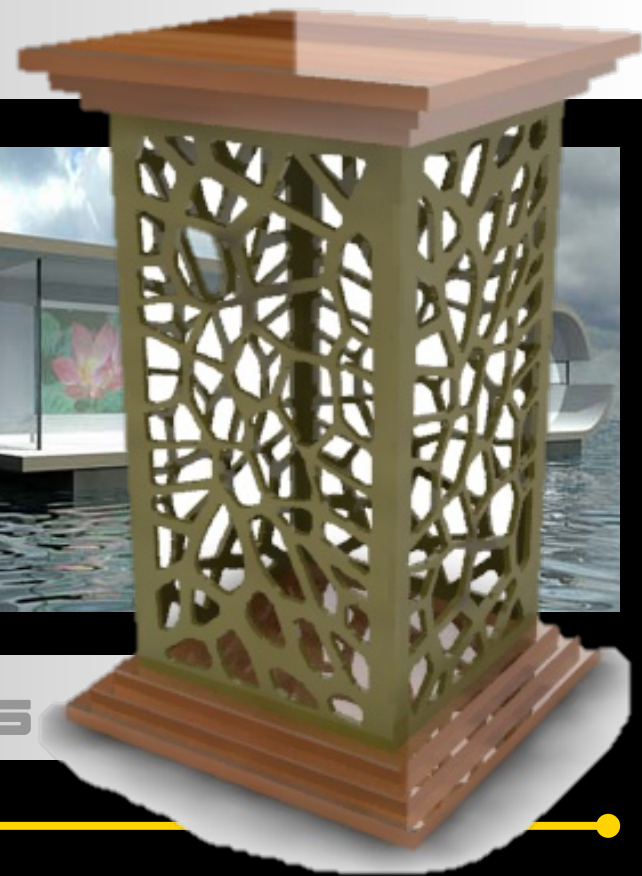CAD SKILLS

CAD Tutorial 18: Nature Inspired Lamp

Level of Difficulty

★ ★ ★ ★ ☆

Time
Approximately 50–60 minutes

By the end of this tutorial you will be able to...

- Link basic shapes
- Use the Arc tool
- Use the Follow Me tool to produce a rounded edge
- Use construction lines/points
- Colour/render your finished toy boat

Skills to be used in this project...

Basic Skills	New and Higher Skills
Zoom tool	Construction lines and points
Orbit tool	Tape Measure tool
Pan tool	Arc tool
Line tool	Follow Me tool
Rectangle tool	Loading new toolbars
Circle tool	Paint Bucket tool
Eraser tool	
Push/Pull tool	

Basic skills are those required to do very basic drawings and are detailed as part of this presentation.

New and higher skills may be new to the novice and are the focus for learning in this presentation.

Learning Styles

Visual : *Presentation*

Auditory: *Video*

Kinaesthetic: *Demonstration*

Sketchup Help Guide:

Computer Aided Engineering: 15. Drawing and Modification Commands

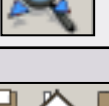| Drawing and Modification Tools	image	Description	Advantages
Modifying Tool 1. **Pencil tool**		used to draw lines in X, Y and Z direction. Can draw simple or complex shapes very quickly.	**Advantages:** Allows user to draw or modify shapes very quickly and can be used to construct 3D objects faster than traditional hand drawings
Modifying Tool 2. **Trim tool**		allows the user to remove overlapping elements.	**Advantages:** Allows user to erase overlapping lines and edges to draw complex 3D shapes very quickly.
Modifying Tool 3. **Push/pull**		tool used to turn solid objects into 3D objects instantaneously. Typing a size allows a user to extrude or pull an object to a certain size or height	**Advantages:** Allows user to draw or modify 3D shapes very quickly faster than traditional hand drawings. You can click on a face (plane) and adjust. Can be used to extrude shapes on 3D objects already drawn.
Modifying Tool 4. **Move Tool**		used to move entire shapes or pull lines on a drawing.	**Advantages:** Allows user to draw or modify shapes very quickly and can be used to construct unusual 3D shapes quickly
Modifying Tool 5. **Dimensions tool**		used to show sizes and radius of drawn objects	**Advantages:** Allows user to draw or modify 3D shapes very quickly faster than traditional hand drawings to correct size if drawn incorrectly. Drawing can be transferred onto the CNC machines directly
Modifying Tool 6 **Extrusion Tool (follow me)**		allows the user to highlight a path that turns blue. A chosen shape will then follow the chosen path	**Advantages:** Allows user to draw profiles of shapes and follow the path to draw complex 3D shapes very quickly.
Modifying Tool 7. **Arch tool**		*You can use the **arch** tool to draw a radius from two given points.* Can be used to draw corners etc..	**Advantages:** Allows user to rotate and position shapes quickly to draw complex 3D shapes very quickly.
Modifying Tool 8. **Circle tool**		allows the user to draw different sized radius circles and chamfered corners	**Advantages:** Allows user to draw profiles of shapes and follow the path to draw complex 3D shapes very quickly.
Modifying Tool 9. **Orbit tool**		*You can use the **Orbit** tool to change the angle that you are viewing your design from. You can do the same by pressing the middle wheel of your mouse*	**Advantages:** Allows user to rotate and see all angles of their design quickly
Modifying Tool 10. **Tape measure tool**		allows the user to draw guide lines to given sizes and mark out radius etc.	**Advantages:** Allows user to draw guides of shapes and draw complex 3D shapes very quickly.

Sketchup Help Guide:

Computer Aided Engineering: 15. Drawing and Modification Commands

Drawing and Modification Tools	image	Description	Advantages
Modifying Tool 11. **Square tool**		used to draw squares and rectangles.	*Advantages:* *Allows user to draw guides of shapes and draw complex 3D shapes very quickly.*
Modifying Tool 12. **Offset tool**		. *You can use the* **contour** *tool to draw parallel lines or lines within lines.*	*Advantages:* *Allows user to draw duplicate lines and position them within shapes quickly to draw complex 3D shapes very quickly.*
Modifying Tool 14. **Rotate Tool**		used to move rotate parts of a shape or entire shapes on x, y and Z co-ordinates.	*Advantages:* *Allows user to draw or modify shapes very quickly and can be used to construct unusual 3D shapes quickly*
Modifying Tool 15 **Scale Tool**		allows the user to select an object or part of an object and increase its sixe from the base point.	*Advantages:* *Allows user to quickly resize objects to draw complex 3D shapes very quickly.*
Modifying Tool 16 **Paint Bucket Tool**		allows the user to select a colour or materials to produce photo-realistic drawing of their object. Shadows etc. can be added.	*Advantages:* *Allows user to quickly draw objects life like using materials, textures etc...*
Modifying Tool 17 **Pan Tool**		*You can use the* **Pan** *tool to grab and move your object around the screen.* *Alternatively, you can pan by pressing the* **Shift** *key* **and** *holding down the mouse's middle wheel.*	*Advantages:* *Allows user to move and position their object quickly*
Modifying Tool 18 **Text Tool**		*You can use the* **text** *tool to add text to your object.*	*Advantages:* *Allows user to add 3D text by clicking on the extrude button or 2D text*
Modifying Tool 19 **Zoom Extents Tool**		*You can use this tool to automatically zoom into your entire project.*	*Advantages:* *Allows user to quickly navigate to the entire drawing if they get lost.*
Modifying Tool 20 **View Tool**		*You can use the* **view** *tool to quickly look at front side and top views as well as 3D views*	*Advantages:* *Allows user to complete working drawings quickly as well as enabling them to show a top view for exporting onto the laser cutter.*
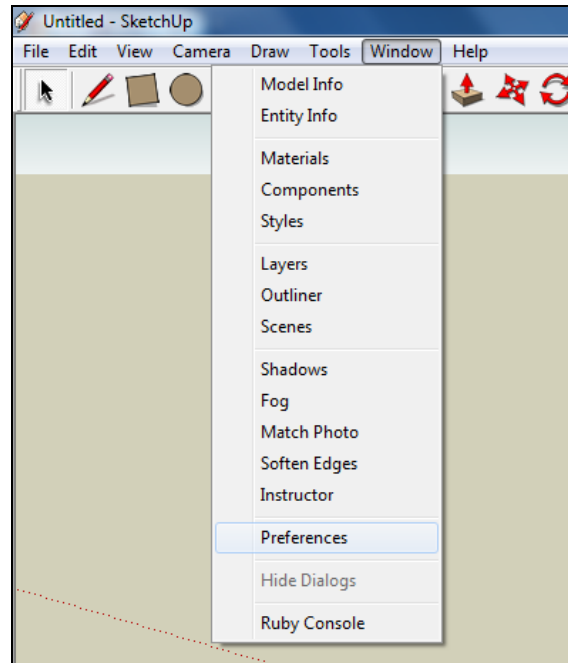
1. Open Library /Designoutthebox.com/ CAD Skills/ Lesson 18 / Nature Inspired lamp

Open the sketch up drawing. Once you have opened SketchUp, go to **Window** and select **Model Info**
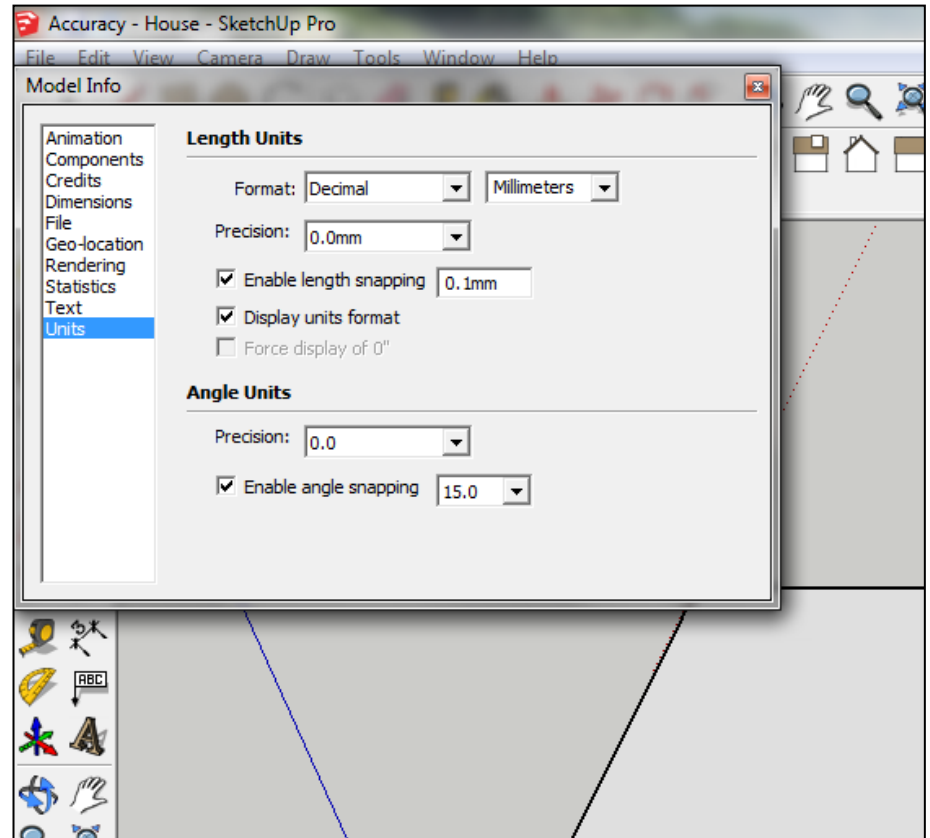
2. Select **Units** and choose **Decimal Millimetres**. We are using this template because we are doing a product design.

*Note: It is often necessary to start a new file to use the new template. Go to **File** then **New**.*

3. Now select the **View** then **toolbars** and ensure **Getting Started** and **Large Tool Set** are ticked
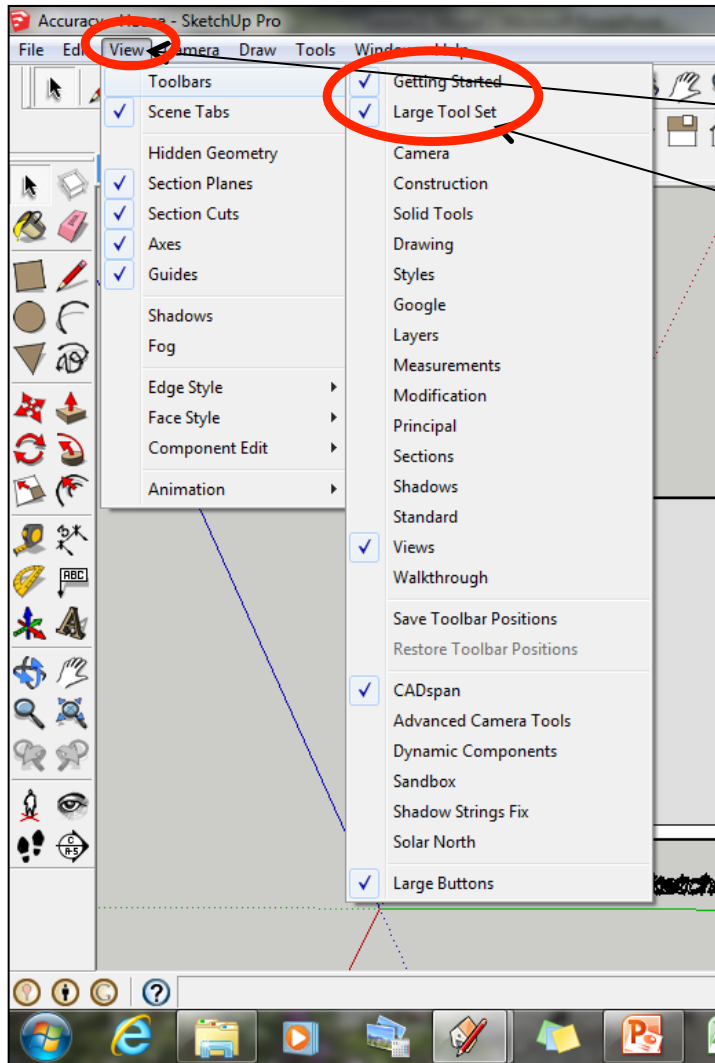
3a Select **View**

