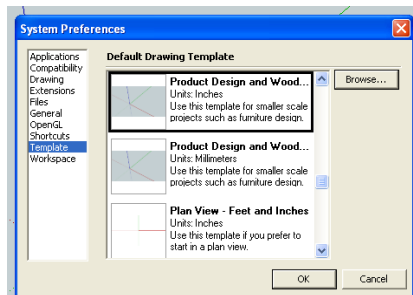# How to draw the CB South Kerf Bent Clock:

Open sketch up, use the Product Design and Woodworking template with Inches as the units.

If there is a person in the drawing space, you can delete him/her.

When we start machining the clock parts, we will start with the clock front, but when drawing it in sketch up, let's start at the bottom (with the clock bottom) and work our way up. When drawing in sketch up, objects are drawn/represented with lines/arcs that bound the edges and then sketch-up creates the surfaces that span between the boundaries. So when you draw, start with the outside edges of an object, once you close the boundary, sketch up should draw a surface inside the boundary. Start with 2D shapes, then push/pull to make 3D.

The clock bottom is a simple rectangle that we can pull to the correct thickness. So, this is a good place to start. Please group each piece of the clock when you are finished drawing it.

First some sketch-up background information:

Sketch-up is a free program that anyone can download from google and use. The program is like sketching in 3D. The program is very useful for figuring out how projects go together and figuring out the sizes and joinery of a project. Or you can use it to design a project.
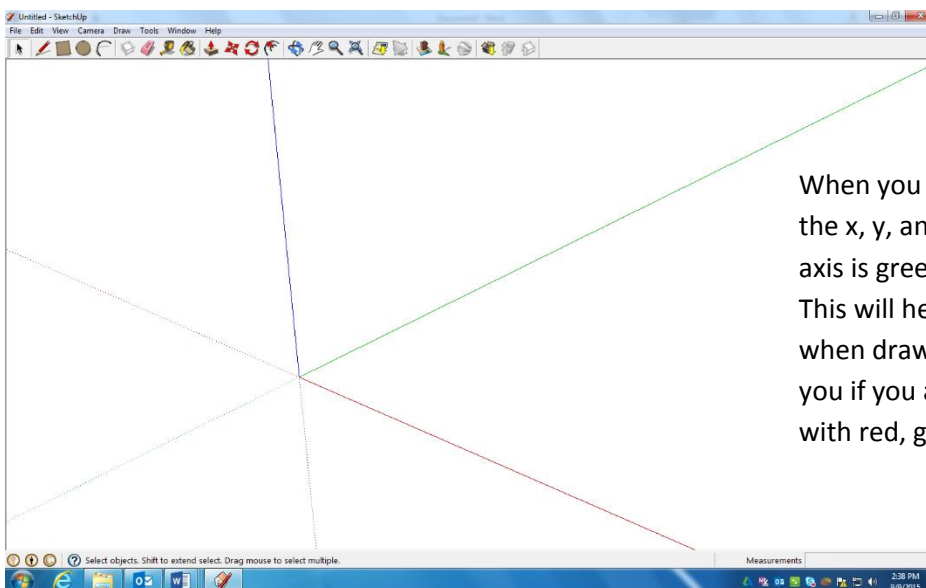
When you boot sketch-up notice the x, y, and z axis. X axis is red, Y axis is green, and Z axis is blue. This will help you keep oriented when drawing. Sketch-up will tell you if you are drawing parallel with red, green, or blue axis.

Sketch-up's basic tools:

Rectangle tool

Move   Orbit

Line tool   Push/Pull

Selection tool
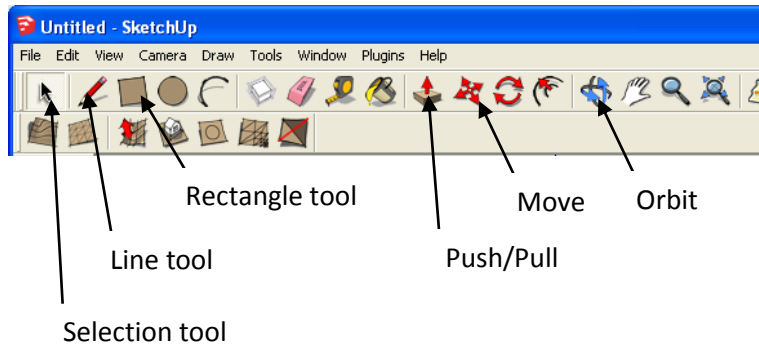
Let's start drawing

Clock Bottom:

To get the dimensions of your pieces please refer to your clock plans. The sketch-up drawing will be graded for accuracy. You will need to input the dimensions when you draw the different parts.
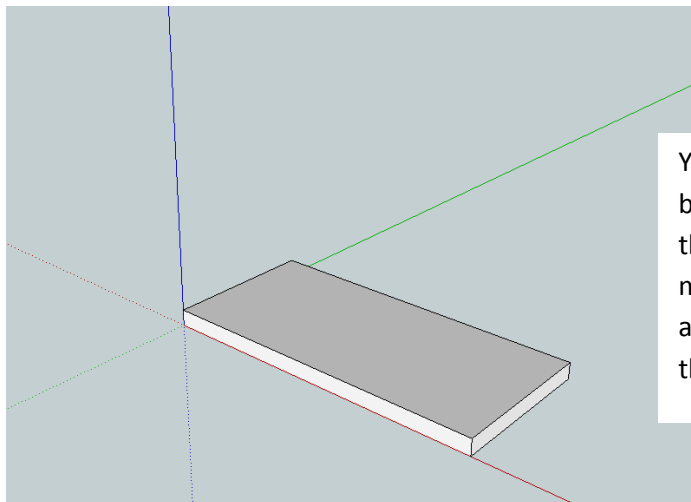
Draw a rectangle that starts at the origin the correct size for the clock bottom.

Rectangle tool

1st click on the origin

2nd type the measurements *in the format of x,y*
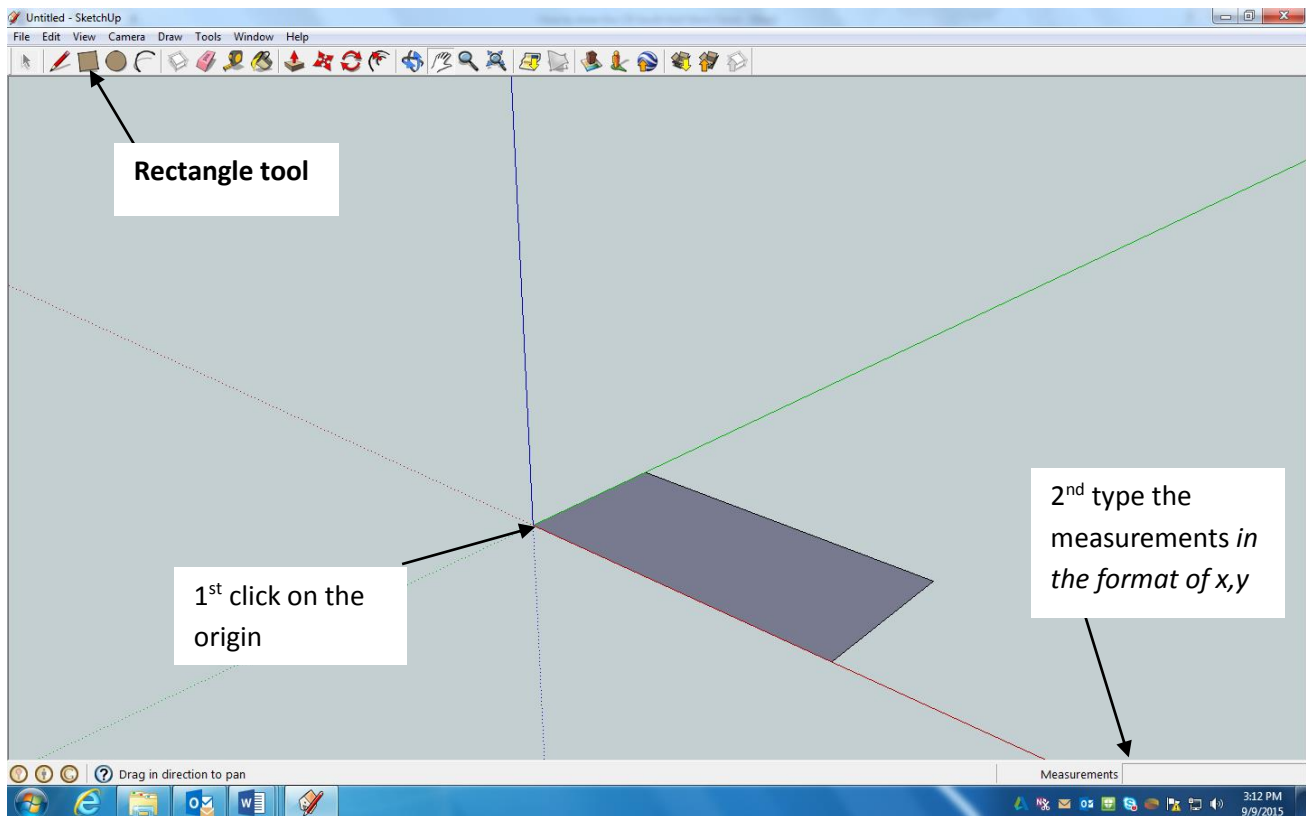
So you now have a rectangle the correct size, to make it 3D the push/pull tool is used. This tool will give a closed shape thickness.

