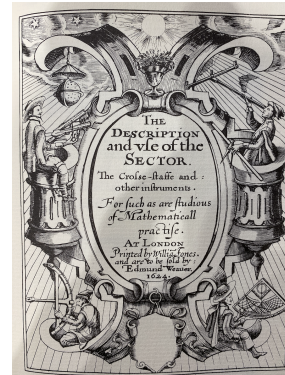
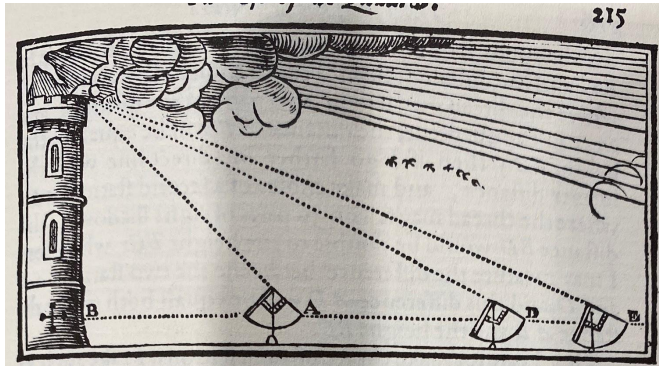


Quadrant Information Sheet

What is a quadrant? A quadrant is a mathematical tool dating back to 150 AD that can be used to find angle differences between the center of the earth (the plumbline) and latitude (by sighting the north star) or to measure tree or building height by sighting to the top of a tree. This illustration is in a book by mathematician and maker of navigational tools Edmund Gunter who created his version in 1623.

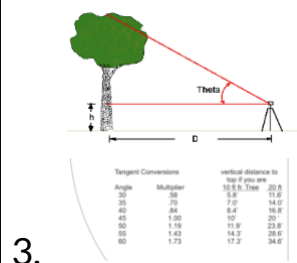
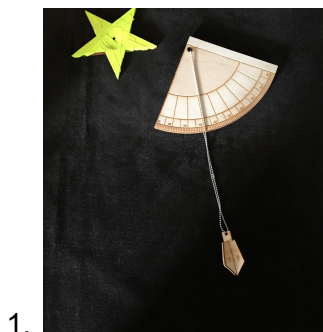


How did sailors use quadrants to navigate the high seas? To determine latitude, identify the North Star in the sky. Look at the North Star through the slit in the quadrant as shown by the students in Picture 2. Depending on your location, the angle you tilt the quadrant to look at the North Star will change. On the side of the quadrant with degree measurements, the plumbline chain is aligned with your degrees in latitude.

Learn how to measure tree heights using quadrants! To measure a tree's height, first locate a spot where you can stand either 10 feet or 20 feet away from the tree. Look up to the top of the tree through the quadrant slit. The plumbline will show the angle of your line of sight based on how much you tilt the quadrant to see the top of the tree. The angle indicated by the plumbline corresponds to a multiplier number (chart found on the right side of the quadrant). Multiply that multiplier number by your horizontal distance in feet from the tree. Lastly, add your own height to the product to determine the tree's height.

Formula: determine multiplier number based on tangent conversion chart.

$$[\text{multiplier number} * \text{distance from tree (ft.)}] + \text{your height (ft.)} = \text{tree height (ft.)}$$



Two ways to Design your own plumbline on a chain and make a quadrant yourself!

1. Use the files created by MathHappens to etch and cut $\frac{1}{8}$ " wood. Glue the wooden pieces together so that the etched sides are on the outside. The finished quadrant is shown in picture
2. Use x-tra large straws and a quarter circle of cardboard to make a working quadrant. This design is nice because it has the sights on both sides of the quadrant. The angles on the quadrant are the same as those on a protractor (0 to 90). Search in our blog for quadrant at mathhappens.org.

