

Make an Astrolabe

An astrolabe is a tool to calculate the height of objects or the angle of stars above the horizon. Make a simple astrolabe and practice using angles to measure height!

Materials Needed:

Astrolabe template (printed on cardstock or copy paper), scissors, tape, string, paper clip, straw, markers (or colored pencils), hole punch (optional).

Instructions:

Step 1: Cut out the astrolabe template on the black lines.

Step 2: Cut a length of string, about 25 cm (10 inches) long. Tie a paperclip to one end of the string.

Step 3: Poke a hole in the corner of the astrolabe, using scissors or a hole punch. Tie the other end of the string through the hole.



Step 4: Cut a straw about 13 cm (5 inches) long. Tape it to one edge of the astrolabe (see template for exact placement).

Step 5: Decorate your astrolabe with markers or other craft supplies. Make sure not to cover up the angle measurements!



How To Use Your Astrolabe

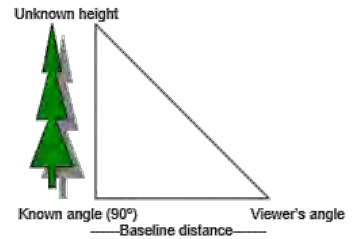
- Choose an object to find the height of.
- Measure the distance from the base of the object to where you are. This is your *baseline distance*.
- Get as close to the ground as you can. Look through the straw, with your eye near the 90° mark.
- Move the astrolabe away from your eye. Read the angle by looking at where the string crosses the angle markings. This is the *viewing angle*.



Go to the next page to calculate the object's height!

Calculating an Object's Height

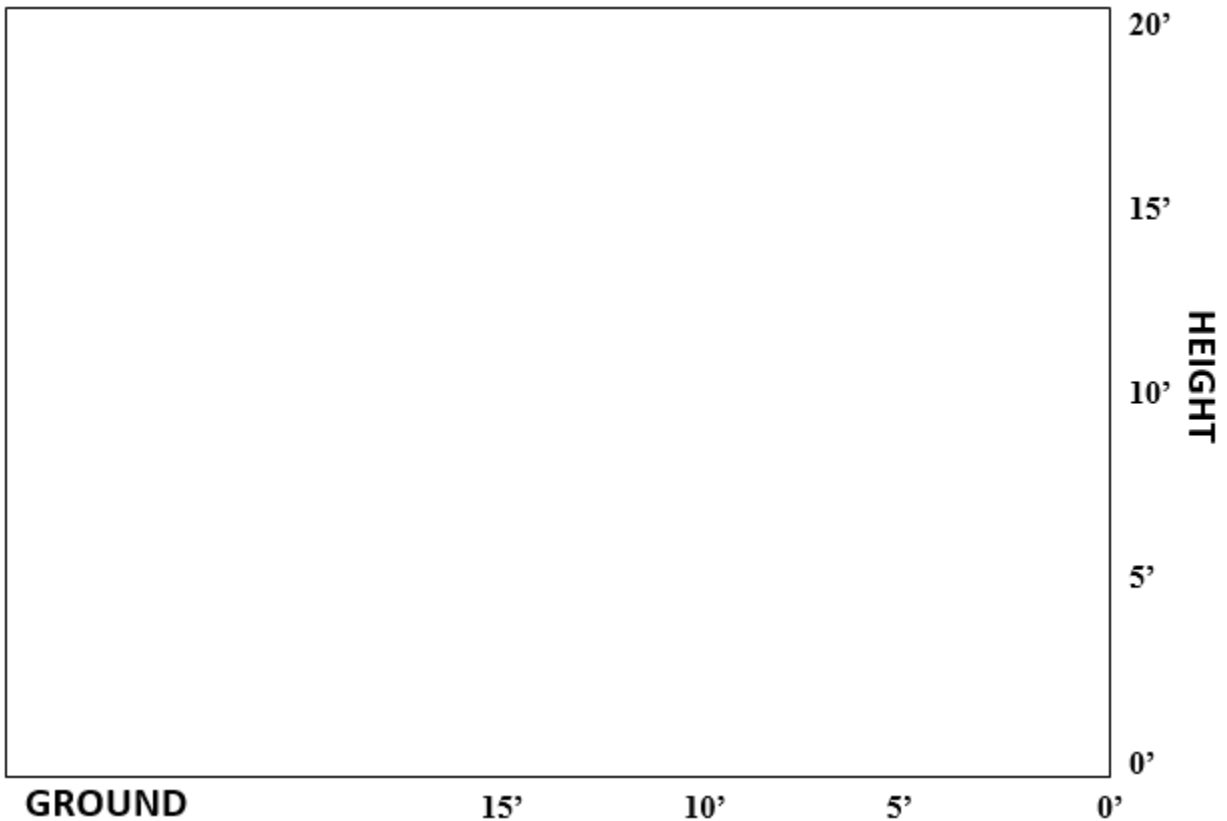
Triangulation is a method to calculate how high an object is. If you know the length of one side of a right triangle and can measure an angle, you can determine the height.



