

Segmented Bowl Construction

By Robert Schasse

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Bob's Mancave

My woodworking shop

Grandpa's Shop

34'x20'

Jet 54" X-Acta Cabinet Saw

Jet 17" Band Saw

Craftsman 10" Band Saw

Nova DVR 16x36" Lathe

Jet 16/32" Drum Sander

Delta 6" Jointer

Delta 12" thickness Planer

Jessem Router Table,

Air compressor

Grinder / Sharpener w/CBN

Bosh 12" Sliding Miter Saw

Delta 12" Disc Sander

Spindle Sander

Veneer Press

Dust Collection System

Bathroom with running water

HVAC

Attic for storage with

moveable staircase

Audio System



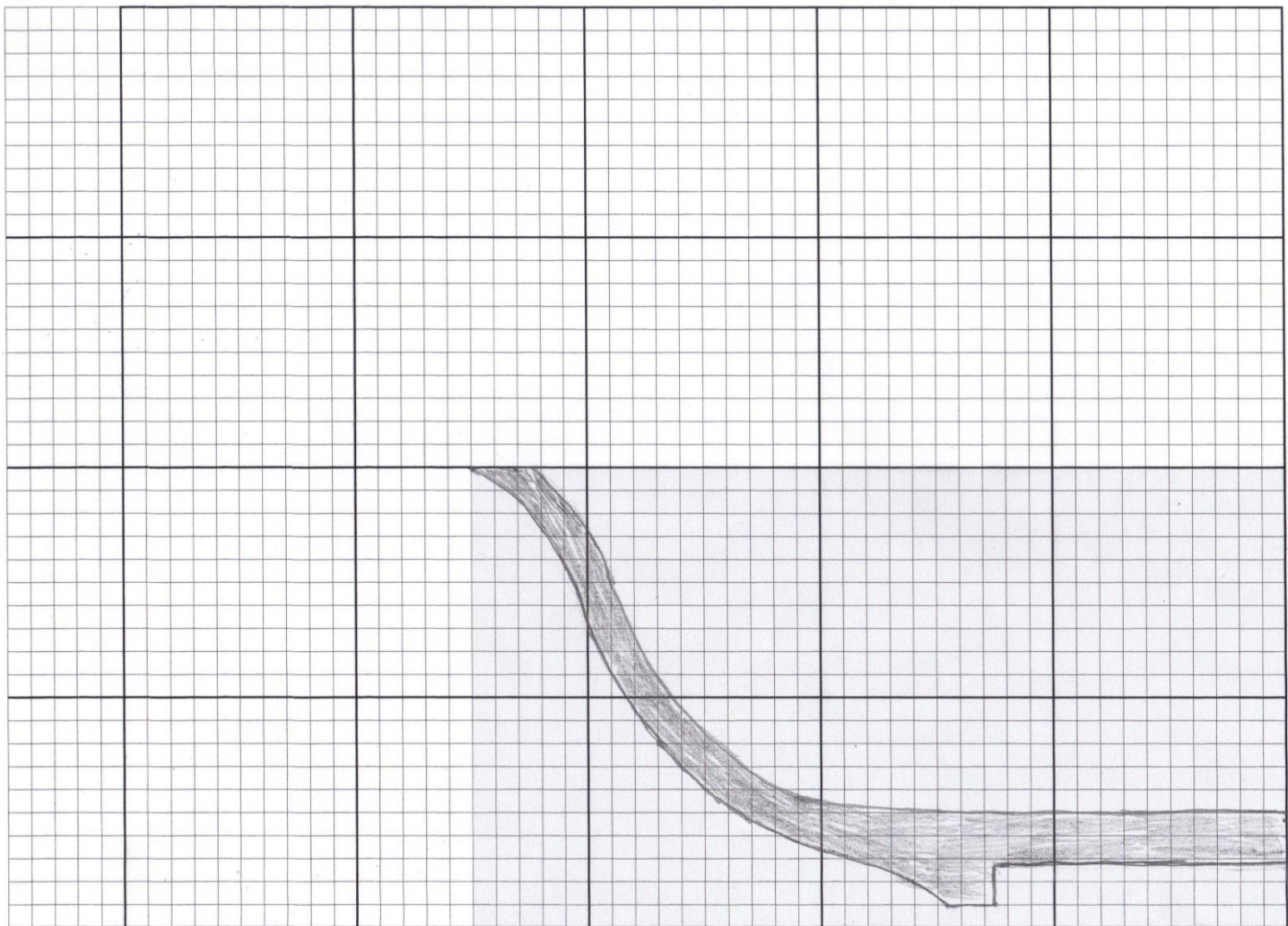
How I learned

- Robert DeHart and Friends
- School for Creative Woodwork
- Segmented Turning by Melcome Tibbetts
- Segmented Turning, A Practical Guide by Dennis Keeling
- Woodturning with Ray Allen, written by Dale Nish
- Internet
- Seg-easy.com – Segmentology videos by Jerry Bennett
- Mostly from The School of Hard Knocks

What is Important in Segmented Work?

