# Pencil and Ruler Exercise: **Creating the Vertex Frame from *n* and *J***

The *Vertex Frame* creates the structure that allows you to do string art on polygons and stars. The *Vertex Frame* is a continuously drawn polygon or star connecting vertices of the parent *n*-vertex polygon where there are *J* jumps between connected vertices (so *J* = 1 produces an *n*-sided polygon drawn clockwise around the vertices starting at the top).

Continuously drawn means that you continue connecting from vertex to vertex until you once again reach the starting point. Always start at the top vertex and always count *J* clockwise around the polygon.

The top two rows show *n* = 7. The bottom two show *n* = 8. **TASK:** Draw the vertex frame for these 15 *n*, *J* combinations.

J = 1   *J* = 2   *J* = 3

J = 6   *J* = 5   *J* = 4   *J* = 7

J = 1   *J* = 2   *J* = 3   *J* = 4

J = 7   *J* = 6   *J* = 5   *J* = 8
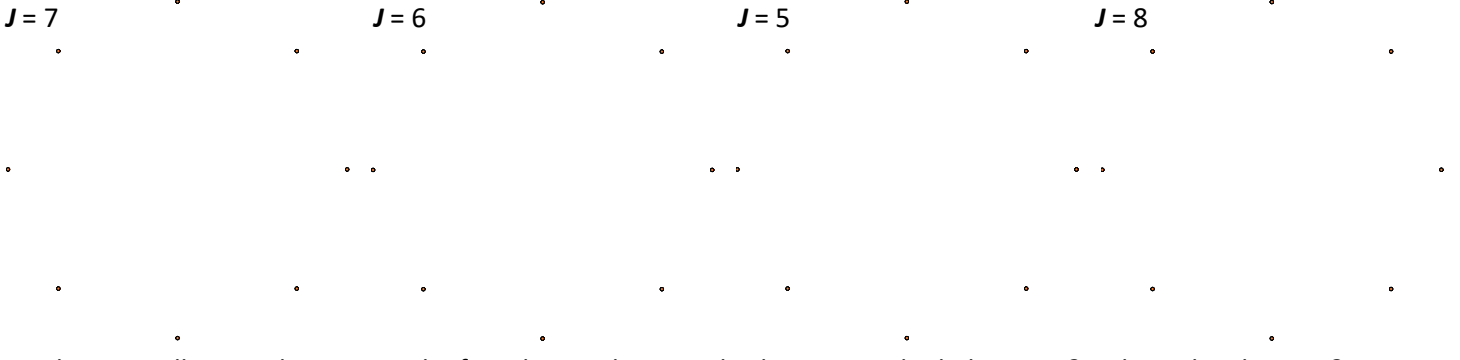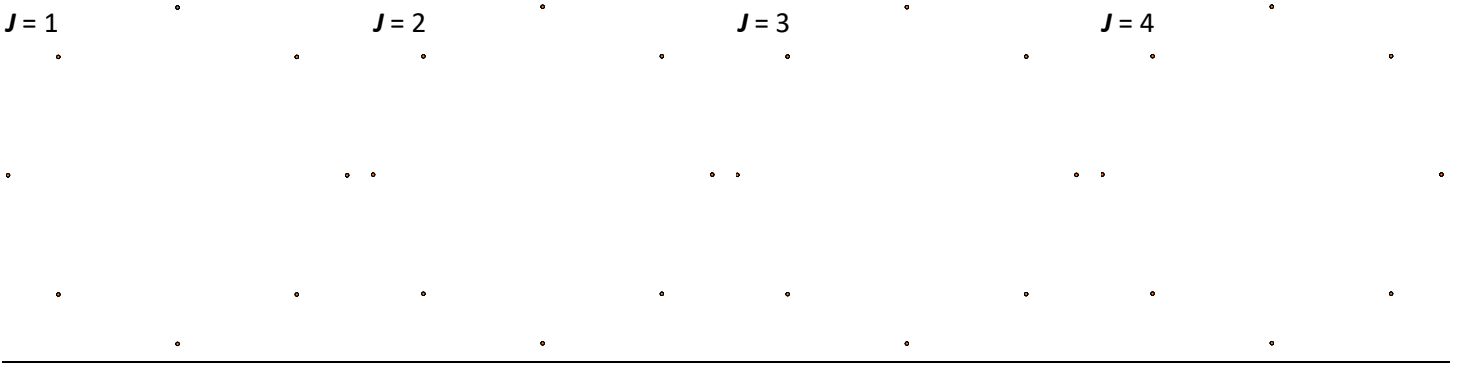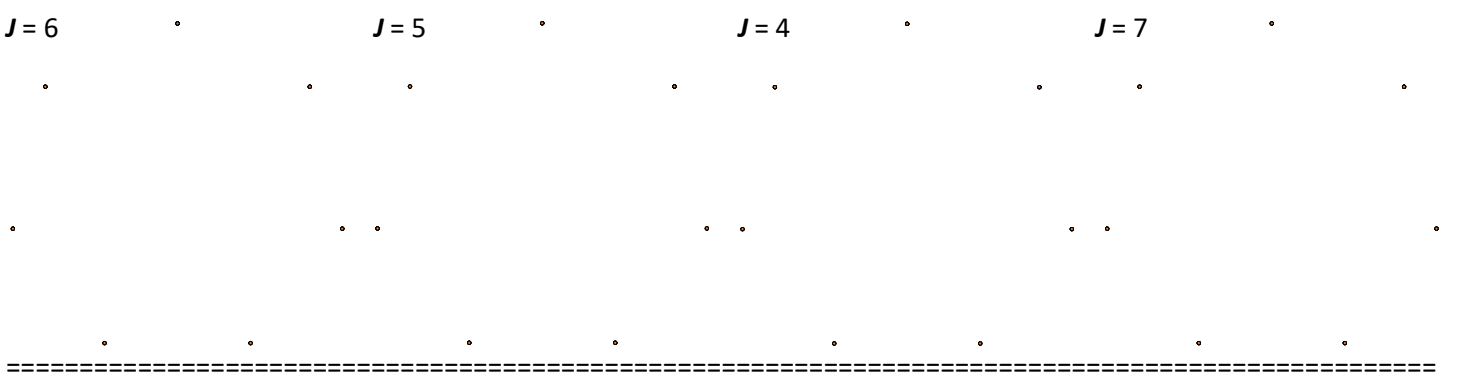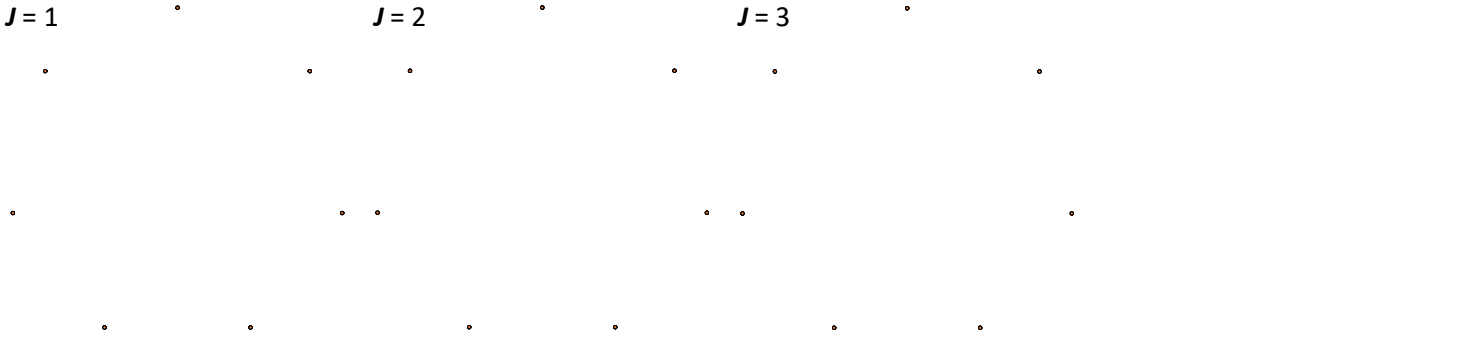
Do the vertically-paired images in the first three columns in both instances look the same? Why is this the case?

Is the image different when *J* = *J* and *J* = *n* − *J*?   What happens when *J* = *n* − 1?   What happens when *n* = *J* ?

If not all of the vertices are used, what fraction <u>is</u> used (1/2, 1/3, 1/4, etc.)? (VCF is the bottom number in this fraction)