Push/Pull Tool

2nd type the thickness

1st click on the surface
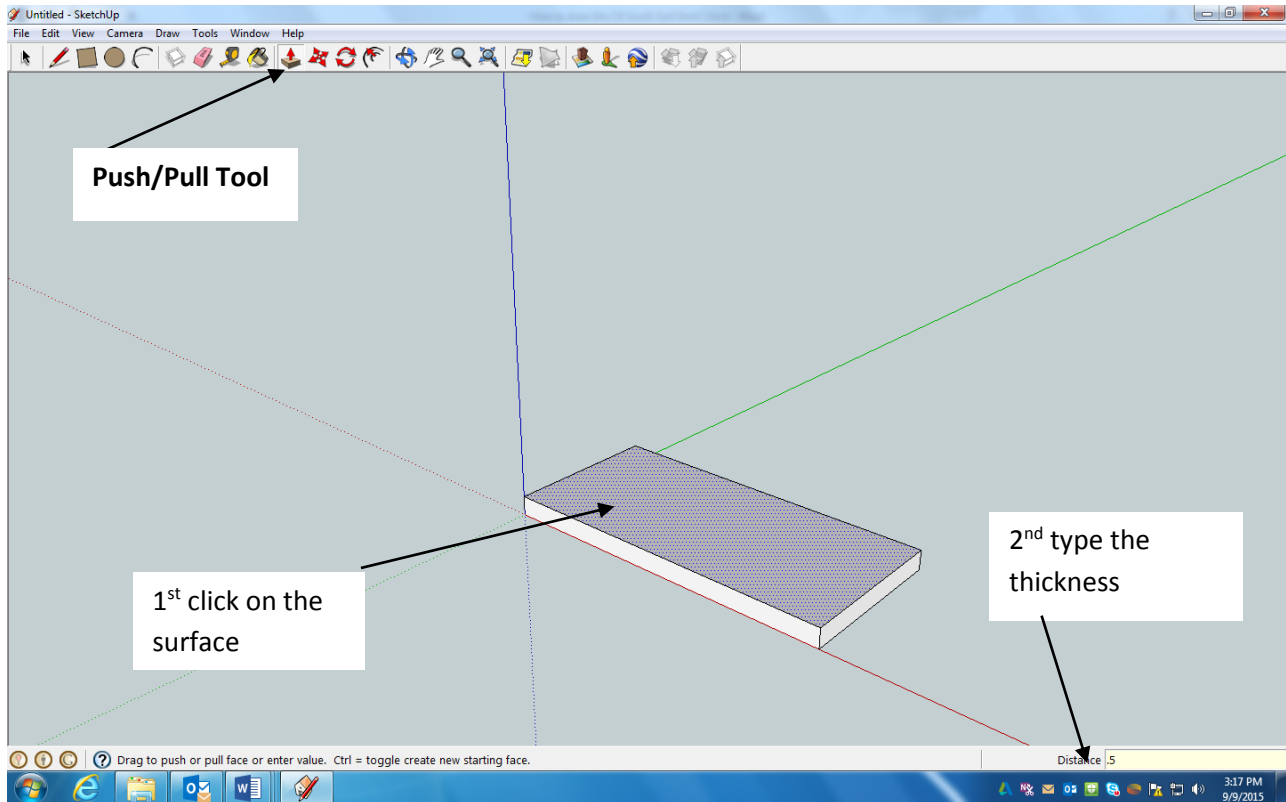
Result:

You should now have the clock bottom completed. Please select the whole part (this part is probably made of 12 lines and 6 surfaces) and **group** it together. Group is in the edit menu.

<u>Case Bottom:</u>

It is probably best if we draw the case bottom directly on the clock bottom where it goes. So we are not going to start this piece at the origin. The case bottom is ¼" smaller all the way around (except for the back) than the clock bottom. From top view it should look like this:

Case bottom

Clock bottom

¼" revel (space) on the front and sides
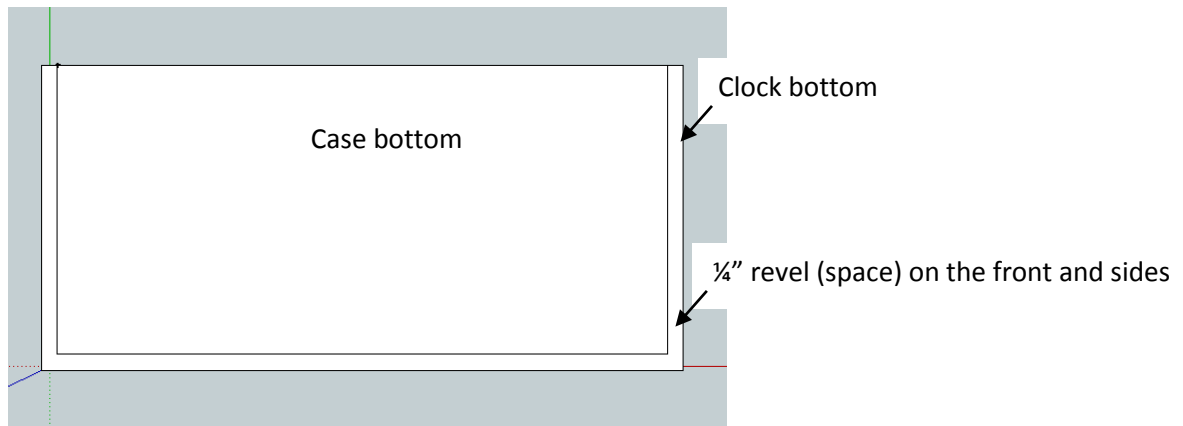
To help draw the case bottom in the correct place, use the **tape measure tool**. This tool you can use to check the measurements of objects, but also you can set reference points.

Tape Measure tool: you can use this tool to set points in the drawing, it's like drawing construction lines without a line
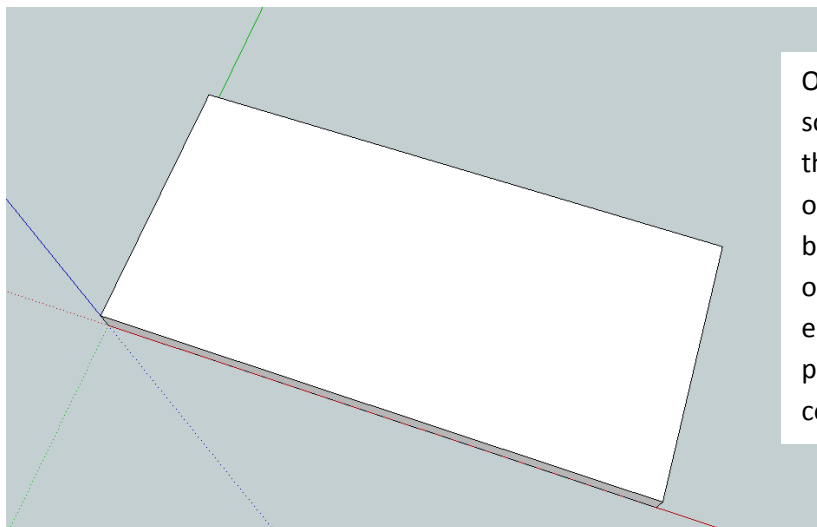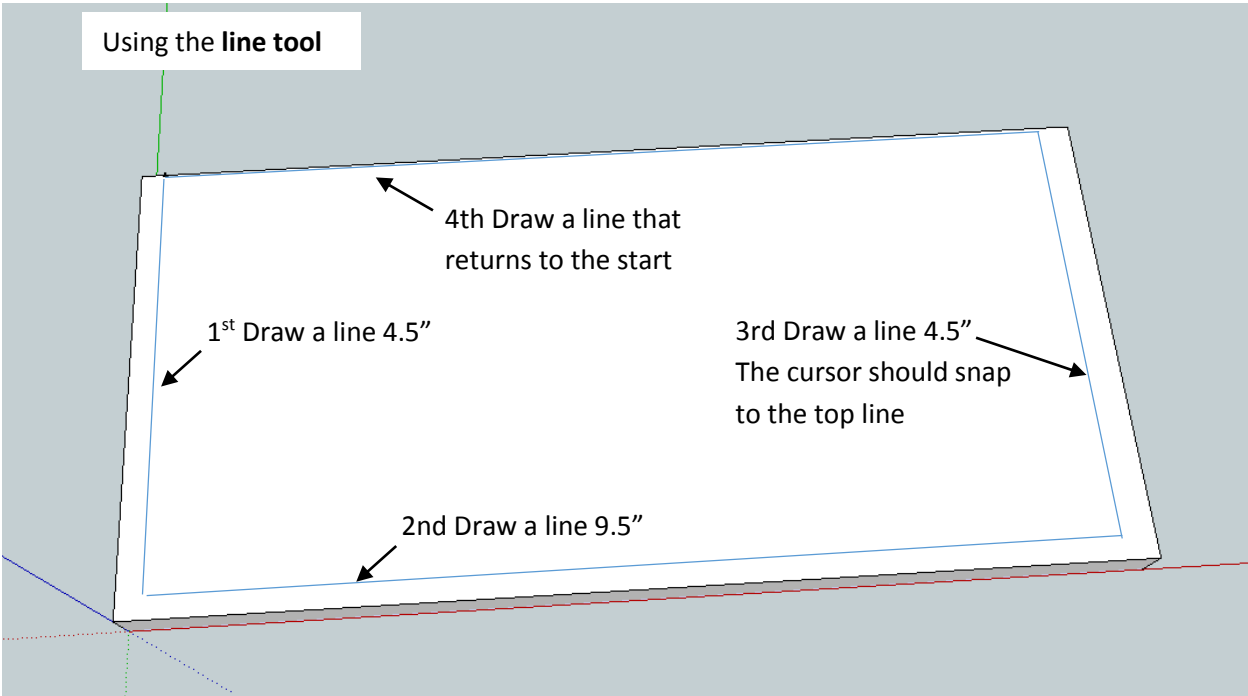
Obtain a view with the **orbit tool** something like the picture. Using the tape measure tool, click on one of the top/back corners of the clock bottom and pull toward the center of the piece. Then enter ¼" and hit enter. You should see a reference point that is ¼" away from the corner.
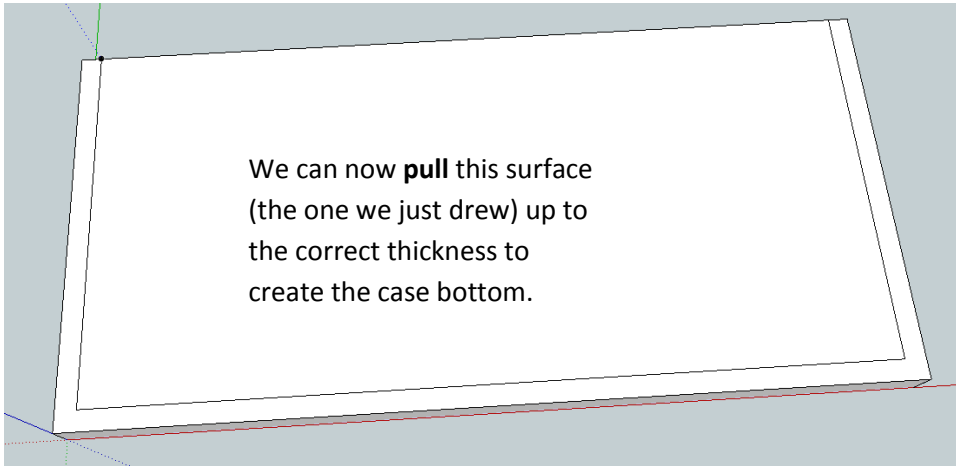
Result:
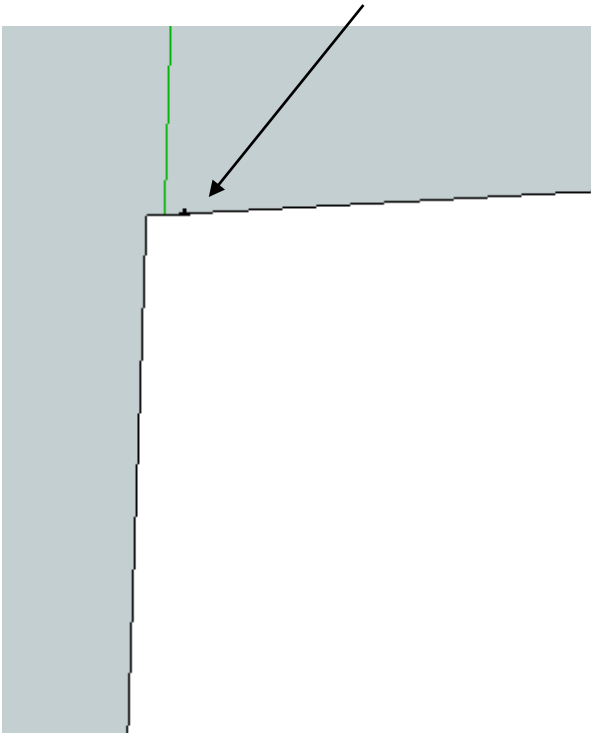
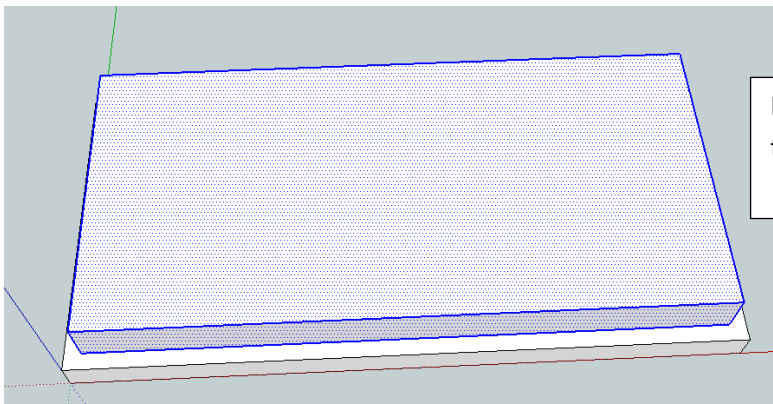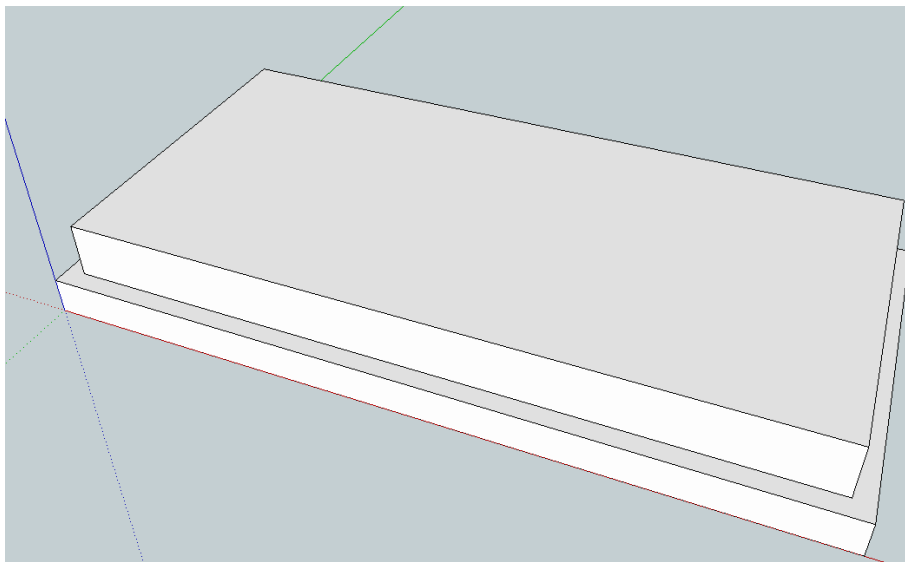To draw the rest of the case bottom, I'm going to use the line tool to show you another way to draw a rectangle.

