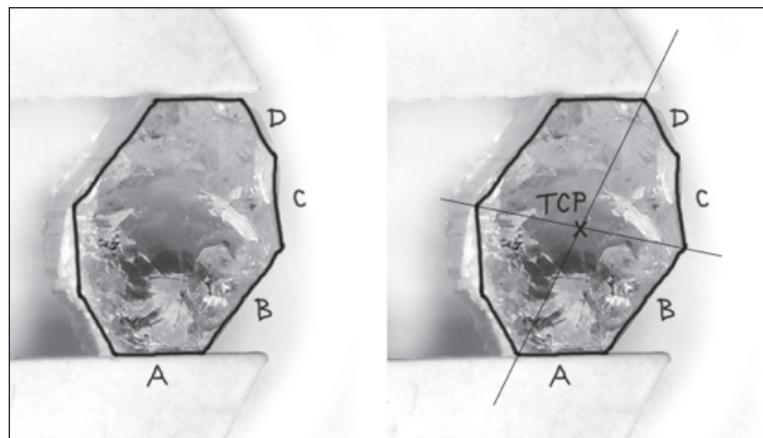


## The Outline of an Outline

Let's begin by simplifying things. Specifically, you should examine the image or sketch and break it down into a few line segments. Yes, a 47-sided outline may trace the periphery of the stone very accurately, but it will be an arrestingly unrewarding exercise to cut it. Also, recall that the pavilion and crown facets of essentially all gemstones provide refinements to the overall outline. This usually means placing facets at different index wheel settings than the girdle. You don't want to use up all the notches on your index wheel, at least not immediately.

Figure 17-11 shows a good compromise for the tourmaline rough. This eight-sided outline follows the skewed crystal structure pretty well. Note that the pattern has through-center or radial symmetry (see Chapter 10.7), and that there are four pairs of equidistant segments. This can reduce the number of mast height and cutting angle changes, and such symmetry almost always produces interesting reflection patterns.

You know by now that measuring the angles of the outline segments (and hence the index wheel settings corresponding to the girdle facets) is a breeze, but how do you get the other piece of the puzzle, the centerline distances? You should start with finding the centerline itself.



*Figure 17-11 Reducing the gem outline to a series of line segments (left). Ideally, the rough will allow a relatively simple solution with interesting symmetry. If not, try to find the best compromise between accuracy and complexity. Label the individual segments to keep track. Connect opposite vertices to locate the center point (right).*

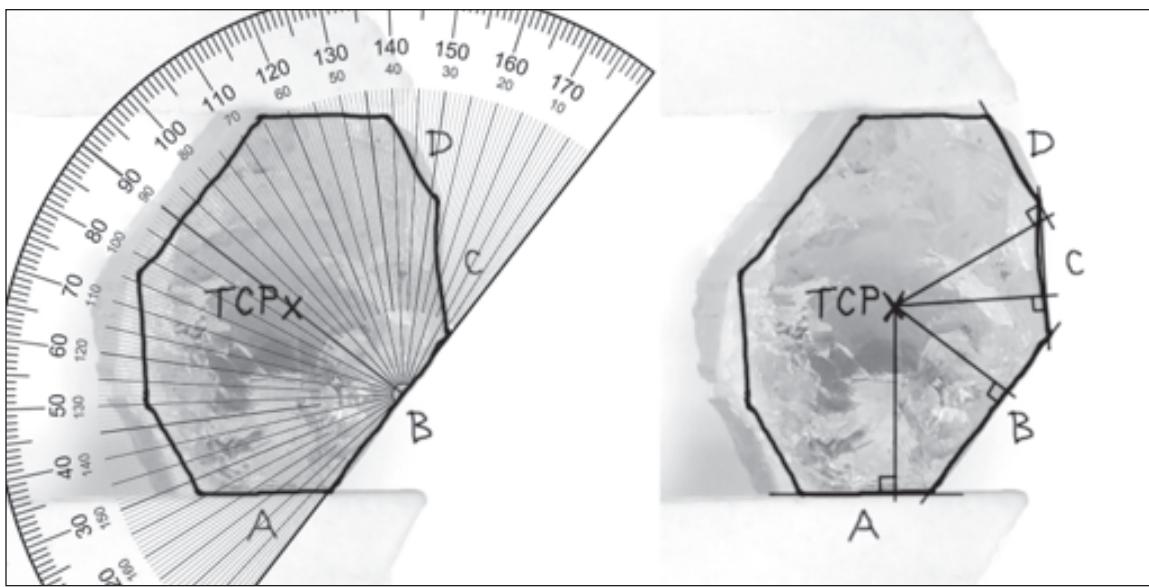
Identify the centerline (or temporary center point) of the gem as best you can. If the outline has reasonable symmetry, try the intersection of a pair of lines connecting opposite vertices. Mark the TCP on the drawing (Figure 17-11).

