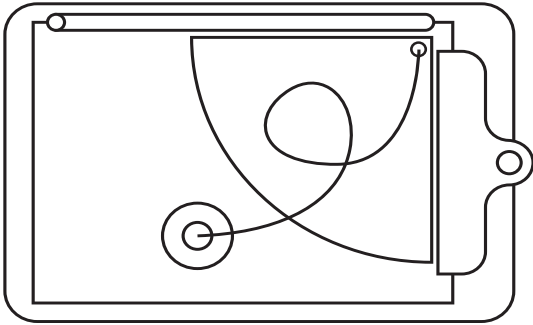


Build a Clinometer



1. Pull a knotted string through the circle in the upper right corner.
2. Attach a weight to the bottom of the string.
3. Tape your straw to the top of the page.
4. Clip to a clipboard or hold against a hard surface.

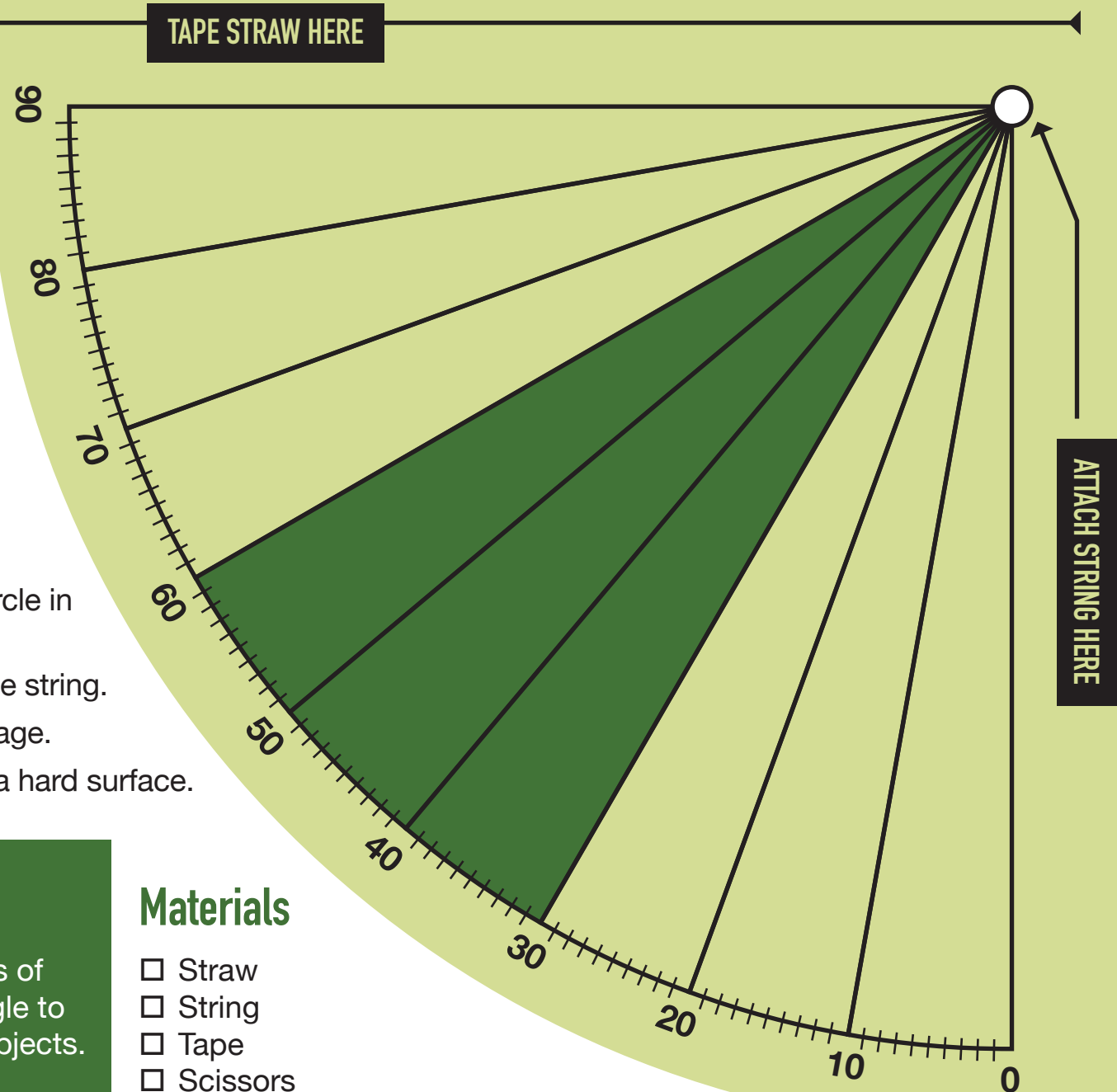
What is a clinometer?

A clinometer is a tool for measuring angles of slope or elevation. You will need this angle to calculate the height of trees and other objects.

Measuring tree height is just one way that scientists study the health of forests. Give it a try using this paper clinometer.

Materials

- ☐ Straw
- ☐ String
- ☐ Tape
- ☐ Scissors
- ☐ Pen or pencil
- ☐ Hard surface (clipboard, book, cardboard)
- ☐ Weight (beads, paper clip, metal washer)



Calculate the Height of a Tree

1. Find a tree on level ground that is at least 15 ft (5 m) tall. Stand where you can clearly see the base and the top.
2. Look at the top of the tree through the drinking straw.
3. Use the clinometer to measure the angle at which you are looking at the tree. It helps to have a friend tell you where the string crosses the arc.
4. Measure the distance to the tree using a tape measure or your pace length.



You can also measure trees with the GLOBE Observer app - no tape measure or clinometer required!



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What is a tangent?

The tangent (tan) of an angle is a trigonometric function used to calculate the legs of a right triangle. When measuring a straight tree on level ground, the tree trunk and ground form a right triangle.

If your calculator doesn't have the tan function, find a tree that can be viewed from a 45 degree angle when looking at the top. The tangent of 45 is 1, so the height of the tree above your eye height is equal to the distance from the tree.



Which measurement system do you prefer?

Imperial (Feet and Inches) or Metric (Meters and Centimeters)

Circle or highlight the units you plan on using. Remember, you can use either system, but it's important to only use one.

Your Height		Eye Height	
in. cm	- 4 in. = - 10 cm =	in. cm	<i>This is an estimate.</i> You can also measure your eye height with the tape measure.

Distance from Tree		Clinometer Angle		Vertical Leg
in. cm	$\times \tan$		=	in. cm

Vertical Leg		Eye Height		Tree Height
in. cm	+	in. cm	=	in. cm

Tree Height		Tree Height
in. cm	$\div 12 =$ $\div 100 =$	ft. m

You can use the same process to measure anything taller than you on level ground.