3b Tick Getting Started
3c Tick Large Tool Set

Note: this will place a tool bar across the top (getting started) and the side (Large Tool Set)

4. Open Library *Designoutthebox.com*/ CAD Skills/ Lesson 18 / Nature Inspired lamp

5. Each one of these pieces has been grouped. We are going to give each one thickness. Using the **select tool, double click** on the piece shown to edit it. All the other pieces should be greyed out.
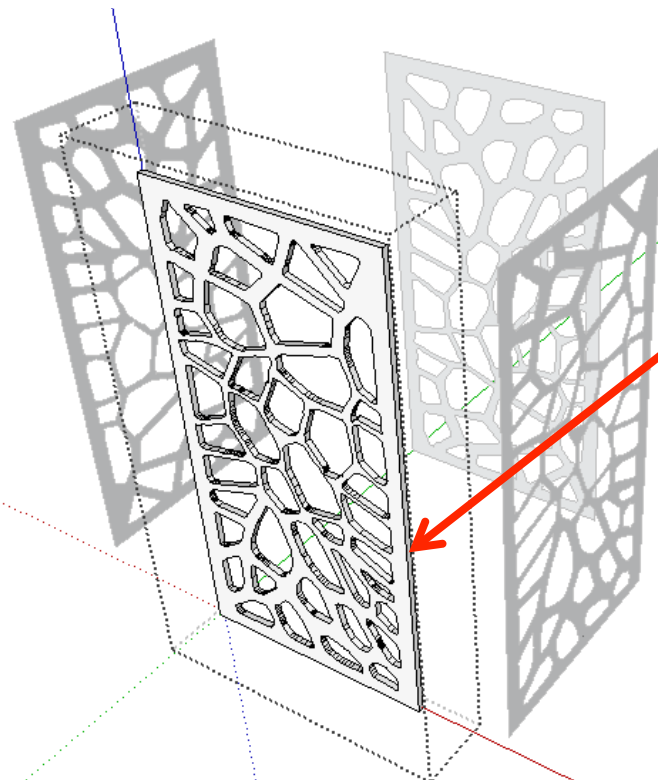
6. Using the *push pull tool.* Hover over the shape indicated. It will go *dotted* as you hover over it. Pull the shape outwards. Type in *4 and press enter.*

7. Repeat steps *4 and 5* on the other three sides so they are all 4mm thick*.*
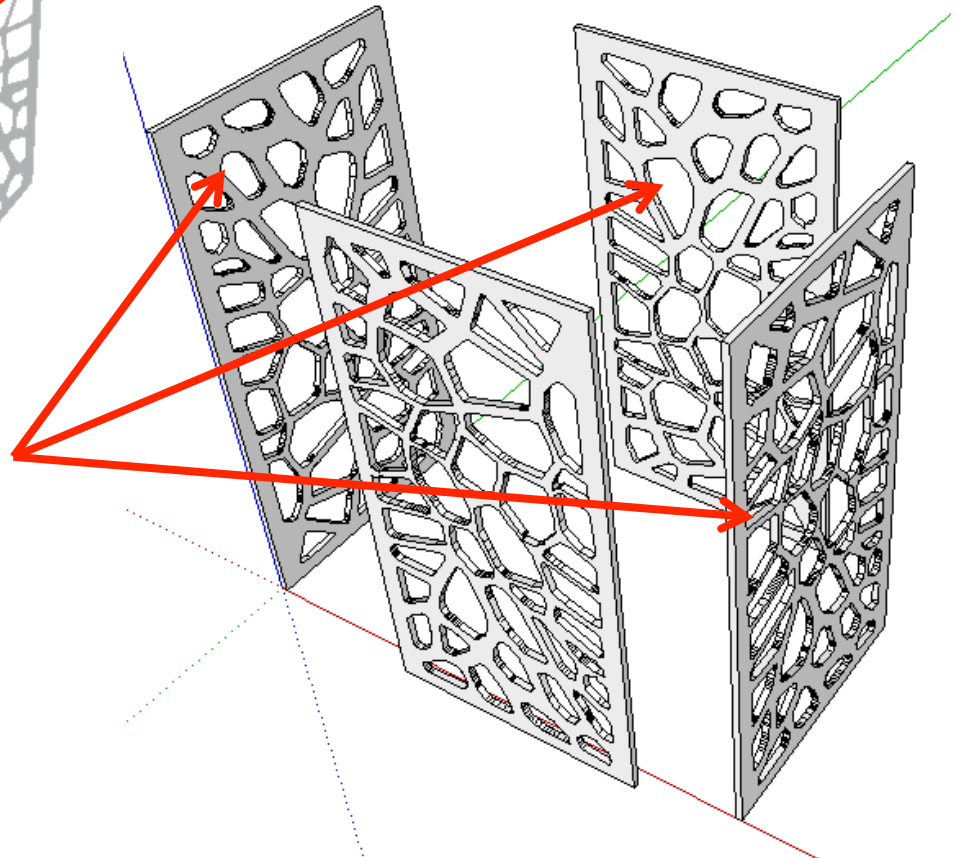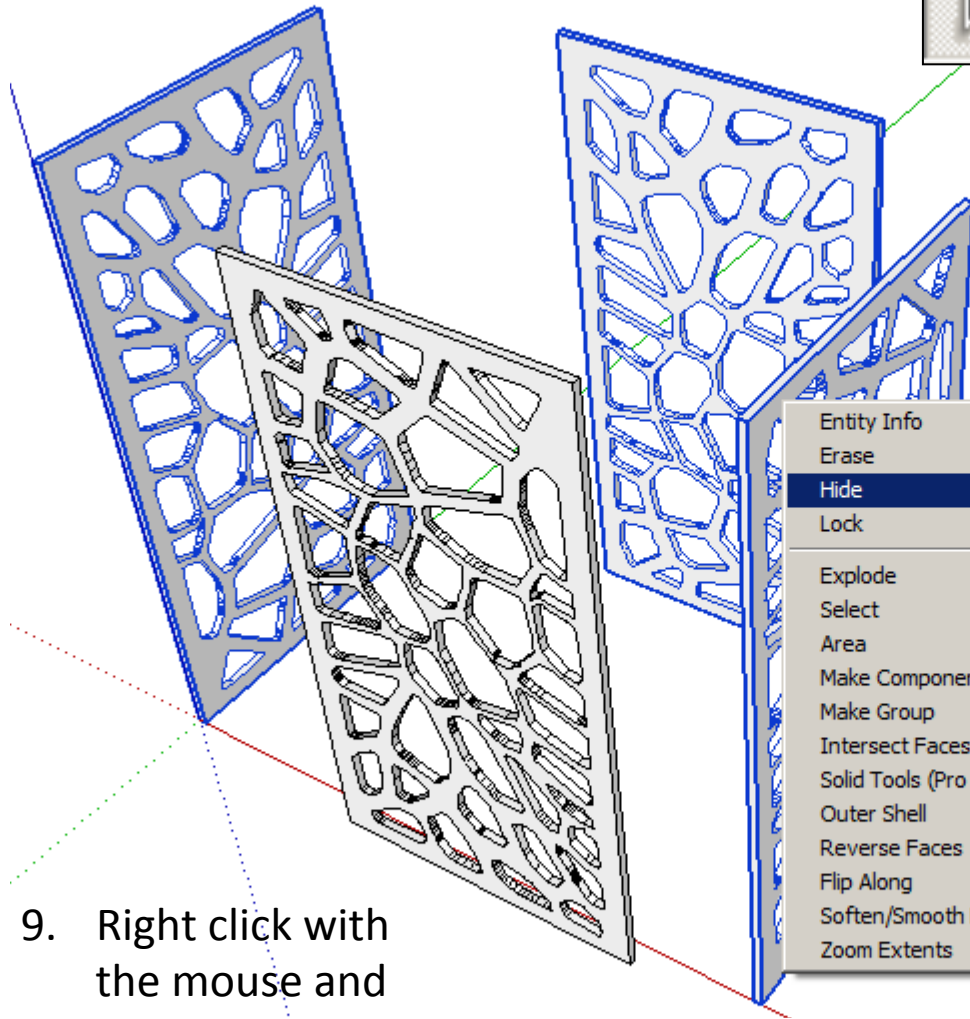
8. Using the **select tool,** click on the one of the side pieces.

   Hold the shift key down

   *(arrow pointing up found under caps lock)*
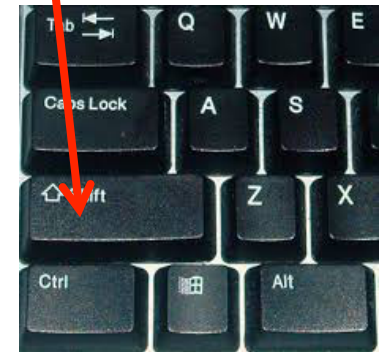
Click on the other two pieces so all three are highlighted

9. Right click with the mouse and select **hide.**

Entity Info
Erase
Hide
Lock

Explode
Select
Area
Make Component
Make Group
Intersect Faces
Solid Tools (Pro Only)
Outer Shell
Reverse Faces
Flip Along
Soften/Smooth Edges
Zoom Extents

10. Using the **select tool, double click** on the piece shown to edit it. All the other pieces should be greyed out. Then click on the edge shown to highlight it in blue.

| Entity Info |
| Erase |
| Hide |
| Select ▶ |
| Soften |
| **Divide** |
| Zoom Extents |
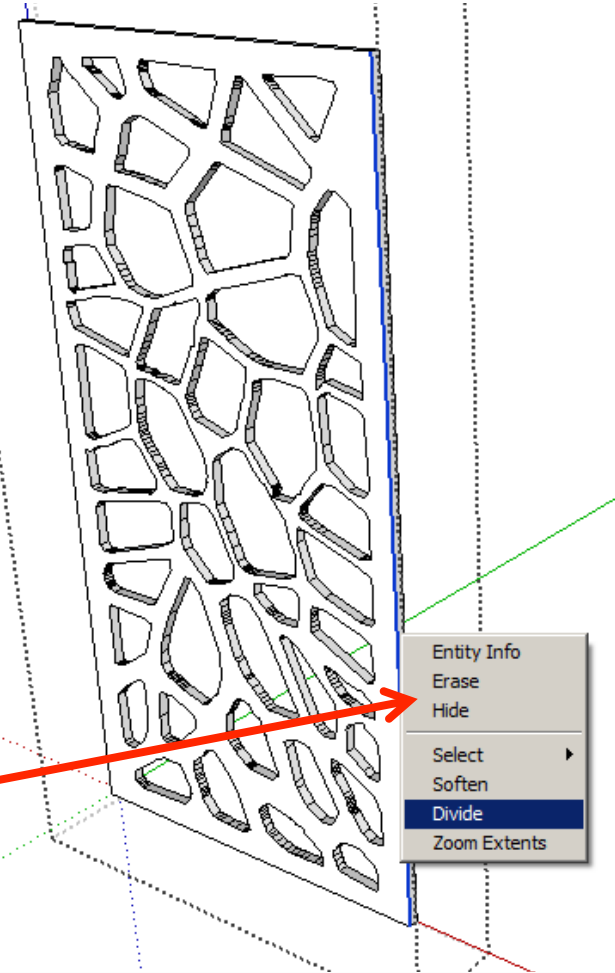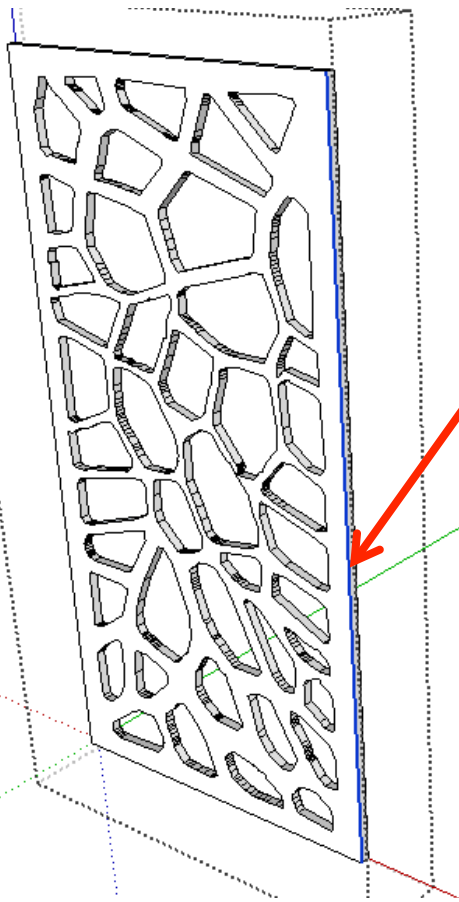
11. Whilst on the selected **blue** line, **right click** with the mouse and select **divide.**
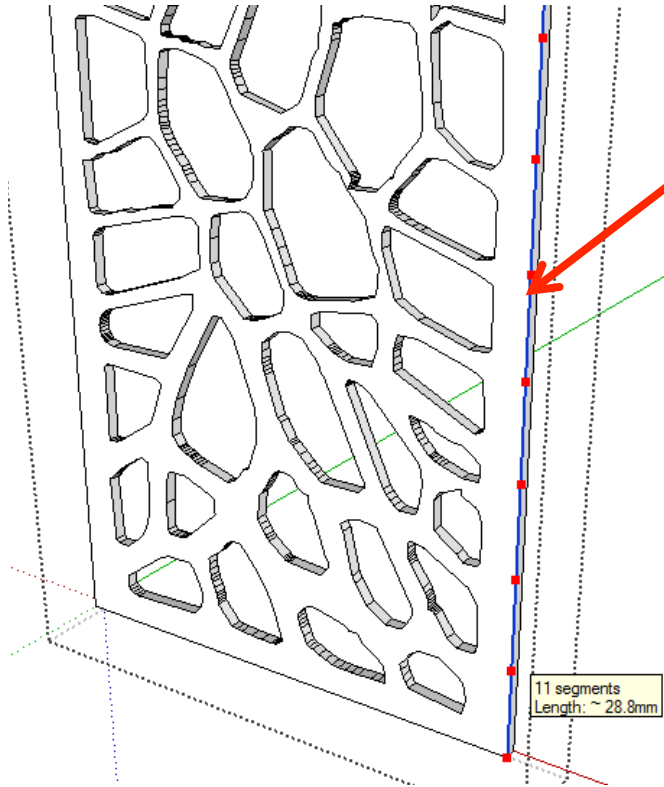
12. Using the *mouse,* you can move it up and down the blue line to divide it into segments or you can type *11 and press enter.*

NOTE: When drawing finger joints you always use an odd number.

