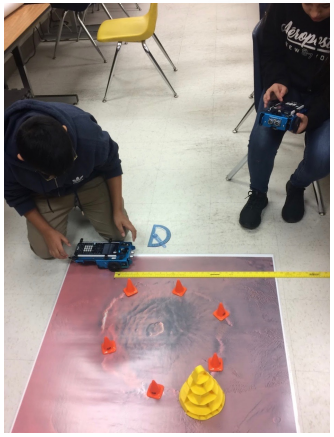
Mars Rover Challenge – Path around Olympus Mons (middle and early high school)



Olympus Mons on the surface of Mars at 69,841 feet (more than twice the height of Mt Everest) is considered to be the tallest mountain on a planet in the solar system. Students will learn and use basic concepts for robotic vehicle control along with math concepts to write a program to drive their Rover around the base of the mountain.

Note: Also, includes concepts to give students an on-ramp to participating on robotics teams.

Project Overview: Prepare for the final challenge by working with basic concepts for moving a robotic vehicle: setting direction and power for the motor controlling each wheel, moving forward and backward, turning. You will apply math concepts of distance-rate-time and angles as part of writing programs to set the vehicle path.

Your challenge: Plot a course and write a program to drive your Rover around the base of the Olympus Mons. Who can have their Rover complete the course in the fastest time?

On-Ramp to Robotics: Unit 1 Motion Skill Builders TI-84 Plus CE Python

Skill Builder 1: Moving Forward

- Control of motor power level and spin direction in relation to vehicle movement.
  - Example Rover function: rv.motors("ccw",200,"cw",200,20)
- **Mini-Challenge:** Drive Rover in a straight line for a specified distance.

Skill Builder 2: Turning

- Turning Left and Right
  - Example Rover function: rv.right(90)
- For Loop: for i in range(size)
  - Example for loop statement: for i in range(12):
- **Mini-Challenge:** Write a program to have your Rover move around the hours of a clock.

Skill Builder 3: Turtle Commands

- Creating a path using Forward, Backward, Left, Right Commands
  - rv.right(30)
  - rv.forward(.7,"m")
  - Measurement of distance and angles
- **Mini-Challenge:** Create a path to navigate around obstacles.

On-Ramp to Robotics: Unit 1 Motion Final Challenge

Unit 1 Final Challenge: Drive Around Olympus Mons!

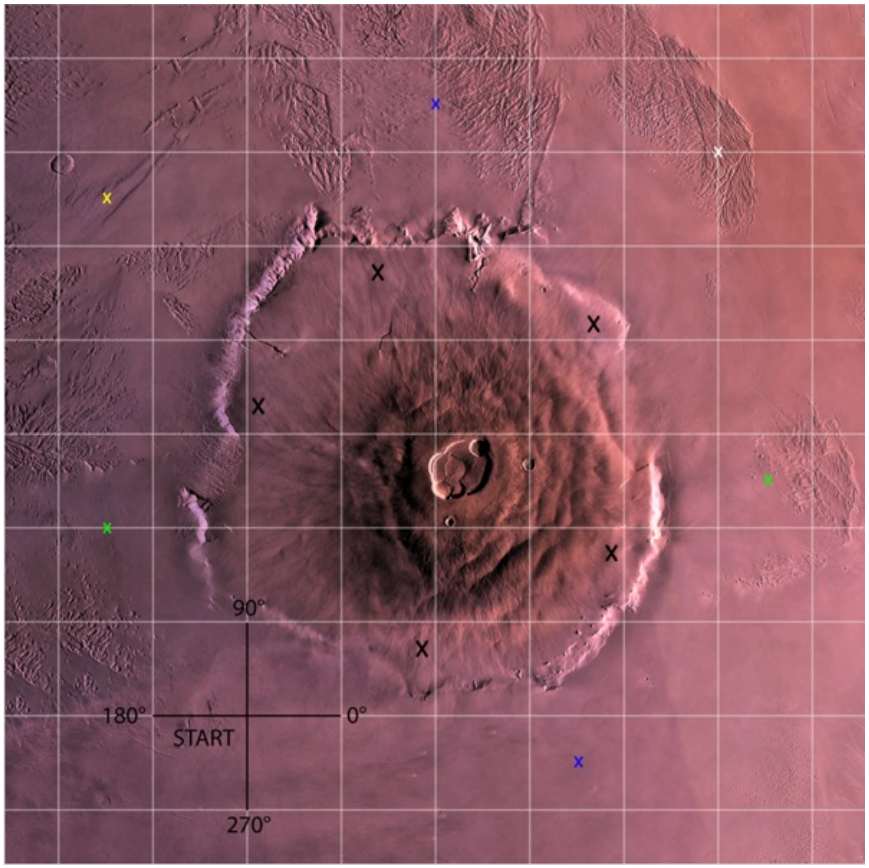
THE ON-RAMP TO ROBOTICS – TI-84 PLUS CE PYTHON **TEACHER NOTES**

