ofn-path-to-shape

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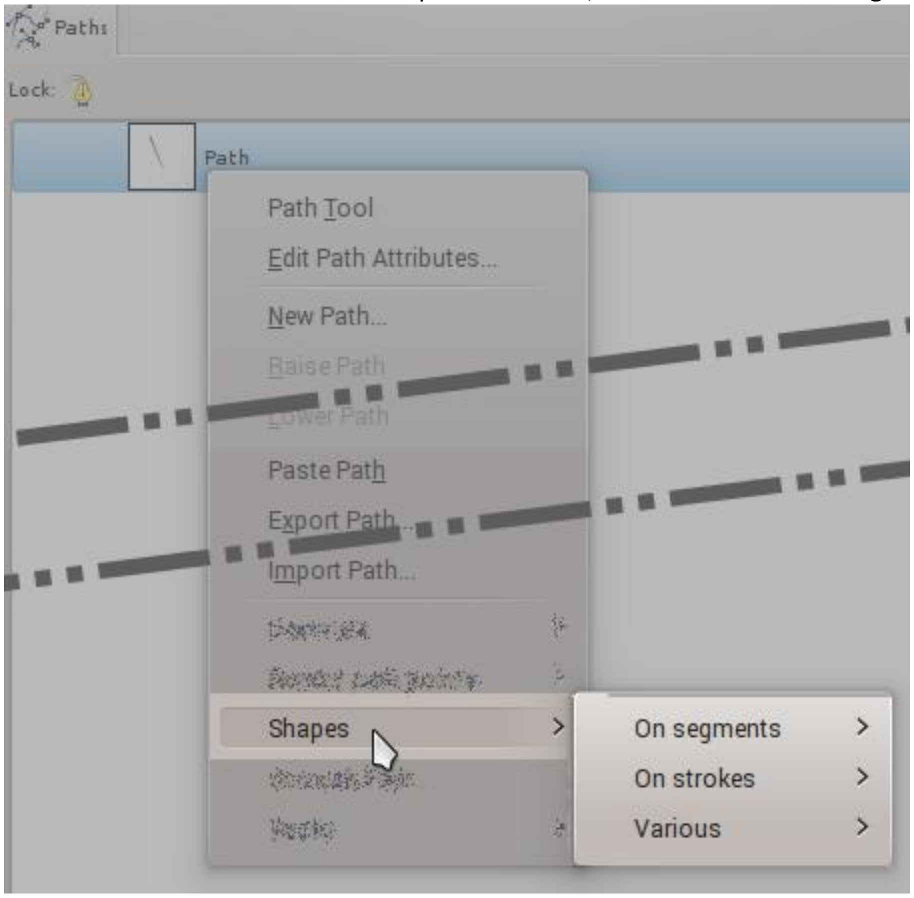
ofn-path-to-shape has been spurred by:

- the inability to obtain paths in the Gfig filter
- the cumbersome entry of point coordinates in other scripts (such as the shape-path.scm classic)

So this script takes a different approach: points coordinates come from anchors in an existing path. In other words, a path is used to specify another path.
Functions in this script are divided in three groups:

- **Shapes on strokes**: each stroke in the path is interpreted to fully describe a shape: position, size, orientation, number of sides, etc.... These functions do not take additional parameters, since everything is specified in the strokes.
- **Shapes on segments**: the successive anchors in strokes are interpreted as the ends of segments. An additional dialog asks for shape parameters (orientation, number of sides, etc...
- a third group contains functions that don't fit any other group (such as drawing tangents)

The functions are accessed in a *Shapes* sub-menu, at the bottom of the right-click menu in the Paths list:



Since a schematic is worth a thousands words, functions are mostly documented with graphics. The source path (the one on which the script is called) is in blue, and the result path is in red.

Functions on strokes
The general rules of functions on strokes:

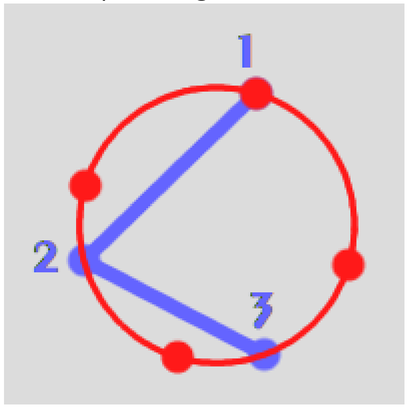
- The scripts creates one shape per stroke in the path. So avoid incomplete strokes and stray points.
- The first point of a stroke is the position of the shape. Where it matters, the shape is guaranteed to pass through that point (or to be exactly centered on it)

- The second point gives a size and/or the orientation
- More points usually determine a count
- There are of course exceptions...

Circles

Circumcircle

This draws the circle going through three points. In practice it finds the center and radius of the circle, and draws an approximation of the circle with Bezier splines, which may not go exactly through all three points, but by construction the first point is guaranteed to be on the circle.

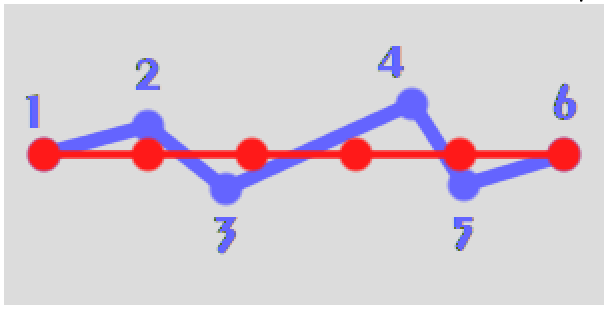


Note: Constructing a circle from a center and a radius or from a diameter is a function on segments (see below)

Lines

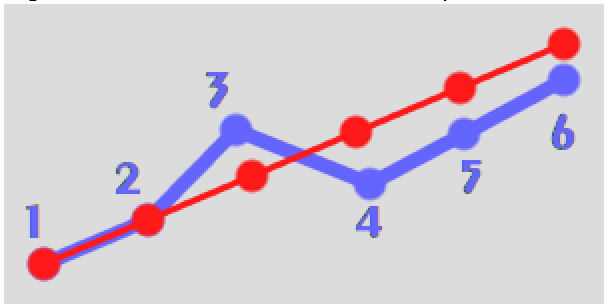
Divide segment

The straight lines that goes through the two ends of the stroke is divided in as many sub-segments. In other words, the intermediate anchors in the source stokes are repositioned to equally divide the stroke.