11 segments
Length: ~ 28.8mm
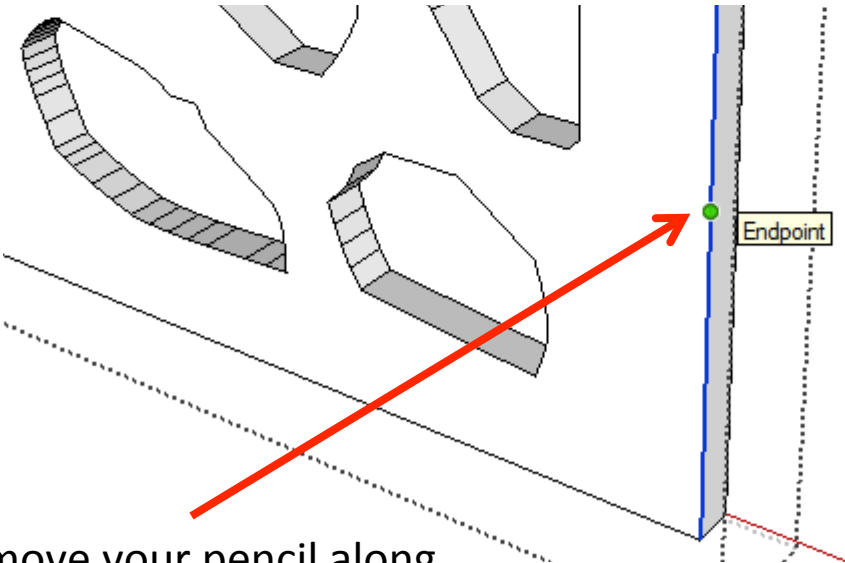
Endpoint

13. Using the *pencil tool,* move your pencil along the blue line until it snaps to an *endpoint*. Make your you *do not click* on a midpoint otherwise you will have 22 lines instead of 11.
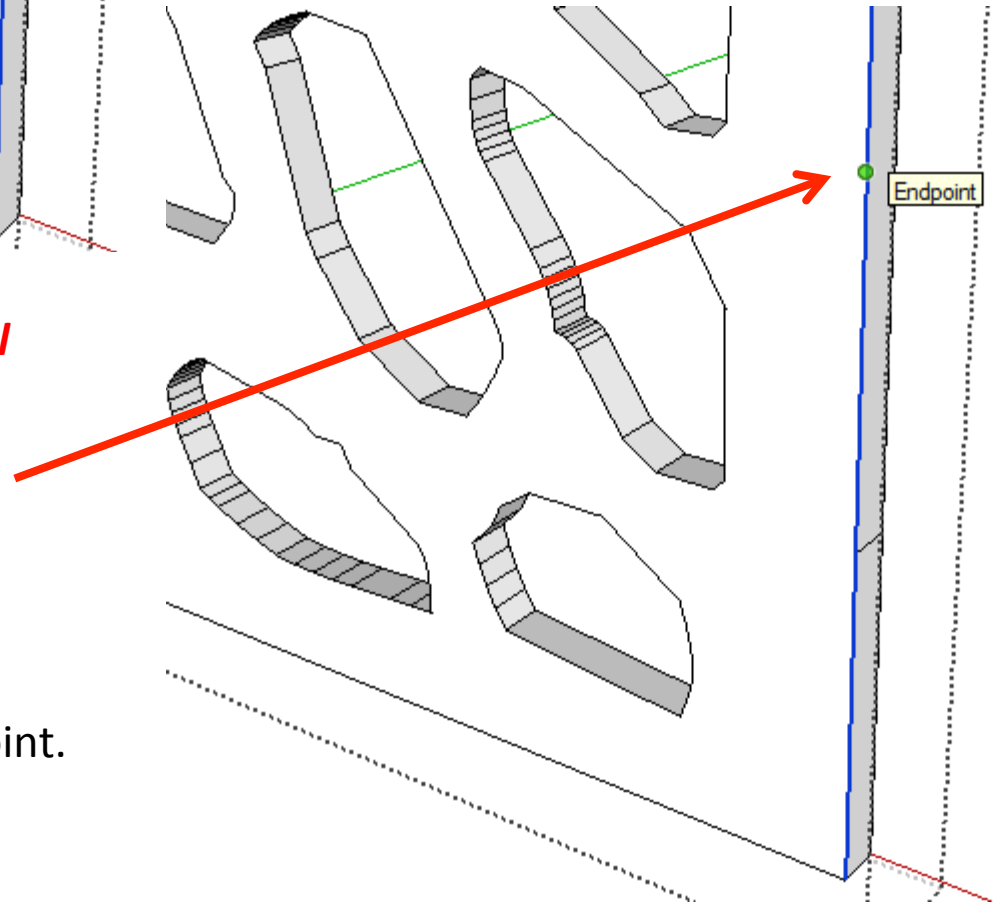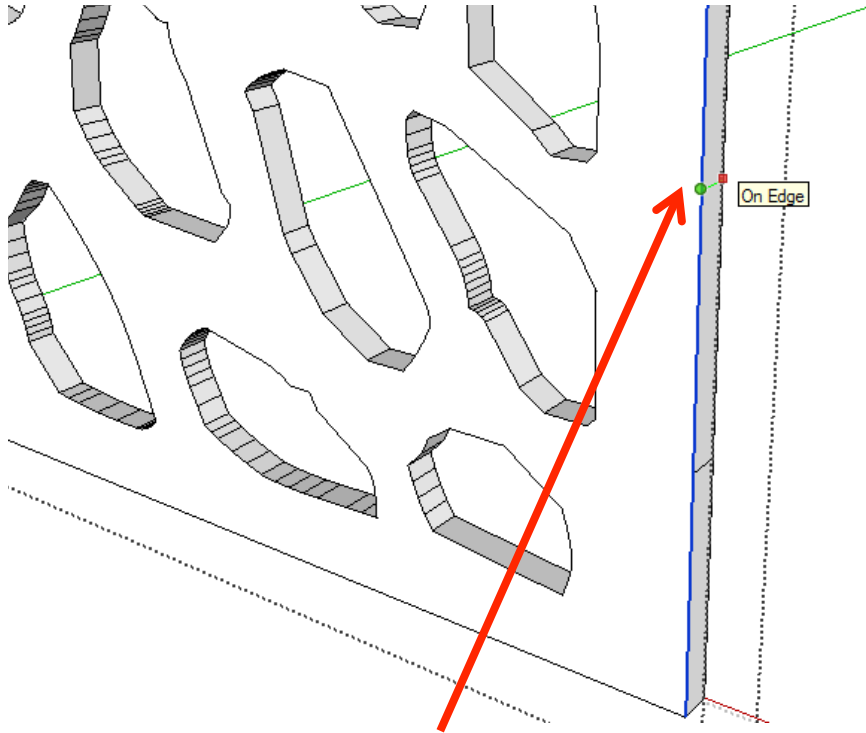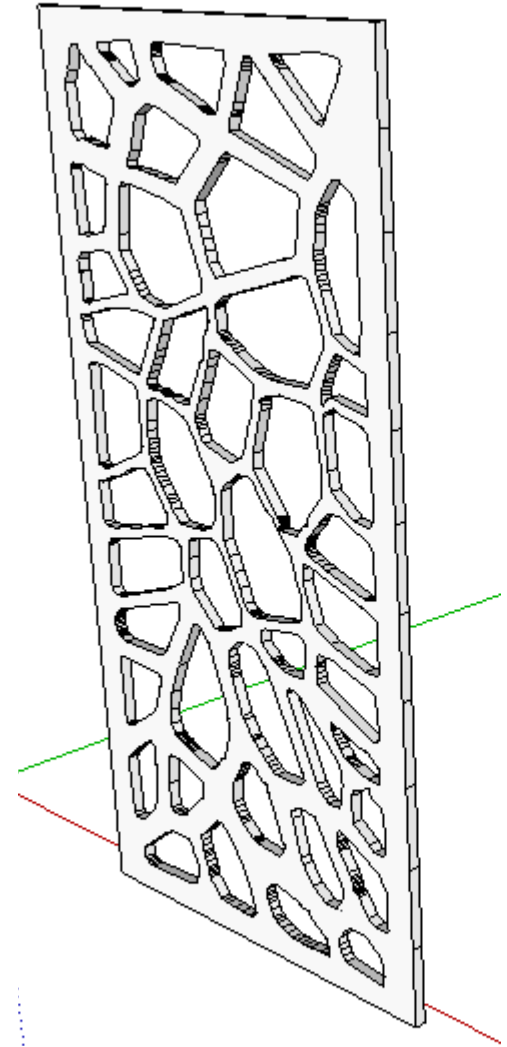
14. Using the **_pencil tool,_** draw a line across the green axis to the other **_edge._**
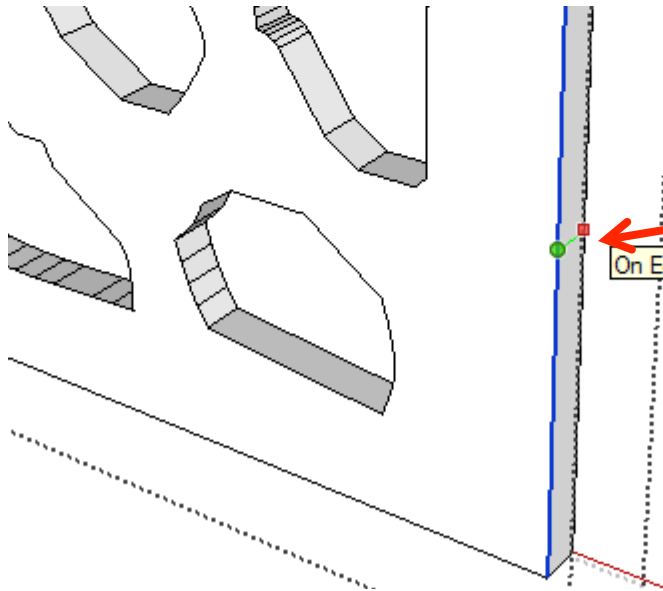
On Edge

Endpoint

15. Using the **_pencil tool,_** move your pencil along the blue line until it snaps to an **_endpoint_**. Make your you **_do not click_** on a midpoint.
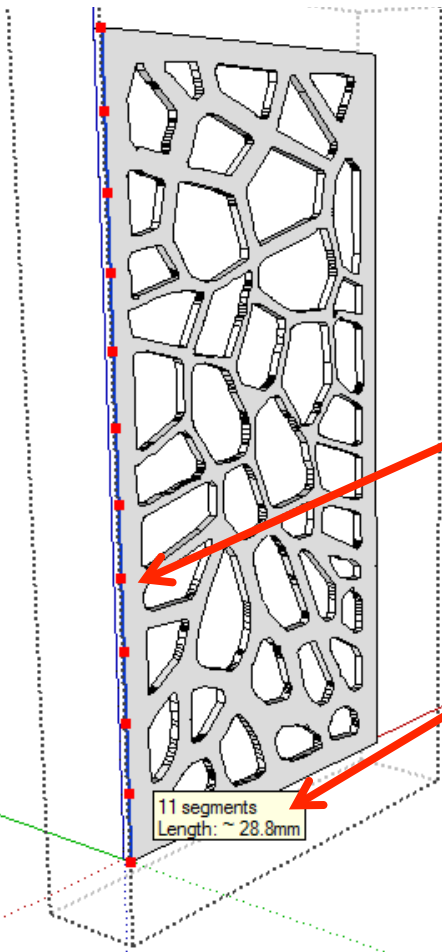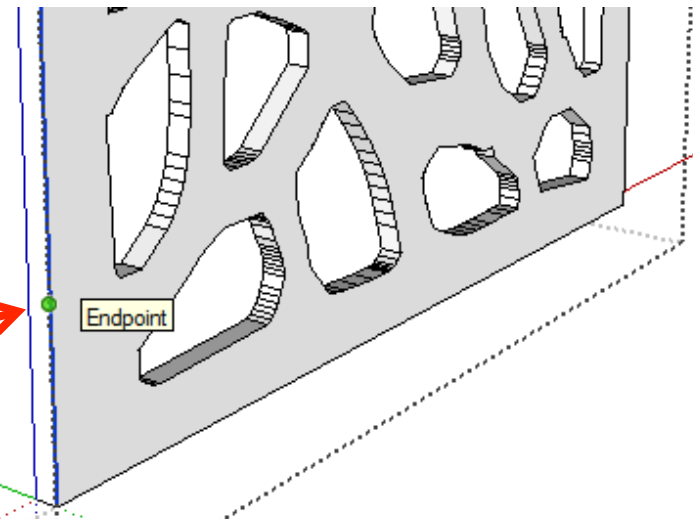
On Edge

16. Using the **pencil tool,** draw a line across the green axis to the other **edge.**

17.Repeat the lines all the way up on each endpoint. You should have 11 rectangles on the side.

