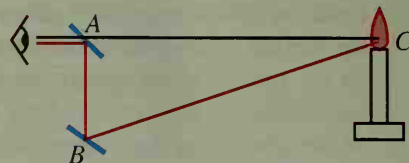


Rangefinders and Stellar Parallaxes (Chapter 8)

A *rangefinder* is an instrument used to find the distance from a viewer to an object. The rangefinder modeled in the diagram has a mirror at B and a semi-transparent mirror at A that allows light from the distant object to combine with light from mirror B . The length AB is fixed.



An operator looking through the eyepiece at A sees two images of the candle—one from the light following the straight-line path from C to A , and the other from light traveling along the angled path from C to B to A . The operator adjusts the angle of the mirror at B until the two images of the candle appear to merge. The distance to the candle can then be read from a scale on the instrument.

1. Show how to calculate AC from the fixed distance AB and the measure of $\angle B$.
2. Suppose that $AB = 12$ inches. Assuming you can measure $\angle B$ to the nearest degree, for what distances is the rangefinder useful?
3. Read about *stellar parallax* and write a description, with diagrams, of how astronomers can use a stellar parallax to measure the distance from Earth to a nearby star. In what ways is this method of finding distances to stars similar to the method of finding distances using a rangefinder?

Chord Designs (Chapter 9)

Materials: You will need some or all of the following items: compass, protractor, ruler, colored pens or pencils, cardboard, tacks, and string.

1. Divide a large circle into 24 equal arcs and number their endpoints consecutively, as shown. Draw a chord joining points 1 and 8 and a second chord joining points 2 and 9. Continue this pattern, drawing chords until each point n is connected to point $n + 7$.
2. What shape is outlined by all the intersecting chords? Explain why.
3. Experiment with the chord-drawing process. For example, you could change the number of points between points joined by a chord. Or you could draw *all* possible chords joining the points. Or try drawing chords by connecting point n to point $2n$.
4. Choose one of the designs you have created and develop it into an art piece. You may want to emphasize different aspects of the design by varying the colors of the chords. You might make your design into *string art*: draw the circle on a piece of cardboard, use tacks to mark the points around the circle, and tie string (of different colors if you like) to the tacks to make the chords.