Accuracy

- Plan your project before starting to cut
- Tight and Invisible Glue lines
- Round and accurately placed segments and rings
- Pleasing curves
- Wood colors that complement and contrast
- Uniform wood grain distribution
- Interesting patterns
- A good finish
- Above all – Enjoy making, sharing and looking at your work



4

3

2

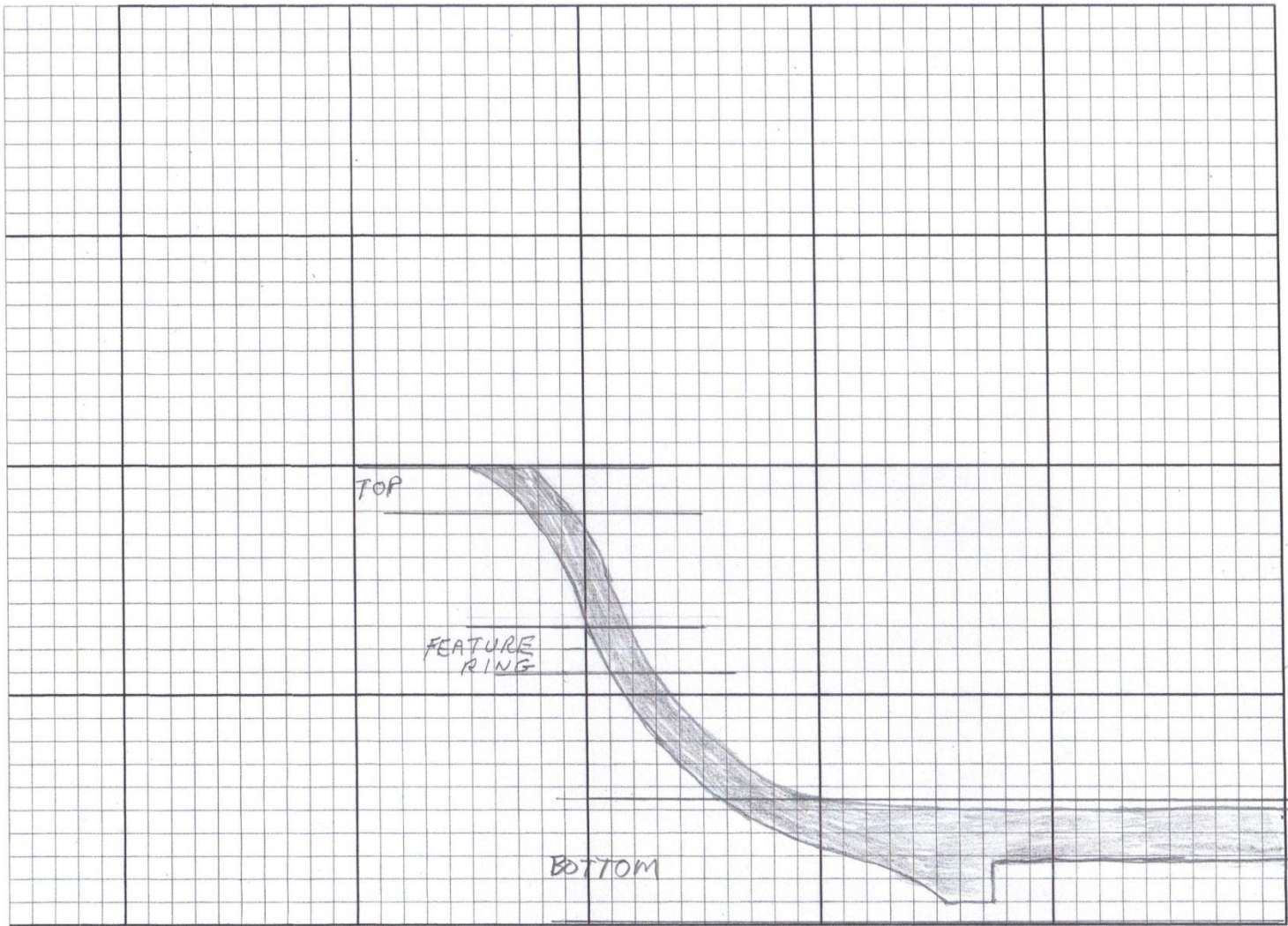
1

INCHES

3

2

1



TOP

FEATURE
RING

BOTTOM

4"

