PolyDraw Tutorial V

Making a Morphed Bowl

So far in the previous four tutorials, the bowls were designed so that each ring would be a uniform width and the bottom of one ring would match the top of the next. That means the shape of all the rings are basically to same. You start with a circle and end with a circle. Morphing is short for metamorphous and it means to change. Ideally this would be done by varying the angle as you cut. Unless someone invents a computer controlled scroll saw, that isn't going to be practical. (If someone does invent one I don't think I want to use it!) An alternative is to make the rings wider where the angle is steeper and sand off the extra material to get back to uniform ring width. An easy example is a four level bowl that starts as a 9" by 7" Oval and ends as a 5" circle. That mean the rings will start with taper at ¼" on the sides (19º for ¾" thick wood) and slowly change to a ½" taper (34º in ¾" thick wood) at the top and bottom.

Open PolyDraw and enter all these values as shown below and click the Draw button to draw your pattern.

Load Save

Draw

Scale 1.000

# of Polys 7

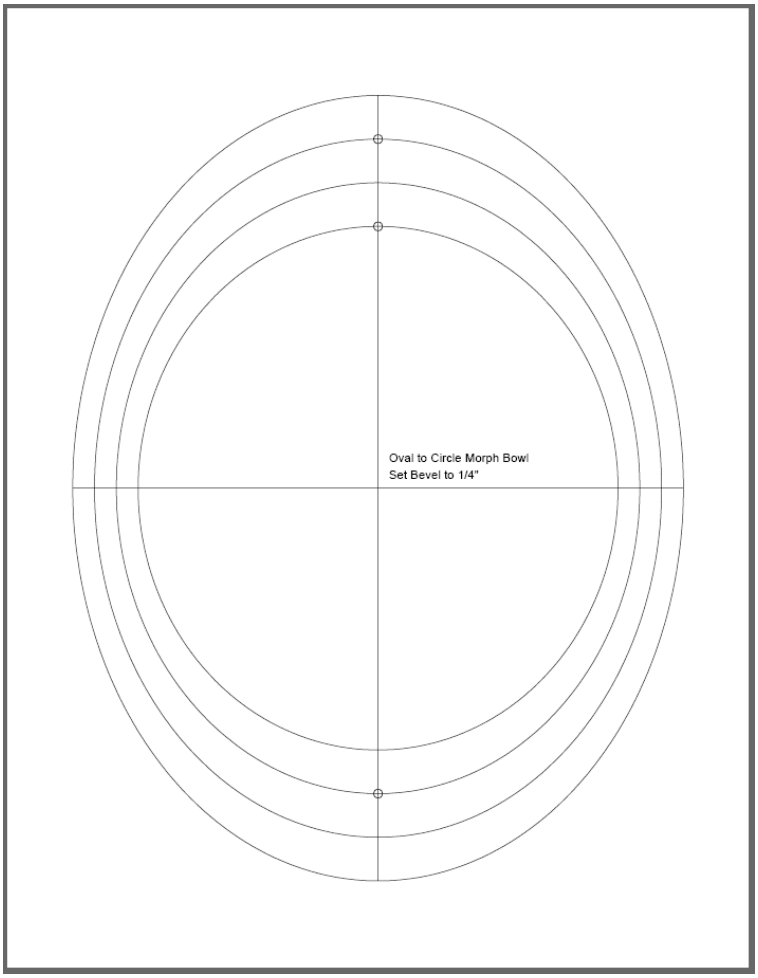
X Radius	Y Radius	Poly Order	# of Waves	+/-Wave Amplitude	X Offset	Y Offset
3.5000	4.5000	2.000	0	0.0000	0.0000	0.0000
3.2500	4.0000	2.000	0	0.0000	0.0000	0.0000
3.0000	3.5000	2.000	0	0.0000	0.0000	0.0000
2.7500	3.0000	2.000	0	0.0000	0.0000	0.0000
0.0500	0.0500	2.000	0	0.0000	0.0000	4.0000
0.0500	0.0500	2.000	0	0.0000	0.0000	-3.5000
0.0500	0.0500	2.000	0	0.0000	0.0000	3.0000