Overview of Mars Challenge:	Goals:
Students use the student map to plot the shortest path around Olympus Mons. The scaled values and angles are used to write a program on a calculator connected to TI-Innovator™ Rover. Students test their paths and programs on the drive mat that you set up on the floor of the classroom.	Students will: 1. plot a course on the student map using a ruler and protractor to navigate around Olympus Mons. 2. use proportional reasoning to convert student map distances into scaled drive distances. 3. use their scaled map measurements to write a TI Python program on their calculator. 4. test and refine their program by driving a TI-Innovator™ Rover on the Olympus Mons drive mat.

Background:

Orienteering is a navigation skill that uses several tools to identify the shortest path from one point to another, often while avoiding obstacles in the terrain. Some of these orienteering tools include a terrain map, protractor, and ruler. Most maps have a scale and compass rose printed in the corner. The scale is a proportion factor that converts a distance measured on the map to the distance in the actual terrain. Similarly, the compass rose is a diagram on the map that indicates the true north direction in the actual terrain. A skilled person with a scaled map and proper tools can lay a course on that map and use it to navigate the course on the terrain. In this activity, the drive mat represents the “actual terrain” while the student map is the “scaled map”.

Olympus Mons Challenge Student Document



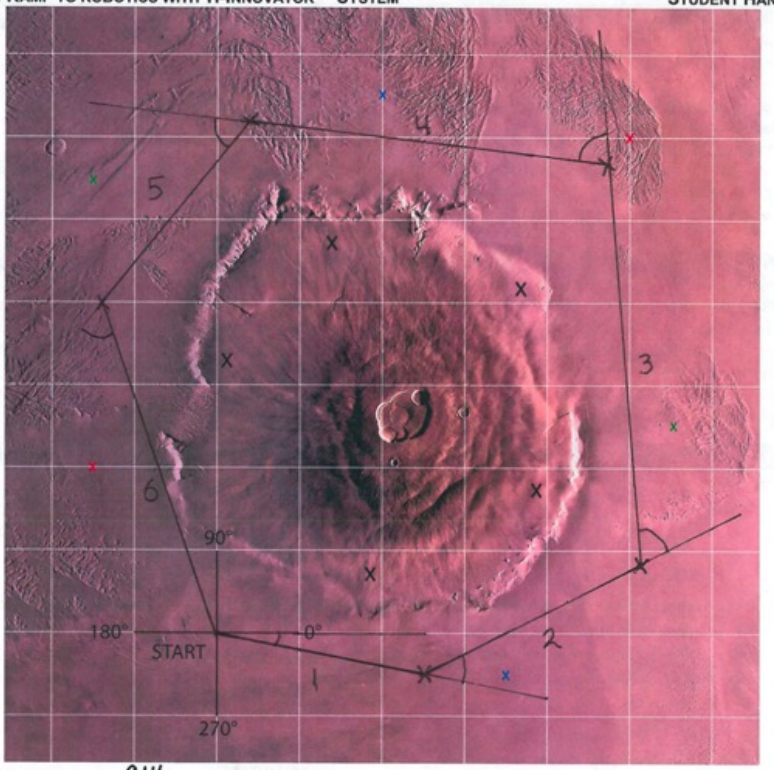
Note: Use Black X's. Color X's are for Unit 2 Mineral Challenge

Segment	Angle Measured	Length Measured	Calculated Drive Distance (Scale x Length Measured)
1			
2			
3			
4			
5			
6			

Olympus Mons Challenge Student – Example Solution

Unit 1 Challenge: Around Olympus Mons! Name_____

THE ON-RAMP TO ROBOTICS WITH TI-INNOVATOR™ SYSTEM — STUDENT HANDOUT



Drive Mat width: .914 meters (m)

Student Map width: 16.3 centimeters (cm)

Scale (Drive Mat Width ÷ Student Map Width): .0561 meters/centimeter

Segment	Angle (degrees)	Turn Direction (L/R)	Student Map Length (cm)	Scaled Drive Mat Length (m)
1	11.0	R	4.55	.255
2	38.0	L	5.30	.297
3	67.0	L	8.70	.488
4	78.0	L	7.80	.438
5	58.0	L	5.10	.286
6	58.5	L	7.60	.426