The centerline distance to each girdle segment is the perpendicular distance between the TCP and that segment. In other words, it is the distance between the center point and the girdle measured along a line at  $90^\circ$  to the segment. To measure the distance, you first have to draw these perpendicular lines. Time to wield your trusty pencil, protractor, and ruler.

Figure 17-12 shows how this is done. The procedure should be familiar to any home carpenter. Note that the perpendicular line through the TCP does not necessarily pass through the midpoint of the girdle segment! In fact, in some cases, such as segment D in the figure, the perpendicular line may lie beyond one of the ends.

That's it for geometric constructions – you can put the pencil away. The next step is to measure the individual (perpendicular) distances and segment angles.

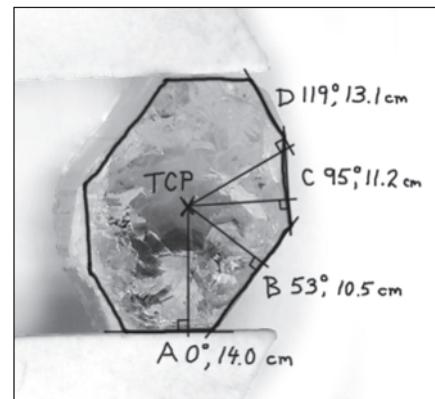
The distances are easy. Simply lay the ruler down on the perpendicular line and measure. Note the distance, in centimeters for example, next to the segment label. Ok...so you weren't 100% done with the pencil.



*Figure 17-12 Using the protractor and ruler, draw a line through the TCP perpendicular to each segment of the outline. You can do this by placing the protractor on the sketch with the TCP on the 90° line and the base of the protractor square with the edge of the stone. The left panel shows this for edge B. Then make a mark at the bottom of the 90° line (near the letter B above). Joining this mark with the TCP using a ruler establishes the needed perpendicular line. Do the same for the remaining three labeled segments (right panel). Note that by this choice of symmetry, you do not have to measure the four remaining unlabeled segments – they will have the same distance and the opposite index wheel setting (i.e. 12-84 for a 96-index wheel).*

The next step is to derive the index wheel settings by measuring the angle of each outline segment using the protractor. The only subtlety here is keeping track of where zero degrees is. Remember that in modern cutting diagrams, facets directly below the TCP (i.e. the 6 o'clock position) are at index zero. It makes sense, then, to define this direction as zero degrees and work outward from there. Figure 17-13 shows the result.

*Figure 17-13 The distances and angles of each of the four unique outline facets.*



## From Measurement to Design

The pieces are now in place: you have all the required information to convert the distances and directions to a prescription for cutting this custom gem outline.

As noted several times above, transposing the segment directions into index wheel settings is dead easy: for a 96-tooth index wheel, simply divide the angle in degrees by 3.75 and round the result to the nearest integer. Don't worry about the rounding: you will always be within half an index of the best setting, which is plenty good enough for a reasonable gem outline. The final column of Table 17-1 shows the resulting index wheel settings.