18. Select the orbit tool and *rotate the piece so you can see the opposite side*.

19. Using the *select tool, double click* on the piece shown to edit it. All the other pieces should be greyed out. Then click on the edge shown to highlight it in blue.
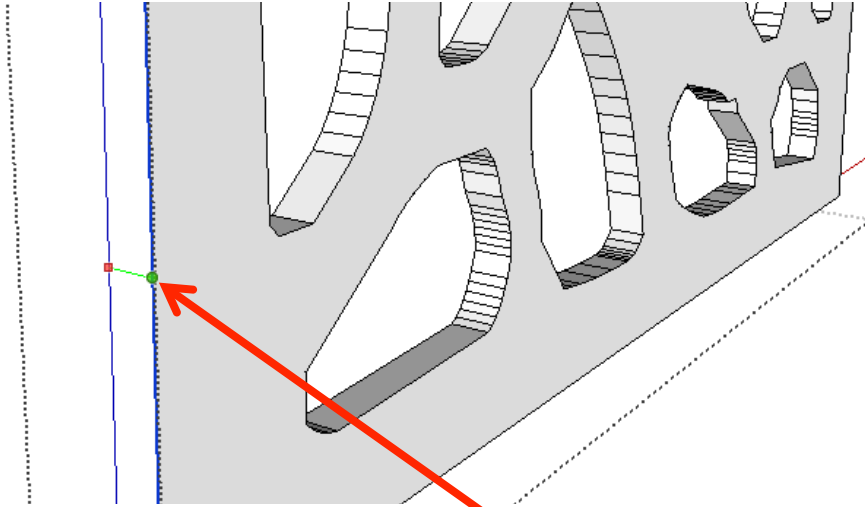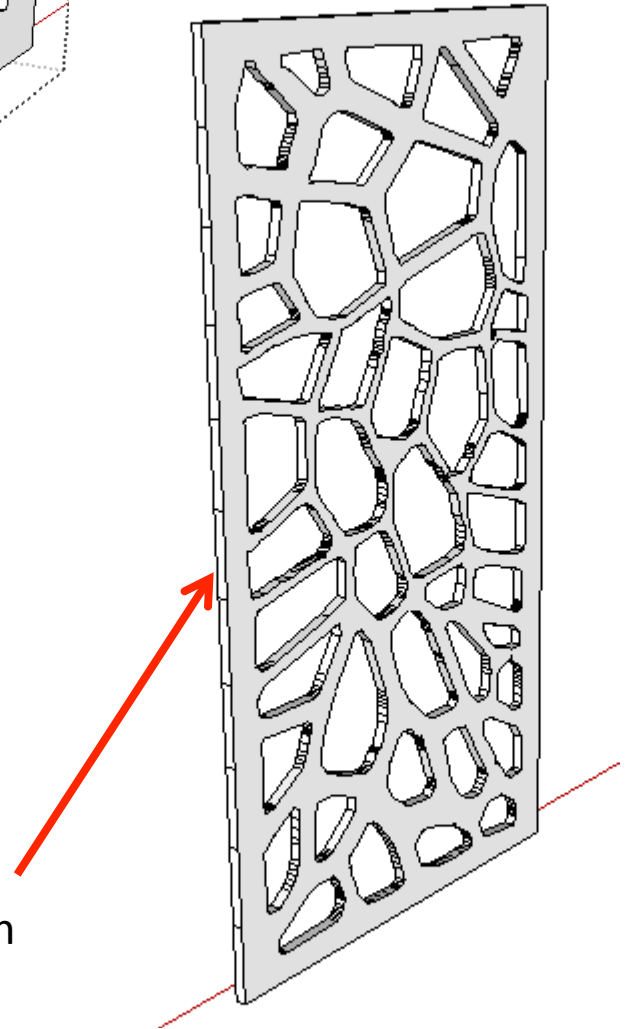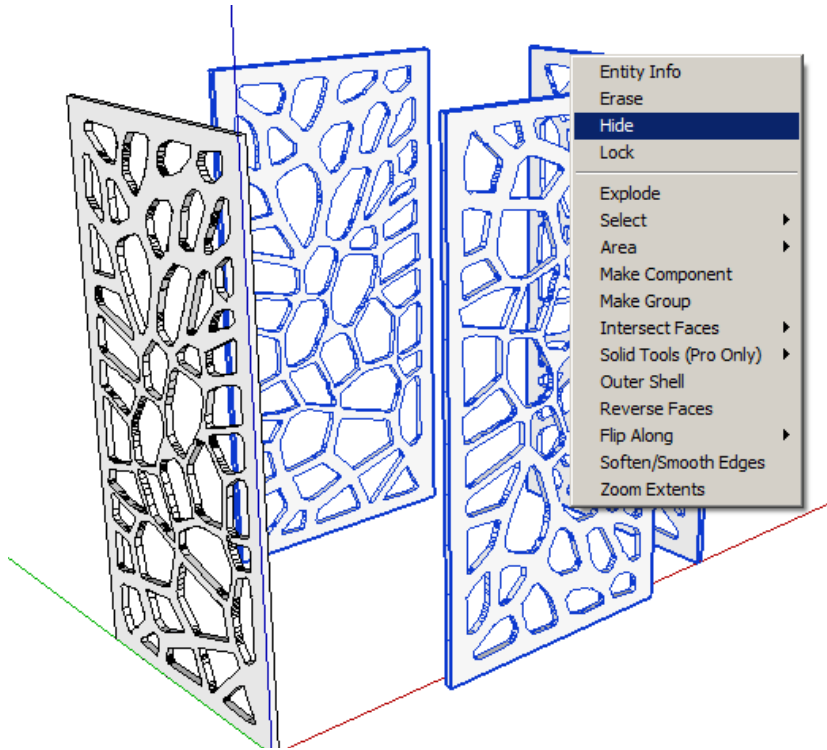
20. Whilst on the selected *blue* line, *right click* with the mouse and select *divide.* Using the *mouse,* you can move it up and down the blue line to divide it into segments or you can type *11 and press enter.*

11 segments
Length: ~ 28.8mm

Endpoint

21. Using the *pencil tool,* move your pencil along the blue line until it snaps to an *endpoint*.

22. Using the *pencil tool,* draw a line across the green axis to the other *edge.*

23. *Repeat* the lines all the way up on each endpoint. You should have 11 rectangles on the side.

24. Select the *edit tool bar* on the top of the page, slide down unit you come to *unhide* and then select *unhide all.*

25. All the pieces you previously hid will come reappear on the screen.

Context menu:

- Entity Info
- Erase
- **Hide**
- Lock
- ---
- Explode
- Select ▸
- Area ▸
- Make Component
- Make Group
- Intersect Faces ▸
- Solid Tools (Pro Only) ▸
- Outer Shell
- Reverse Faces
- Flip Along ▸
- Soften/Smooth Edges
- Zoom Extents

26. Using the *select tool,* click on the side piece with the lines drawn on.

Hold the shift key down

(arrow pointing up found under caps lock)

27. Right click with the mouse and select *hide.*
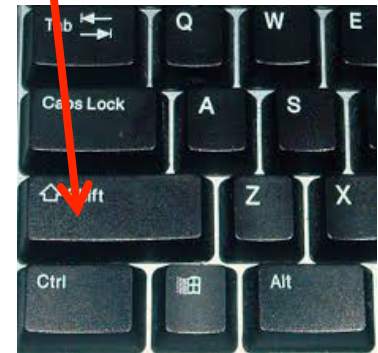
Click on the other two pieces so three are highlighted
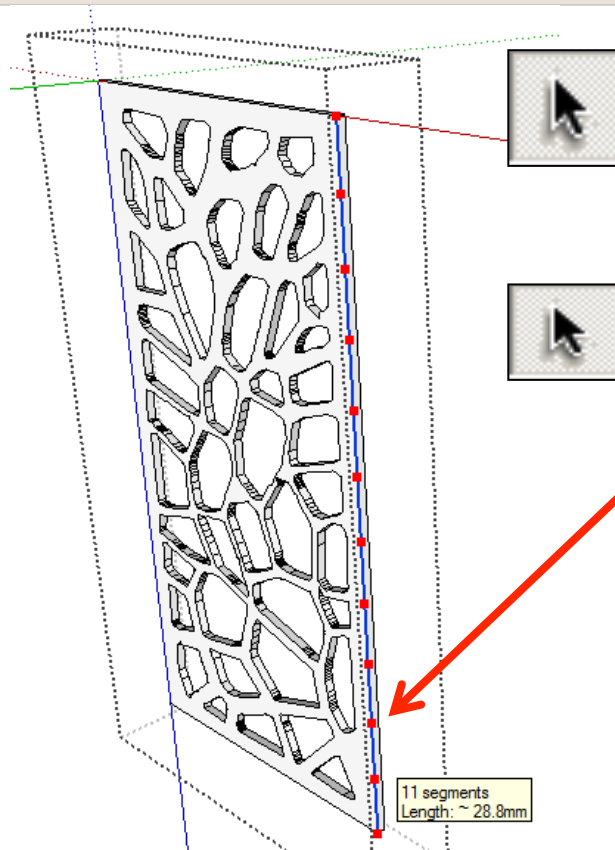
28. Using the *select tool, double click* on the piece shown to edit it. All the other pieces should be greyed out. Then click on the edge shown to highlight it in blue.

29. Whilst on the selected *blue* line, *right click* with the mouse and select *divide.* Using the *mouse,* you can move it up and down the blue line to divide it into segments or you can type *11 and press enter.*

11 segments
Length: ~ 28.8mm

30. Using the *pencil tool,* move your pencil along the blue line until it snaps to an *endpoint*. Draw your lines and repeat on the other side
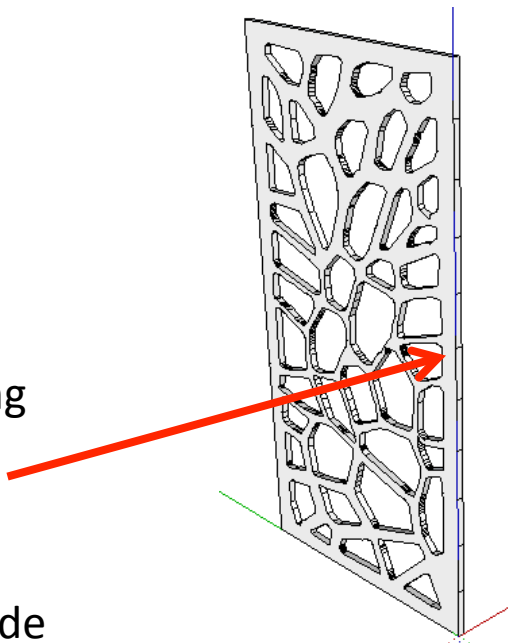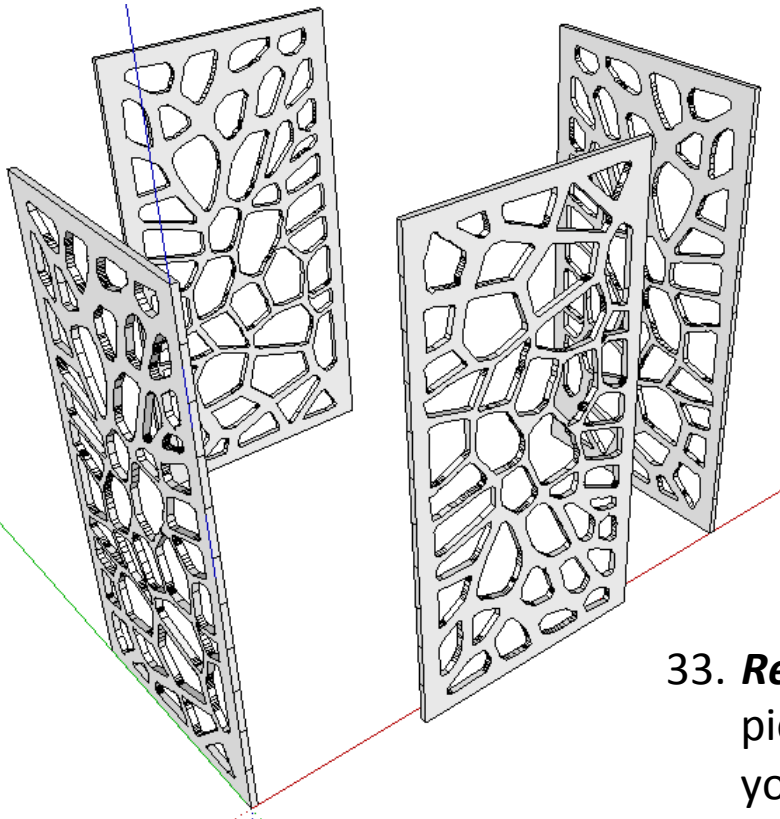
31. Select the *edit tool bar* on the top of the page, slide down unit you come to *unhide* and then select *unhide all.*

32. All the pieces you previously hid will come reappear on the screen.

33. *Repeat the previous steps* so that all four pieces have the divide lines on each side. If you get stuck just follow the steps *8 - 24*
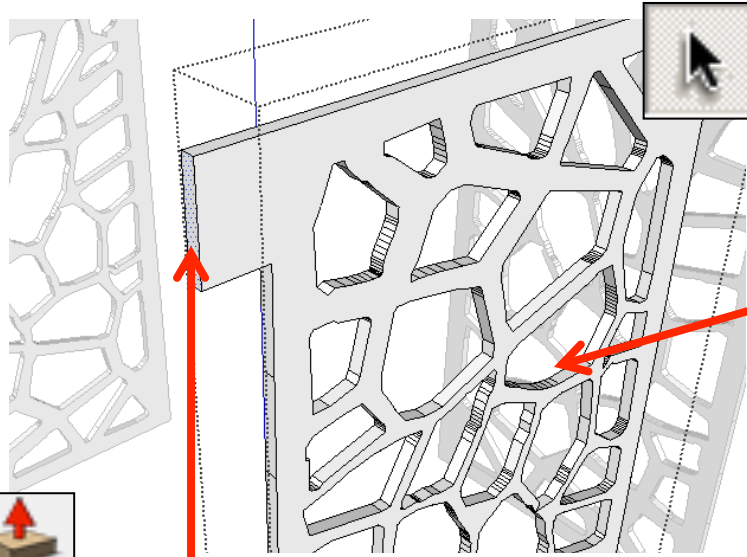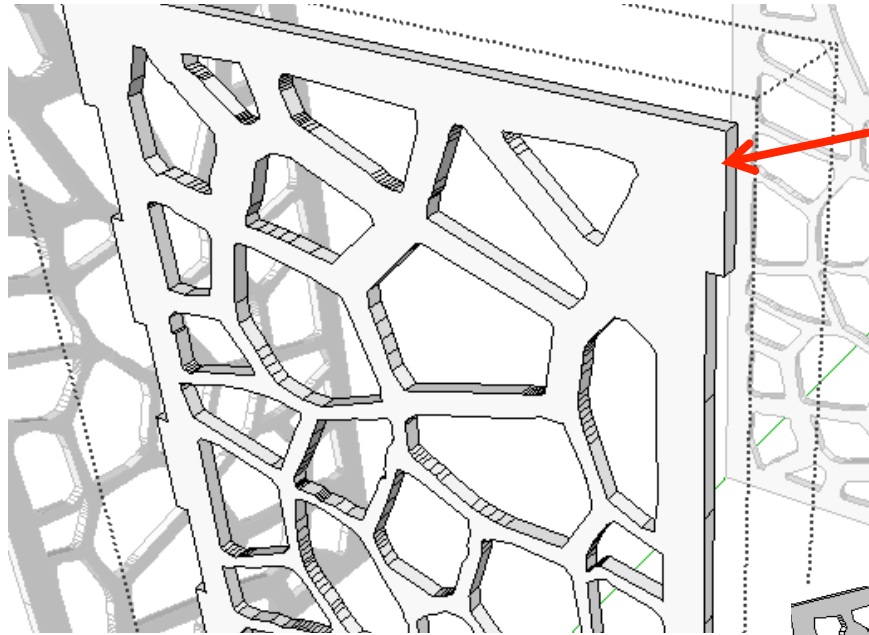
34. Using the *select tool, double click* on the piece shown to edit it. All the other pieces should be greyed out..