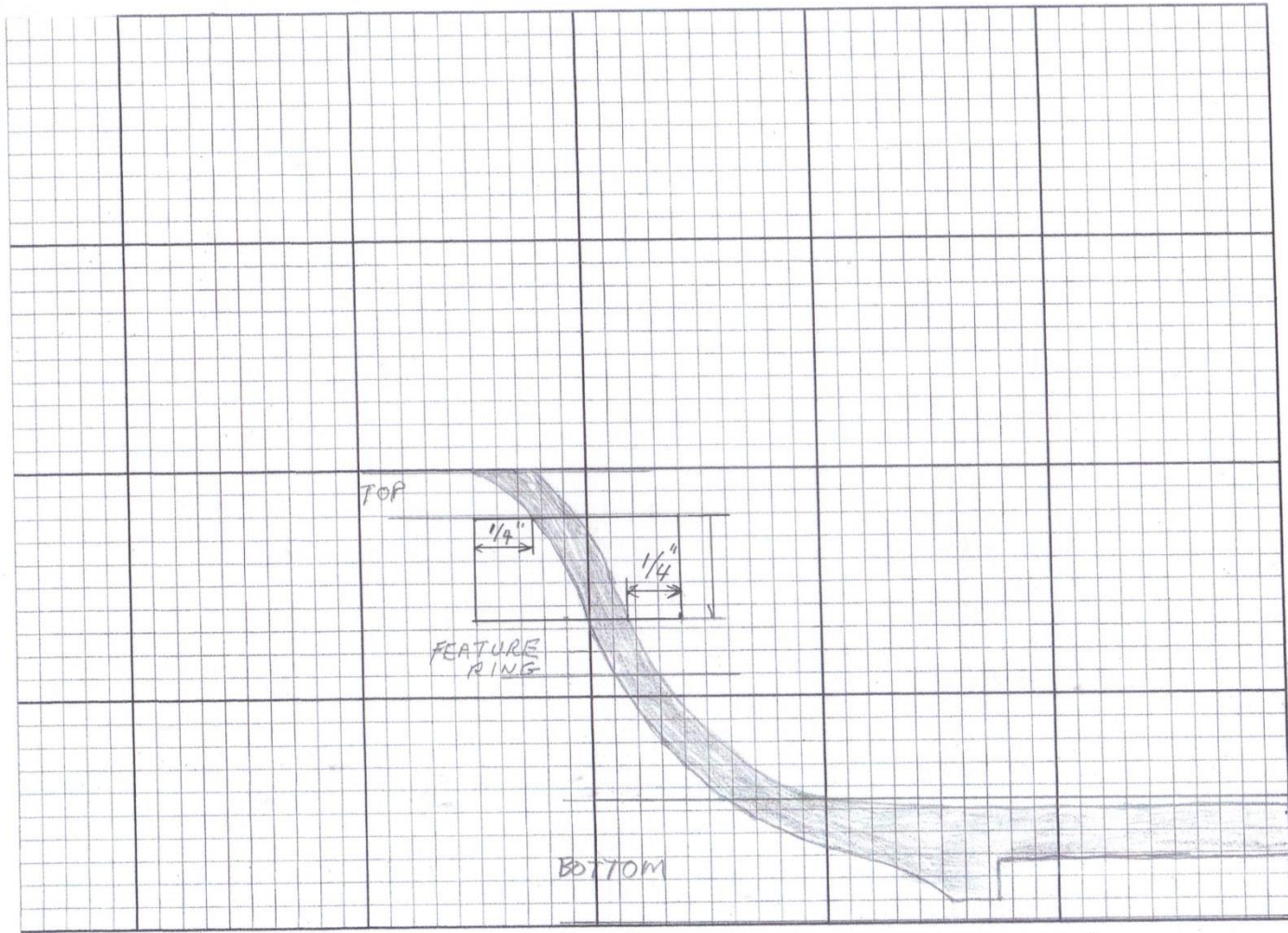
3"

2"

1"

2"

1"



4"

3"

2"

1"

2"

1"

TOP

1/4"

1/4"

FEATURE RING

BOTTOM

4

RING #1: OUTSIDE DIAMETER = $3.75 \times 2 = 7.5''$

INSIDE DIAMETER = $2.80 \times 2 = 5.6''$

BOARD WIDTH = $3.75 - 2.80 = .95''$

BOARD THICKNESS = $.25''$

3

2

1

5

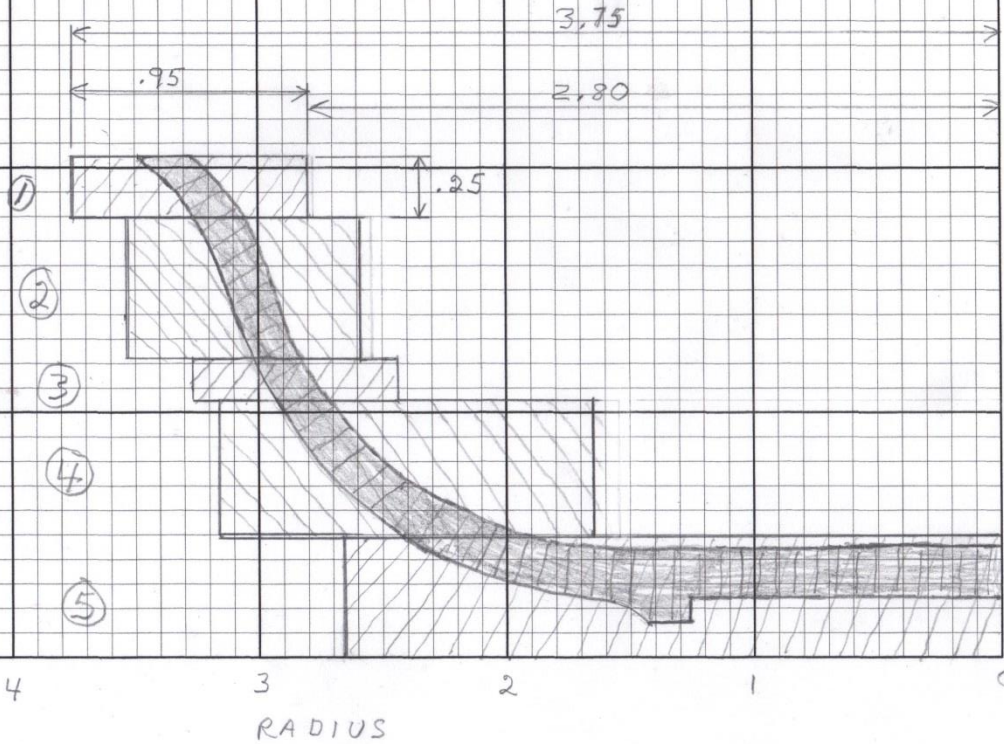
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3

