December 22, 2018 & January 5, 2019
2018 Year in Review

Activity Guide for Students: Asking for Directions on Mars

Purpose: To learn how to use an interactive online map of Mars — including working with coordinate systems and layers — and will identify features and make generalizations about Martian geography.

Procedural overview: After a review of latitude and longitude, you will explore [NASA's Mars Map](#), first through a tutorial and then on your own. You will identify specific sites and will use the map's interactive tools to learn more about the sites and locate nearby geographic features. Finally, you will make geographic generalizations about specific regions. Sites on Mars come from "[A buried lake on Mars excited and baffled scientists](#)," "A year of launches and farewells in space" and even from the fictional film *The Martian*.

Directions for students:

Take the tutorial

Go to [NASA's Mars Map](#), take the tutorial and answer the following questions.

1. Briefly explain what each of the following buttons looks like and the actions it allows you to take.

> Menu
>
> Search
>
> Tools
>
> Share
>
> Layers
>
> Explorer
>
> Projections
>
> Fly To

2. What kind of information can you add to the map by applying each item listed below? How does the interactive map change when you add the item?

> Bookmark
>
> Nomenclature

Product

3. Where is map information such as scale and latitude/longitude coordinates displayed?

Begin to explore the map

Now explore some of the features mentioned in the tutorial by answering the following questions.

4. As you move your mouse across the map in Global Map view, what do you notice about the latitude and longitude coordinates? Which is listed first? How are they different from Earth's coordinates? What does a negative latitude mean? What does a negative longitude mean? Why do you think that the interactive map uses the negative values?

5. What are the coordinates for the point where Mars' equator intersects Mars' prime meridian? What about the point where the equator intersects the antimeridian? Do these points have the same or different coordinates on Earth? What is the latitude of the prime meridian?

6. Go to the Layers panel and select "Static." You can click the "Toggle Visibility" button (looks like an eye) for layers such as Nomenclature and Graticule. Using the Fly To button, type in only the longitude of the prime meridian. The name of the feature that defines the prime meridian's location on Mars will appear below as you type. What is its name? Click on the feature's name to find it on the map. Click on the Explorer button, find the name of the feature and click on it. The feature should be flagged on the map. Based on the map topography, what type of feature is it? You can check your answer by searching for the feature using the search panel.

7. In the same view (the scale should measure about 50 kilometers), click on the Explorer button. Identify a landing site within your view, name it and give its approximate coordinates. What other geographic features are within the view? Name one geographic feature and give its approximate diameter in miles (change the units of the scale, if necessary).

8. Using the Search panel, locate and "fly to" two other successful landing sites. Use the map topography and the Explorer button (when zoomed so the scale is approximately 50 km) to describe the geographic features near the site. Use the map tools available to give two other interesting facts about the site.

9. Using the Search panel, locate and "fly to" the Martian Path (from the fictional film *The Martian*). Describe the approximate size of the area shown. Use the map topography and the Explorer button to describe the geographic features in the area. On the Layers panel with "Static" selected, you can click the "Toggle Visibility" button (looks like an eye) to see more information. Imagine that you are in a rover near the Martian Path. Based on the information you have gathered, where would you travel and what would you expect to see during your journey and upon your arrival?

10. Finally, using the Fly To button, locate the site of the possible underground lake reported in the *Science News* article "A buried lake on Mars excited and baffled scientists," at -81, -167 (or 81° S, 167° W). What do you notice about the limitations of Global Map view in this region? Is there a better map projection that you can use to view the area? Use the Explorer tool to name any geographic features nearby.

Make geographic generalizations

Now that you're familiar with the map and some geographic features, you can form some generalizations.

11. Use the Projections button to toggle through different map projections. Make sure you have turned on Graticule in the Static Layer panel, so you can see the lines of latitude and longitude. Observe the geography in the regions listed below. Describe any patterns or predominate features that you see. Please note: In the 3D Globe view, you may want to adjust the "Terrain Exaggeration" so you are better able to distinguish geographic features.

North Pole region:

South Pole region:

Northwest hemisphere:

Northeast hemisphere:

Southwest hemisphere:

Southeast hemisphere:

12. If you could choose a location for a future lander or rover mission to Mars, where would you choose? What factors would you consider?

13. Would you sign up for the first human landing on Mars? Why or why not?