“Build an Astrolabe” Activity

Volunteers Needed: 1-2

Materials Needed:
- Tape
- Scissors
- Pens or pencils
- Photocopier to make copies of template

Materials Provided:
- Astrolabe templates
- String
- Paperclips
- Straws

Description:
Construct a simple tool that can be used to calculate the angle of stars above the horizon or to triangulate the height of objects.

Procedures:
- Cut out an astrolabe (quadrant) along the heavy black line.
- Cut a length of string approximately 2-3” longer than the astrolabe.
- Punch a hole in the astrolabe and tie one end of the string through it.
- Tie a paperclip to the other end of the string so it hangs freely past the angle markings.
- Tape a straw to the edge of the astrolabe to use as a site.
- Write your name on your astrolabe and decorate as desired.
- At home, you may wish to stiffen your astrolabe by gluing stiff paper or cardboard to the back.

Background:
An astrolabe (pronounced AS'-tro-layb) is a tool used to measure the altitude of objects in the sky from the horizon. Objects at the horizon are at 0° and objects at the zenith are at 90°.

“The astrolabe was invented in Greece either by Hipparchus, a 2nd century B.C. astronomer, or Apollonius of Perga, a 3rd century B.C. mathematician.
For many centuries, it was used by both astronomers and navigators, and especially by the 15th century explorers who used it to determine latitude, longitude, and time of day. 

(http://cse.ssl.berkeley.edu/AtHomeAstronomy/index.html)

Astrolabes are called by other names, including quadrant. They were commonly used by mariners to determine their latitude. This was done by sighting the noon sun and reading the angle.

Angles are used by astronomers and sky watchers to discuss the location of objects in the sky like stars. In fact, the height of Polaris (the north star) in the sky can tell you your latitude! Latitude lines are imaginary lines that circle the earth, running parallel with the equator. Latitude is used to express how far north or south of the equator a place is. In the northern hemisphere, the angle of the north star above the horizon directly corresponds to your latitude. The North Pole is at 90º north latitude. Someone standing at the North Pole would have to look straight up to the zenith to see the North Star.

Astrolabes can also be used in a process called triangulation. Knowing the angle and length of one side of a triangle allows you to calculate the other side (height of the triangle). Two people at a distance apart can sight towards an object. The distance between them is the base of the triangle and their viewing angles are two angles of the triangle. In the 1920s, a Norwegian named Carl Stromer used triangulation to find out the height of the aurora. There are many other things you could measure using triangulation (tall trees, skyscrapers, etc). If you line things up so that one angle is 90º, then only one viewer is needed.

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\text{height} = \text{angle tangent} \times \text{baseline distance}
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Instructions:

Building
1. Cut out your quadrant.
2. Write your name on your quadrant.
3. Punch a hole in your quadrant and attach a string (~2" longer than the quadrant).
4. Tie a paper clip to the end of your string.
5. Tape a straw to the edge of your quadrant.

Using
- Look through the straw with the string far away from your nose.
- Let the string hang freely. Don’t get your fingers in the way!
- When you have sited something you want to know the height of, pinch the string to the quadrant with your fingers.
- Move the quadrant from your eye and read the angle.