Nomogram: A simple method for the transposition of faceting angles.

By Clive Washington

One of the first problems encountered by the beginner is the conversion of published faceting designs to a form suitable for materials other than quartz. Virtually all published designs use angles which have been optimized for quartz, and since other materials have different refractive indices and critical angles, they require the facets to be cut at different angles to the original design….
…
I realized that the proper procedure was to perform a mathematical transformation on the stone…keeping the geometrical relation between the facets correct. It didn't take an awful lot of thought to come up with the tangent ratio method for this transform - which was probably known well before I devised it for myself in the mid 70's. This method transforms angles by scaling their tangents by the ratio of the tangents of the design and target angles - easy to do on a calculator [*and it's described in another article in this website Library—ed.*]…

… I wanted to find an easier way…. I became interested in nomograms - graphical lines like fixed slide rules that allowed you to perform simple calculations by laying a ruler across them. I realized that it should be possible to use a nomogram for faceting angle conversion, and tried to work out the transforms for the various lines. After a bit of head-scratching, and taking into account the obvious properties of the transform (it doesn't affect angles of zero or 90 degrees, and it needs to transpose circular functions) I came up with the circular diagram in the figure. It works like this:

THE INSTRUCTION:

Suppose you want to convert from quartz pavilion angles to topaz pavilion angles. Again you look up the recommended mains angles in the tables, 43 degrees and 39 degrees. The top semicircle in the diagram is used for the original design angles, while the bottom is used for the required transformed angle (which I call the target angle). You need a ruler and a sharp pencil. Place the ruler so that it joins the design angle of 43 degrees on the top half of the diagram and the target angle of 39 degrees on the bottom half of the diagram. Draw a short line where the ruler crosses the horizontal centre line. Now to convert any other angle from the original design, all you have to do is to place the ruler so that it lies on the design angle on the top half of the diagram, and passes exactly through your mark on the centre line. The point at which the ruler crosses the bottom angular scale is the target angle you need. This is actually much easier to do than to describe. With a good ruler and a sharp pencil it is possible to work to a tenth of a degree.

You should remember that you will need a different centre mark for the crown conversion because the recommended crown angles are different to the pavilion ones. It pays to copy or print a few of the diagrams so that they can be disposed of when they get tatty, and it helps to use a soft pencil so that you can rub out your centre mark when you have finished, to avoid confusion with later stones.
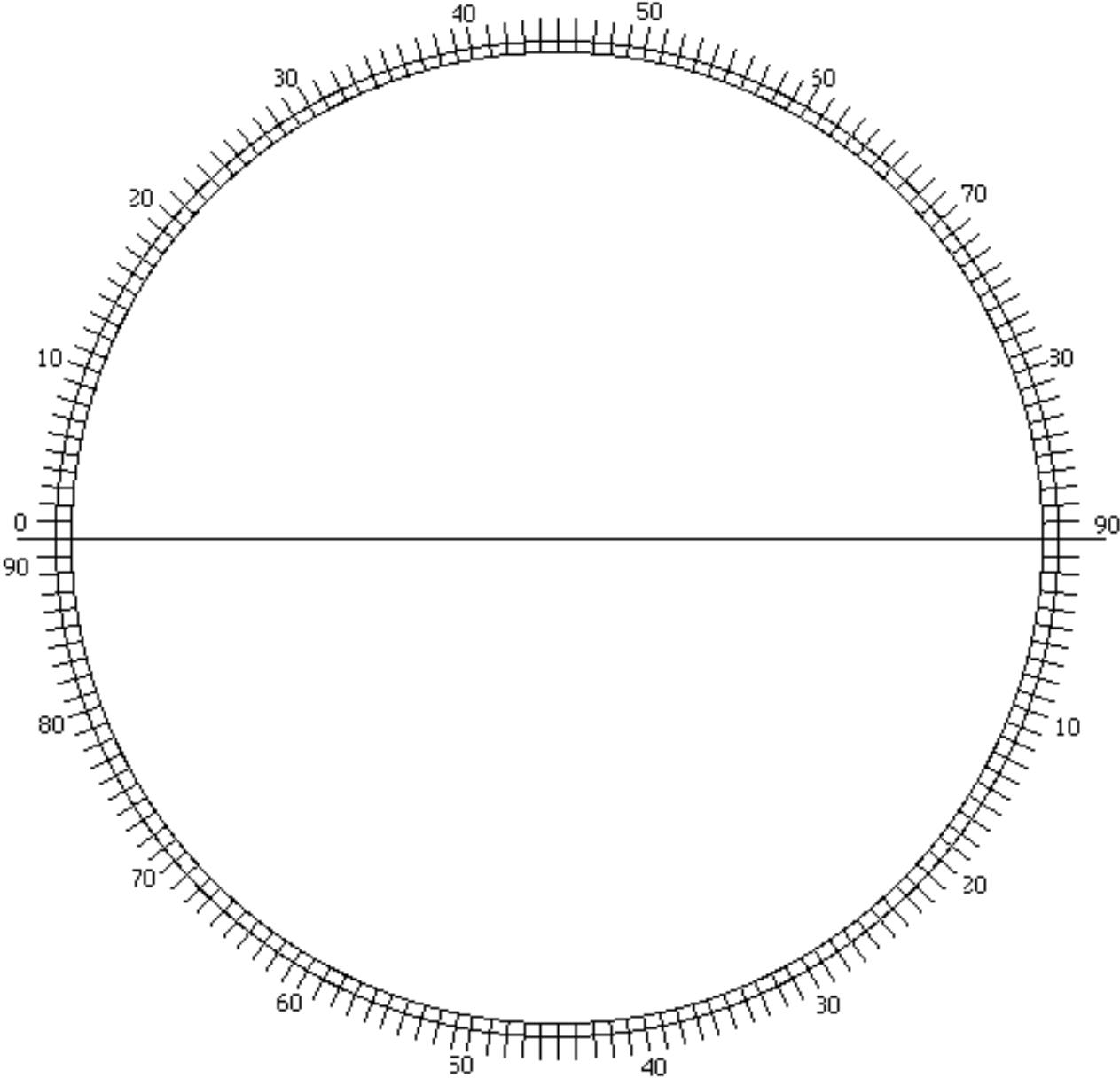
I find this procedure extremely quick and accurate, and can convert a design in a shorter time than it would take to start up the computer to get at a tangent ratio spreadsheet…. this method is completely calculation-free… I hope someone out there will find it useful.

NOTE: *You can find this article, in its complete form, on the UK Facet Cutters' Guild website (http://www.ukfcg.org/)—find it in the "workshop" section. The portion below has been abridged, to concentrate mostly on the how-to use of the nomogram.*

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Origin Angle

Target Angle