Using the **line tool**

4th Draw a line that returns to the start

1st Draw a line 4.5"

3rd Draw a line 4.5" The cursor should snap to the top line

2nd Draw a line 9.5"

Result:

We can now **pull** this surface (the one we just drew) up to the correct thickness to create the case bottom.

Please use the **push/pull tool** and pull the case bottom up ¾"

Result:

Please **group** all the parts to the case bottom together.

Clock Case:

The clock case should look like the picture below. To build the case in sketch-up, it probably easiest to start with a large cube-looking shape and subtract parts away to achieve our desired result. Let me give you some measurements before we get started.
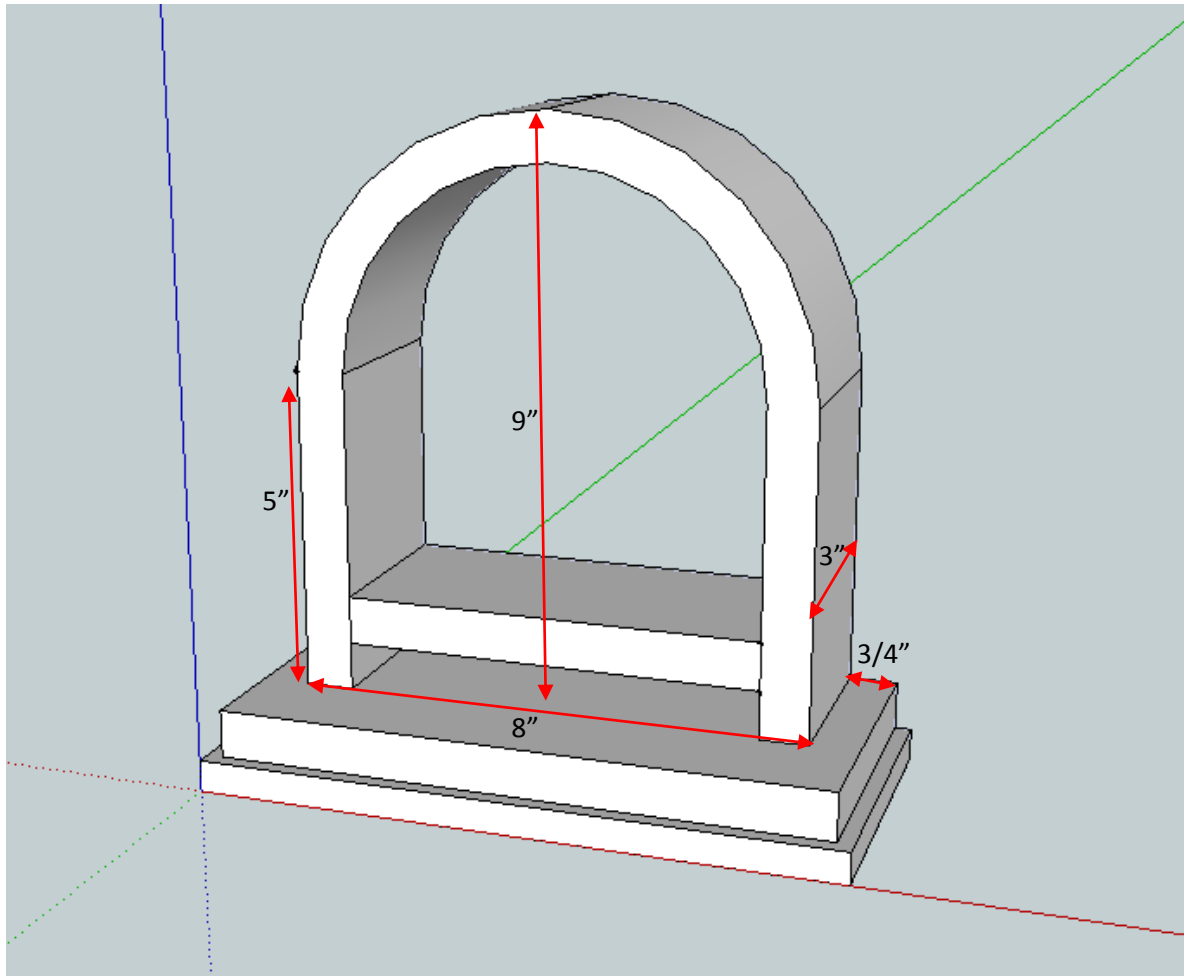
To start drawing the case, start with an extruded rectangle to get a shape that we can start subtracting parts from. The Case is 8" wide, 9" tall, and 3" deep. It sits flush to the back edge of the other pieces, and ¾" smaller that the width of the case bottom.