Multiply segment

The straight line segment that goes through the first two points of the stroke is extended with as many aligned sub-segments. In other words, the subsequent anchors are realigned with the first two and equally spaced.



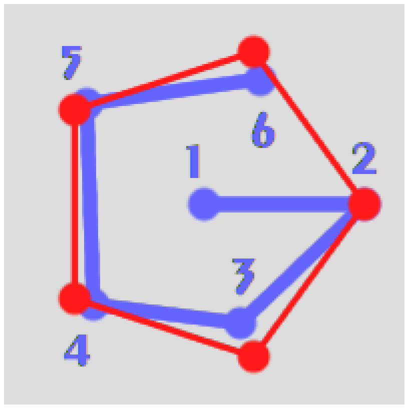
Polygons

Polygon from circumradius

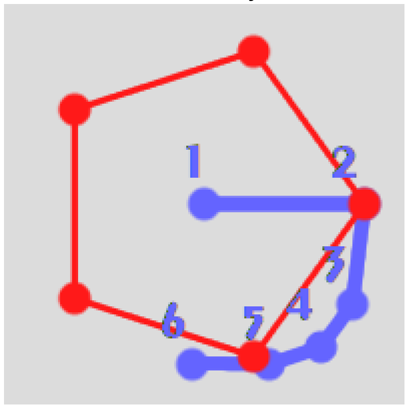
The circumradius is the line between the center of the polygon and a vertex. The stroke points are:

1. The center,
2. The first vertex,

3. More points indicates the other vertices, so that the whole stroke has one more anchor than the required number of vertices.



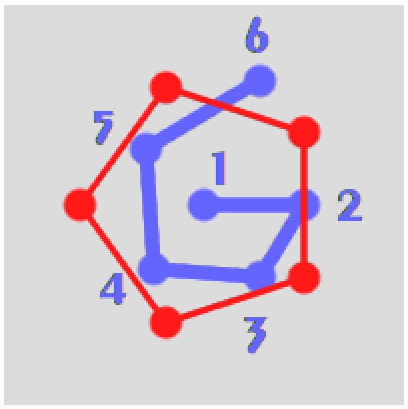
Note that this works just as well:



Polygon from apothem

The apothem is the line between the center of the polygon and the middle of a side. The stroke points are:

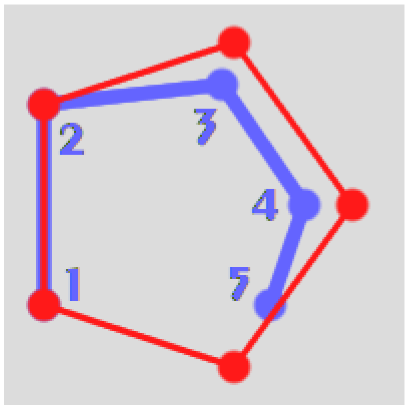
1. The center,
2. The middle of the first side,
3. More points indicate the other sides, so that the whole stroke has one more anchor than the required number of sides.



Polygon from side

The stroke points are:

1. The beginning of the first side of the polygon,
2. The end of the first side of the polygon,
3. The first additional side, it also indicates on which side of the initial segment the polygon should be
4. More points indicate the number of sides

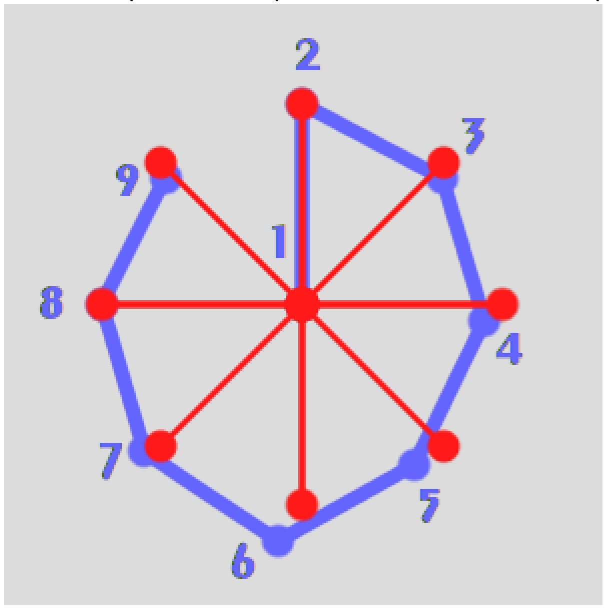


Stars

Spokes

The stroke points are:

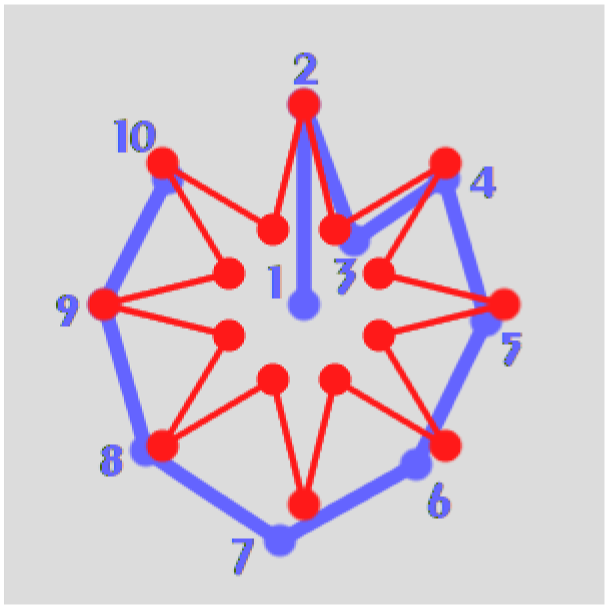
1. The center,
2. The end of the first spoke,
3. Any additional points indicate additional spokes.