2

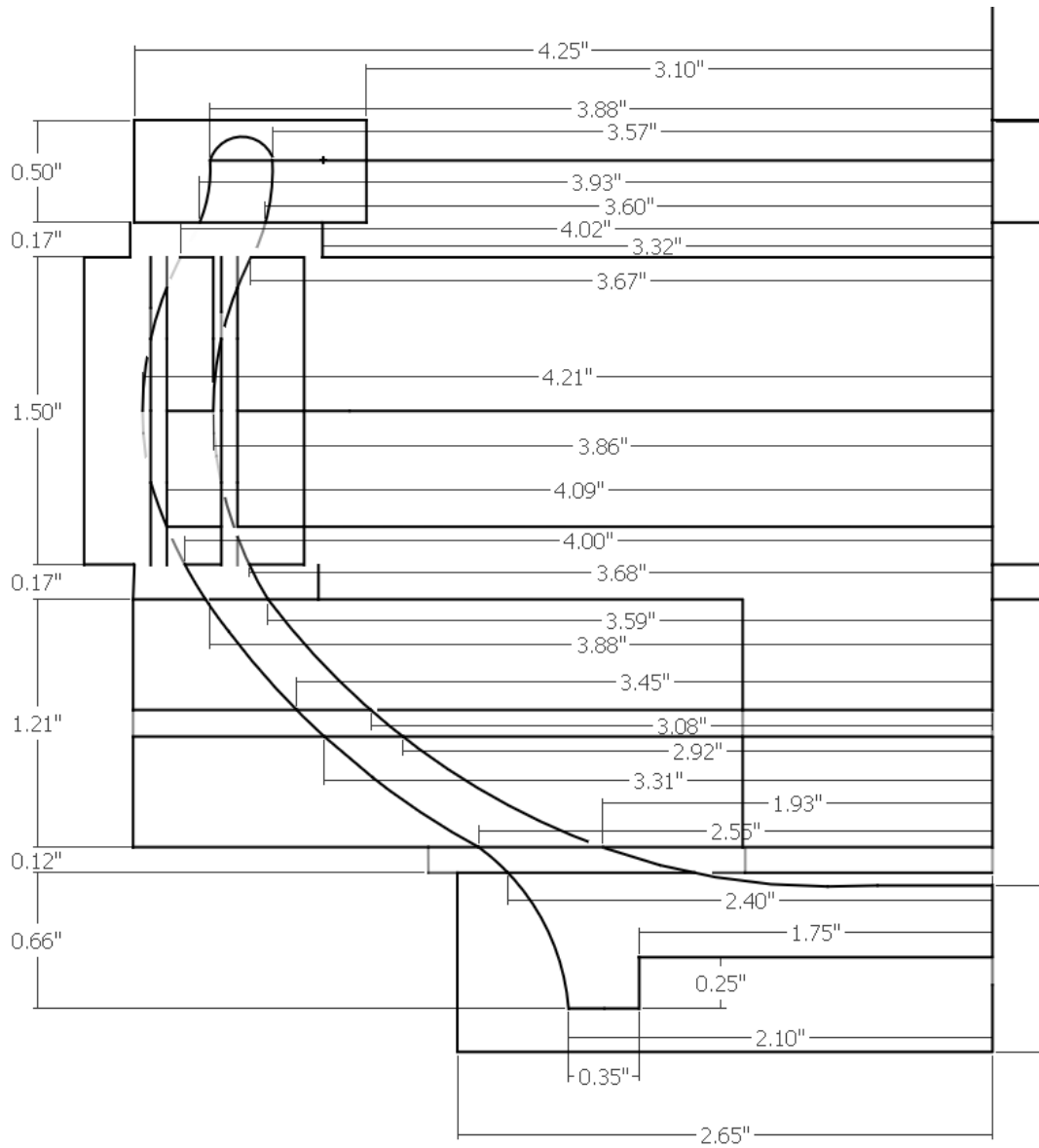