Using the **tape measure tool**, add 2 guide points ¾" in from the outside edges of the case bottom. There should be 8" between the points. Result:
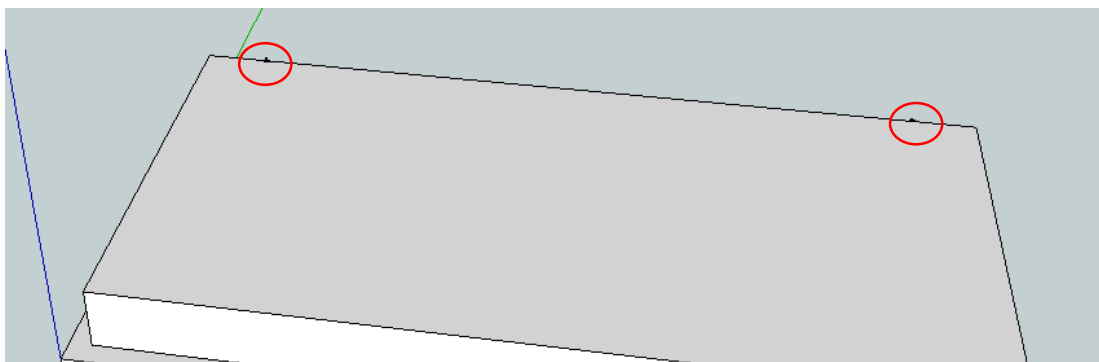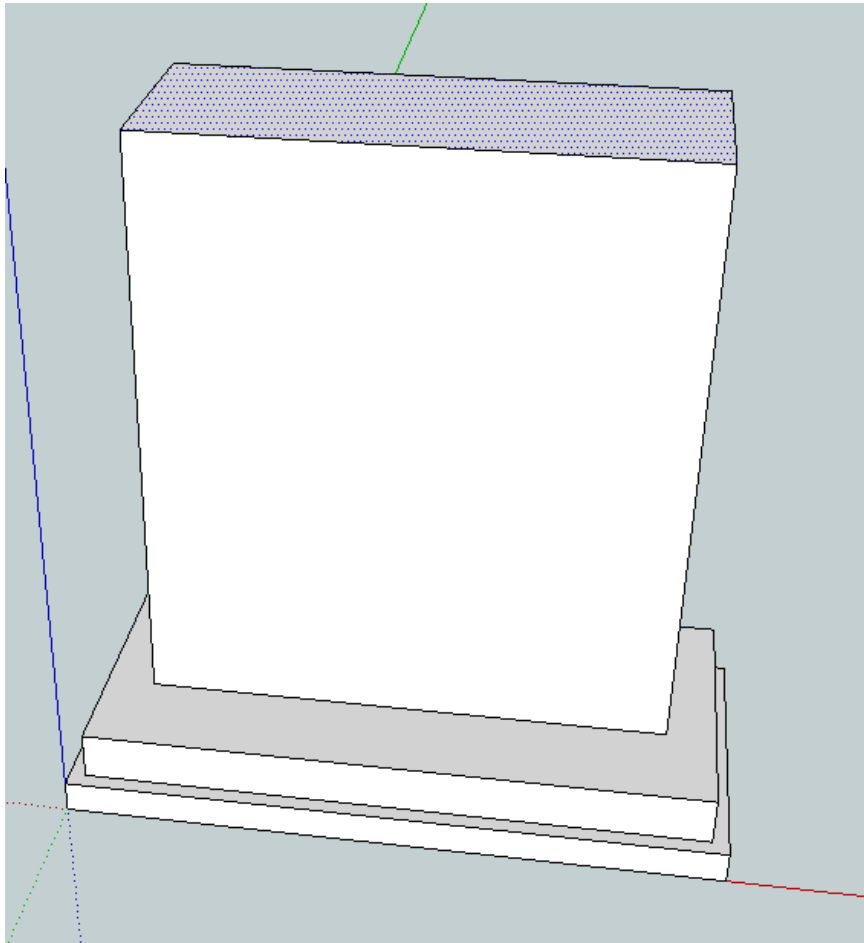
Then with the **line tool**, draw the bottom the clock case. Start at one of the last guide points, and draw 3" forward, 8" across and then back the other guide point. Last close the boundary by drawing to the first point.

Result:
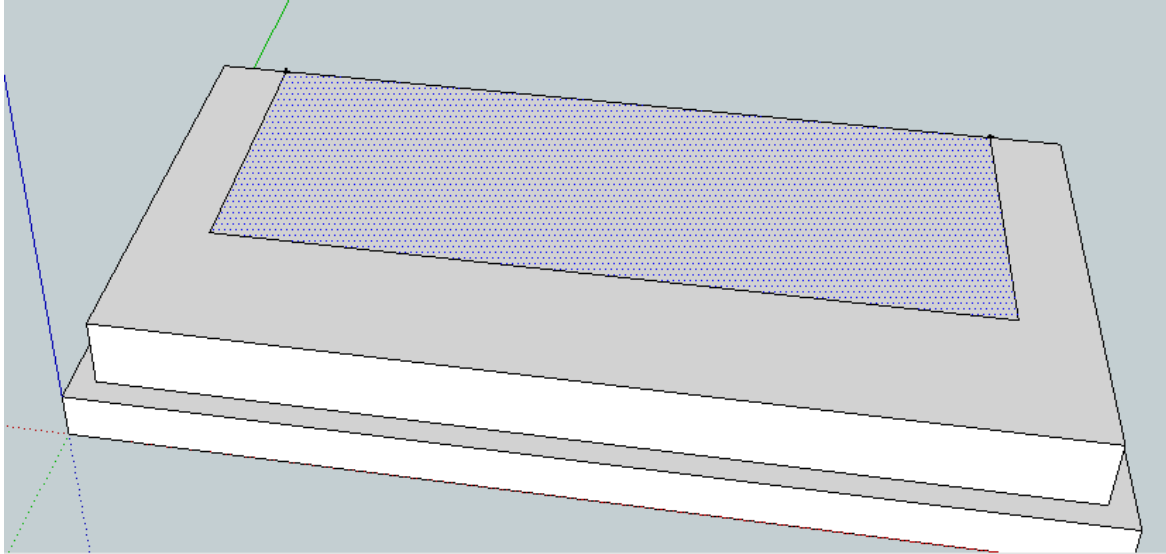
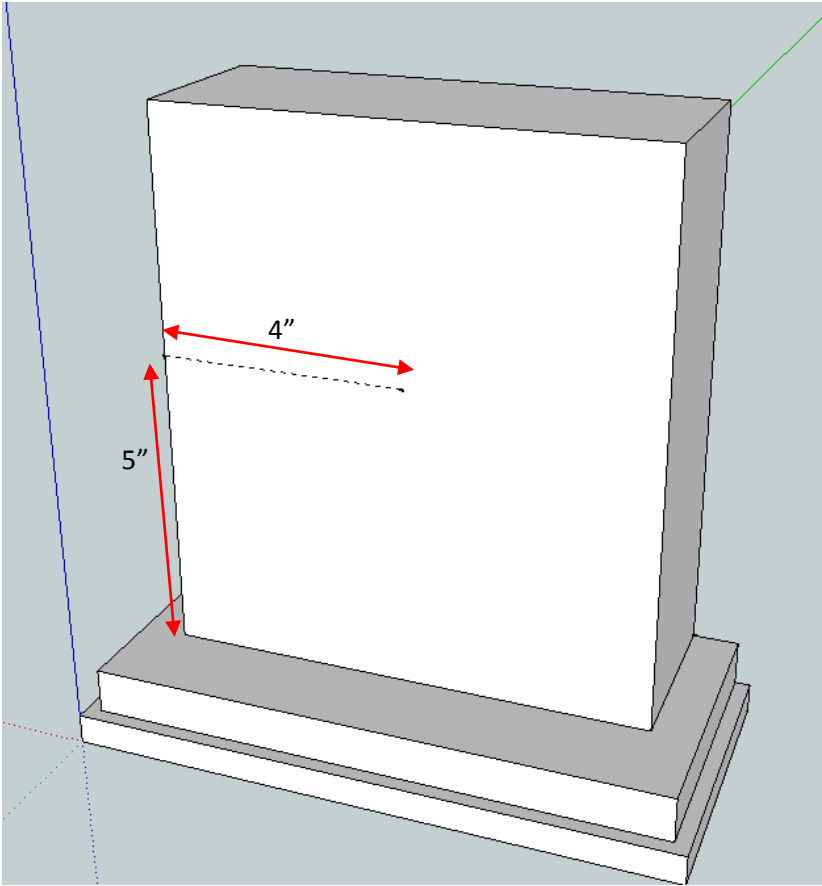We can now **push/pull** the closed rectangle from above and make it 9" tall.

Result:

To continue, we need some more guide points. The top of the case is a ½ circle, so we need to find the center of the circle before we can draw it. With the **tape measure tool**, draw 5" up on one side and 4" into the center of the circle.
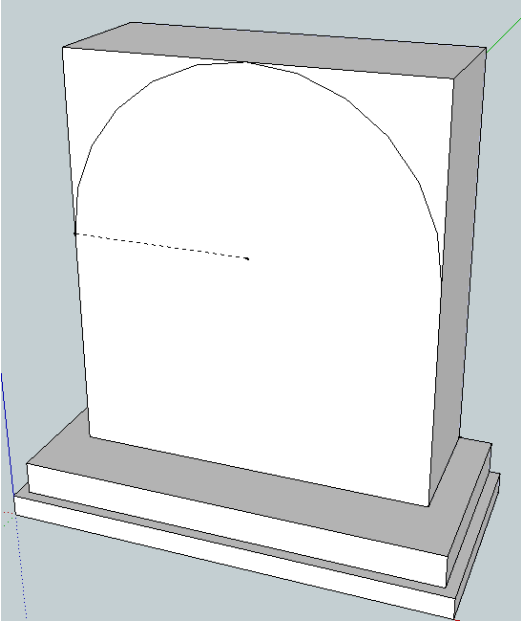
Result:

The ½ circle in sketch-up is called an arc. We will use the arc tool. There are a number of ways to draw and arc. We can just use the standard **arc tool**.
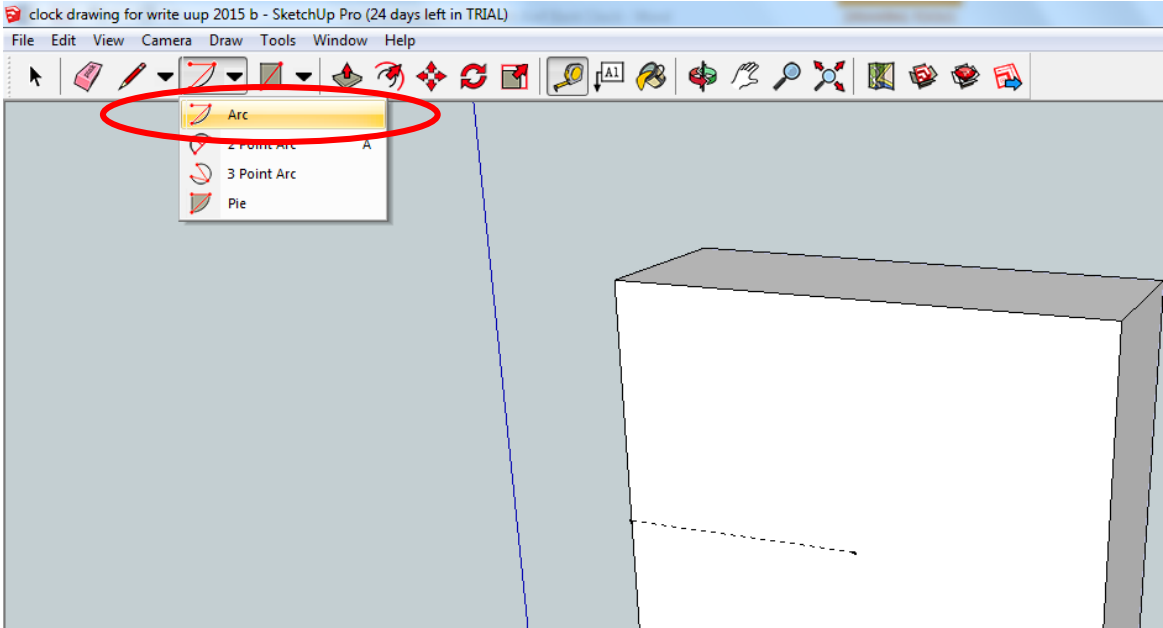
After you click the **arc tool**, sketchup wants the arc's center point first then the radius. So click on the last guide point that is in the middle of the clock case, then click on the case horizontal from the guide point. Last draw the ½ circle.


1st click the center

2nd click on the start point

3rd Draw the arc to the end point on this side.
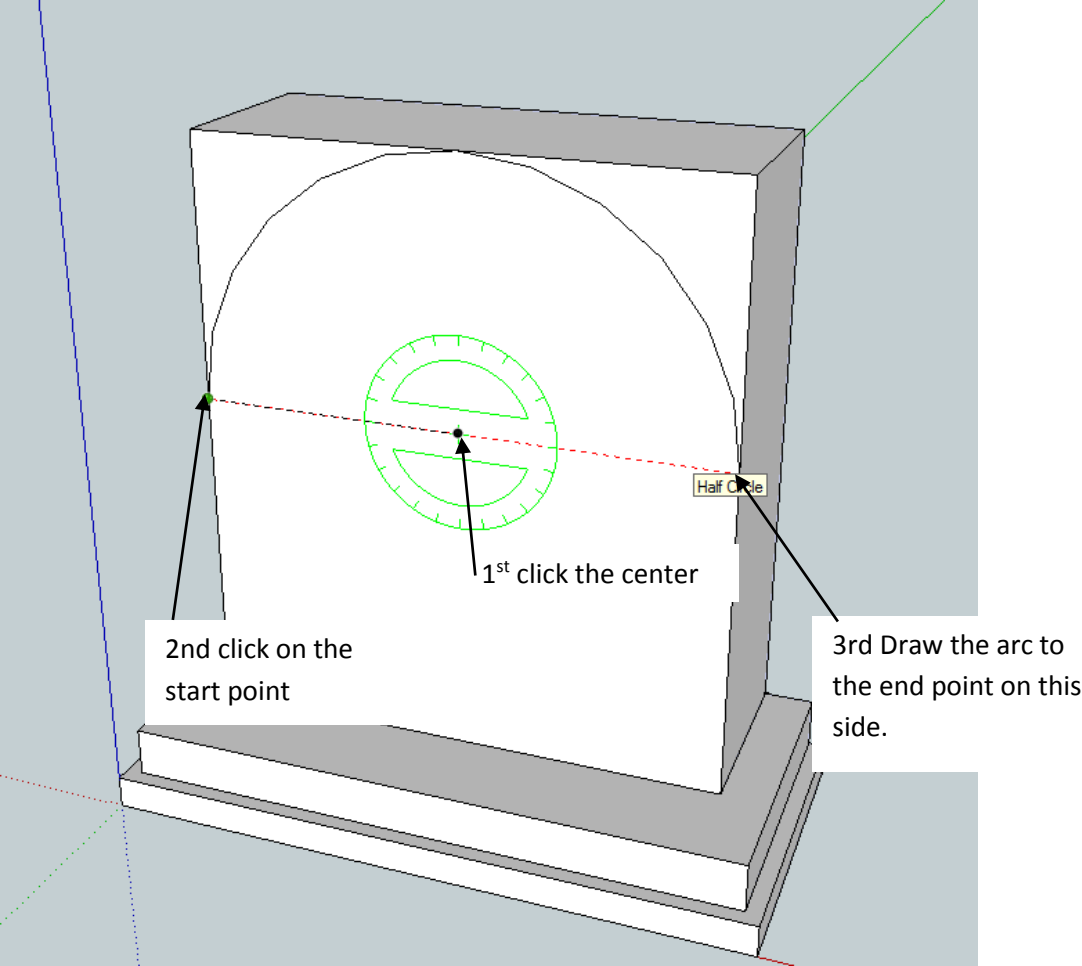
Result:

Next we can use the push pull tool to remove/subtract the extra material above the arc. Please get the **push/pull tool** and click on one of the top portions and remove it such as below.
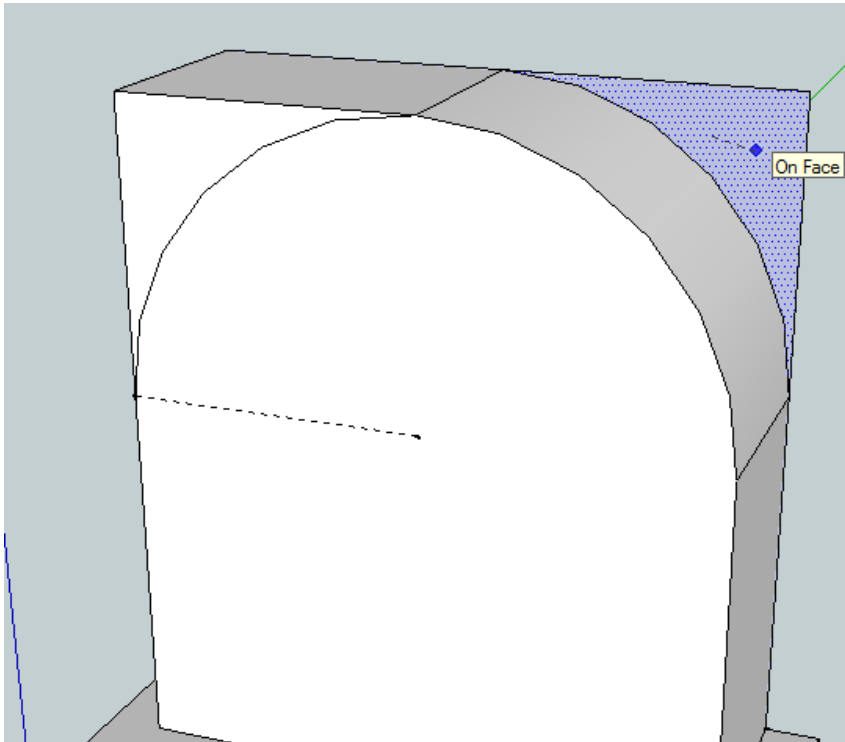
To remove the section, click and drag the surface until it touches the back face. Sketch up usually says "on face" or "offset limited to …." This means you are at the back of the work piece and you will remove the section. You can go too far and extend the section behind the part, so be careful.
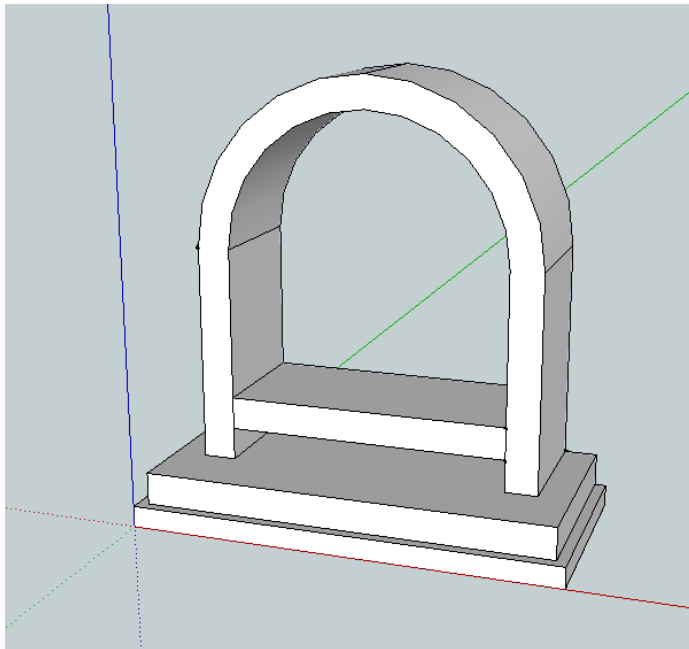
Then do the same to the other side.
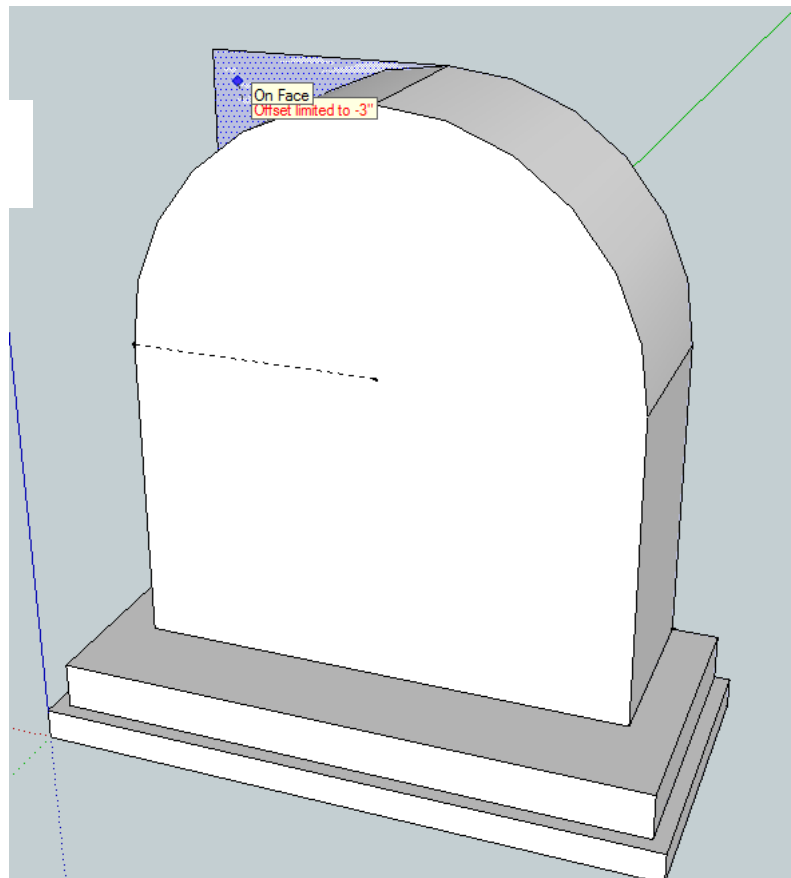
Result:
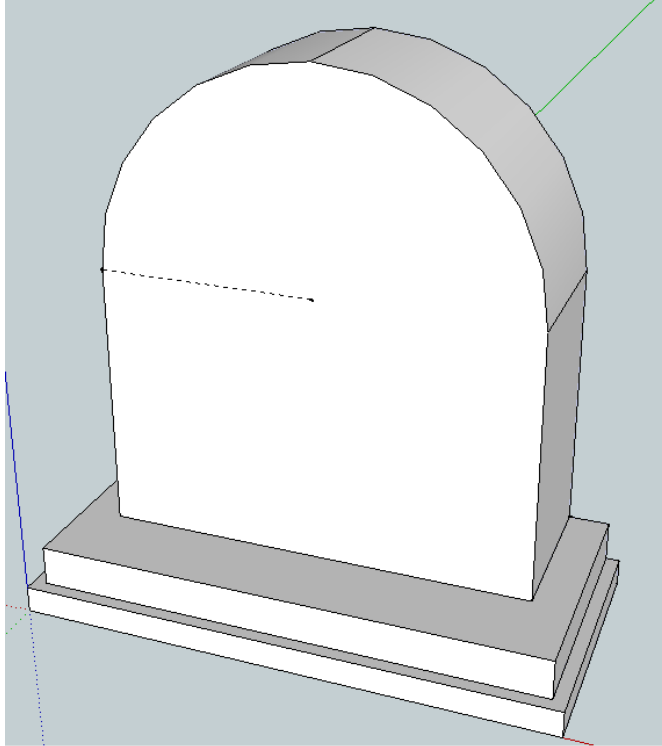
To complete the case (well we are actually making the case and the cross member) we need to subtract the middle of the arc section and the space under the cress member. The thickness of the wood is ¾" and the cross member is ¾" up from the bottom of the case. When we get finished it should looks such as below:

