How To Make a Clark's Nomogram

In a typical Clark's nomogram, the left scale (1) and right scale (2) are arcs on the same circle or ellipse, and the center scale (3) is a vertical straight line.

Start with the equation that you wish to turn into a nomogram. Let's say it involves the parameters $u, v,$ and w. Find five functions (g_1, g_2, g_3, f_3 and h_3) that express your equation in the following general form:

$$g_1 g_2 f_3 + (g_1 + g_2) g_3 + h_3 = 0,$$

where:

g_1 is a function solely of the left (1) parameter,

g_2 is a function solely of the right (2) parameter, and

g_3, f_3, and h_3 are functions solely of the center (3) parameter.

Note that if you set $g_3 = 0$, the outer scales will lie on the same ellipse, and the center scale will be a vertical straight line. If you set $g_1 = g_2$, the outer scales will lie on the same circle.

Most equations you are likely to want as a nomogram are simpler in form than the general relation above.

To make a Clark's nomogram for a really simple equation like $uv = w$, you can set $f_3 = 1$ and $g_3 = 0$; then we have $g_1 = u$, $g_2 = v$, and $h_3 = -w$.

Or, to make a Clark's nomogram for $u + v = w$, another very simple case, set $f_3 = 0$, $g_3 = 1$, and again we have $g_1 = u$, $g_2 = v$, and $h_3 = -w$.

In any case, once you have the five functions (g_1, g_2, g_3, f_3 and h_3) suitably defined, the "mapping equations" for the drawing the nomogram on Cartesian (x, y) graph paper are these:

Scale 1: $\quad x_1 = a\left(-\frac{g_1}{1+g_1^2}\right), \quad y_1 = b\left(\frac{g_1^2}{1+g_1^2}\right)$

Scale 2: $\quad x_2 = a\left(-\frac{g_2}{1+g_2^2}\right), \quad y_2 = b\left(\frac{g_2^2}{1+g_2^2}\right)$

Scale 3: $\quad x_3 = a\left(\frac{g_3}{f_3+h_3}\right), \quad y_3 = b\left(\frac{h_3}{f_3+h_3}\right)$

The constants a and b can be chosen and adjusted arbitrarily, to stretch the nomogram into a more readable shape.

These instructions are adapted from the extended treatment of nomography in chapter 32 of *Survey of Applicable Mathematics*, Karel Rektorys, ed. (The M.I.T. Press, 1969).