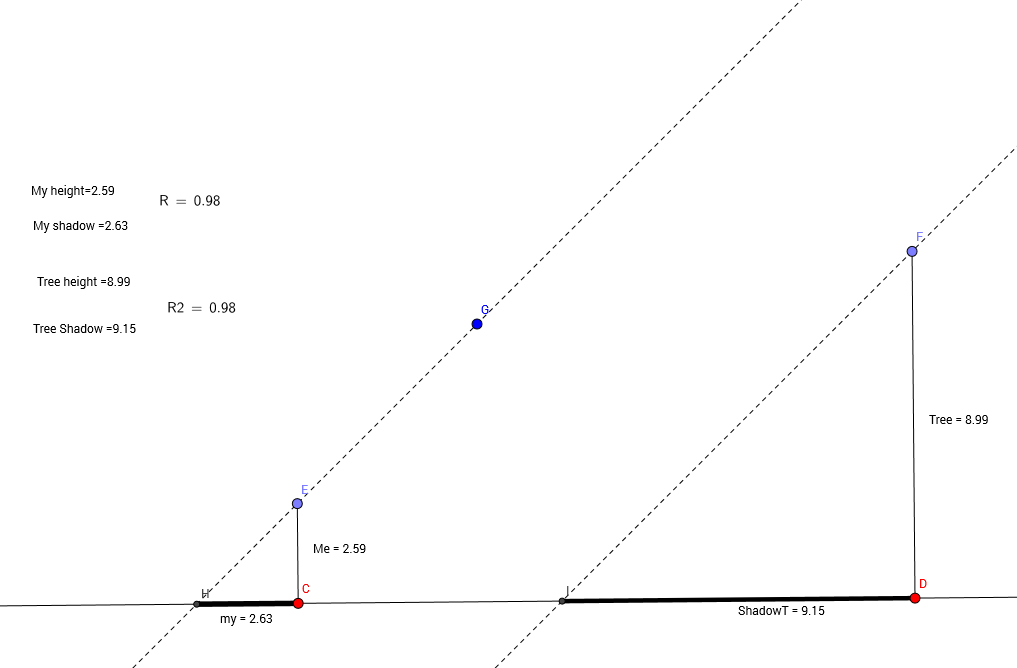
Modeling Indirect Measurement with Similar Triangles

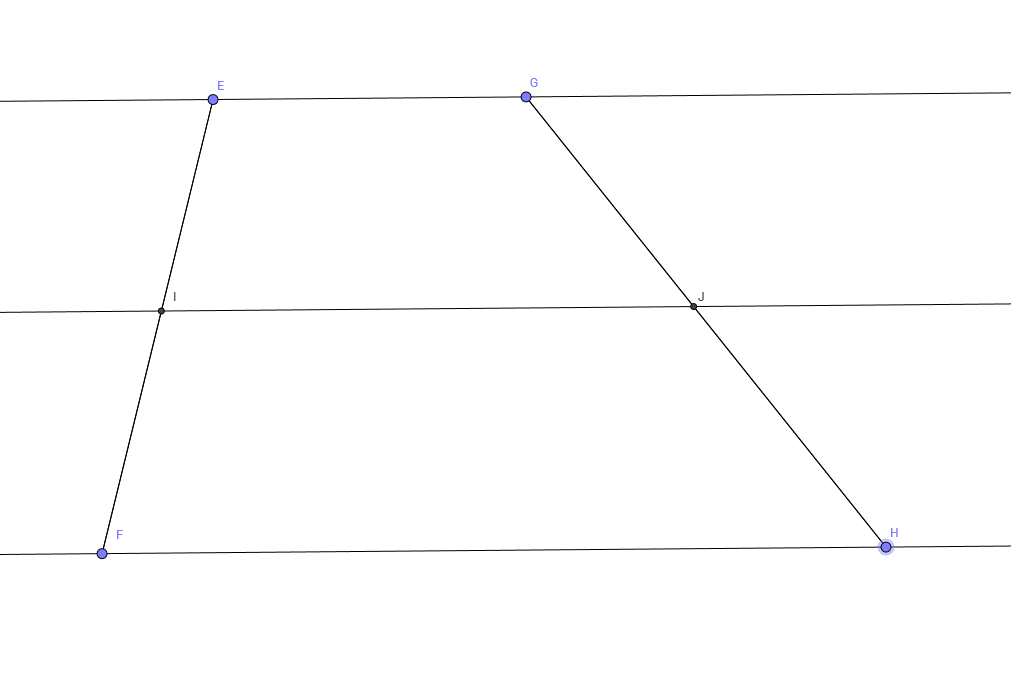


We are going to model using shadows from the sun to find the height of a tall object.