# of Comments 2

X Offset	Y Offset	Comment
0.1250	0.3000	Oval to Circle Morph Bowl
0.1250	0.1000	Set Bevel to 1/4"

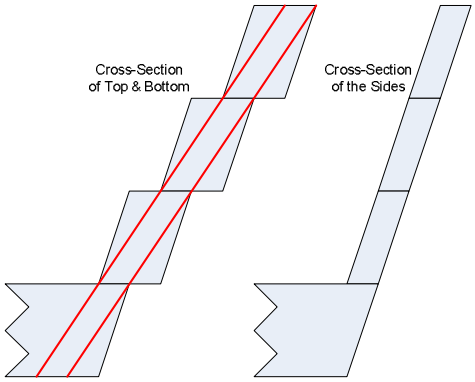
# of Lines 2

	X	Y		X	Y
From:	-3.5000	0.0000	To:	3.5000	0.0000
From:	0.0000	-4.5000	To:	0.0000	4.5000



You now have a bowl that starts as an oval and ends as a circle. Save the pattern as **OvalToCircleMorphBowl.txt.**

The rings have a width of ¼" of the sides and ½" at the top and bottom. If these rings are cut with a ¼" taper you get the following cross section when the layers are assembled.



The cross section of the top and bottom show that there is extra material at the inside of the ring's top and on the outside of a ring's bottom. When this material is sanded away from the rings they will have a uniform width of ¼".

Another example is an offset circular bowl. Each ring tapers in 5/16" and is offset 1/16" from the ring above it.

Open PolyDraw and enter all these values as shown below and click the Draw button to draw your pattern.

Load Save

Draw

Scale 1.000

# of Polys 4

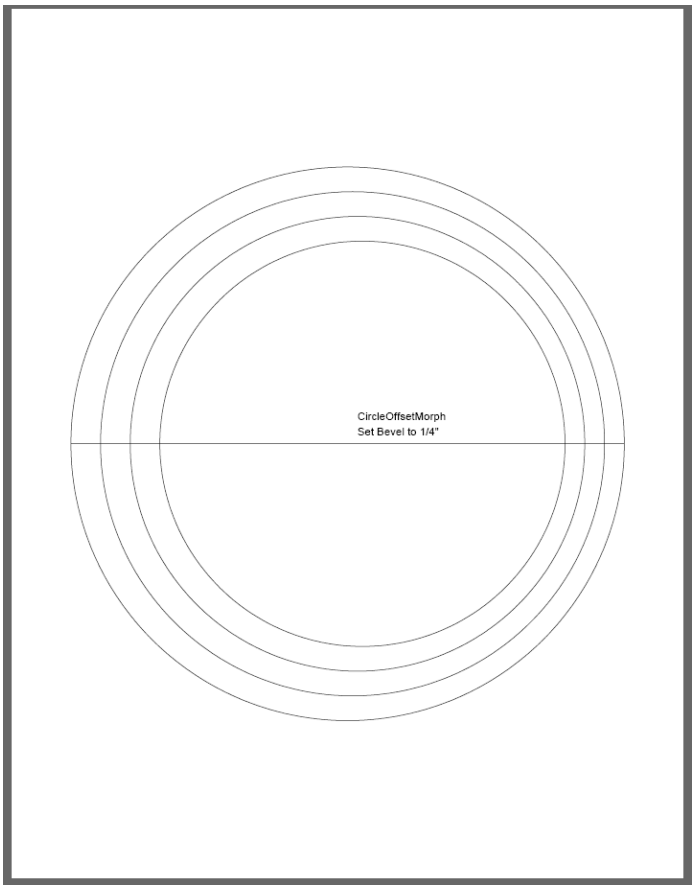
X Radius	Y Radius	Poly Order	# of Waves	+/-Wave Amplitude	X Offset	Y Offset
3.5000	3.5000	2.000	0	0.0000	0.0000	0.0000
3.1875	3.1875	2.000	0	0.0000	0.0625	0.0000
2.8750	2.8750	2.000	0	0.0000	0.1250	0.0000
2.5625	2.5625	2.000	0	0.0000	0.1875	0.0000