- **Write** down the baseline distance and viewing angle, from your measurements on the previous page.

Baseline Distance: _____ **Viewing Angle:** _____

- On the graph below, **mark** your baseline distance with a dot on the horizontal line.
- **Place** your astrolabe on the graph so the bottom of the straw (near where the string is tied) touches the mark you made on the horizontal line.
- **Find** your viewing angle on the astrolabe. **Draw** a dot on the left side of the graph at the viewing angle.
- **Draw** a straight line connecting the two dots. Where the line crosses the vertical line is the height of the object!



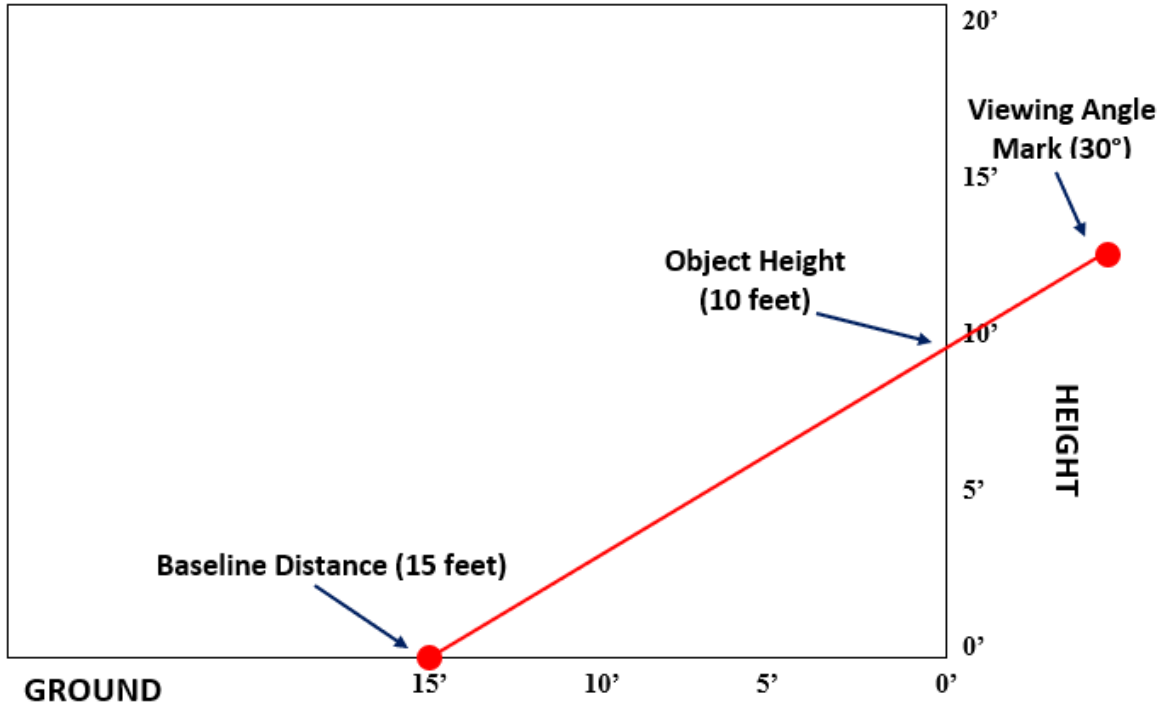
Note: You can also use trigonometry to find the object height. Use this equation:
Tangent of Viewing Angle X Baseline Distance = Object Height

Calculating an Object's Height, Page 2

Example Graph

Baseline Distance: 15 feet

Viewing Angle: 30 degrees



Astrolabes, Triangulation, and Astronomy



Canterbury Astrolabe Quadrant,
ca. 1388. *British Museum, Wikimedia Commons*

An **astrolabe** is a tool used to measure the altitude of objects in the sky. The astrolabe was invented around 200 BC, and since then has been used by astronomers and navigators around the world to determine latitude, time of day, time of year, and position of stars and planets.

You can also use an astrolabe to calculate the height of objects, in a process called **triangulation**. If you know the length of one side of a right triangle and can measure an angle with an astrolabe, you can then determine the height. In the 1920s, a Norwegian astrophysicist named Carl Størmer used triangulation to find out the height of the aurora. He discovered the aurora is usually between 90 and 130 km (56 to 81 miles) above the Earth!

Printable Astrolabe Templates