Star

The stroke points are:

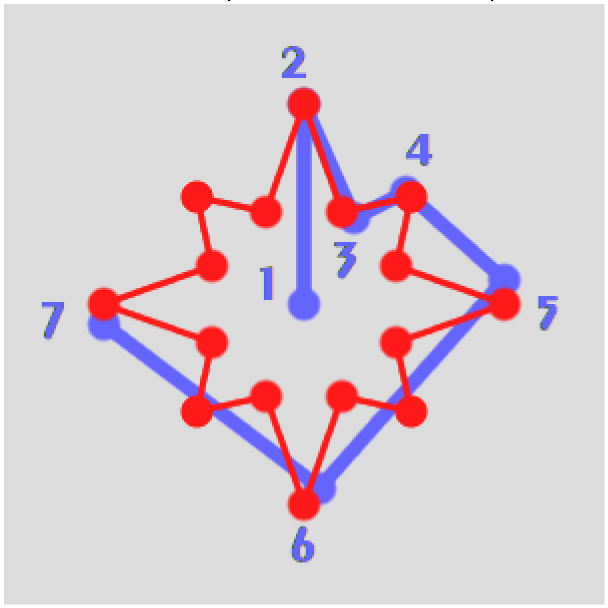
1. The center,
2. The first outer vertice,
3. The radius for the inner vertices,
4. Additional points indicate the required outer vertices.



Double star

The stroke points are:

1. The center,
2. The first outer vertice,
3. The radius for the inner vertices,
4. The radius for the alternate outer vertices,
5. Additional points indicate the required outer vertices.

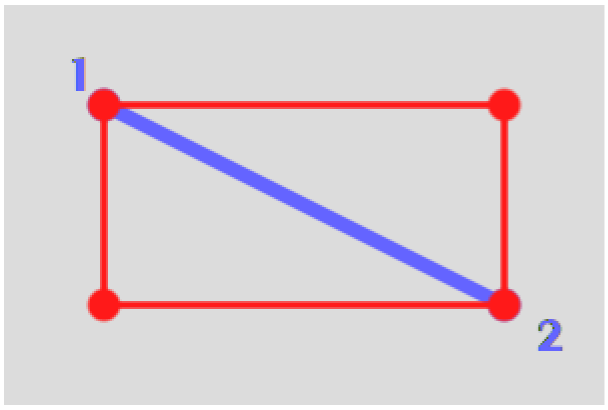


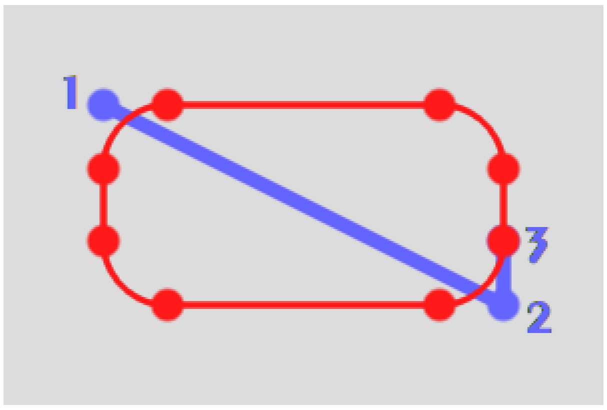
Rectangle

Unlike the other constructs, the stroke points do not define the orientation. The rectangle is always upright, with vertical and horizontal sides.

The stroke points are:

1. One corner of the rectangle,
2. The opposite corner of the rectangle,
3. Optionally the radius of the rounded corners,



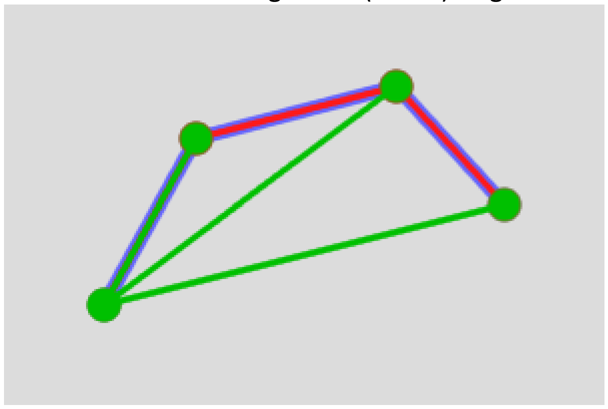


Functions on segments

Functions on segments build a shape using intervals between anchors in each stroke. The intervals only define the size and orientation of the shapes, everything else is specified in a dialog.

There are two ways to obtain segments from the stroke (in blue):

- *overlapping* segments (in green) originate on the first anchor of the stroke, and end on each of the other anchors.
- *consecutive* segments (in red) originate on the successive anchors, and end on the next anchor.



Circles

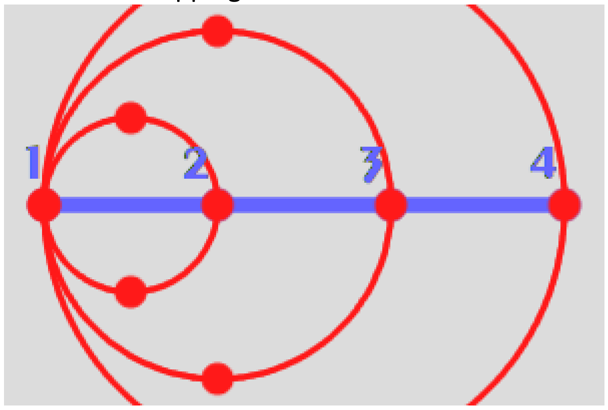
Parameters are:

- The use of the segments as radius or diameter (when used as a radius, the first anchor is the center)
- The overlapping/consecutive segments

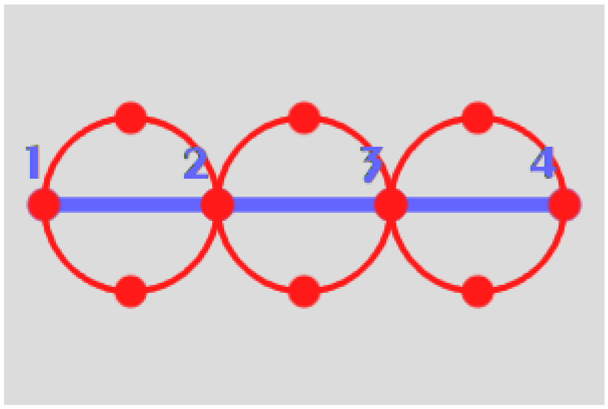
Of course, a single stroke with two points can be used to generate a simple circle.

