Hangin' Out on Mars!?!
Student Version

Why should you complete this activity?

How much do you know about Mars? How similar and/or different is it in comparison to the Earth? Scientists believe that people will live on Mars by the year 2036. Using what scientists know about Mars, **what do you think Mars is like?** Hopefully, this activity will help you create an image of Mars using the data that scientists have collected in order to understand the physical properties of Mars.

The Necessities

- Calculator
- Scratch paper
- Road atlas or Google Maps
- Pen or pencil
- Your Idaho TECH Lab Notebook

Directions

Check out the data tables that list the physical properties of both Earth and Mars. Work together to answer the questions that are located after the data tables. Have fun!

Physical Properties

Measurement	Earth	Mars	Convert both Earth & Mars data to:
Average Distance from the Sun	149,597,890 km	227,936,640 km	Earth =_____miles
			Mars =_____miles
Equator Diameter	12,756 km	6,974 km	Earth =_____miles
			Mars =_____miles
Polar Diameter	12,718 km	6,744 km	Earth =_____miles
			Mars =_____miles
Mass	5.97×10^{27} g	6.4×10^{26} g	Earth =_____pounds
			Mars =_____pounds
Maximum Surface Temperature	331 K	293 K	Earth =_____degrees C Earth =_____degrees F
			Mars =_____degrees C Mars =_____degrees F
Minimum Surface Temperature	184 K	133 K	Earth =_____degrees C Earth =_____degrees F
			Mars =_____degrees C Mars =_____degrees F

Other Physical Properties to Note

Measurement	Earth	Mars	Convert both Earth & Mars data to:
Rotational Period *(planet spins on its axis)*	1.0 day	1.02 days	How many hours for Earth?___ For Mars?___
Orbital Period *(planet revolves around sun)*	365.26 days	686.98 days	How many years for Earth?___ For Mars?___
Density	5.52 g/cm^3	3.94 g/cm^3	Earth = 0.197 lbs/in^3 Mars = 0.141 lbs/in^3
Escape Velocity at Equator *(speed at which you can "escape" from a planet's atmosphere)*	11.2 km/sec^2	5.02 km/sec^2	Earth = 6.94 miles/sec^2 Mars = 3.11 miles/sec^2
Gravity *(how fast objects fall to ground when dropped)*	980 cm/sec^2	371 cm/sec^2	Earth = 0.0061 miles/sec^2 Mars = 0.0023 miles/sec^2

Atmospheric Components:

Element/Compound	Earth	Mars
Nitrogen	78%	3%
Oxygen	21%	0.1%
Carbon Dioxide	less than 1%	95%
Water Vapor	less than 1%	0.03%

Conversion Factors:

Metric Unit	Conversion
1 kilometer (km)	0.62 miles (m)
1 gram (g)	0.035 ounces (oz) -- How many ounces in a pound (lbs)?
1 centimeter (cm)	0.394 inches (in)
1 Kelvin (K)	Celsius (C) -- subtract 273 from Kelvin
1 Kelvin (K)	Fahrenheit (F) – Convert to C, then multiply by 9/5 and add 32
1 day (d)	24 hours (hr) – how many seconds (sec) in an hour?
1 year (yr)	365 days (d)

Questions: Remember there are ***not*** always correct answers to questions. Please use the information in the data tables and your imagination to create logical and creative responses to the questions. Place the responses in your Idaho TECH Lab Notebook. Remember -- scientists do not always have ***answers***; rather, they carefully examine the data (or information) and develop ***ideas*** based on that information.

1. What do the letters mean that are listed after the numbers in each column? *(The letters are called metric units)*

2. Using the information in the Physical Properties and Conversion Factors tables, convert each number from Metric units to English units.

   For example:
   10 kilometers = 6.2 miles. This means that for every 1 kilometer, there are 0.62 miles in that kilometer. Therefore, you must multiply the number of kilometers by 0.62 to convert the kilometers to miles.

   Here is the math:
   1 km x 0.62 miles = 0.62 miles
   10 km x 0.62 miles = 6.20 miles

3. Why do you think scientists use the Metric system? Is this system easier to use than inches, feet, and miles? *(Look at a ruler and observe how millimeters and centimeters relate to one another)*

4. Astronomers use the radius of the Earth's orbit (149,597,890 kilometers) as a handy "yardstick" to measure other distances in the solar system. They call it 1 Astronomical Unit (abbreviated 1 AU). On the average, Mars is 227,936,640 kilometers from the Sun. How many Astronomical units is that?

   HINT: Divide 227,936,640 kilometers by 149,597,890 kilometers.

5. Pluto is the farthest known planet. Its average distance from the Sun is about 5,920,000,000 kilometers. How many Astronomical Units is that?

   HINT: Divide 5,920,000,000 kilometers by 149,597,890 kilometers. The first number may be too big for your calculator. No problem! Just think of it as 5,920 million kilometers, and divide by 149 million kilometers. That's the same as dividing 5,920 by 149.

6. If you plan to travel 240 kilometers at an average speed of 80 kilometers per hour, how long will your trip last? Use the fact that **the time anything travels is equal to the distance it travels divided by the speed.**

   HINT: Divide distance (240 kilometers) by speed (80 kilometers per hour)

7. On Mars, the Sojourner Rover only went about 24.4 meters per hour (Why so slow? To keep out of trouble, and because Sojourner only has about 60 watts of solar power). How long would it take the rover to move 48.8 meters?

   HINT: Divide distance (48.8 meters) by speed (24.4 meters per hour).

8. Now, let's go a little faster! Pathfinder traveled just over 499,000,000 kilometers along its curved orbit to get to Mars. How long would it take to fly that far at the average speed of a passenger jet, about 960 kilometers per hour?

   HINT: Divide distance (499,000,000 kilometers) by speed (960 kilometers per hour). This will give you how long it will take in hours. Divide the length of time in hours by 24 hours per day to get the number of days it will take. Then divide the number of days it will take by 365 days per year to get the number of years it will take. Now you have your final answer!

9. Now let's try the fastest speed in the universe! When Pathfinder landed on Mars, it was 194,000,000 kilometers from Earth. The spacecraft communicated using radio waves, which travel at the speed of light – 300,000 kilometers per second. How long did it take Pathfinder's first message from Mars to reach the Earth?

   HINT: Divide the distance to Mars (194,000,000 kilometers) by the speed of light (300,000 kilometers per second). Divide your answer by 60 seconds per minute to get your answer in minutes.

10. What do the numbers reveal about the differences between Earth and Mars? – Earth and Mars have different values for gravity. Do you think you would be able to stand on the Martian surface? How many times can you travel to Disneyland to cover the same distance around Mars?

    HINT: Use Google Maps to measure the distance from your school to Disneyland, then compare it to the equator diameter of Mars.

11. Using the tables on the previous pages, how do the physical properties of Earth compare with those of Mars?

12. Pretend your Engineering Team is traveling to Mars. What do you think it will be like according to the information listed above? What will you bring? What would you wear? Could you breathe on Mars? What other information would you like to know before you left for the trip?

13. Your Engineering Team will be designing a Mars Rover for the Idaho TECH: Mars Rover Challenge. If you were really going to send your Rover to Mars, what types of things would you have to consider while designing and building your team's Rover? How could you test the Rover on Earth before it is sent to Mars?

Remember to write down the answers and your ideas in your team's Idaho TECH Lab Notebook!