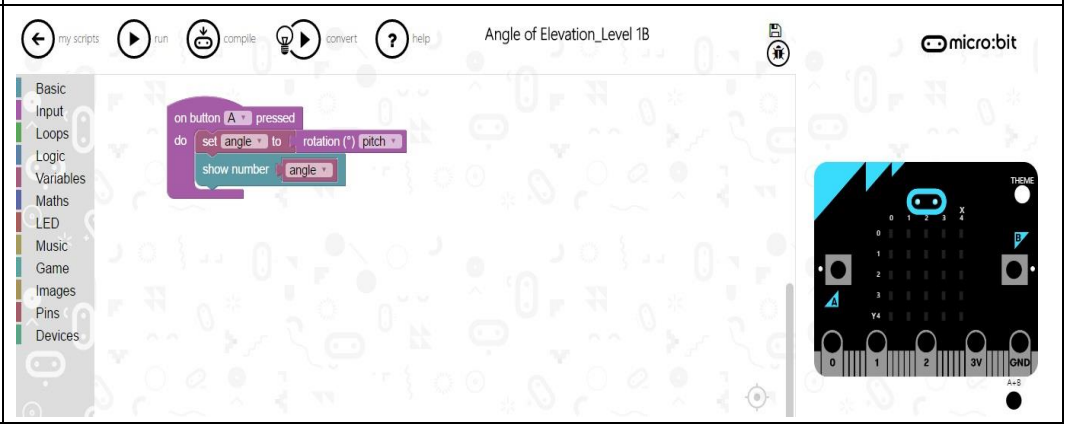
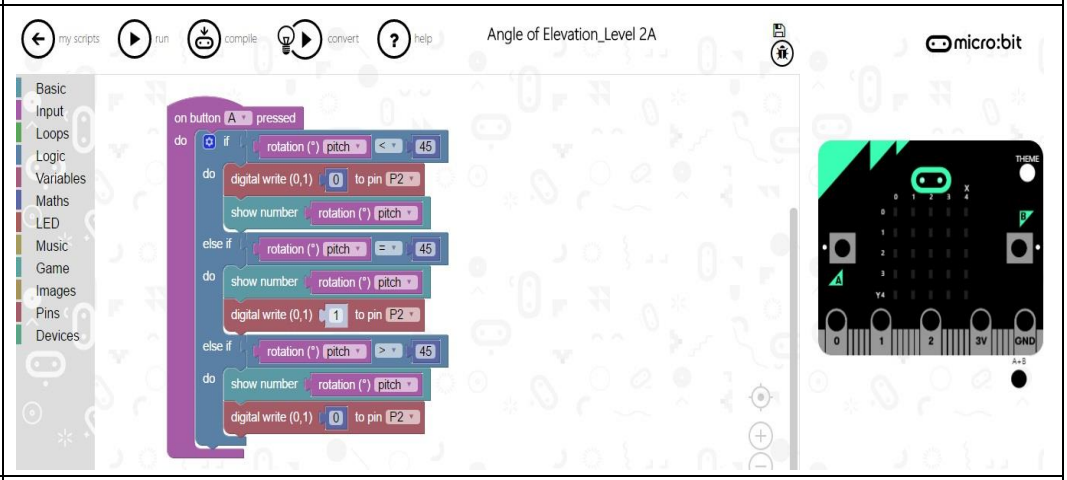
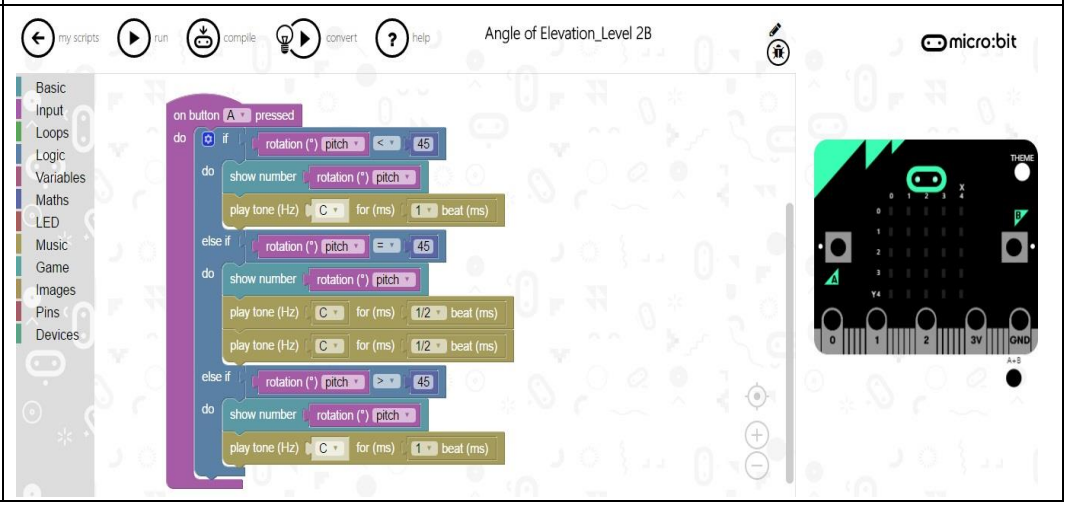
Teacher Micro:bit Guide

Annex B

Level 1A (Basic)	
Level 1B (Basic)	
Level 2A - Light (LED bulb)	
Level 2B - Sound (Buzzer)	

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