Some examples:

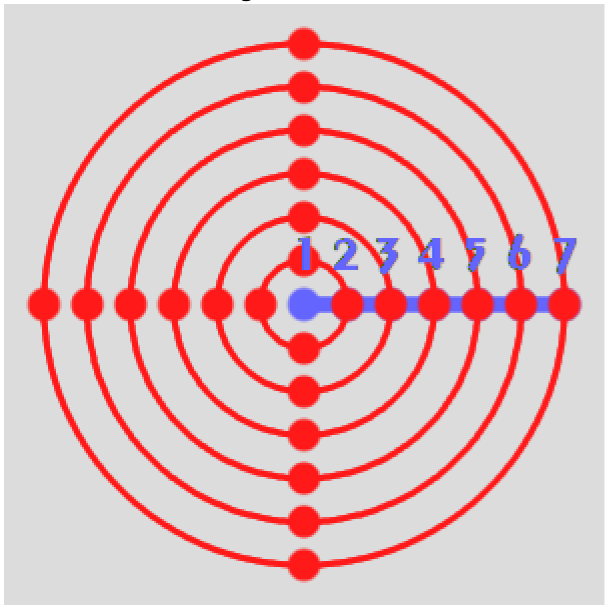
- Overlapping & diameter:



- Consecutive & diameter:

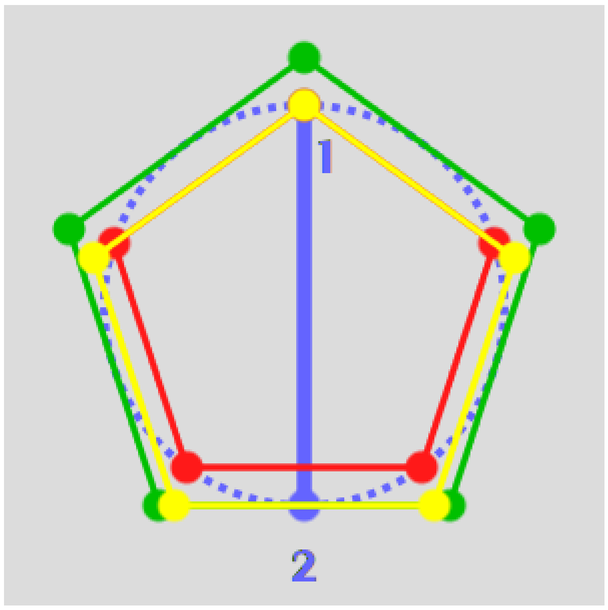


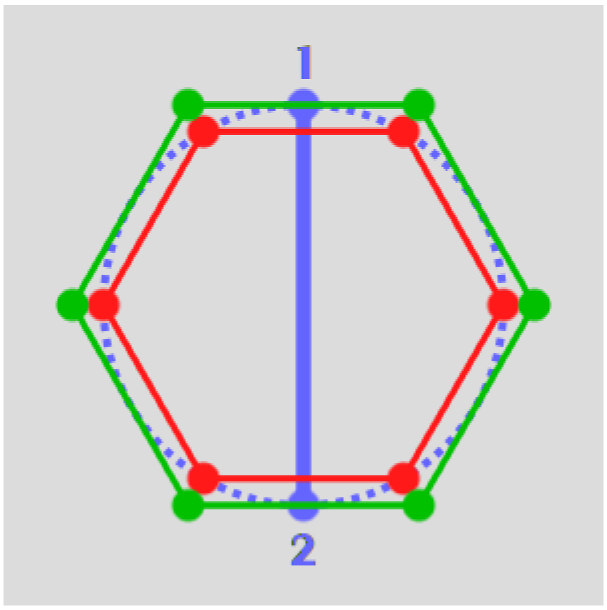
- Concentric circles obtained by overlapping segments used as radiuses. The source stroke has been equally divided using the *Stroke>Line>Divide* function.



Polygons

- The shapes: polygons are self-explanatory, spokes are just the radiuses of the same polygon
- The use of the segment to define the summits or the sides. Considering the circle that has the segment as a diameter (dotted blue circle), this circle can be:
    - The circle that goes though the summits (circumcircle, red)
    - The circle that goes through the middle of the sides (incircle, in green)
    - A slightly augmented and shifted circle, so that the polygon goes through both ends of the segment (pseudo-diameter, in yellow). For even polygons this option will produce polygons that are also available with other options.
- Whether the first point of the segment is a summit or a side
- The overlapping/consecutive segments



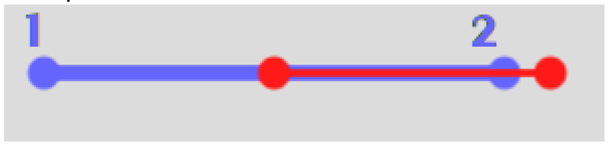


Modify segments

This function is merely a way to move/resize the segments. The parameters are:

- **Start**: the position (as a percentage) of the new first point relative to the current segment
- **End**: the position (as a percentage) of the new second point relative to the current segment

Example: result with Start=50 and End=110:



Hints:

- Start=0, End=100 leaves the segment unchanged
- Start=100, End=0 reverses the direction of the segment
- Negative values (down to -100) are taken backwards from the first point of the source
- Values above 100 (up to 200) extend the result segment beyond the second point of the source segment.