35. Using the *push pull tool.* Hover over the top rectangle on the side. It will go *dotted* as you hover over it. Pull the shape outwards. Type in *4 and press enter.*

36. Using the *push pull tool.* Repeat for every other rectangle down the side by pulling each one out by 4 as shown opposite
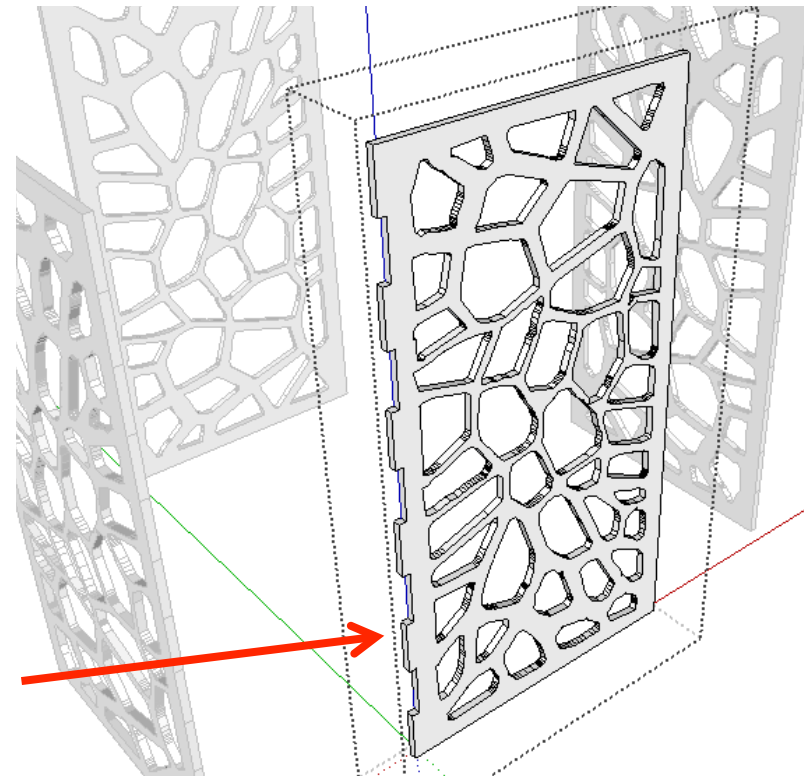
37. ***Repeat the previous steps*** on the opposite by pulling the top rectangle out, typing ***4 and pressing enter.***

38. Using the ***push pull tool.*** Repeat for every other rectangle down the side by pulling each one out by 4 as shown opposite
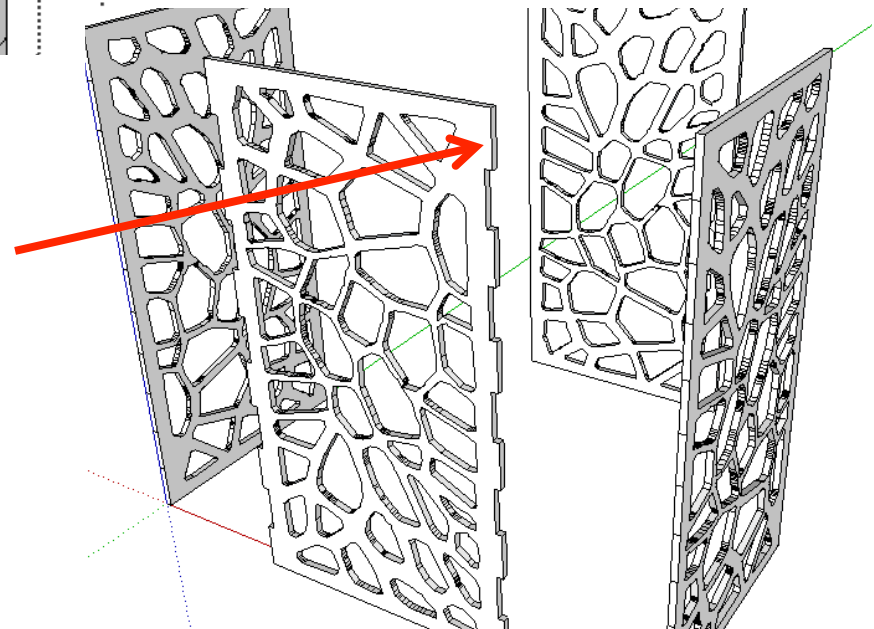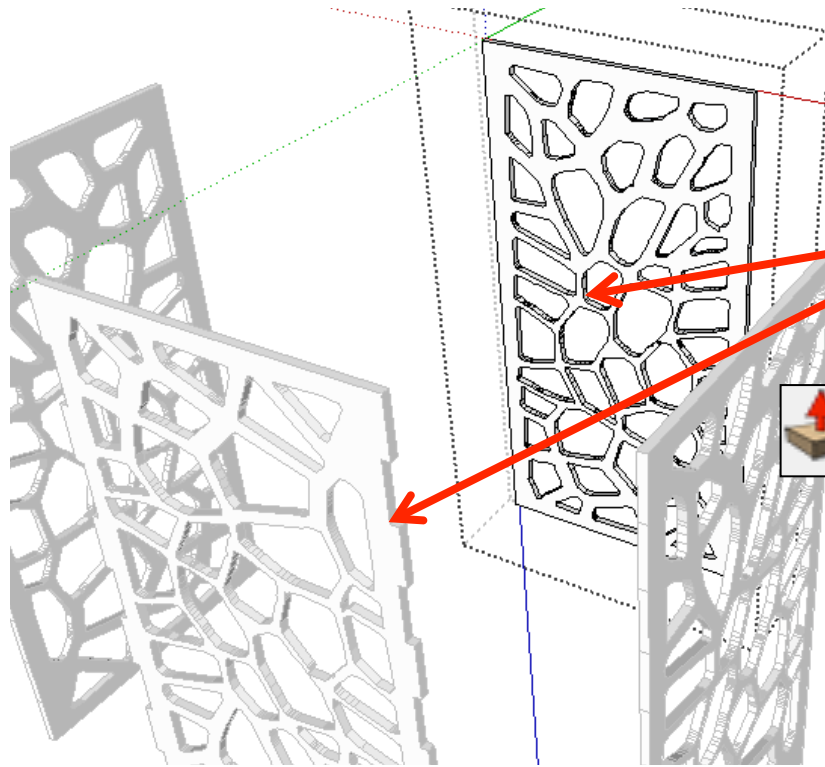
39. Using the *select tool, double click* on a piece directly opposite the last one to edit it. All the other pieces should be greyed out.
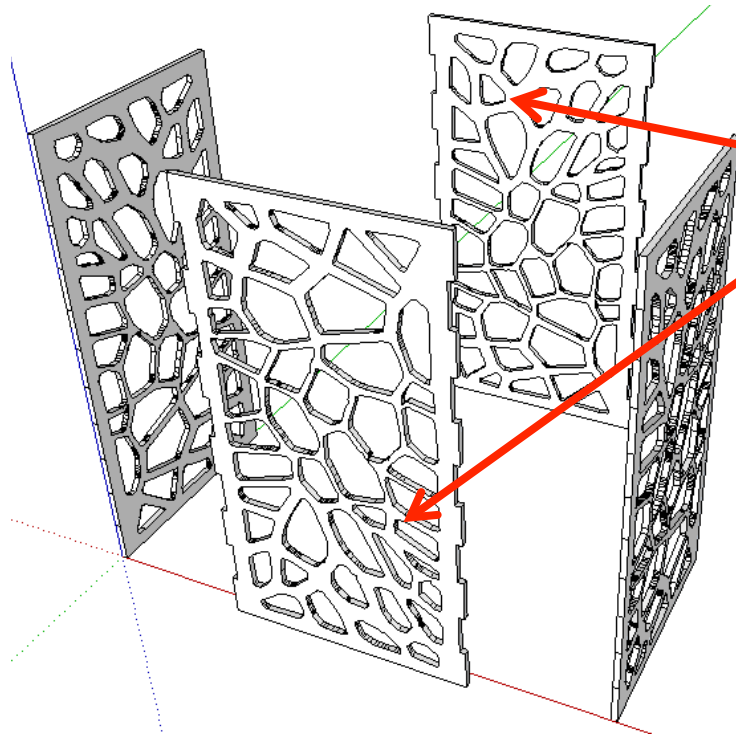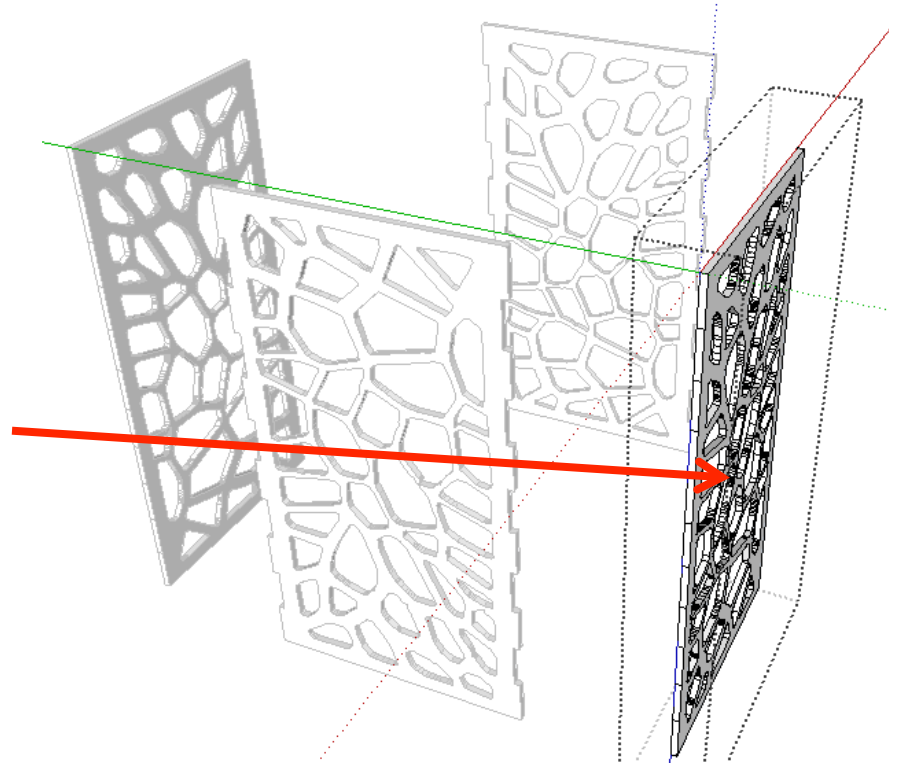
40. Using the *push pull tool.* Hover over the top rectangle on the side. It will go *dotted* as you hover over it. Pull the shape outwards. Type in *4 and press enter.*

41. Using the *push pull tool.* Repeat for every other rectangle down the side by pulling each one out by 4 as shown previously and repeat on both sides
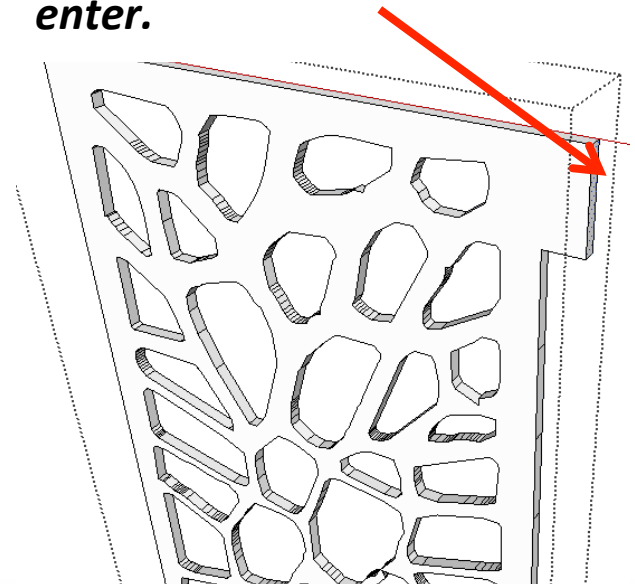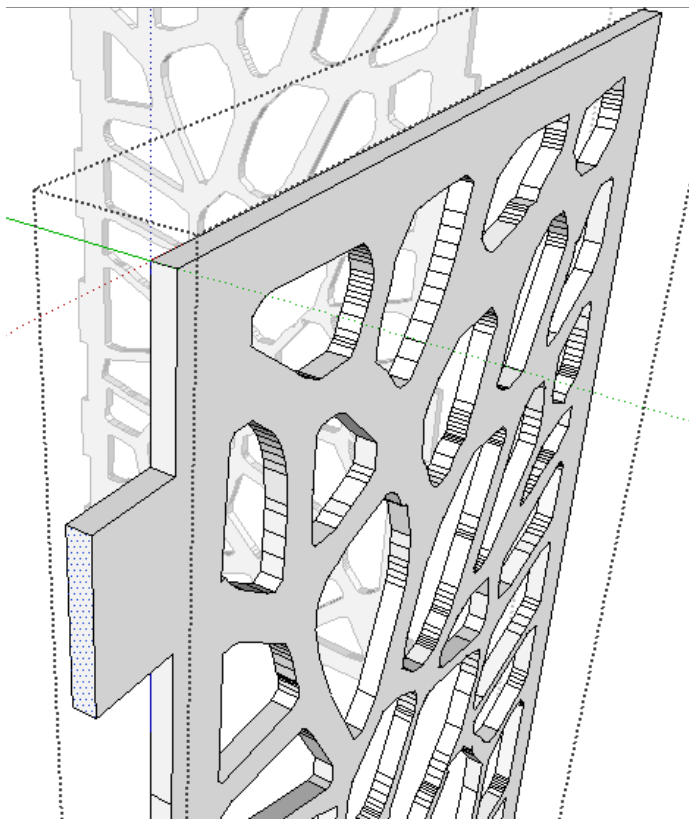
42. You should now have two pieces opposite each other with identical finger joints on both sides as shown