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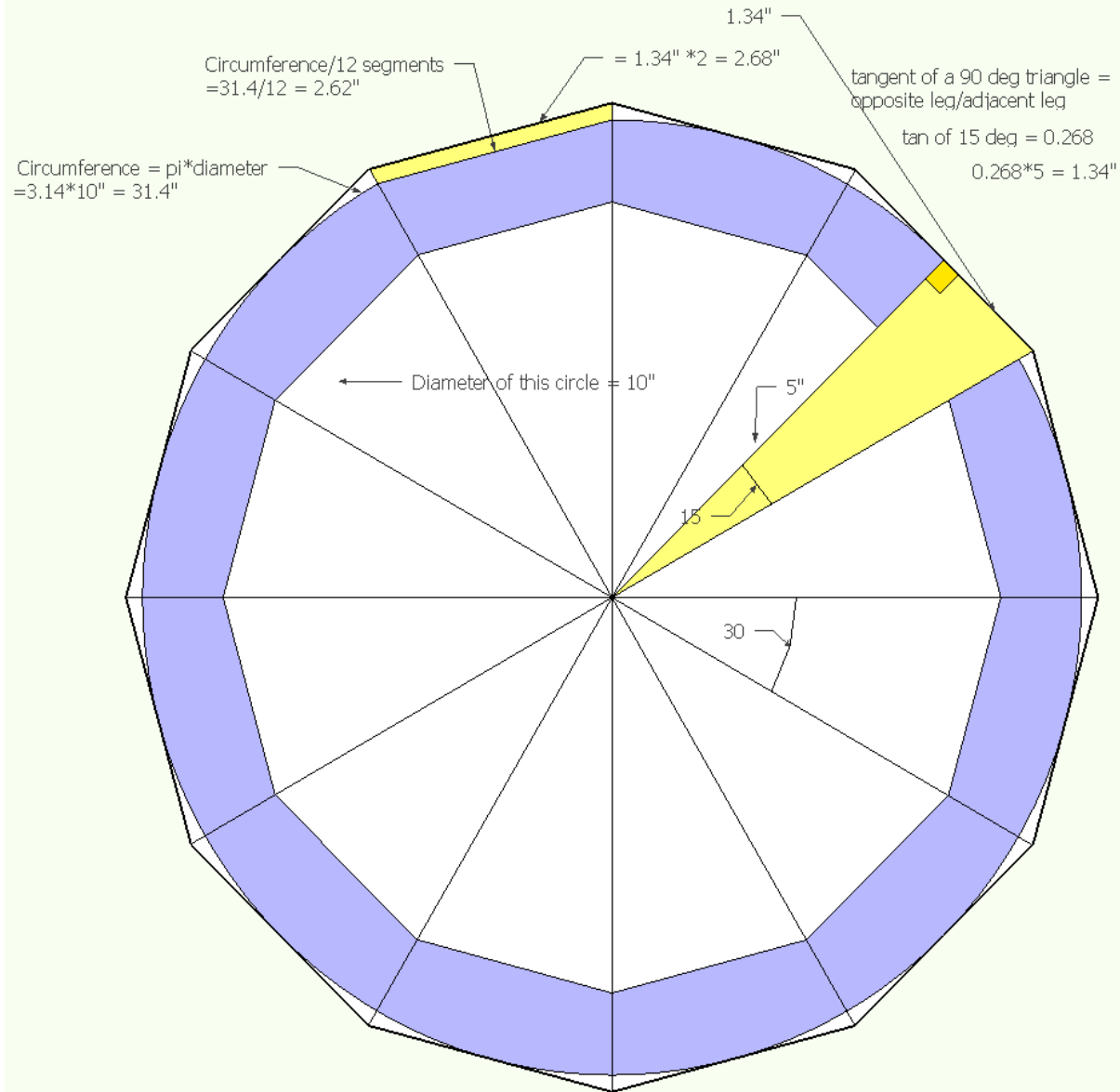