Various functions

The catch-all section for everything that doesn't fit elsewhere.

Tangents

These functions compute the tangent to circles from either another circle or from a point. The circles are specified as either:

- Three points that define a circle as in *Shapes>On strokes>Circle>Circumcircle*
- Two points that define a center and a radius (if a diameter is available, it can be divided in two using *Shapes>On strokes>Lines>Divide segment*

In other words, **these functions do not operate on circle paths, but on the paths that are used to construct the circles.**
The result of these functions are additional paths that define the tangents. All possible tangents are computed, but there is one path per category of tangent so unwanted tangents can be easily discarded.
When a continuous path must be obtained using parts of the circle(s) and the tangents:

- Make the required tangents visible
- Create the circle path using the paths that were used to compute the tangents
- Add anchors on the circle where the tangent ends (Ctrl-click on the circle). If you aim well, the tangent handles for the added anchor will be aligned with the tangent path.
- Remove the unnecessary segments and anchors of the circles (between the contact points)
- Click on one of the contact points so select it, and Ctrl-click on the corresponding contact point on the other circle (or on the tangents origin point). This should create a straight line between the two.

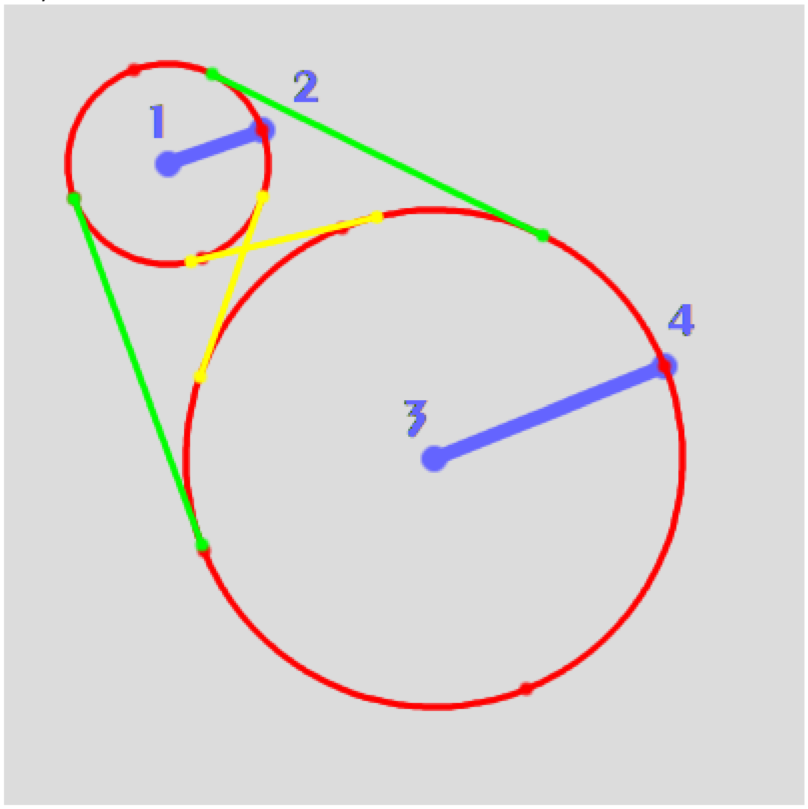
Tangents between circles

- If the selected path contains several strokes then the first stroke is the target circle and other strokes are assumed to define other circles from which tangents to the target circle are computed. However the order of the strokes can be difficult to determine, so this method is only recommended for two circles.
- If the selected path contains one single stroke, this stroke is the target circle and the function searches for "linked" paths to use their strokes to define the other circles.

Note:

- There are two pairs of tangents between circles, the "inner" tangents (that go between the circles) and the "outer" ones.
- The inner tangents do not exist if the circles intersect
- There are no tangents if one circle is completely inside the other.

In the example below, a path containing two strokes (in blue) is used to create the tangents between two circles: the inner tangents (in yellow) and the outer tangents (in green), and it can of course be used to also construct the circles (in red).



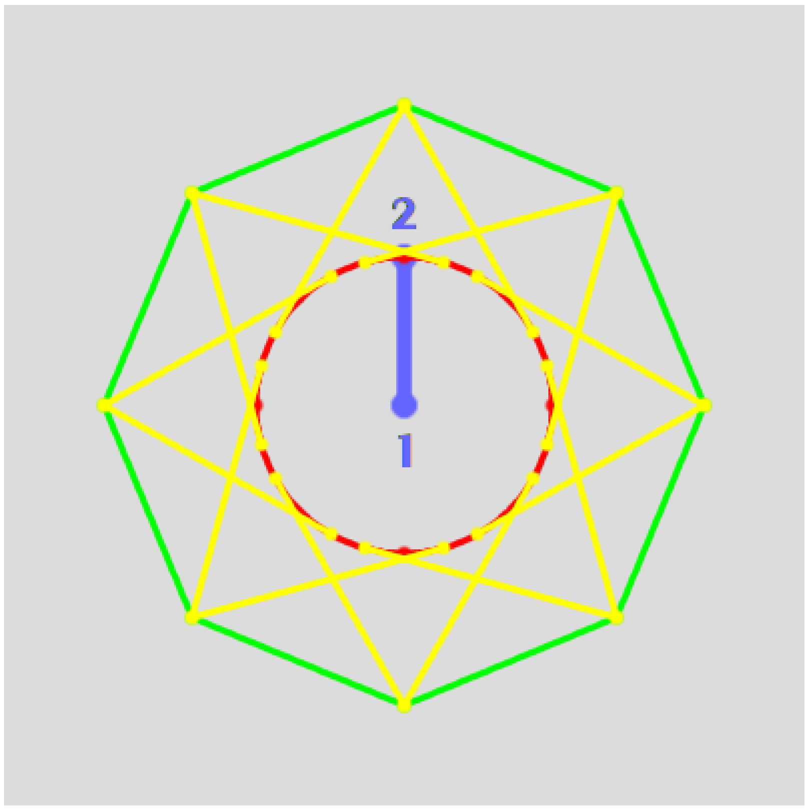
Tangents to circle from point

- If the selected path contains several strokes then the first stroke is the target circle and other strokes are assumed to define the origin points from which tangents to the target circle are computed. The path editor allows strokes containing a single point.
- If the selected path contains one single stroke, this stroke is the target circle and the function searches for "linked" paths to use their strokes to define the origin points of the tangents.

