Name _____ Date _____

Measuring the Altitude of the Sun

Due to the tilt of Earth's rotational axis, each hemisphere is tilted toward the Sun during the summer months and is tilted away from the Sun during the winter months. When each hemisphere is tilted towards the Sun, the Sun's altitude is higher in the sky, takes a longer time to appear to cross the sky, and provides more direct sunlight. When each hemisphere is tilted away from the Sun, the Sun's altitude is lower in the sky, takes a shorter time to appear to cross the sky, and provides more indirect light.

During this activity, you will be measuring the altitude of the Sun, in degrees, at the same time once a week, from the same place, using an astrolabe. Depending upon the time of the year, the altitude of the Sun will change as time progresses.

For this activity, two important dates are important to remember. The first date is the Summer Solstice, or the longest day of the year. During the Summer Solstice, the Sun's altitude reaches its highest height in the sky. In the northern hemisphere, the Summer Solstice takes place on June 21st. The second date to remember is the Winter Solstice, or the shortest day of the year. During the Winter Solstice, the Sun's altitude, at its highest point of the day, is the lowest altitude of the year. In the northern hemisphere, the Winter Solstice takes place on December 21st.

Before you begin, make a hypothesis on whether you think the Sun's altitude will be increasing or decreasing each week. Think about which solstice is approaching. Phrase your hypothesis as an if, then statement.

Hypothesis

If _____

_____

Then _____

_____

_____

Materials:

- Astrolabe Template
- String
- Scissors and Tape
- Small Metal Washers
- Wooden Skewer
- Drinking Straws

Making an Astrolabe

1. Print the astrolabe template onto card stock.
2. Cut out the astrolabe.
3. Write your name on the back of the Astrolabe.
4. Cut a drinking straw to the same length as the side of the astrolabe.
5. Tape the astrolabe to the edge of the astrolabe marked "Attach Straw to this Edge". Be careful to attach the straw to just the edge of the astrolabe, not on either side of the astrolabe.
6. Use a wooden skewer to carefully poke a small hole through the astrolabe where the "X" is marked.
7. Thread one end of the string through the small hole and tape the end to the back of the astrolabe.
8. Tie the small weight to the opposite end of the string, in front of the astrolabe.

Using an Astrolabe to Measure the Altitude of the Sun ** Warning – Never look directly at the Sun ******

1. Go outside and choose a spot where you can see the Sun in the sky. Make sure you are not standing in the shadow of a tree or building and try to choose a spot away from other students. You will measure the altitude of the Sun from this same spot each week. So, choose wisely.
2. Hold your astrolabe so that the straw points in the direction of the Sun. DO NOT LOOK THROUGH THE STRAW AT THE SUN.
3. Hold a piece of black paper in your other hand, angled about a foot below the bottom of the astrolabe.
4. Aim the straw so that you see the shadow of the straw on the paper.
5. Move the straw slightly until a small circle of light forms on the paper. The straw is now pointing directly at the Sun.
6. Use your finger to hold the string in place on the astrolabe scale, so that it doesn't move.
7. Keeping the string in place, look and read the altitude of the Sun, in degrees, where the string is crossing the scale of the astrolabe.
8. Record the date, the time of day, and the altitude of the Sun, in degrees, in the chart below.
9. One day a week, at the same time each day, measure and record the altitude of the Sun.

Altitude of the Sun Measurements		
Date	**Time**	**Altitude (Degrees)**

Analysis

1. Did you observer a change in the Sun's altitude?
2. During the time you made your measurements and recordings, how did the altitude of the Sun change?
3. Is there a predictable pattern to this change? (Think back to your hypothesis)
4. How would you explain these changes? (Think about the time of the year and the length of the day)

Please Turn In:

- This sheet as a cover sheet
- Your typed or neatly written answers to the above questions, in full sentence form.