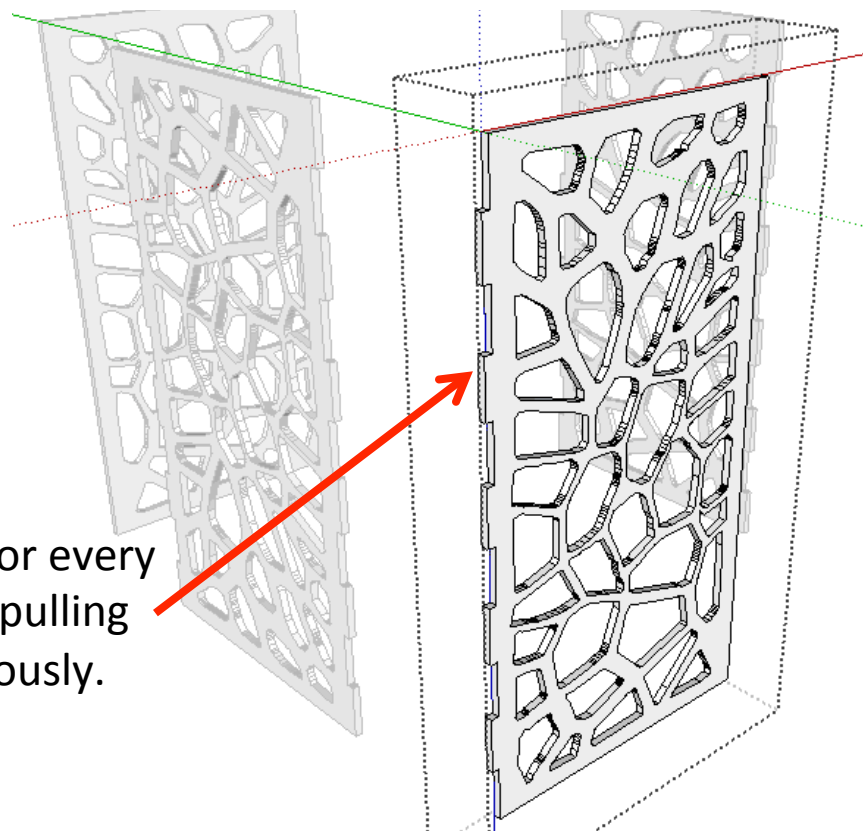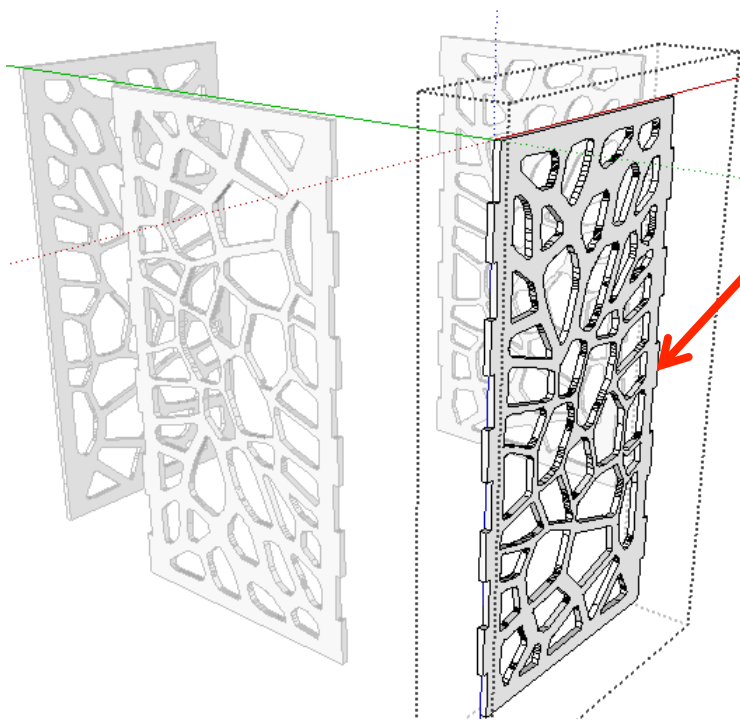43. Using the *select tool, double click* on the piece shown. All the other pieces should be greyed out.

44. Using the *push pull tool.* Hover over the second from top rectangle this time. It will go *dotted* as you hover over it. Pull the shape outwards. Type in *4 and press enter.*
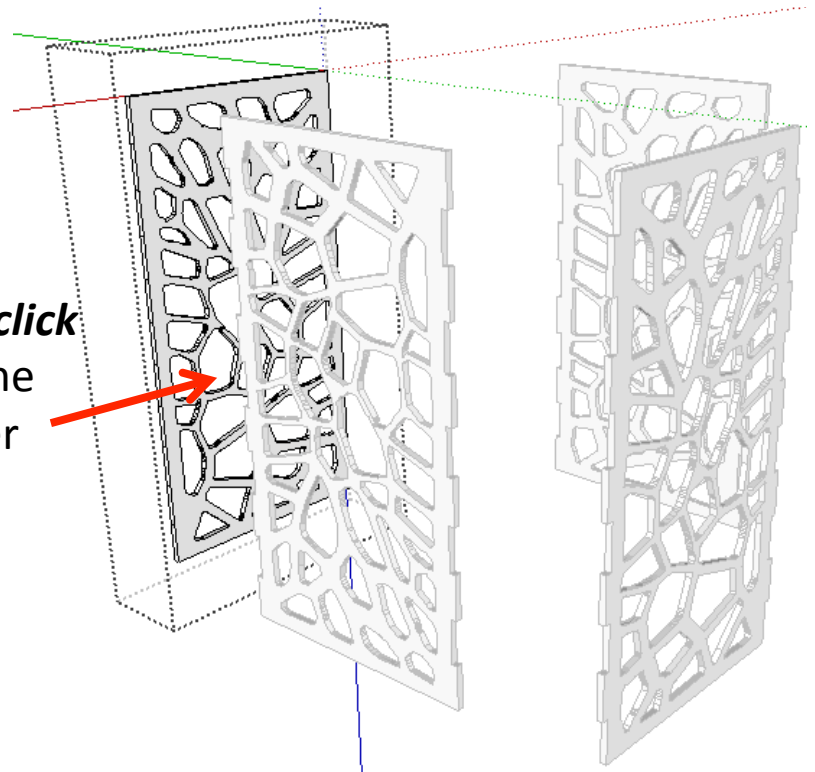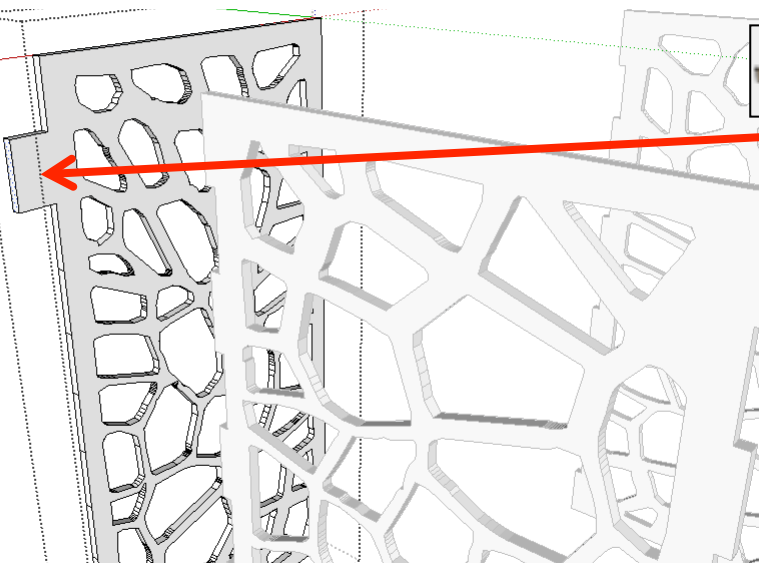
45. Using the *push pull tool.* Repeat for every other rectangle down the side by pulling each one out by 4 as shown previously.

46. Using the ***push pull tool.*** Repeat on the opposite side starting with the second from top rectangle first.

47. Using the ***select tool, double click*** on a piece directly opposite the last one to edit it. All the other pieces should be greyed out.
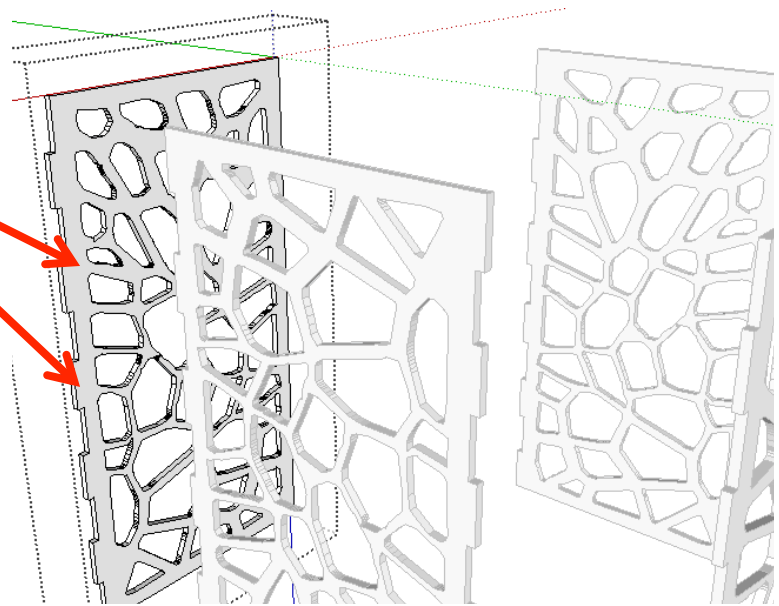
48. Using the *push pull tool.* Hover over the second from top rectangle this time. It will go *dotted* as you hover over it. Pull the shape outwards. Type in **4 and press enter.**
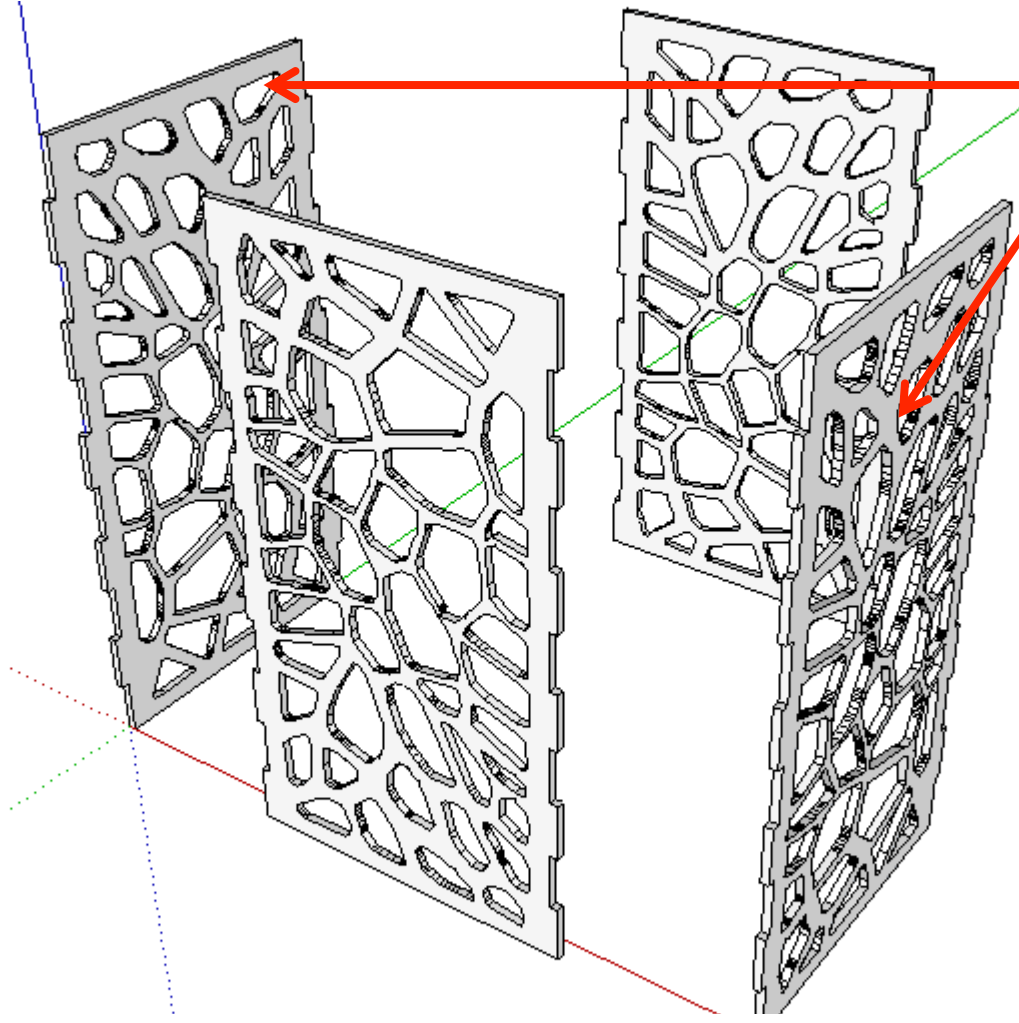
49. Using the *push pull tool.* Repeat for every other rectangle down the side by pulling each one out by 4 as shown previously.
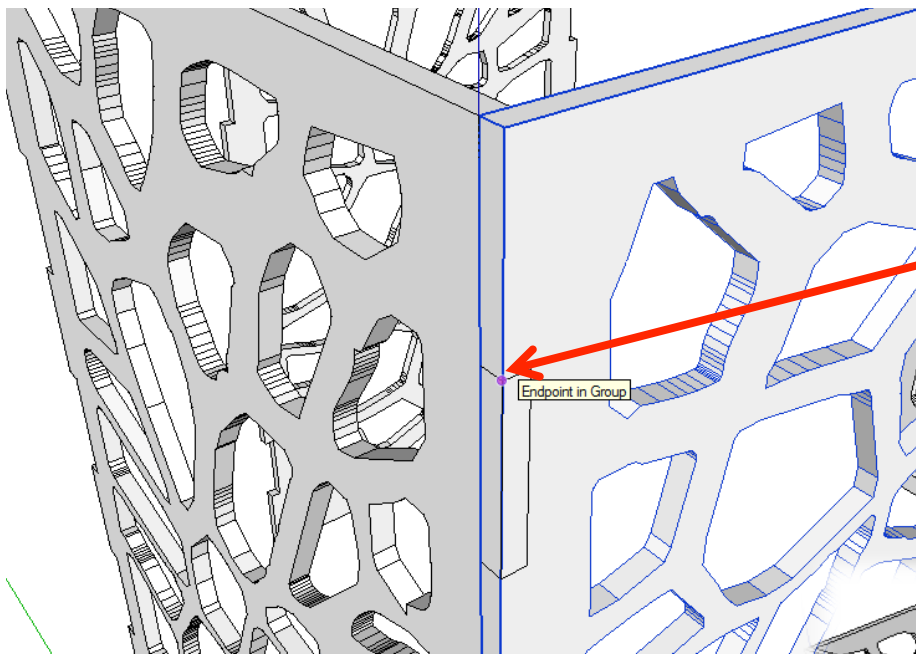
50. Using the *push pull tool.* Repeat on the opposite side starting with the second from top rectangle first.