Note:

- There are no tangents if the origin point is completely inside the circle.

In the example below, a path containing one stroke (in blue) defines a target circle while a linked path containing a polygon (in green) defines the origins of several tangents (in yellow). The corresponding circle is shown in red. the circles (in red).

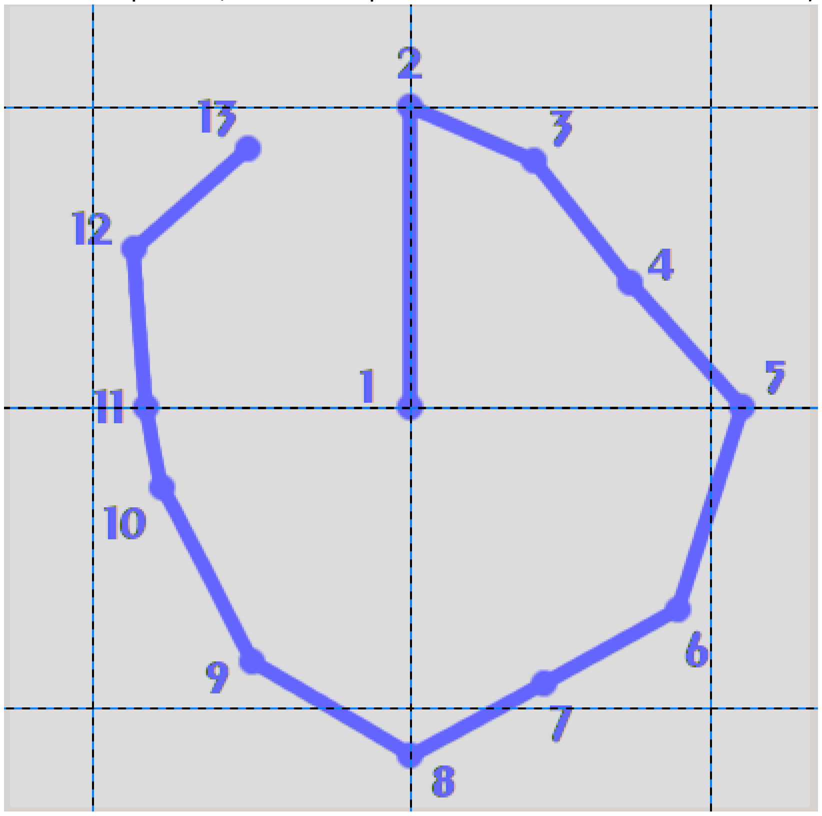


Putting it all together, making a clock dial

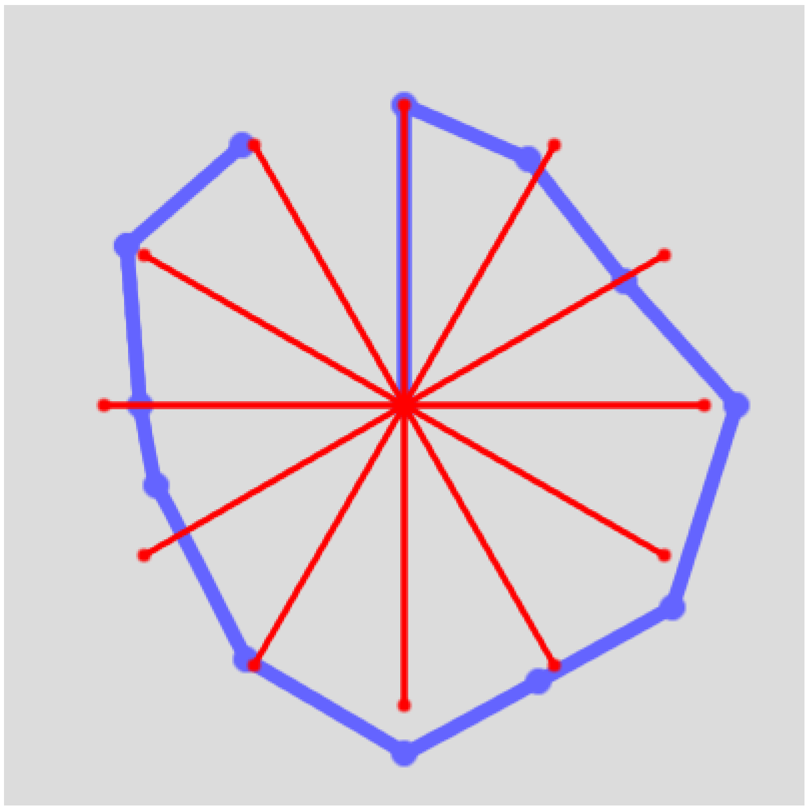
The clock dial will have circles to make the hours, and small ticks for the minutes.