Information Needed to Build a Segment Ring

- Outside radius of the segment ring?
- Inside Radius of Segment Ring
- Width of the strip to cut the segments from?
- Thickness of the segment ring?
- -----
- How many segments in the ring?
- Which wood to use?
- -----
- Angle of cut to make the segment wedges?
- Length of each segment?
- -----
- How much wood is needed?



Back to School - Trigonometry

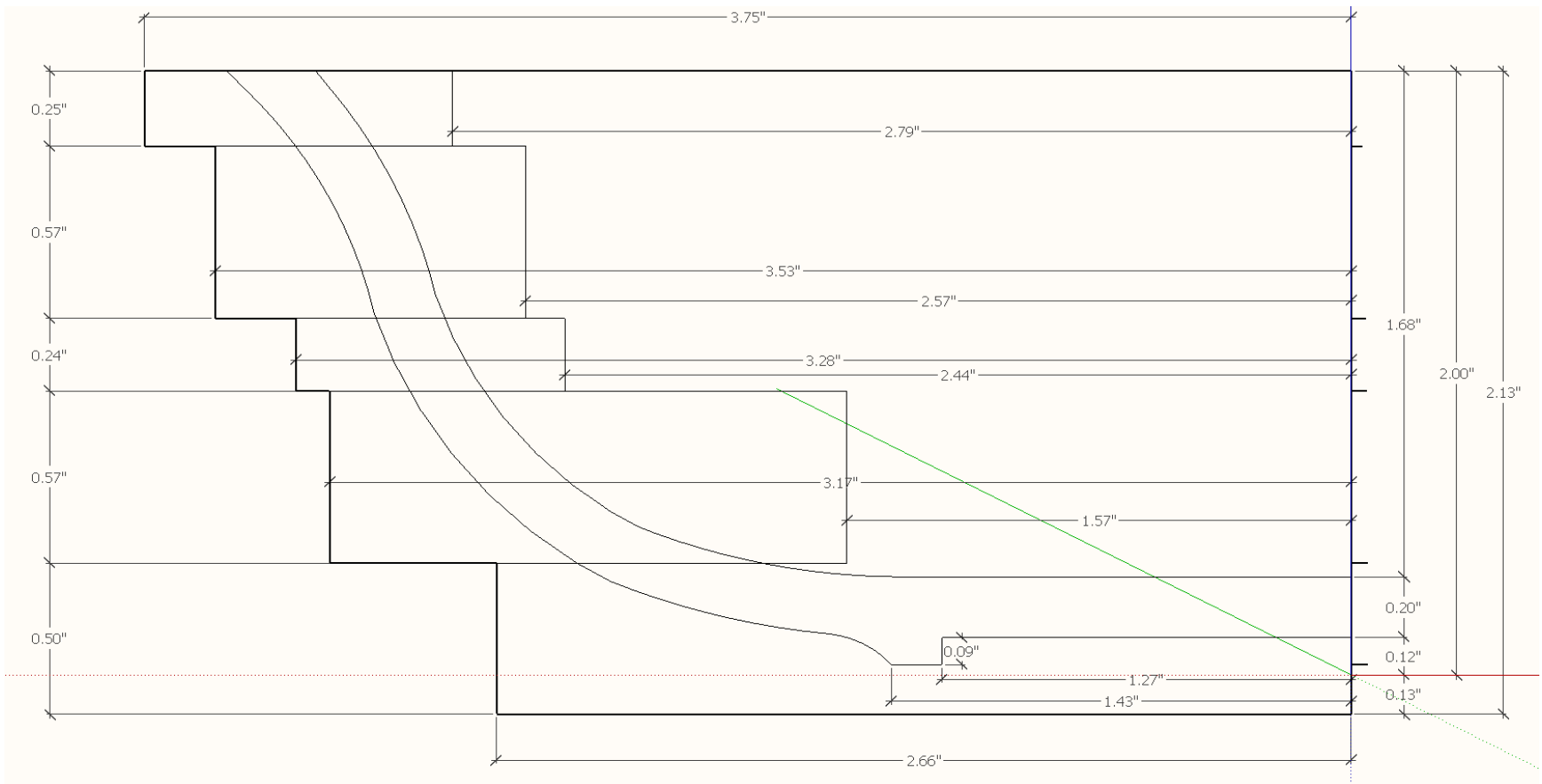


Example of a 12 segment, 10 inch bowl – Segment calculations

- I want a ring that is 10 inches in diameter and I want it to have 12 segments.
- I know every circle contains 360 degrees. I know the perimeter of a circle is pi (3.14) multiplied by its diameter. I know the tangent of a right triangle is its opposite side divided by its adjacent side.
- 12 segments require 24 cut angles. 360 degrees divided by 24 = 15 degrees per cut.
- I can find that the tangent of 15 degrees is equal to .268
- The radius of the circle is 5 inches so the opposite side = $5 * .268 = 1.34$. There are 2 of those triangles in each segments, therefore the segment's long side is $2 * 1.34$ or 2.68".
- Many people just estimate the length to be 1/12 of the perimeter of the circle. The perimeter is = $\pi * \text{diameter} = 3.14 * 10 = 31.4$ ". So $31.4 / 12 = 2.62$ ". That makes the segment length about 1/16" shorter than should be. The end result will be that the bowl will be about 1/4" smaller in diameter than you planned.

	A	B	C	D	E	F	G	H	I	J	K	L	M
	Ring Number	Ring Outside Radius (Flat)	Ring Inside Radius (Apex)	Number of Segments	Height of Segments	Miter Angle	Spline thickness	Board Width	Length of Segment Outside	Ring Outside Diameter (Flat)	Ring Inside Diameter (Apex)	Board Length	Wood Type
2													
3	1a Top	3.75	2.79	12	0.25	15	0	0.96	2.01	7.50	5.58	30	walnut
4	2	3.53	2.57	12	0.57	15	0	0.96	1.89	7.06	5.14	28	walnut/ash/alder
5	3	3.28	2.44	12	0.24	15	0	0.84	1.76	6.56	4.88	26	walnut/ash/alder
6	4	3.17	1.57	12	0.57	15	0	1.60	1.70	6.34	3.14	26	walnut/ash/alder
7	5	2.66			0.50					5.32			walnut
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													

I do the same using Google Sketch-up



Ripping and dimensioning the wood strips:

