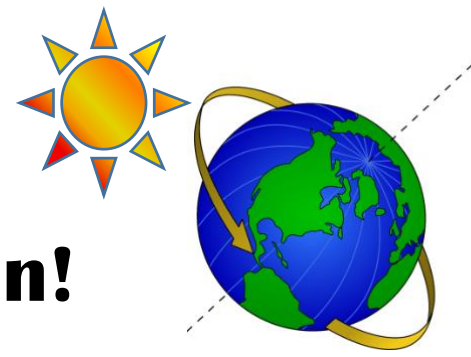


DIY Air Force Activities:

Time in the Sun!



Materials:

- chalk
- cardboard
- large bowl or compass drawing tool
- marker, pen, or pencil
- compass (for direction, most smart phones have an app)
- scissors
- measuring tape or ruler
- bendy straw
- protractor



The light of the sun makes life on Earth possible. The sun's rays travel a huge distance to the Earth! Light however, cannot pass through all objects, and when it is blocked a shadow is cast. This is why we have night and day; as the Earth rotates around its axis the sun seems to rise and set. At night, the sun is blocked by the Earth. Let's do an experiment! Go outside with a friend and pick a sunny spot. Draw a circle on the ground with chalk and stand inside it. Mark which way you are facing. Have your friend trace your shadow with the piece of chalk. Come back out every hour and repeat this. What do you observe? How does your shadow move and change throughout the day? As the Earth rotates, the sun's position in the sky changes, and the shadow you cast changes too. This phenomenon can be used to tell time by building a tool called a sun dial!

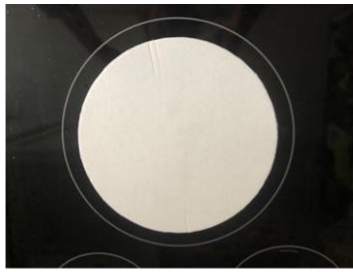
Directions

1. Use your large bowl (or a compass drawing tool if you have one) to draw a big circle (about 9-12 inches in diameter) on your cardboard.
2. Carefully cut out your circle with the scissors.
3. Find the center of the circle using the compass drawing tool or a ruler. Have an adult use the scissors to CAREFULLY poke a hole in the center large enough for your straw to fit through.
4. Using your ruler, draw a line from the center radiating out.
5. Cut the short part of your straw as shown on the back of this page. Stick it through the hole and secure it with tape. Leave the bendy part through the other side.
6. Find the latitude of where you live. Bend the straw to an angle that matches it using the protractor. For example, in Ohio, I am at latitude of about 40, so I set my straw at a 40° angle. Make sure the straw lines up with the line you drew on the cardboard. This gives you a reference point to be sure your straw has not moved. The straw is the part of the sundial that casts a shadow, it is called a gnomon.
7. Go outside and find a sunny spot. Use a compass to find North. Lay your sundial down so that the line and gnomon point exactly north. You can use push pins, small nails, or a rock to secure it on the ground to keep it from blowing away.
8. At the start of a new hour, observe where your shadow falls and mark that spot, then label it with the time! Repeat this throughout the day.

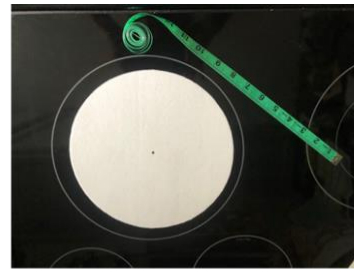
Air Force Associations:

There is an enormous sundial in Colorado Springs, Colorado at the US Air Force Academy outside the Center for Educational Multimedia. When you stand on the date and act as the gnomon, your shadow will point out the time of day!

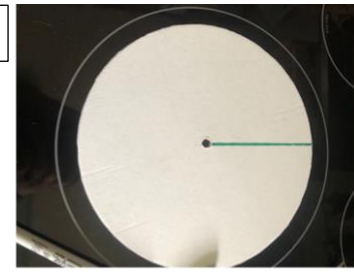
Step 1 -2



Step 3



Step 4



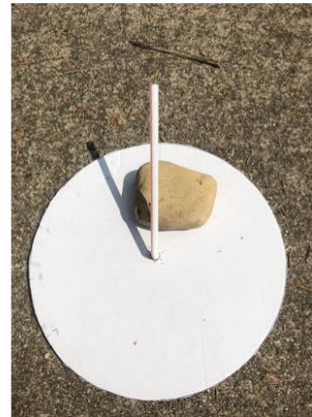
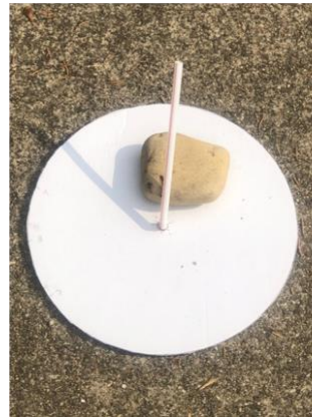
Step 5: Cut your straw as follows and secure it to your cardboard circle with tape.



Step 6



Mark the changes on your sundial every hour! If your North line isn't in shadow at noon your compass likely isn't accurate. This is ok! Just mark the time as you observe it and the sundial will be precise for your yard. You can check it over a few days!



Set your gnomon at an angle equal to the latitude you live at. Line it up with the line you drew from the center.

You can use a rock to keep your sundial from blowing away in the wind.

How does a sun dial work?

If we were standing at the North Pole our sundial would be fairly accurate, and the amount the shadow moved each hour would be exactly 15°. This would be a polar dial. We set our gnomon at an angle to have it line up with the imaginary pole. You will also notice that because we are at an angle the shadow on your dial seems to change by different degrees throughout the day (smaller amounts closer to noon). If you were to repeat this experiment at various times of year or at other locations on Earth, you would notice differences in the sun dials you made. More detailed measurements are needed to make an exact sundial!

There are many great websites that can provide more information on telling the time using the sun and the details that go into building a highly accurate one!