Hours

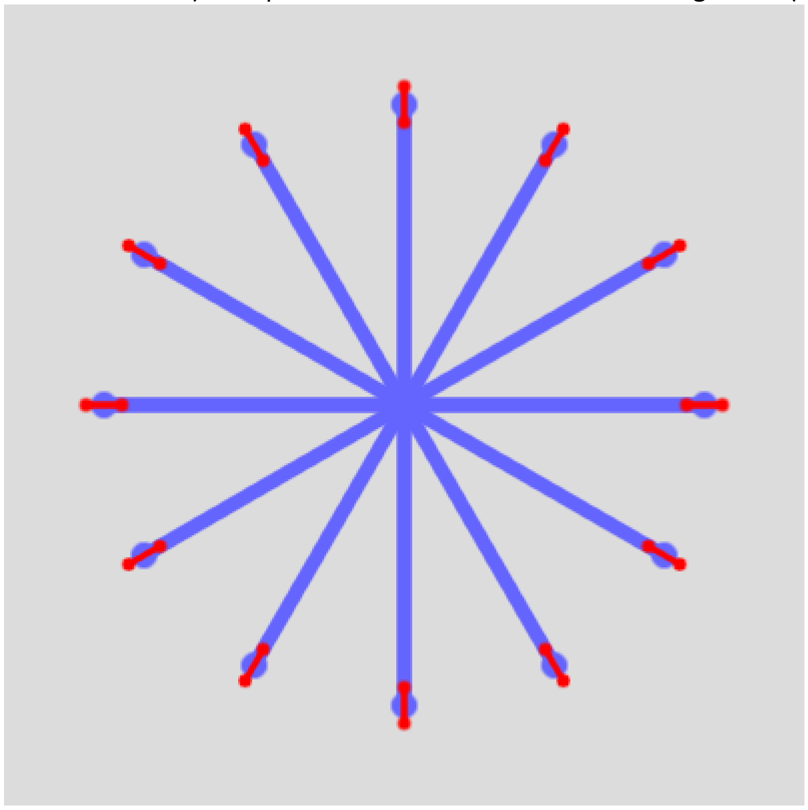
Add guides as an aid, and creeate a first path with the first point on the clock center, the second point on the 12 o'clock mark, then eleven more points roughly where the other hour marks will be (they could actually be anywhere, only their count is important, but this helps make sure their number is correct)



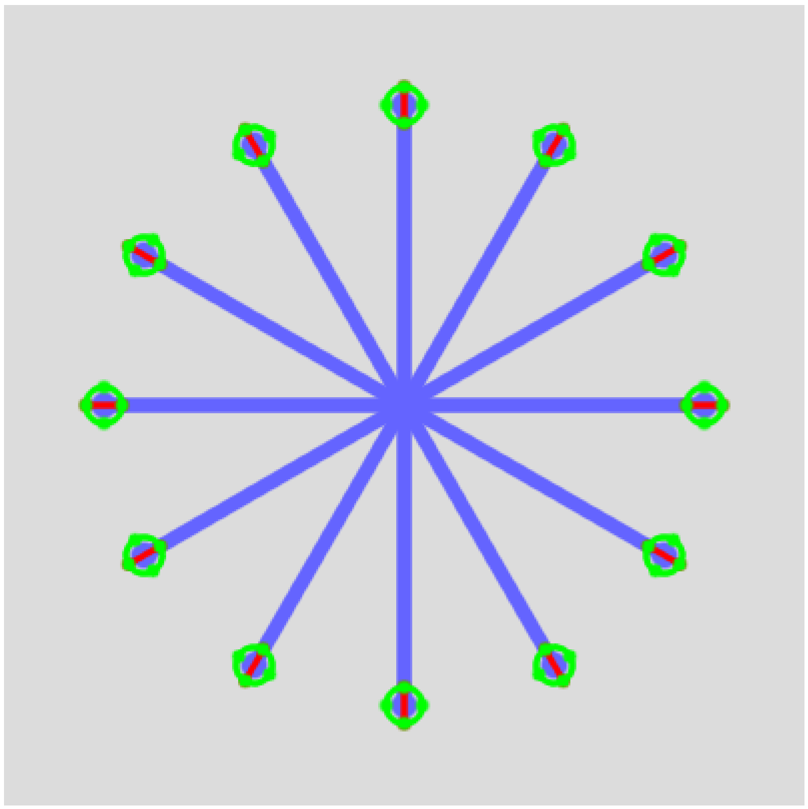
Use *Shapes>On strokes>Stars>Spokes* to create 12 spokes evenly spaced:



Getting the circles from there requires two more steps. First, using *Shapes>On segments>Modify segments* (with *Start: 94* and *End: 106*) the spokes are transformed into small segments (in red) centered on their end:

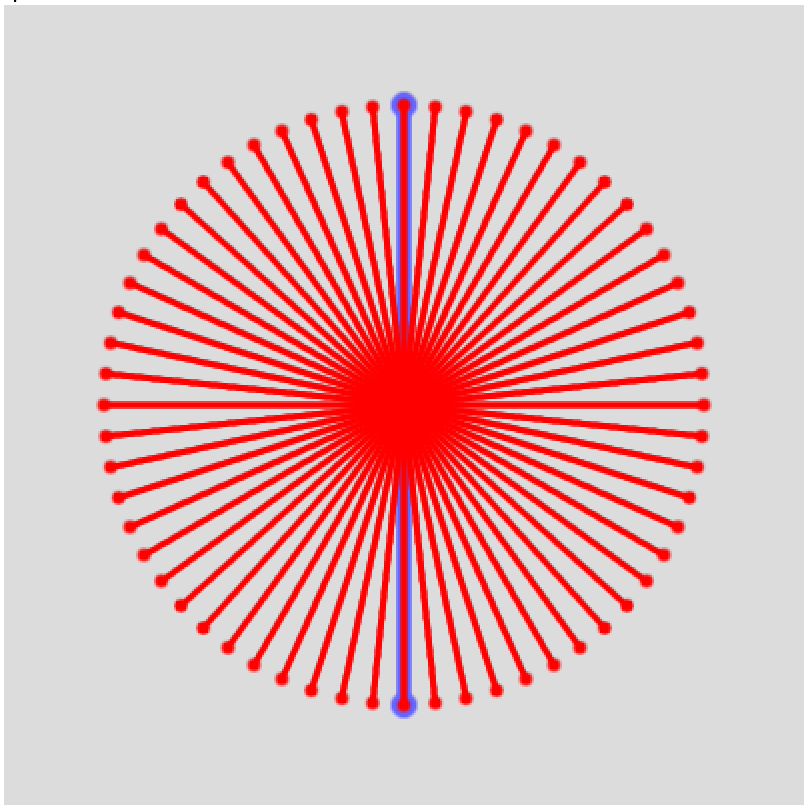


Then circles (in green) are obtained from these segments using *Shapes>On segments>Circles* and using *Segment reference: Diameter*.