Let's make the subtraction for under the cress member. Again with the tape measure tool, make some guide points to help us draw accurately. We want to set the thickness of the pieces and the placement of the cross member. With the **tape measure tool**, measure ¾" from the outer edge of the case and then go ¾" up to set the space under the cross member.
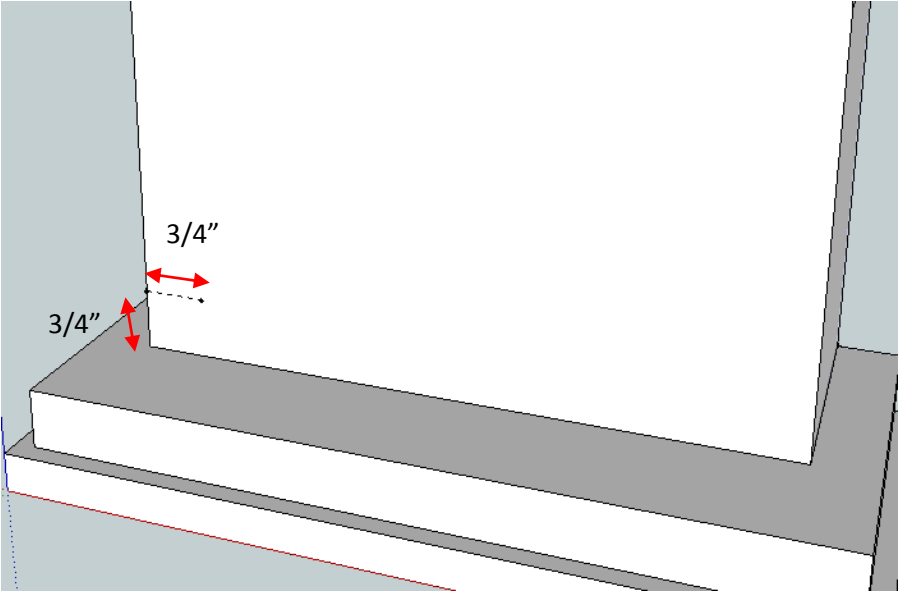

Then we can draw the bounding rectangle with the **line tool** so we can subtract the space under the cross member.
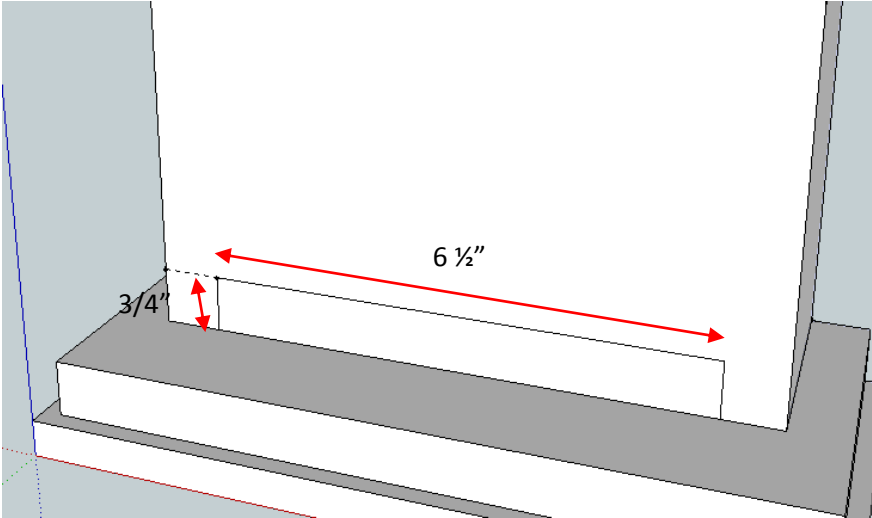

