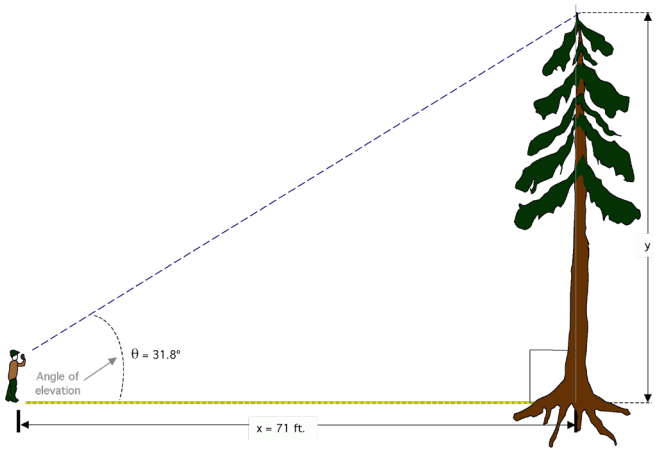
Smartphone Science in the Park – Height

[designed for Android, but can be used with iPhone]

Age Group: Older kids and adults

Description: Tree height is an important property that scientists use to estimate tree biomasses and for investigating tree life history. A device that can be used to estimate the height of objects, including trees is the clinometer. A clinometer is a device used to measure the angle from the ground to the top of an object.



The path to the base of the object plus the path to the top of the object plus the height of the object forms a right triangle. By knowing the distance to the base and the angle, we can apply some basic trigonometry to determine the height of the object. In this activity you will determine the height of objects around the Cove.

Procedure:

1. Download a clinometer app. There are dozens on the Google and Apple stores. For this activity, we will use a free and no Ads app from the Google Play Store called Measure Height.
2. Walk to the start position [yellow circle on map].
3. Start the Measure Height app.
4. For this activity, we will only be using the Angle component.
5. Click the Measure distance and height button. If you are asked to enter your height or distance, simply click OK. You do not need to enter any information.
6. You should now see a clear view through your camera, crosshair in the middle and an Angle reading at the top. Ignore Distance and Height values.
7. Align your cross air to each of the map targets: top of bridge, top of flag pole, top of light pole.
8. Record the angle for each in the table below. Distance has already been provided for you in feet.
9. Enter your height in feet under "eye level".
10. Use the tangent table at the bottom to look up each angle. Record this value under "tan".
11. Finally, the height of the object is given by:

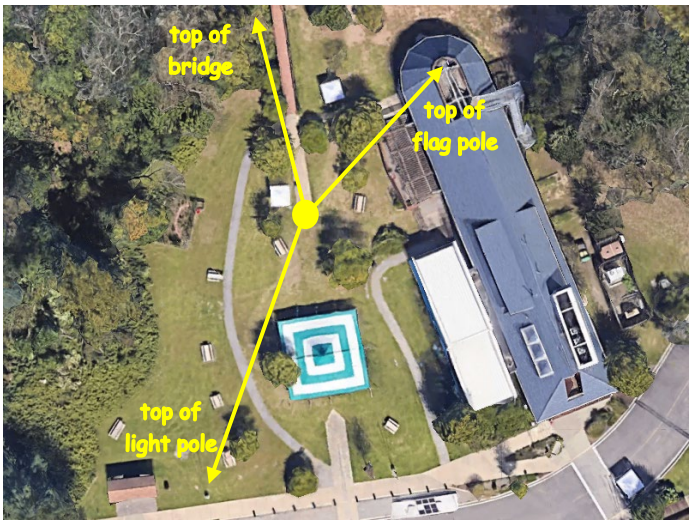
Height = (distance x tan) + eye level

Observations:

object	distance	angle	tan	eye level	Height
bridge	1500				
flag	100				
light	145				

Challenge: Now that you know how to find the height of objects, you are ready to measure the height of trees. Visit Trees Around the GLOBE to participate in a tree height measurement campaign through GLOBE Observer.

Want to learn more about GLOBE Observer? Visit Palmyra Cove GLOBE Observer.



angle	tan	angle	tan	angle	tan
1	0.017	9	0.158	17	0.306
2	0.035	10	0.176	18	0.325
3	0.052	11	0.194	19	0.344
4	0.070	12	0.213	20	0.364
5	0.087	13	0.231	21	0.384
6	0.105	14	0.249	22	0.404
7	0.122	15	0.268	23	0.424
8	0.140	16	0.287	24	0.445