# of Comments 2

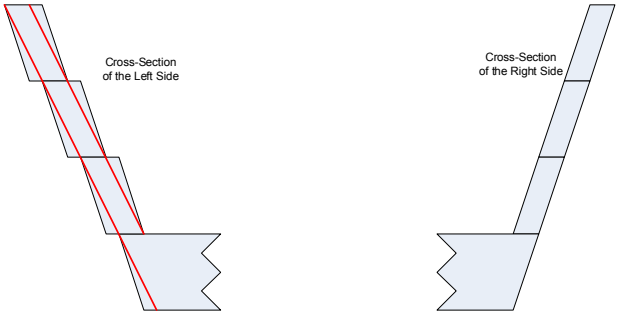
X Offset	Y Offset	Comment
0.1250	0.3000	CircleOffsetMorph
0.1250	0.1000	Set Bevel to 1/4"

# of Lines 1

	X	Y		X	Y
From:	-3.5000	0.0000	To:	3.5000	0.0000



You now have a circular bowl that's center is offset. The rings at their far right will have a minimum width of ¼ " and at their most left will have a maximum width of 3/8".Save the pattern as **OffsetCircularMorphBowl.txt**. Again the rings are not a uniform width. Set your cutting taper to 1/4". When stacked the layers should look as follows.



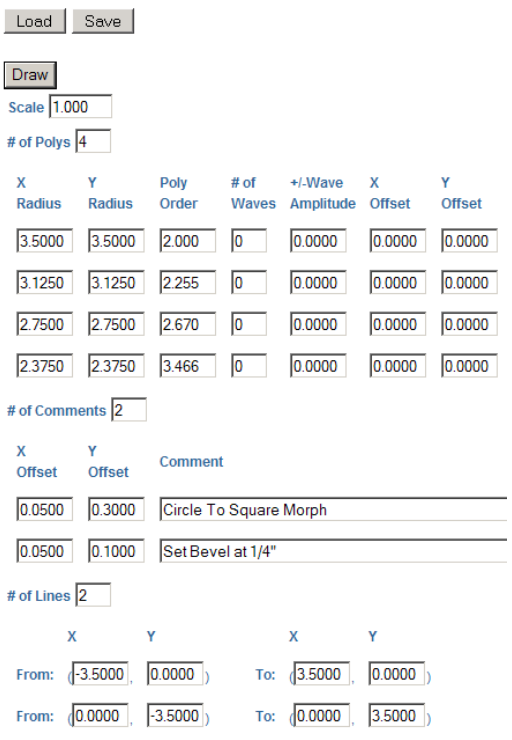
The cross section of the left side shows that there is extra material at the inside of the left side of the ring's top and on the outside of a ring's bottom. When this material is sanded away from the rings they will have a uniform width of ¼".