Then **push/pull** the section to subtract it just like the space above the arcs.
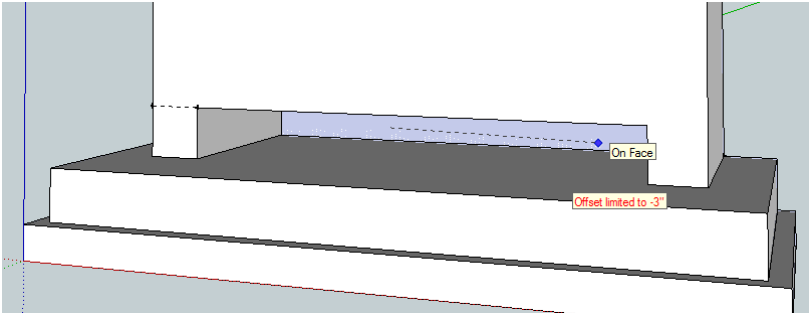
To subtract the center of the rest of the case, let's start with another arc. Using the **arc tool**, draw an arc with the same center as the arc for the outside of the case and its radius is 3 ¼" such as the graphic below:
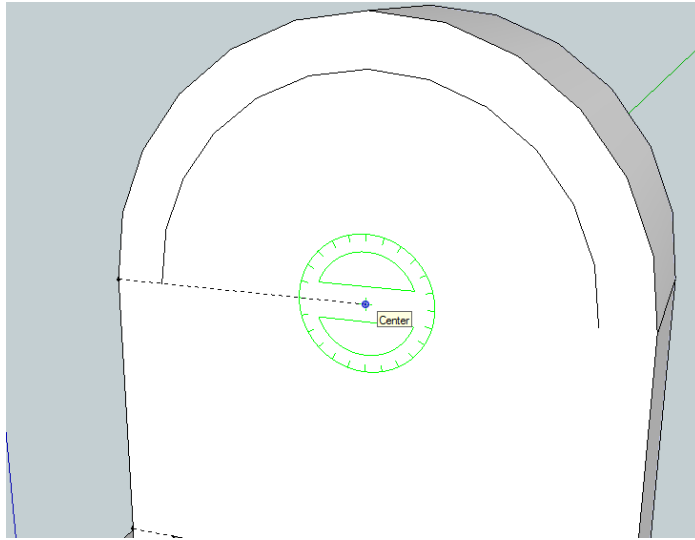
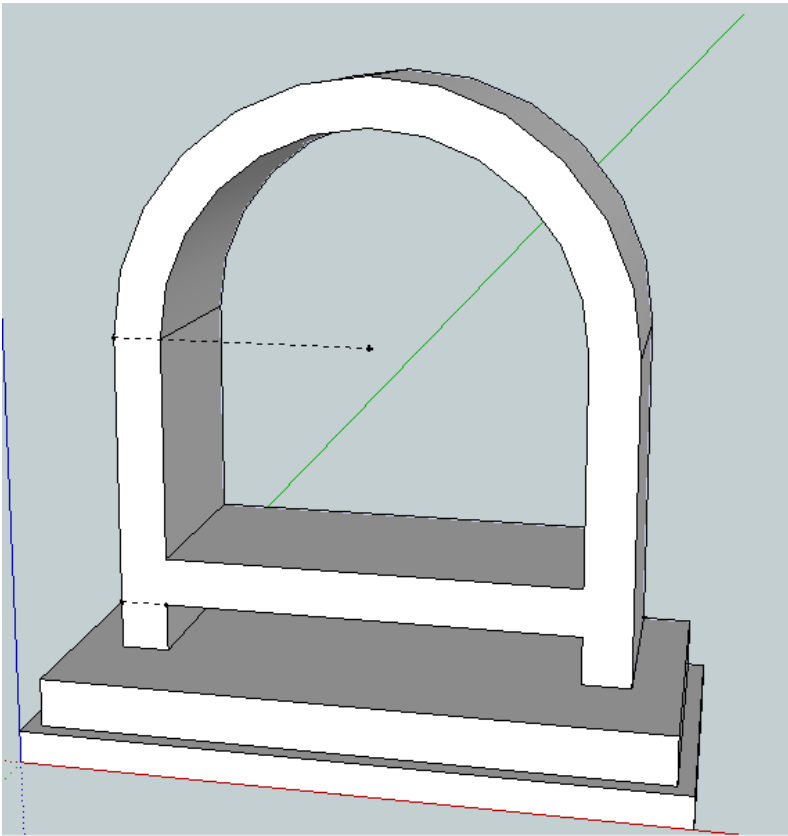Next, using the **line tool**, start at one of the arc ends and draw 3 ½" down and 6 ½" across to bound the rest of the subtraction.
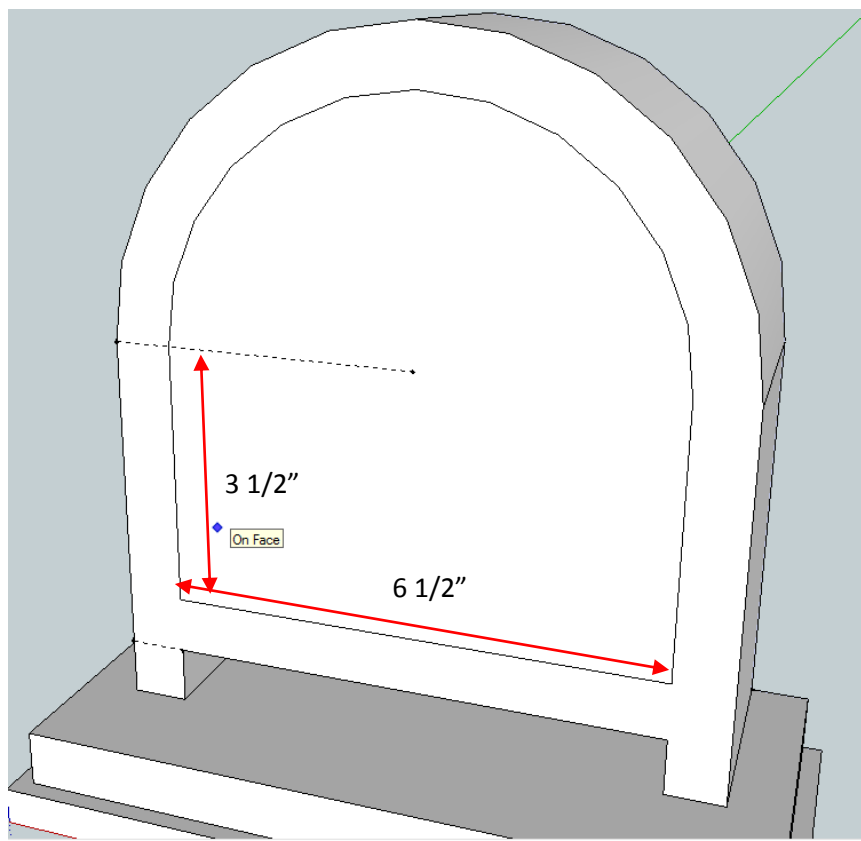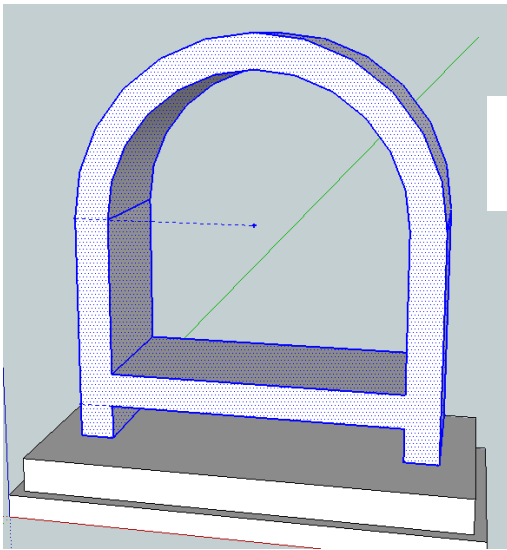
With the **push/pull tool**, remove/subtract the inside of the case. Such as below:
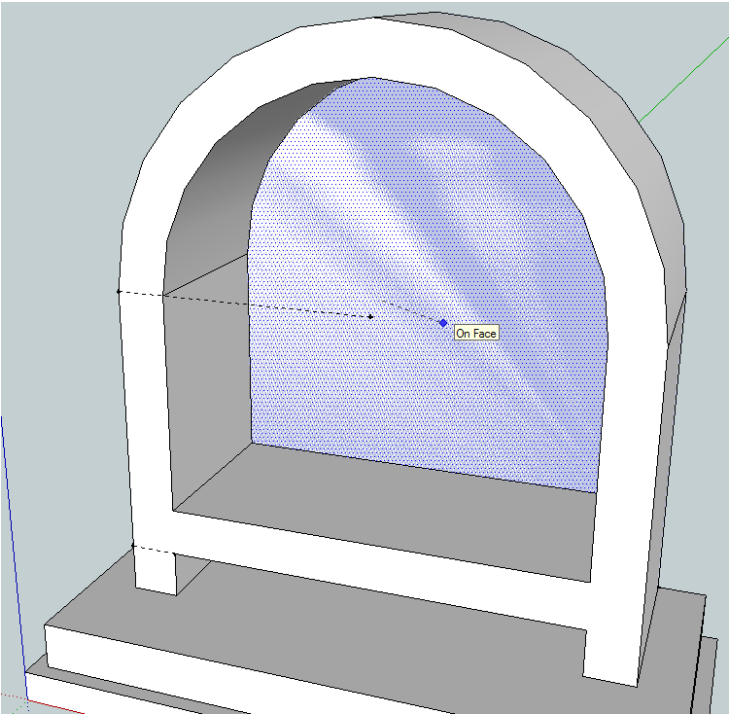

Result:

Please **group** the case and cross member geometry together.

The last part is the front or the door. Whichever you are making. Again we want to start with a closed shape or closed boundary so we can push pull the geometry and give it thickness. Basically we want to trace the outside, front of the case and pull it forward to make the front/door. We can start with the arc. With the **arc tool**, draw an arc with the same center as the other ones and the radius should be the same as the outside of the case. You may have to orbit the view to more of a front view so the arc tool snaps to the correct drawing plane.
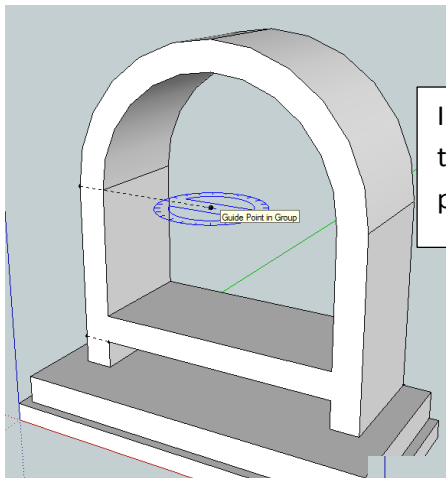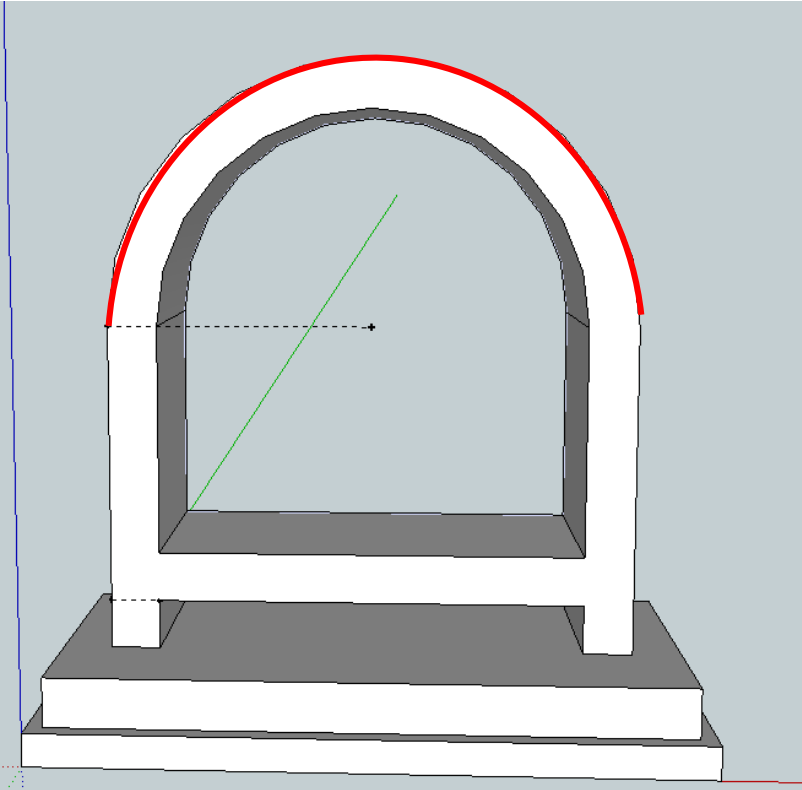
Incorrect: change view so the arc tool is in the front plane.
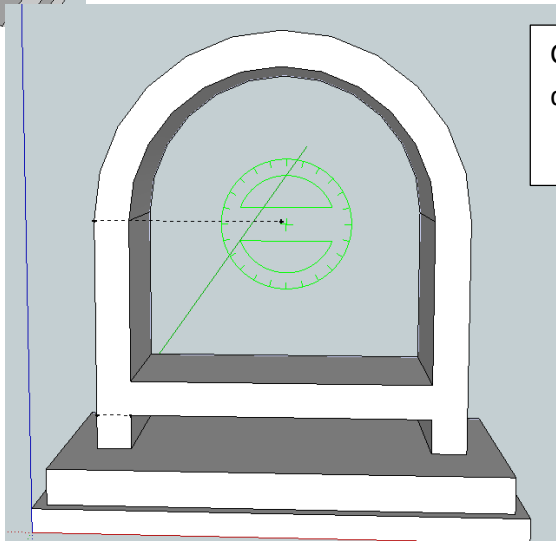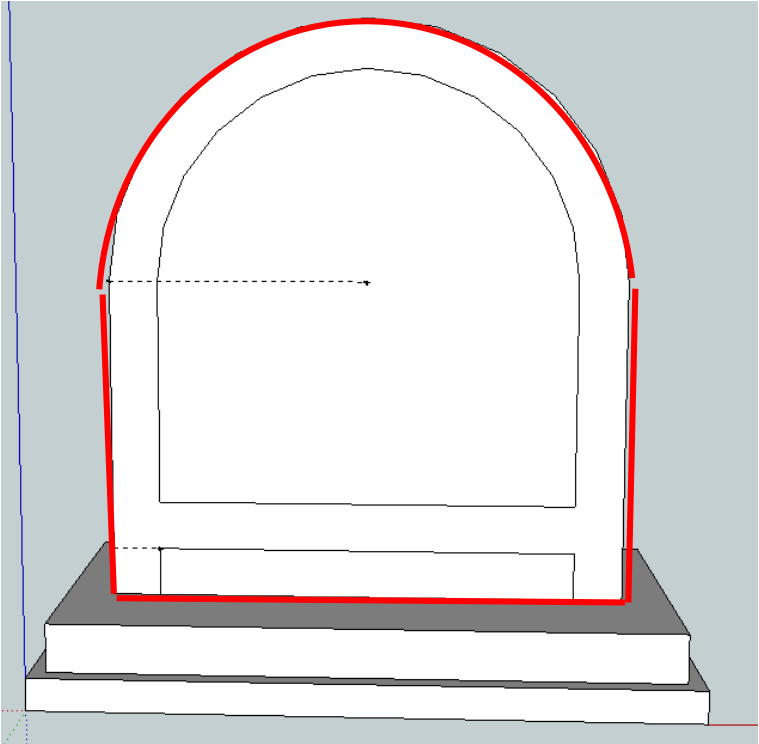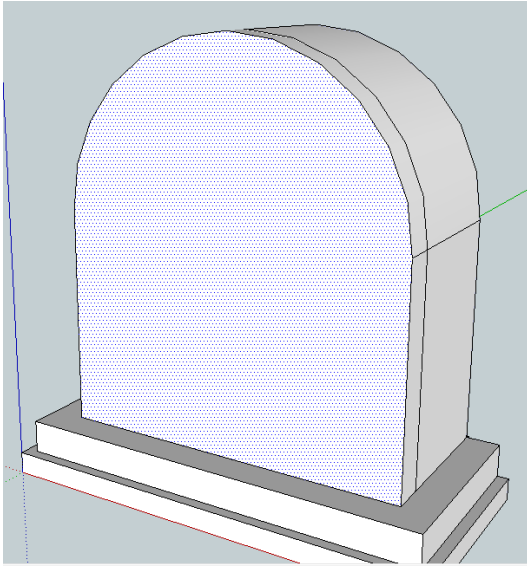
Correct: the arc tool will draw in the front plane.

