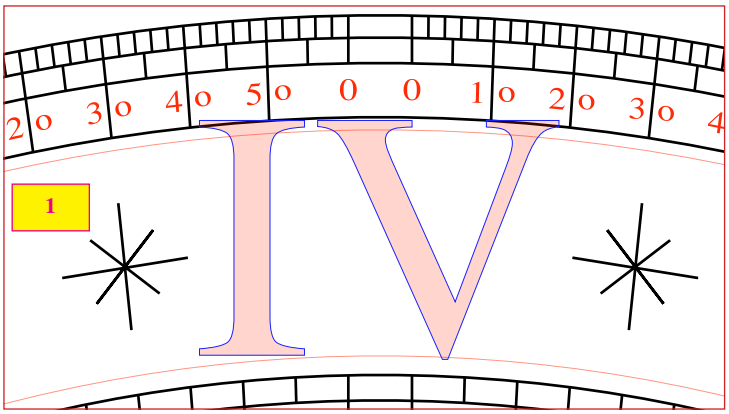

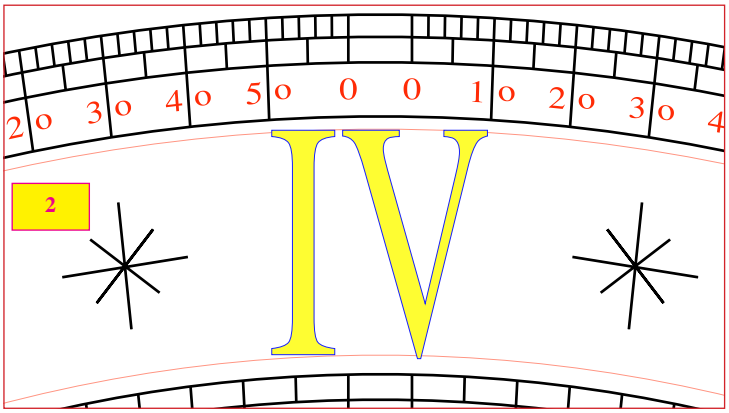

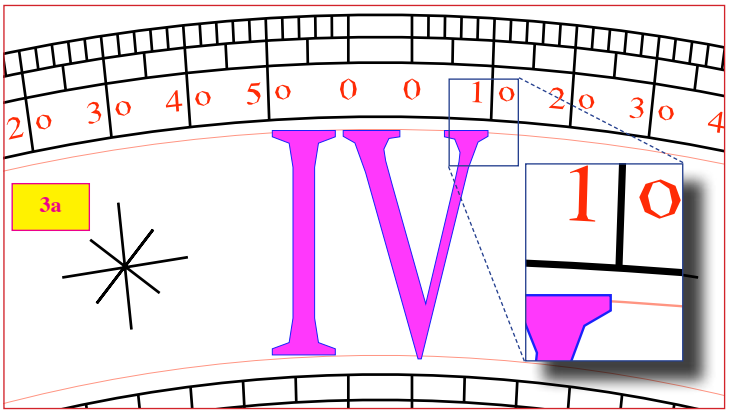

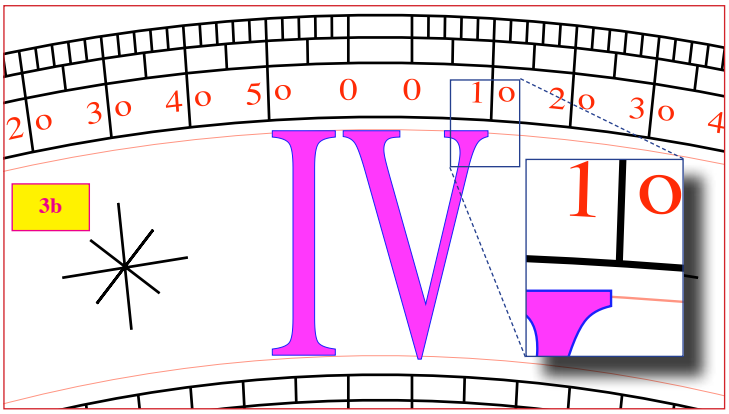

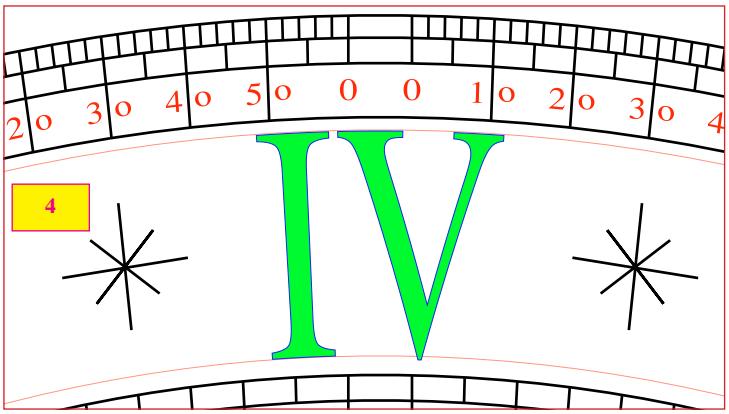

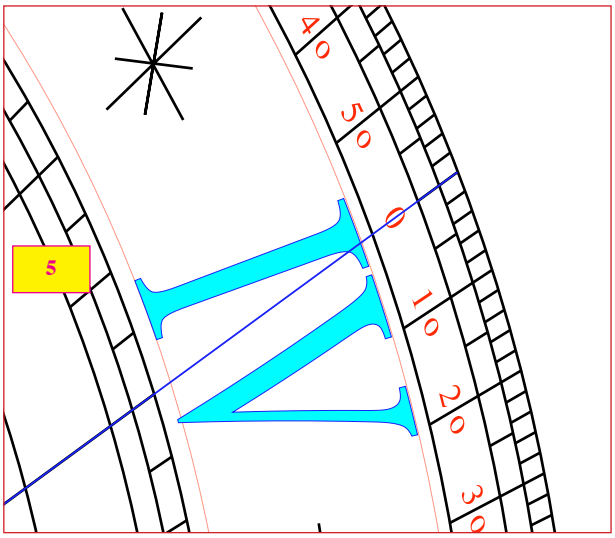

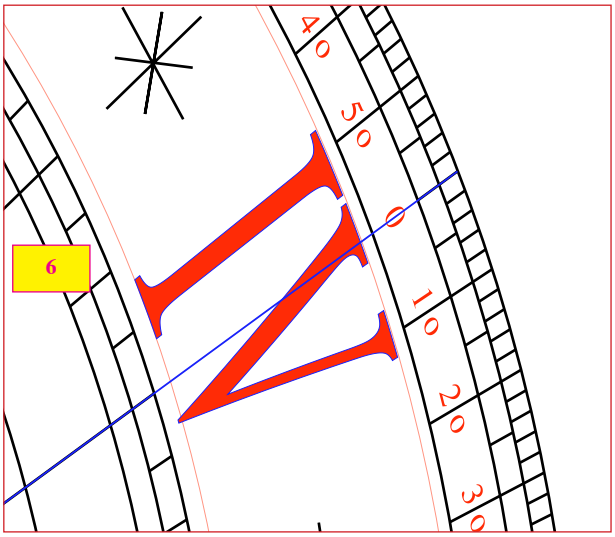

Using Nodebox to produce the precise geometrical artwork needed to photo-etch a Sundial

The Dial design shown is being made for my brother, who kindly hosted the weddings of my two children in the grounds of his property. A Sundial can be painted on wood, carved in stone, cast in cement or made of a metal such as bronze - with the lines and numbers photo-etched. Photo-etching requires precise black and white artwork to be prepared. The 'Hour Lines' on the dial must be geometrically correct - since their position varies with both time and latitude - and must point towards the foot of the 'Gnomon' (the shadow caster). And, for aesthetic and practical reasons, the Hour Numbers should also point toward the foot of the Gnomon. Such artwork can be produced using a graphics package such as Illustrator; but the slanting of the text is imprecise and tedious. However, NodeBox can do the job repetitively and precisely. This example shows how NodeBox allows a character string to be transformed with total precision. Simple font transformations can be done by applying the transformation (rotations, scaling, translations or skewing) equally to the character string's Bezier points and controls. However, complex transformations on Bezier controls, particularly with tightly serifed fonts, can lead to weird results. Equally most standard transformations leave straight lines as straight lines. In this application, both the character string's Bezier curves and straight line segments are split into any number of very small straight segments, which are then subject to the complex transformations. For the sundial, all numbers, large and small - as well as all the small ornamentations - were transformed in this way.

There are 6 steps in the transformation:

Step 1 Original Text.

Step 2 Simple Linear squeezing of font points and their Bezier control points.

Step 3a Font Bezier curves are converted to *single* straight line segments (just for illustrative purposes) - see inset.

Step 3b Font Bezier curves are converted to *multiple* straight line segments (and appear as curves) - see inset.

Step 4 Font points linearized in the previous step are 'circularized' so that ....

(a) originally vertical lines point to the centre of the circle,

(b) originally horizontal lines curve around circles.

The character string now 'points' towards the centre of the dial.

Step 5 A simple rotational transformation to bring the mid point of the character string in line with the appropriate 'Hour Line' of the Sundial.

Step 6 A complex slant transformation so that ....

(a) previously radial lines point towards the foot of the 'Gnomon (the shadow caster) of the Sundial,

(b) segments previously on the circumference of a circle are maintained on the original circle, but shifted along it by (a) above.