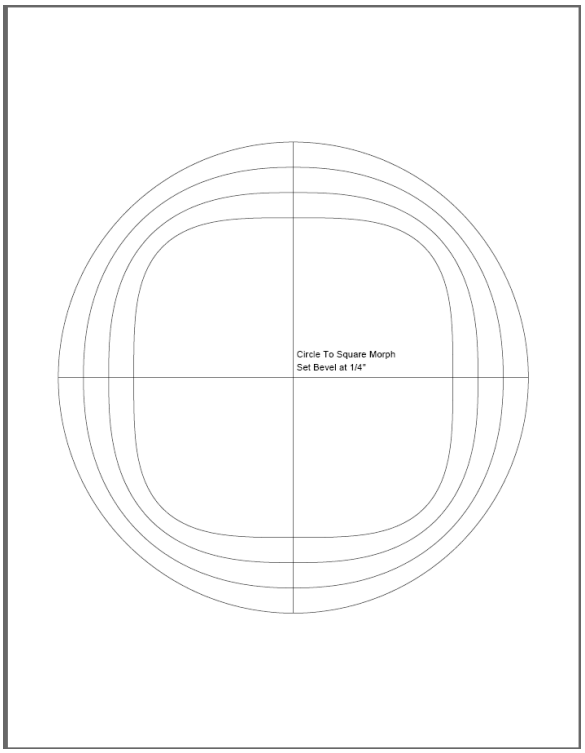
The next example is a bowl that starts as a circle and become a square. Starting with a 7" diameter circle with each layer tampering by ¼" at the corners and 3/8" at the sides. The dimensions are shown in the table below.

Sides (X & Y Radius)	Corners (D Radius)	PolyOrder
3.5000"	3.5000"	2.000
3.1250"	3.2500"	2.255
2.7500"	3.0000"	2.670
2.3750	2.7500"	3.466

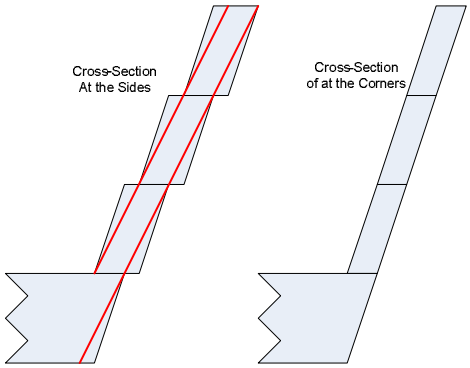
Using PolyAnalyze you can calculate the Poly Order value for each XY Radius and D Radius pair. They are also shown in the table.

Open PolyDraw and enter all these values as shown below and click the Draw button to draw your pattern.





As you can see the width of the rings is 3/8” at the sides and ¼“ at the corners. Save the pattern as **CircleToSquareMorphBowl.txt**. Again the rings are not a uniform width. Set your cutting taper to ¼“. When stacked the layers should look as follows.



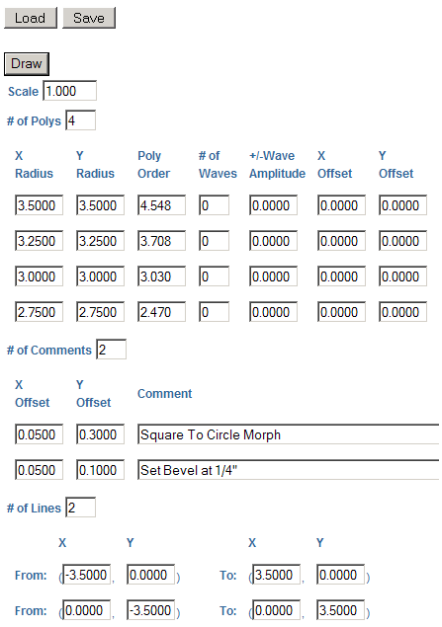
The cross section of the side shows that there is extra material at the inside of the ring’s top and on the outside of a ring’s bottom. When this material is sanded away from the rings they will have a uniform width of ¼”.

