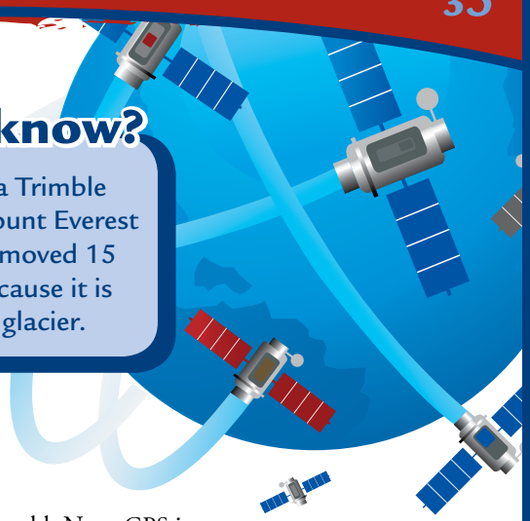
MSU Science Zone

No. 33

What is GPS?



Did you know?

MSU scientists used a Trimble GPS to show that Mount Everest Base Camp in Nepal moved 15 feet in one month because it is on an active, moving glacier.

GPS stands for Global Positioning System. It is the most global and accurate navigation system ever built. GPS can provide people who use it with their exact position on Earth, tell them how to get to another location, how fast they are moving, where they have been, how far they have gone, what time it is, and more. The system consists of a constellation (a group with a pattern) of 24 satellites that orbit about 12,000 miles (19,312 km) above Earth's surface and travel approximately 7,000 miles (11,265 km) per hour.

To use GPS, you must have a GPS receiver. The receiver gets information from the GPS satellites that circle the Earth twice a day and transmit signals. The receiver compares the signals from several satellites to find the difference between the time the satellite sent the signal and the time the signal was received. That information allows the GPS receiver to calculate how far away the satellite is, and determine the location of the GPS user. If the GPS receiver locks onto the signal of three satellites, it can calculate latitude and longitude and track movement. With signals from four or more satellites, the receiver can also calculate altitude.

GPS was originally designed to help the U.S. military with finding the accurate location of their soldiers, vehicles, planes and ships around the world. Now, GPS is used in cellular phones, outdoor recreation, emergency services, navigation and map making. It is also used a lot in scientific research. For example, meteorologists use GPS to forecast the weather and geologists use it to measure earthquake movement.

A team of climbers including an MSU scientist and several Montanans will be attempting to climb Mount Everest on the Everest Education Expedition. They will be using lots of GPS units to do scientific research. Your class can track the progress of the climbers and learn about the science of the region as the team sets out to commemorate the 50th anniversary of the first American ascent of Everest. Follow along and join the adventure. Visit ***www.montana.edu/everest*** to learn more.

Try this!

If you want to make a map or take a measurement without GPS and you don't have any measuring equipment with you, you can estimate. For example, often people will estimate the size of a room by counting how many steps long each wall is. Let's try to make a map of a room, or you can choose another area like a park or even map something smaller like your desk.

1. You can use parts of your body to take measurements. Try practicing your estimating skills by guessing the lengths of these things, then measuring to see if you are correct.

	Estimate	Real measurement
Your hand	_____	_____
Your foot	_____	_____
Both your arms stretched out	_____	_____
Your chin to the top of your head	_____	_____
Your whole body	_____	_____

2. Now go use these parts of your body to measure items or locations in the place you want to map. Use the measurements you make with your body to calculate the real sizes of objects and distances between places. If you can't reach things just estimate their size. (For example: if your hand is 5 inches tall and you are making a map of the top of your desk, if the desk is 5 hands wide and 7 hands long, then your desk is about 25 inches wide and about 35 inches long.)

3. If you have a GPS, you can retake the measurements and compare your map measurements to ones made with GPS. Note that you can only use GPS outside.

One other thing you can try is geocaching—an outdoor game where you try to find hidden objects using GPS. With the permission of an adult, visit ***www.geocaching.com*** and type in your zip code to see how many geocaches are hidden in your area. If you have a GPS and your parents' permission, you can join this website and keep track of the geocaches that you find.

EVEREST Education Expedition

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