-The Board Strip -

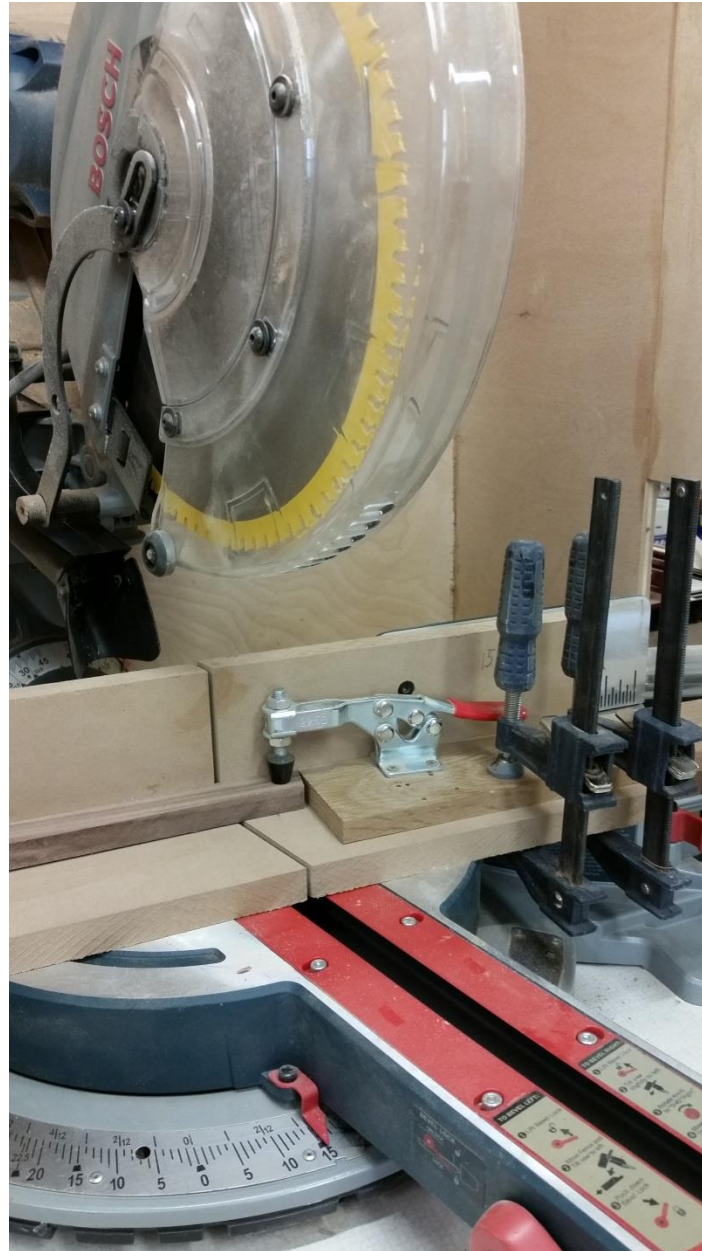
- The “board width” and “thickness” dimensions shown on the Excel Sheet refers to a finished ring.
- Often the strip after cutting it needs some re-dimensioning
- The strip may deform again due to internal stresses and need to be jointed again. Not good to try cutting segment angles from a curved board strip.
- The board strip will need some additional thickness sanding- either on lathe or drum sander.
- If your strip is a glued-up laminate, it will need to be cleaned-up. So add some additional wood as you see fit.
- Generally, I add 1/16” to the width and 0.10” to the thickness before cutting. If gluing up laminates, I will add 1/4” to the width.

Cutting the Segments

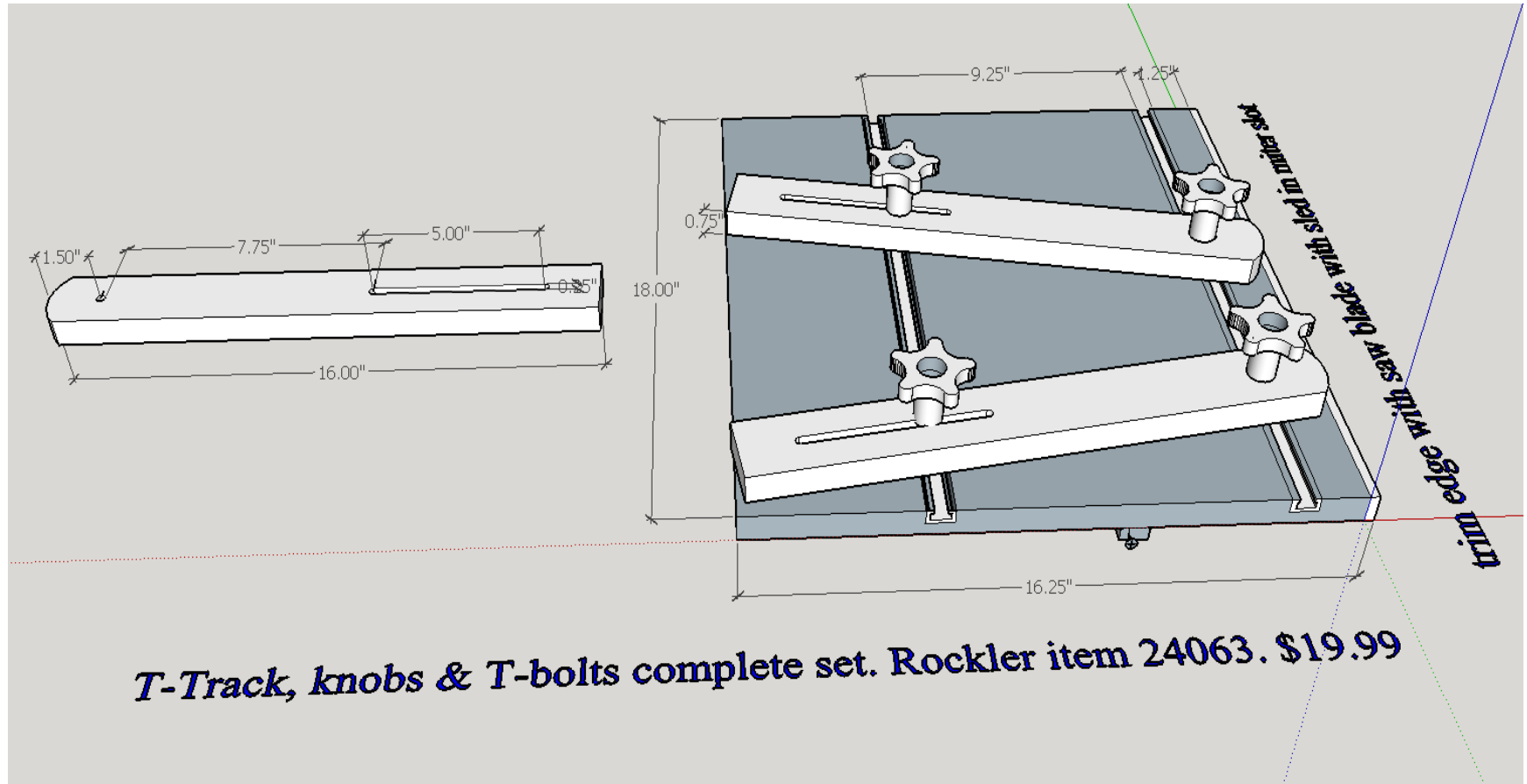
“Considerations”