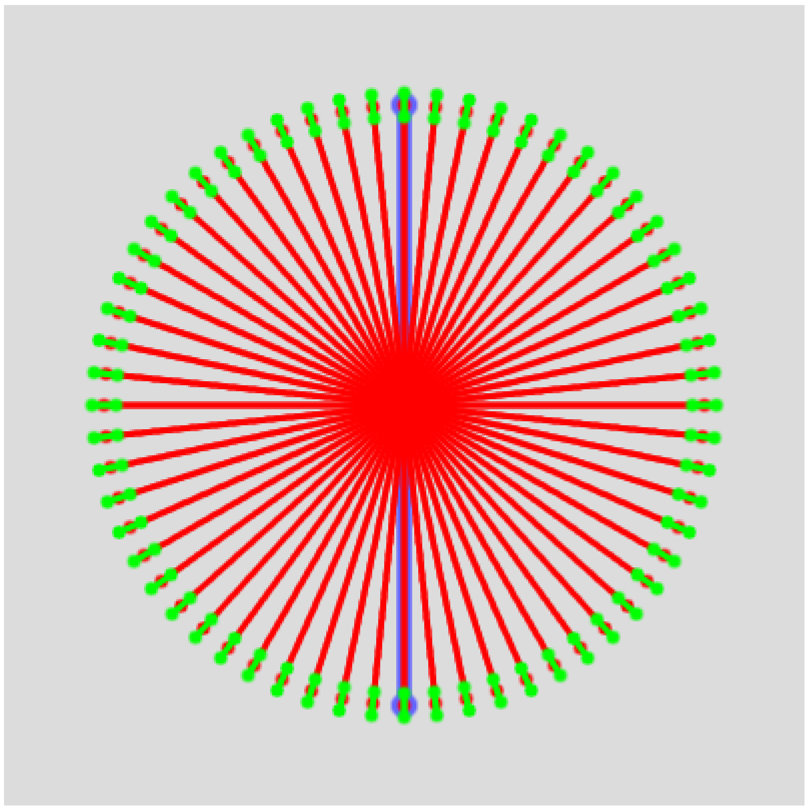


Minutes

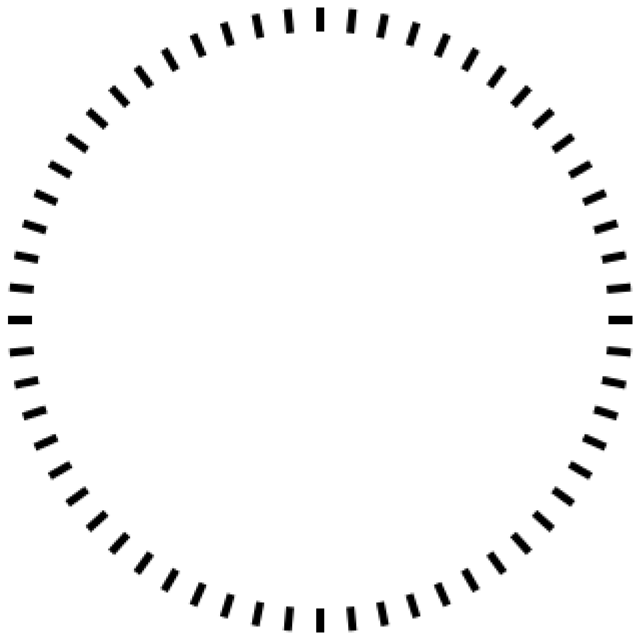
Creating the minutes marks could be done the same way, but clicking 61 points could be prone to errors. A better way is to create a path for the clock diameter (in blue) and then use *Shapes>On segments>Polygons or spokes* with *Shape: Spokes*, *Segment reference: Circumcircle*, Sides/Spokes: 60, and *First point of segment: Summit/Spoke* to create 60 spokes:



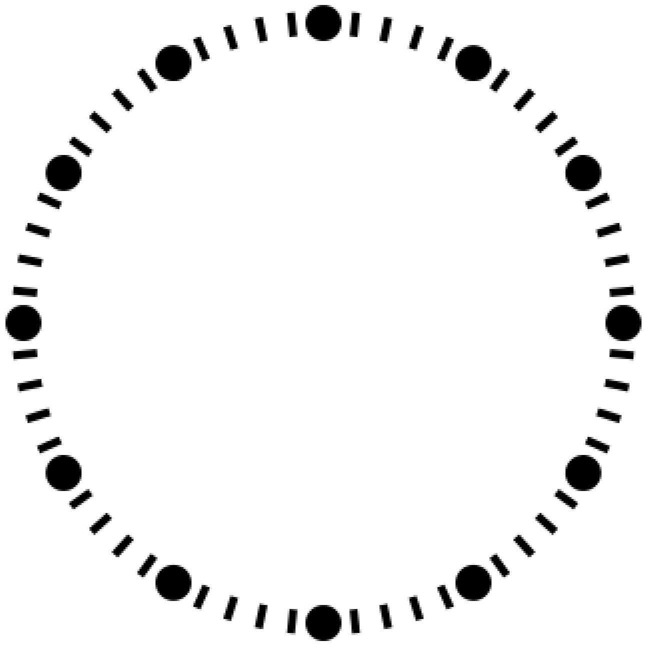
Then as for hours, create segments (in green) on the tip of the spokes, making them slightly shorter ((with *Start:96* and *End:104*):



Finally
Use *Edit>Stroke path* to stroke the minute marks,



Then create a selection from the hours circles, and bucket-fill the selection:



Thanks to Rich2005 for his suggestions and review