Draw the **arc** for the outside of the clock front/door.

Then trace the outside and bottom of the case to create a closed boundary or closed shape. Use the **line tool,** it should look like beolow:

Then **push/pull** the front forward so it is ¾" thick.

Last make the circle for the dial. The hole for the dial is a 6" diameter or 3" radius circle. To find the center of the circle, draw a **line** across from the start to the end of the arc on the front of the door/front. Such as below:
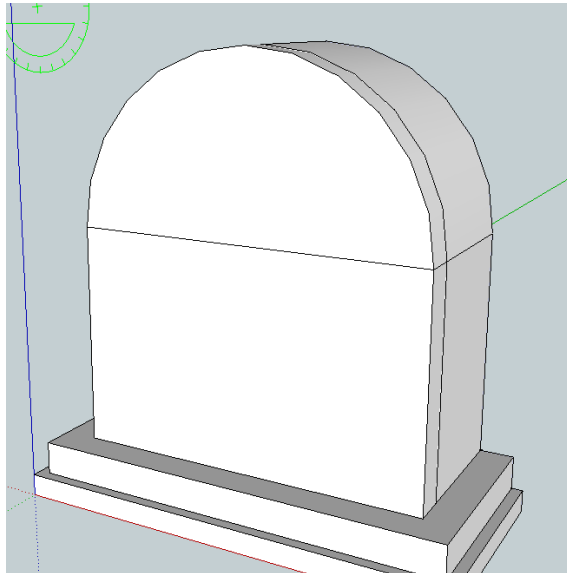

Then find the center of that line and draw an **arc** that has a radius of 3" and draw a full circle with the arc tool. Result:
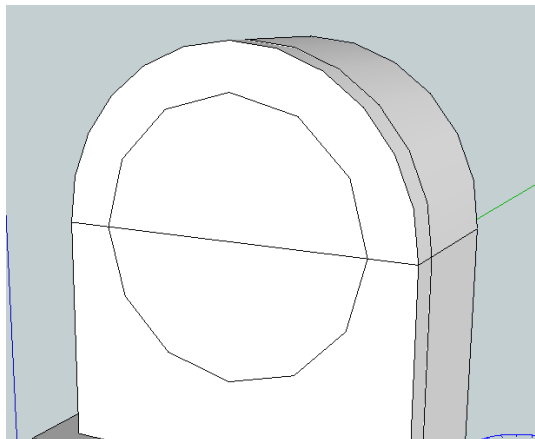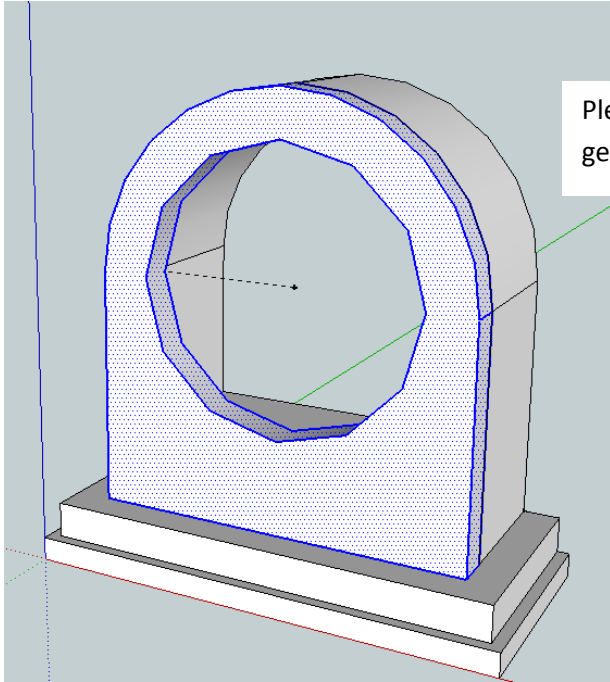
It would be helpful to delete the construction line we used to make the circle. It is not 3 line segments. Once you cross a line with another piece of geometry, sketch up automatically cuts the line at the intersections. So select the 3 line segments and delete them.
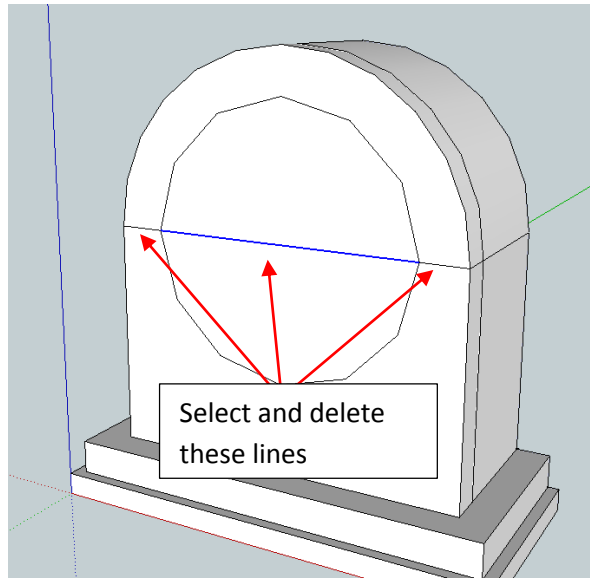
Last **push/pull** the center of the circle to make the hole for the dial. Result:
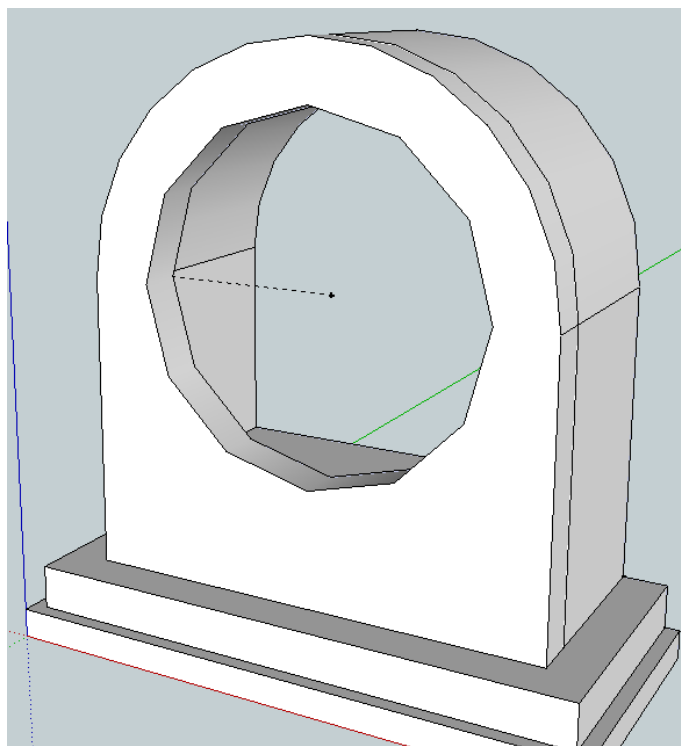
Please **group** the front/door geometry together.

Please save your work and show your instructor. Congratulations you finished drawing the clock.