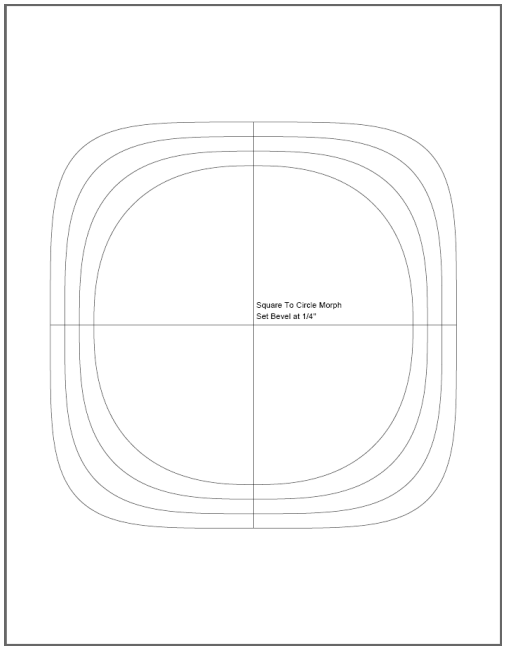
The next example is a bowl that starts as a square (7” across and 8½“ on the diagonal). Each layer tapers 7/16” in the corners and ¼” on the sides. The dimensions are shown in the table below.

Sides (X & Y Radius)	Corners (D Radius)	PolyOrder
3.5000”	4.2500”	4.548
3.2500”	3.8125”	3.708
3.000”	3.3750”	3.030
2.7500	2.9375”	2.470

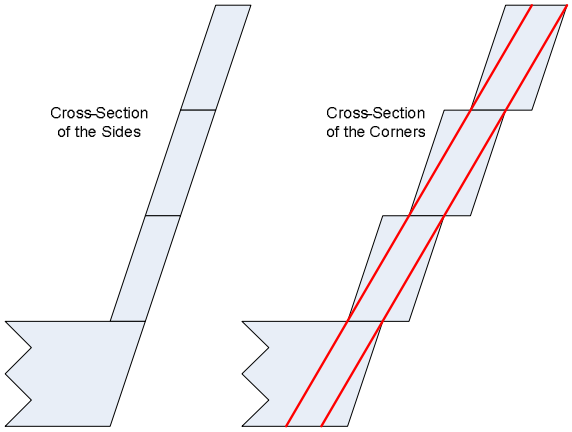
Using PolyAnalyze you can calculate the Poly Order value for each XY Radius and D Radius pair. They are also shown in the table.

Open PolyDraw and enter all these values as shown below and click the Draw button to draw your pattern.





As you can see the width of the rings is ¼" at the sides and 7/16" at the corners. Save the pattern as **SquareToCircleMorphBowl.txt**. Again the rings are not a uniform width. Set your cutting taper to ¼". When stacked the layers should look as follows.



The cross section of the corner shows that there is extra material at the inside of the ring's top and on the outside of a ring's bottom. When this material is sanded away from the rings they will have a uniform width of ¼".

Morphing is not reserved for just bowls with constant ring taper. The next example is a curved bowl that starts as a circle and become a square. Starting with a 7" diameter circle the corners start with a taper of 3/16" that increases by 3/32" for each layer. The taper for the sides start at ¼" (4/16") that increases by 1/8" (4/32") for each layer. In this design, for each ring, the side taper is 1.33% that of the corner taper. It is important that this ratio be preserved. The dimensions are shown in the table below.

Sides (X & Y Radius)	X Y Taper	Corners (D Radius)	D Taper	PolyOrder
3.5000"	1/4"	3.5000"	3/16"	2.000
3.2500"	3/8"	3.3125"	9/32"	2.116
2.8750"	1/2"	3.0313"	3/8"	2.361
2.3750	5/8"	2.6563"	15/32"	2.954

Using PolyAnalyze you can calculate the Poly Order value for each XY Radius and D Radius pair. They are also shown in the table.

Open PolyDraw and enter all these values as shown below and click the Draw button to draw your pattern.