51. You should now have two pieces opposite each other with identical finger joints on both sides as shown
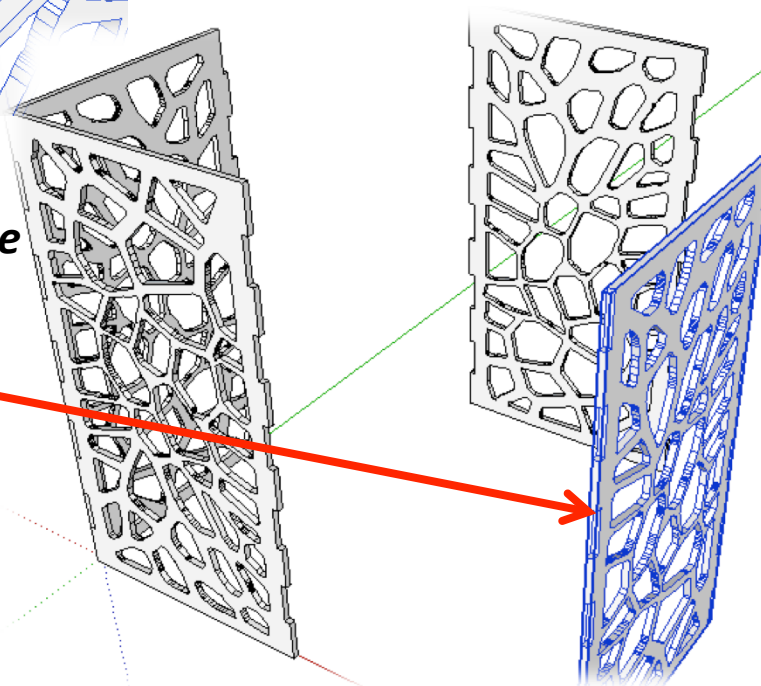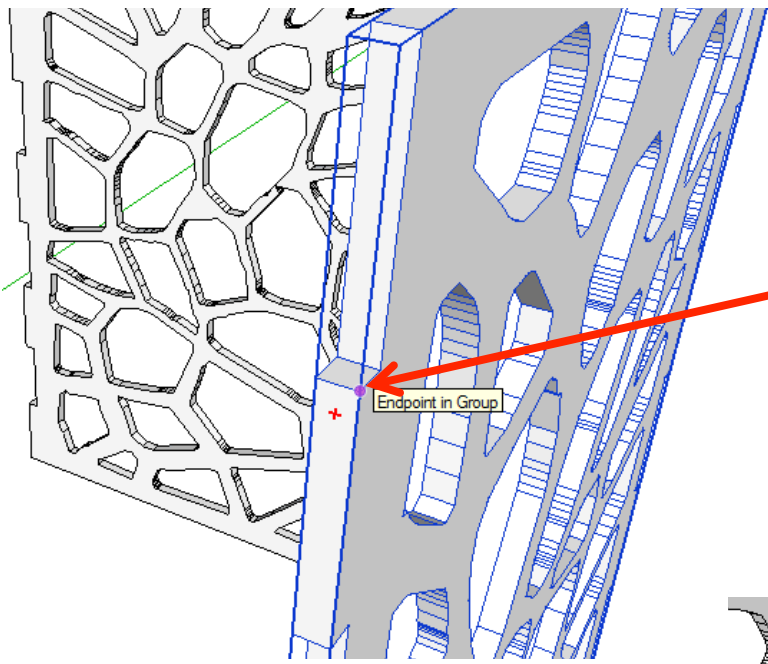
52. Using the **select tool, click once** on one of the pieces. It will go **blue** as shown.
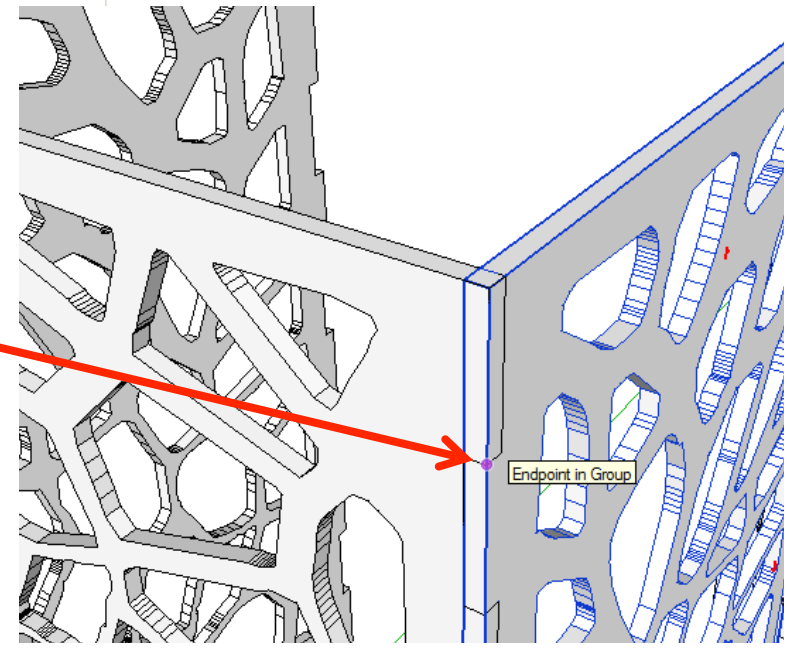
Endpoint in Group

53. Using the **move tool**, click on the **end point** shown.

Endpoint in Group

54. Using the ***move tool***, move the piece so the finger joints ***end points*** line up as shown.

Endpoint in Group

55. Using the ***select tool, click once*** on one of the pieces. It will go ***blue*** as shown.
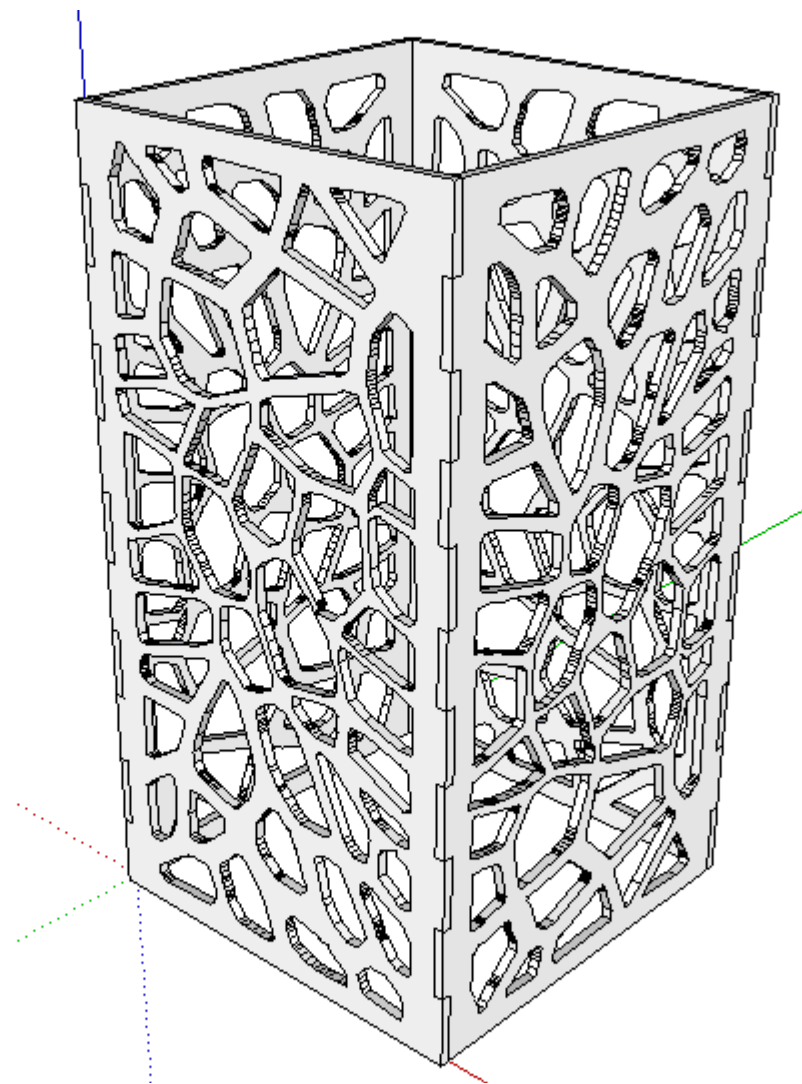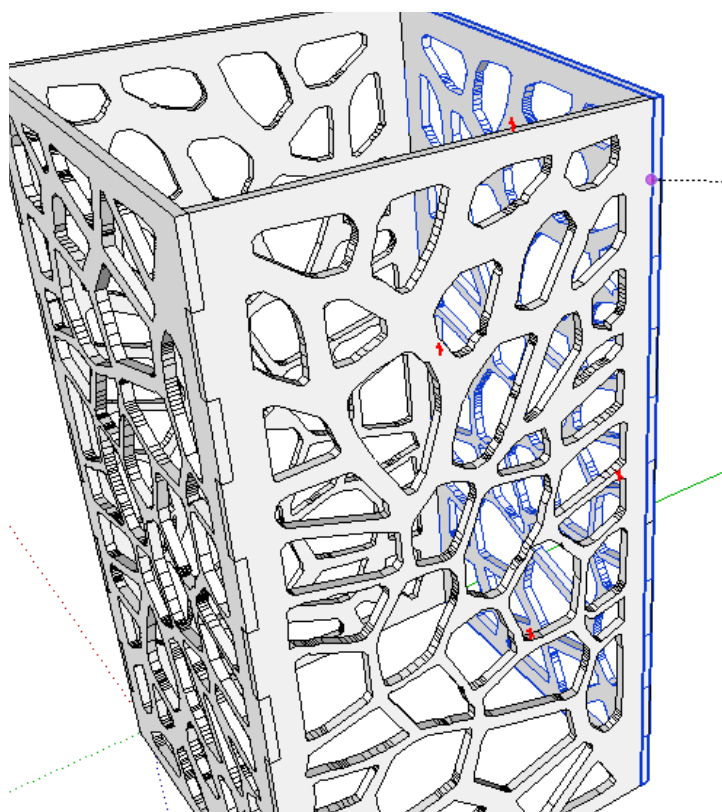
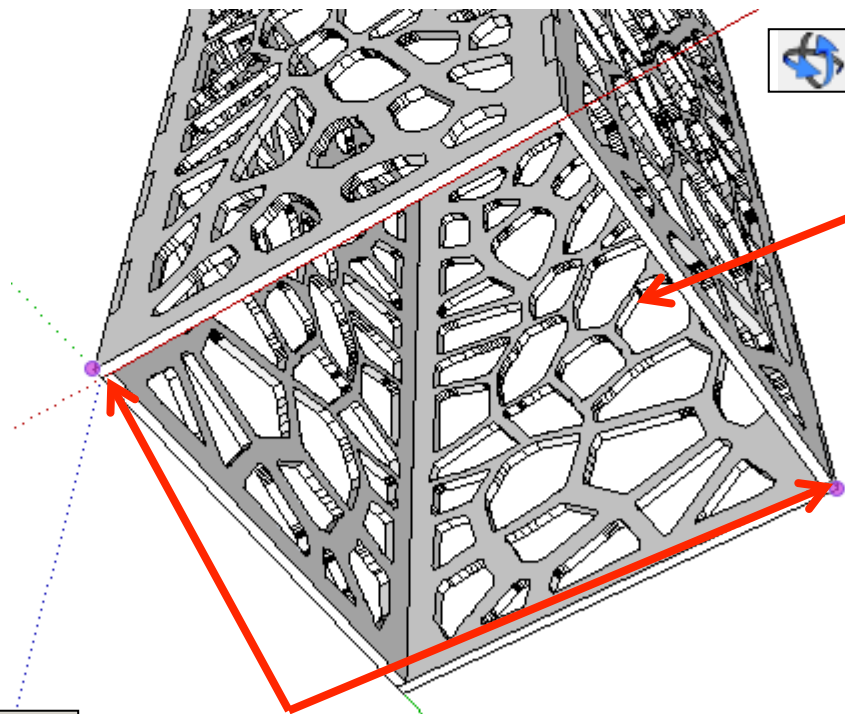56. Using the *move tool*, click on the **end point** shown.