- Accuracy is the main consideration. Fine work needs to be cut to $1/10^{\text{th}}$ of a degree.
- Digital protractors and digital angle gauges and digital calipers are very helpful.
- Saw blade should be 90 degrees to the table. Use a sharp, clean and quality cross-cut saw blade.
- Use zero clearance saw blade insert.
- Test your segments by assembling them with rubber bands or clamp them. If they do not fit tight, adjust the angle of the cut.
- Consider wood grain direction before cutting.
- Determine the best method to cut the segments.

Miter Saw Set-up



My Go-To Sled



T-Track, knobs & T-bolts complete set. Rockler item 24063. \$19.99

Sled set-up Recommendations

- See seg-easy.com videos
- Can use a digital protractor
- Can use a seg-easy template
- If making a 12 segment ring, can use a 30/60 degree triangle.

How to use the sled

Only the top guide arm

- Set the top guide arm to the needed angle.
- Board strip to be flipped over with each cut
- If saw blade not vertical, it will compensate.
- Works good for woods with little or no visible grain
- Only half as accurate as using both arms
- Always good to mark the top of the strip and number the consecutive cut segments



How to use the sled

Using both guide arms

- Set both guide arms to the needed angle with a digital protractor, or use a set-square template or 30/60 triangle between the two arms.
- Board strip is not flipped over from top to bottom guide arm. The front and back of the strip will alternately be flipped
- Can flip the segments over after cutting them so they have the same affect as cutting on the top guide arm only.
- Works good for woods with little or no visible grain. Jerry Bennett says this method is twice as accurate as the single arm method.



How to use the sled

Using both guide arms but re-establishing original angle on top

- Board strip is not flipped over from top to bottom guide arm
- If saw blade is not vertical, it will not compensate.
- Works good for woods with heavy visible grain. Nothing gets flipped
- Number all consecutive segments.
- A small wedge needs to be cut off and wasted on the top arm cut.
- Requires a longer strip
- Requires more time
- I move segment build-up away from the saw blade with a thin flat strip



Setting up to cut the segment length

- Use a lateral saw stock stop
- Use an accurate calipers
- Cut a waste strip at the needed angle
- Mark the strip at the length
- Place strip on the sled
- Align the mark with the saw blade tooth
- Retract the sled to the lateral stop
- Adjust the stop to the strip protrusion
- Tighten the stop knob



Preparing and Assembling the Segments

- I use a flat piece of sand paper on a flat surface and clean the fuzz off of the 4 sides. I try to stay off of the angle surfaces.
- Assemble the segments in a circle. Try to match them with respect to their consecutive cut and/or grain orientation and color.
- Assure the fit is tight.
- Number them either clockwise or counterclockwise.

Gluing the Segments

- Most glues will work. Most people use Titebond II Premium. It's good and less expensive
- I've been using Titebond II Extend Wood Glue. It's good, gives more working time, is white and dries clear so glue lines are less noticeable.
- Segments must fit tightly
- Align segments in order on top of a strip of masking tape
- Apply glue evenly on all segment contact surfaces.
- Cut the ends of the tape so it doesn't get between the end segments.
- Wind the tape with the segments in a circle.
- I use wax paper to protect the surfaces of tools and the clean ring surfaces.
- Clamp together. I like to use large hose clamps. Rubber bands can also be used.
- I also clamp my rings flat down in a homemade veneer press so the ring surfaces are flat.
- Can also hand glue the segments together, one pair at a time, by the contact friction method. Glue them up into half circles.
- I will demonstrate both methods.
- Have a damp rag near you so you can keep glue off of your hands, segments and tools

Cleaning-up the Segment Rings

- I use my drum sander
- Can flatten a face of a ring against a disk sander
- Can flatten a face by manually sanding the ring against a flat surface
- Can mount the ring to a concentric flat disk on the lathe and either flatten it with cutting tools or with sandpaper mounted on a flat surface.

Gluing the Rings Together

- Build the assembly onto a Glue Block
- Can use a press, clamps or the lathe for gluing pressure. I like using my veneer press.
- Turn the outside diameter of the glue block and the successive rings round.
- Center the next ring on the stack, align the segments and wedge the ring in place with scrap wood chips and hot glue and place the assembly in a press or in other clamps.
- If assembling the ring stack on the lathe, prepare a concentric tailstock disk, center the segment ring on the disk and attach it to the tail stock.

Ring Repairs

- If there is an open glue joint in a ring, I have been successful running it through a band saw and regluing and clamping it.
- When gluing pairs together by the contact friction method, normally the resulting the semi-circle joints won't join. They can best be trimmed using a ring clamping sled on the table saw.
- Some people are successful adjusting angles, etc on a disk sander. I have had only limited success with that.

Turning

- I usually start by turning the sharp edges off of the exterior so if I accidentally touch it, I won't get hurt. I leave most material on the outside to provide rigidity while turning the inside.
- I use small round scrapers on the inside to shear off the rough edges. I finish the inside to my drawing dimensions before returning to the outside.

Turning Dimensions