Load Save

Draw

Scale 1.000

# of Polys 4

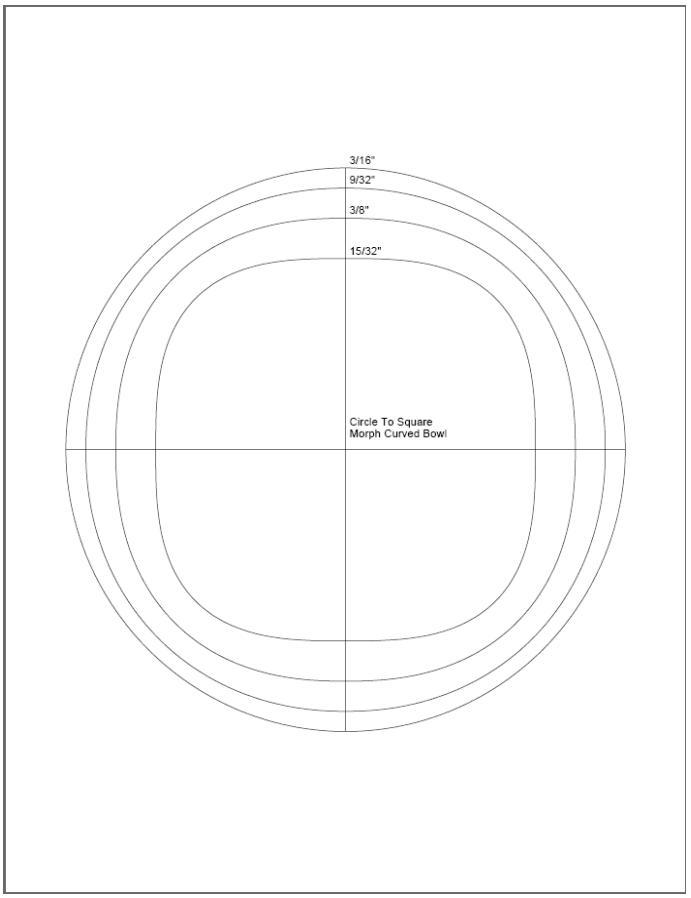
X Radius	Y Radius	Poly Order	# of Waves	+/-Wave Amplitude	X Offset	Y Offset
3.5000	3.5000	2.000	0	0.0000	0.0000	0.0000
3.2500	3.2500	2.116	0	0.0000	0.0000	0.0000
2.8750	2.8750	2.361	0	0.0000	0.0000	0.0000
2.3750	2.3750	2.954	0	0.0000	0.0000	0.0000

# of Comments 6

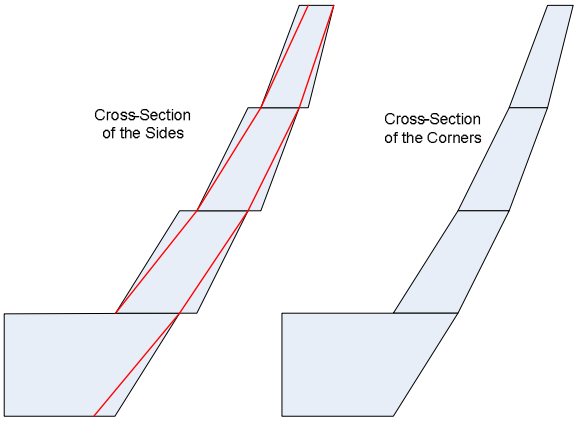
X Offset	Y Offset	Comment
0.0500	0.3000	Circle To Square
0.0500	3.5500	3/16"
0.0500	3.3000	9/32"
0.0500	2.9250	3/8"
0.0500	2.4250	15/32"
0.0500	0.1000	Morph Curved Bowl

# of Lines 2

	X	Y		X	Y
From:	-3.5000	0.0000	To:	3.5000	0.0000
From:	0.0000	-3.5000	To:	0.0000	3.5000



As you can see the width of the rings is 133% greater at the sides than it is in the corners. Save the pattern as **SquareToCircleMorphCurvedBowl.txt**. Again the rings are not a uniform width. Set your cutting tapers to the values shown on the pattern. When stacked the layers should look as follows.



The cross section of the sides show that there is extra material at the inside of the ring's top and on the outside of a ring's bottom. When this material is sanded away from the rings they will have a uniform width.

This ends this tutorial and you are now a Master of Morph. You are ready to move on to **Tutorial VI, Making a Morphed Basket**.