Mars Mosaic
Teacher Version

Introduction & Purpose

When a satellite is sent to orbit Mars, one of its missions involves taking thousands of pictures of the planet's surface. When NASA receives the pictures back, the pictures are used to create an image mosaic – a larger image, or picture, made from combining several smaller images. This activity will help your students take two-dimensional mosaics and use them to create a three-dimensional globe of Mars, allowing them to understand distance transfer from a two-dimensional wall map and/or image to a three-dimensional object.

Objective

Students will discover how a two-dimensional map/image translates into a three-dimensional object, and how distances are appropriately measured in each venue. Students will be engaged in viewing and interpreting satellite imagery in order to create a three-dimensional globe of Mars.

Materials Needed

- Wall map of the Earth
- Globe of Earth
- Mars mosaic (in Student Version)
- 5" Styrofoam© ball
- Yardstick
- Glue
- Scissors
- String *(at a minimum, string should be the width of the wall map)*
- Idaho TECH Lab Notebook

Procedure

The Student Version contains the directions for this activity.

1. As students are working through the wall map/globe component of this activity, step back and allow students to make errors – for example, students may likely measure across the entire wall map to determine the distance between Seattle and Tokyo, or Honolulu and Paris (depending on your wall map layout), not realizing that they should measure to the edge of the map, and then from the edge to the location due to the "flattening" of the globe. Students most likely will realize this error when they measure the distance between the same locations on the globe.
2. After the students complete the measurements, discuss why students ranked distances the way they did, leading into a discussion on how two-dimensional images representing three dimensional objects, such as spheres (or planets), can be deceiving. Encourage the students to determine how the wall map would turn back into a globe.
3. Has the map been distorted at all, or would this be an easy task (depends on your map, but most likely, the map has been distorted in order to "fit" into a two-dimensional format)? Discuss the benefits of using a two-dimensional image versus a three-dimensional globe (for example - ease of use, able to view the entire surface of a planet at the same time, etc.).
4. As the student team is constructing the Mars globe, make note to have them cut out all of the trapezoid-like pieces separately, **but to cut out the square strip as one piece**. The globe will fit together better if the slight space in-between each square image remains. Use the circle

"poles" to "best fit" the trapezoid pieces – in other words, the trapezoid pieces will need to be slightly overlapped on each side in order to fit the pole correctly. Once they are positioned to fit each pole, the square images will wrap around the center of the globe with slight overlap. Overlap is okay and very expected when trying to "merge" several mosaics.

5. After the team creates their globe, speak with them about why the images did not fit together "perfectly." Point out that Mars is not a perfect sphere like the Styrofoam© ball they used to create the globe, and that the images are mosaics – a combination of pictures that make a "best fit" and are designed to tell a "story" about a particular area, rather than provide every single detail as a regular photograph would do. NASA often works in a "best fit" mode in regards to imagery, hence the high use of image mosaics. Mosaics are used to help NASA mission teams learn more about an area for landing purposes, exploration, etc. It is quite common that mosaics contain several overlapping components, "not perfect" seams, and appear slightly "pieced" together. It is important that the student teams note that while mosaics are not perfect, they are very valuable in planning, and can be quite useful and convenient.
6. Being able to understand how "piecing" together several satellite images into one master image is important, and will assist the team in discovering terrain they may have to traverse in Idaho TECH (the manual will contain several "satellite" images that when used to create a mosaic, will form a picture of possible competition courses).

Answers

Locations	**Ft / Inches**	**Est. Mileage**
Boise, Idaho, USA and Orlando, Florida, USA	*Depends on type and size of map used*	2182 miles
Paris, France, and Honolulu, Hawaii, USA		7432 miles
Tokyo, Japan and Seattle, Washington, USA		4778 miles
Anchorage, Alaska, USA and Seattle, Washington, USA		1434 miles
Anchorage, Alaska, USA and Moscow, Russia		4345 miles

___2___ Boise, Idaho, USA and Orlando, Florida, USA
___5___ Paris, France, and Honolulu, Hawaii, USA
___4___ Tokyo, Japan and Seattle, Washington, USA
___1___ Anchorage, Alaska, USA and Seattle, Washington, USA
___3___ Anchorage, Alaska, USA and Moscow, Russia