Creating your sketch

* Draw a horizontal line to represent the ground. (Right click on the object and use properties to make it green.
* Construct two free points on the line. This will represent the places where your feet and the roots of the tree meet the ground.
* Construct a perpendicular line through each point.
* Construct a point on each of these perpendicular lines. (Right click on each line and hide the line by unchecking the show object box.)
* Use the segment tool to construct segments from each of these points to the point below them on the ground.
* Right click on each segment and use properties to change the names to “Me” and “Tree”.
* Adjust the heights so that the tree is much taller than you.
* Construct a diagonal line through the point at the top of your head. Click on it and use object properties to make the line dashed. This line represents the sun’s rays.
* Since the sun is so far away, its rays are essentially parallel. Use the construct parallel tool to construct a line through the top of the tree, parallel to the other line. Use properties to make it dashed.
* Use the point intersect tool to construct points where these lines intersect the ground.
* Construct segments that represent each of the shadows. Use the properties tool to make these segments black and thick.
* Change the label for these to “shadow1” and “shadow2”.
* Use the measure tool to measure the heights and the shadow lengths.
* Create text boxes for each of the objects
  + Click the text tool and then click somewhere to place the text.
  + Type “My Height =” and then click on the Advanced drop-down menu. Click on the little geogebra icon and search for the variable name that identifies your height. It should be “me” if you followed earlier directions.
  + Repeat this process for each of the measurements.
* Next we will get it to calculate one of the ratios. Go to the input bar at the bottom of the screen. Enter “R1=segment[letter1,letter2]/segment[letter3,letter4]” and then press enter. Letter1, letter2, letter3, and letter4 correspond to the endpoints of the segments.
* Repeat this process to calculate the other ratio but call this one “R2.”
* To display the ratios on the screen, open a text box and type, “My Ratio =”then search for that variable name in the list. Repeat to get it to display “Tree Ratio=.”
* Explore what happens as you change the height of the tree, the height of the person, and the angle of the sun.

**Segments between parallel lines**

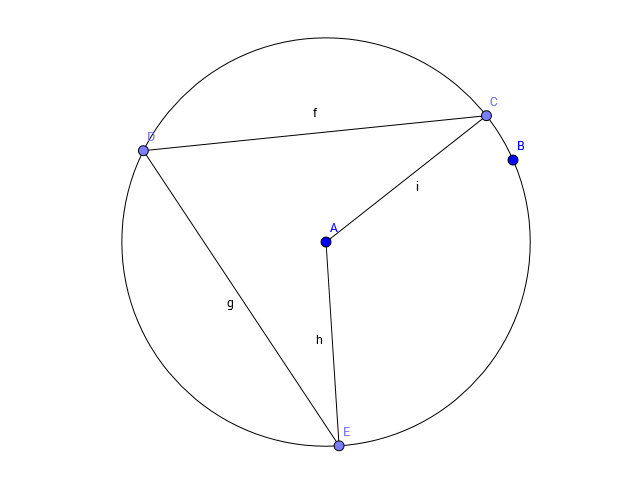


Construct three parallel lines.

Construct segments between the parallel lines as shown in the picture.

Explore the ratios between pairs of segments.

Inscribed Angles and Central Angles



Create a construction similar to the one shown above and use the angle measure tool to investigate central and inscribed angles.

Note: When you select the points that define the angle, do it in the way you name angles, selecting the vertex as the middle point.

If you get a reflex angle click on the button on the right side of the screen that looks like and angle and change the option to 0-180.

