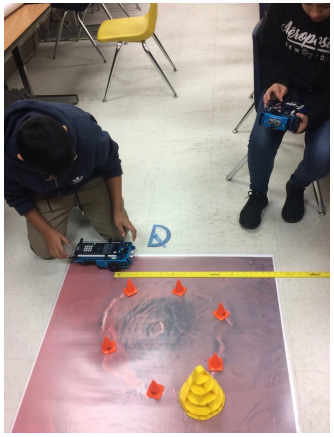
Mars Rover Challenge – Path around Olympus Mons (middle and early high school)



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-Nspire CX

Skill Builder 1: Moving Forward

- Control of motor power level and spin direction in relation to vehicle movement.
  - Example Rover command: Send "RV.MOTORS LEFT CCW 200 RIGHT CW 200 TIME 10”
- **Mini-Challenge:** Drive Rover in a straight line for a specified distance.

Skill Builder 2: Turning

- Turning Left and Right
  - Example Rover Command: Send "RV RIGHT 45”
- For Loop
- **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
  - Send "RV RIGHT 30”
  - Send "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 Skill Builders TI-84 Plus CE

Skill Builder 1: Moving Forward

- Control of motor power level and spin direction in relation to vehicle movement.
  - Example Rover command: Send("RV.MOTORS LEFT CCW 200 RIGHT CW 200 TIME 10")
- **Mini-Challenge:** Drive Rover in a straight line for a specified distance.

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- Turning Left and Right
  - Example Rover Command: Send(" RV RIGHT 45")
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On-Ramp to Robotics: Unit 1 Motion Final Challenge

Overview:

Students use the Olympus Mons student map to plot a course around the volcano on Mars and avoid all obstacles placed on the drive mat indicated by an +. Students use a ruler to measure drive segment lengths and a protractor to measure drive segment angles. These values are then used to write a Rover program that navigates the course on the drive mat.

Goals:

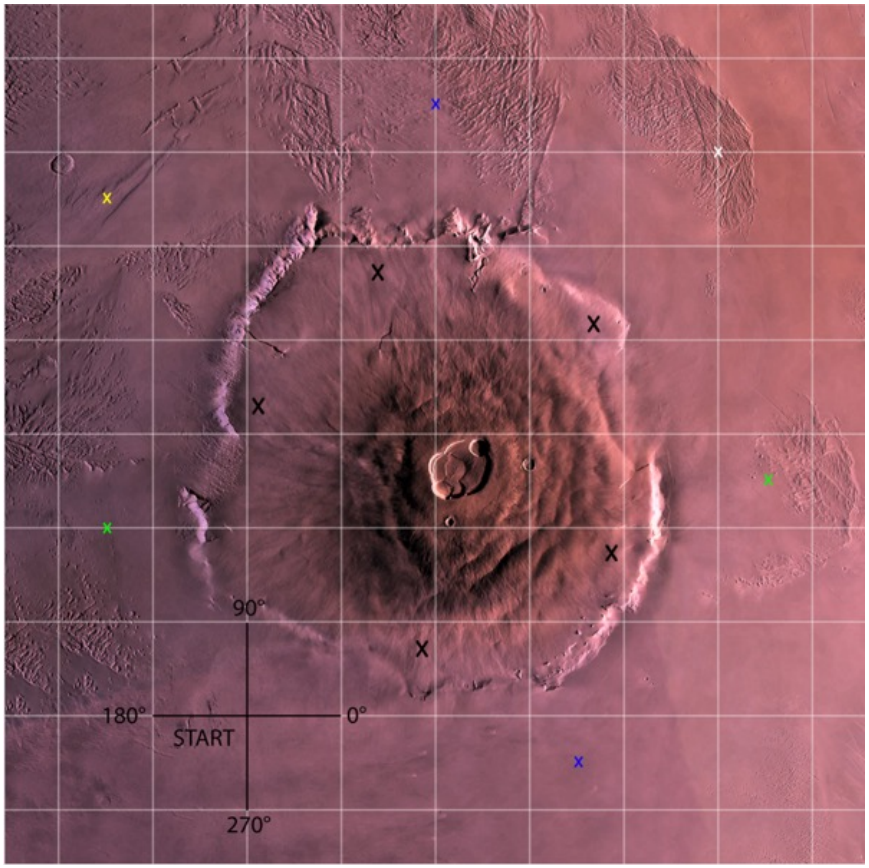
Students will:

1. lay a course on a scaled map using a ruler and protractor to navigate around Olympus Mons.
2. use proportional reasoning to convert map distances into actual drive distances.
3. use map course measurements and calculations to write a TI BASIC program to drive Rover around the Olympus Mons drive mat.

Background:

Orienteering is an activity that uses a host of measurement tools. Some of these tools include a map, protractor,and ruler to create a path from one point to another, often while avoiding obstacles and finding the shortest path. Most maps have a scale and compass rose printed in the corner. The scale is a factor that converts a distance measured between two points on a map with the actual distance between those points on the terrain the map represents. Similarly, the compass rose is a diagram on the map that indicates the actual magnetic compass direction. A skilled person with a scaled map and the proper measurement tools can lay a course on a map and then use those measurements to navigate to the actual path in the terrain the map represents.

Olympus Mons Challenge Student Document



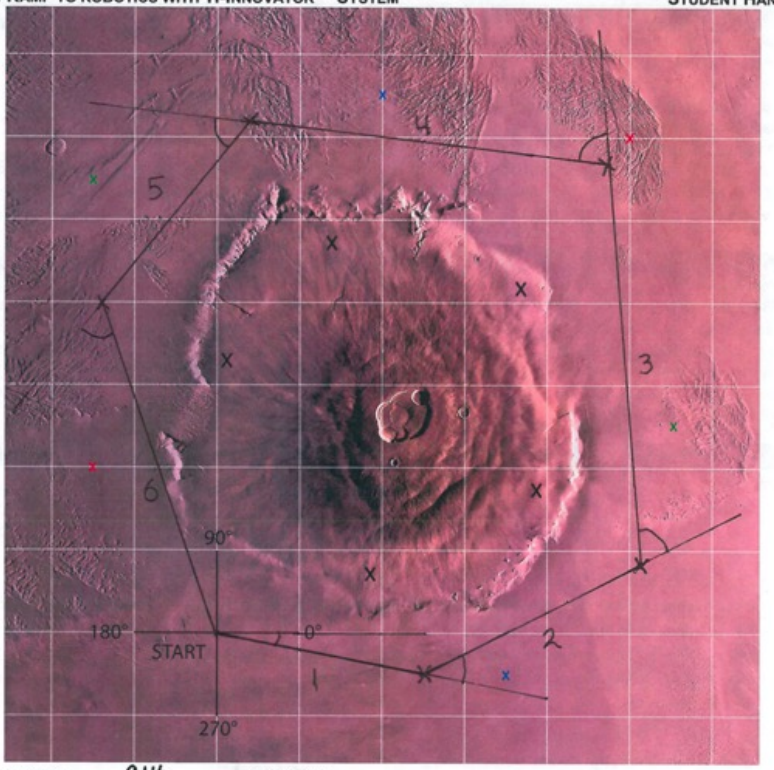
Note: Use Black X's. Color X's are for Unit 2 Mineral Challenge

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