57. Using the *move tool*, move the piece so the finger joints **end points** line up as shown.
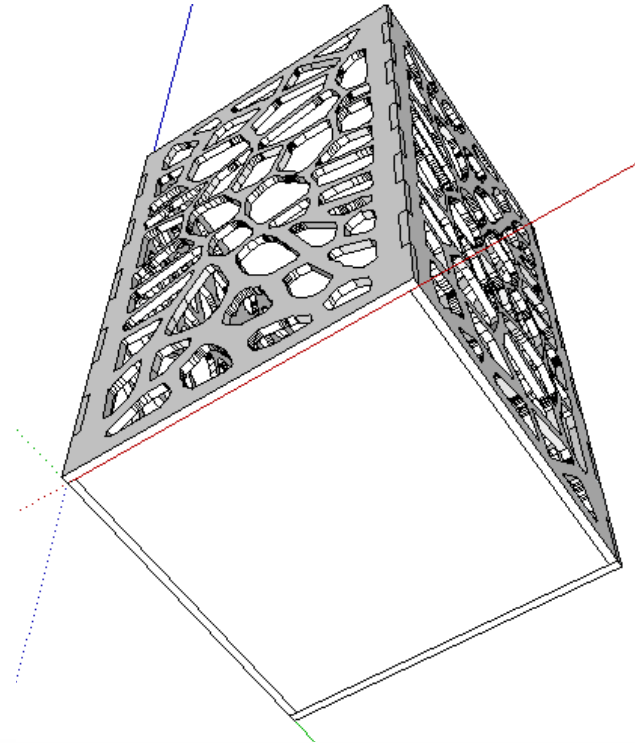
58. Using the *move tool*, move the last piece so the finger joints *end points* line up as shown. Your lamp side pieces should line up as shown.
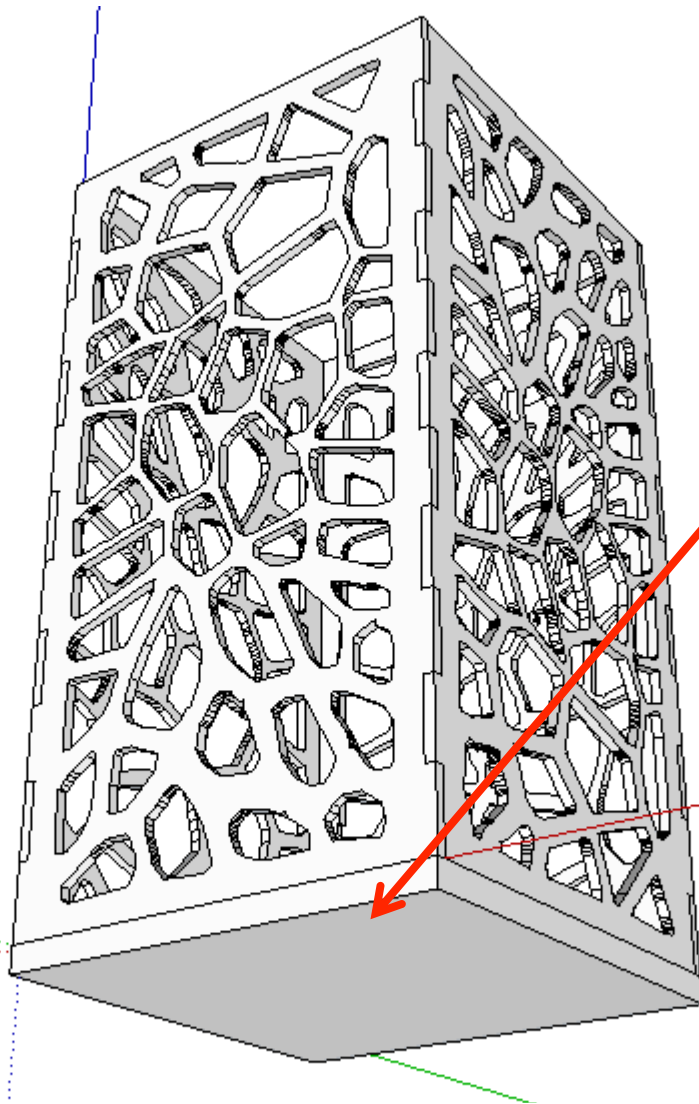
59. Select the orbit tool and *rotate the piece so you can see the underneath of your lamp*.
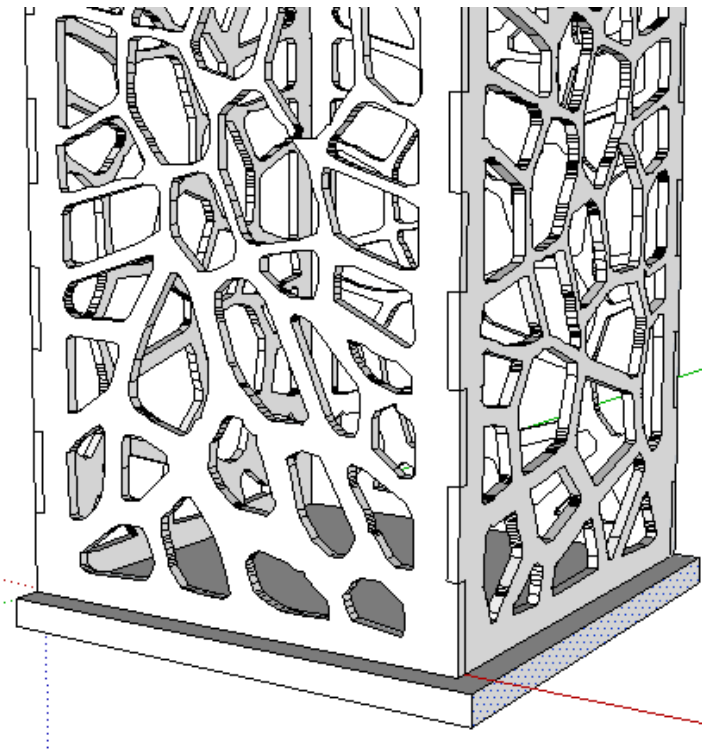
Endpoint in Group

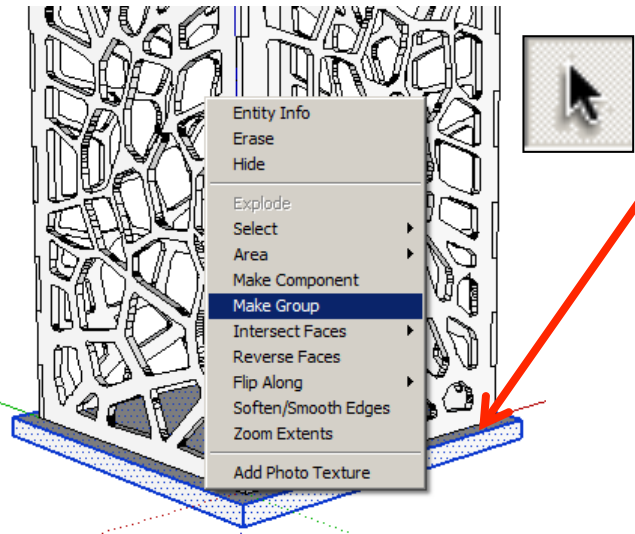**60.** Select the *rectangle tool* and click to *start one one endpoint* shown and *finish on the endpoint* on the *diagonal.*
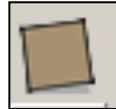
61. Using the *push pull tool.* Pull the rectangle down. *Type in 10 and press enter.*

62. Using the **_select tool, click_** on the base piece three times and right click on the mouse and **_press make group_**

Entity Info
Erase
Hide

Explode
Select ▸
Area ▸
Make Component
Make Group
Intersect Faces ▸
Reverse Faces
Flip Along ▸
Soften/Smooth Edges
Zoom Extents

Add Photo Texture

63. Select the **_rectangle tool_** and click to **_start one one endpoint_** shown and **_finish on the endpoint_** on the **_diagonal._**

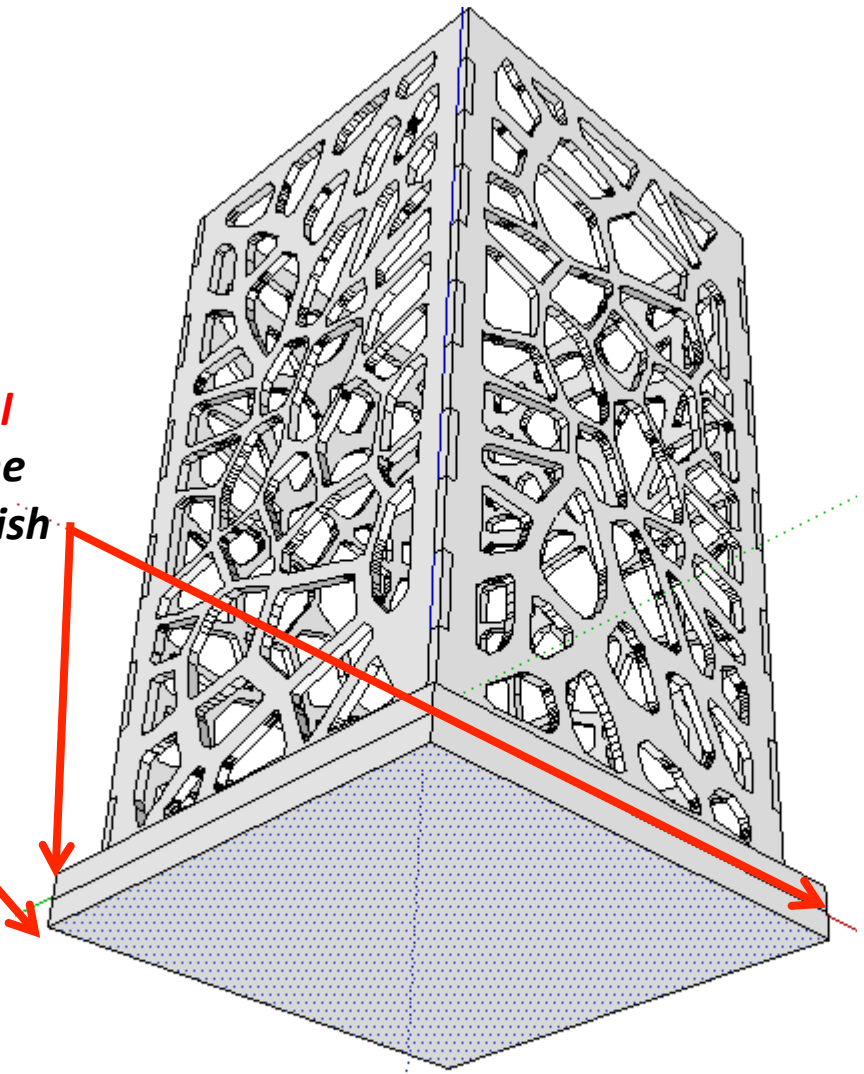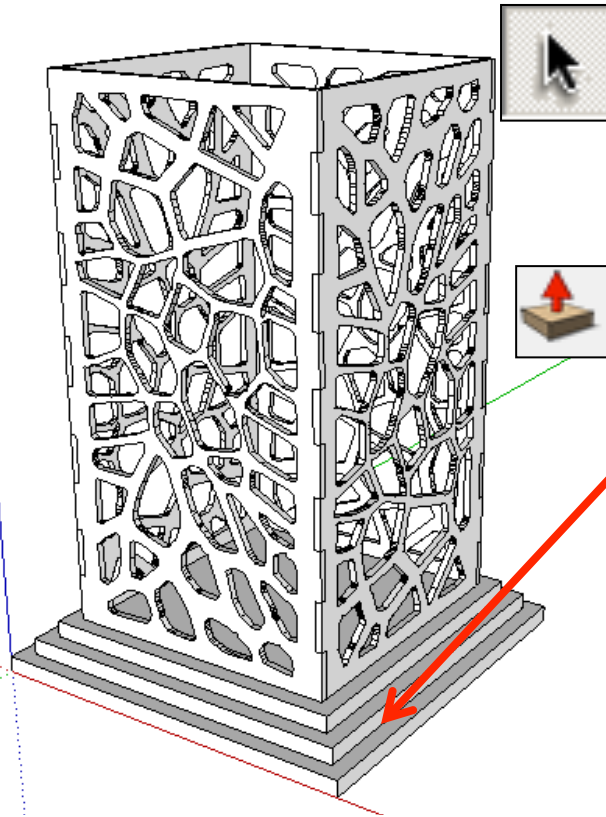64. Using the **_push pull tool._** Pull the rectangle down. **_Type in 10 and press enter. Make it a group_**

65. Using the **select tool, double click** on a piece bottom piece you have drawn to edit it. All the other pieces should be greyed out.

66. Using the **push pull tool.** Pull the sides out. **Type in 10 and press enter. It should give you a stepped effect.** Add a third base and step again.

67. Repeat all the steps to add a roof on. Experiment with your roof and base design. Perhaps use the **follow me tool** to add a fancy edge.
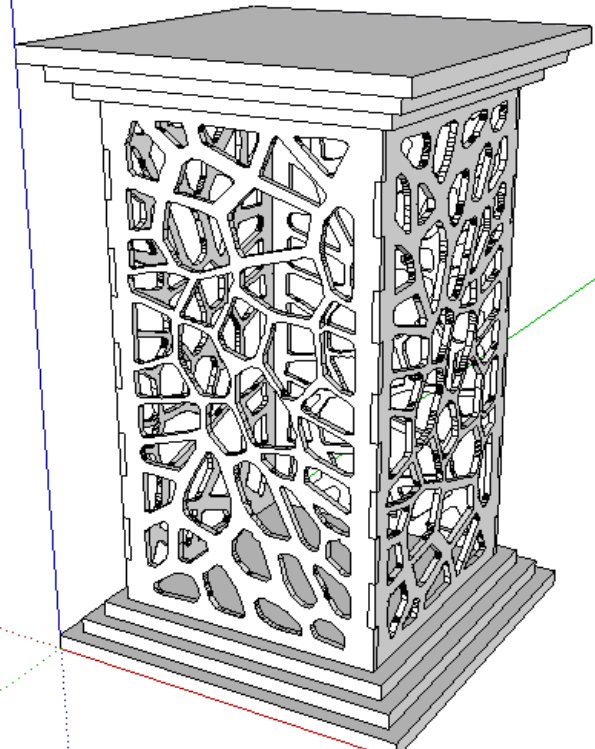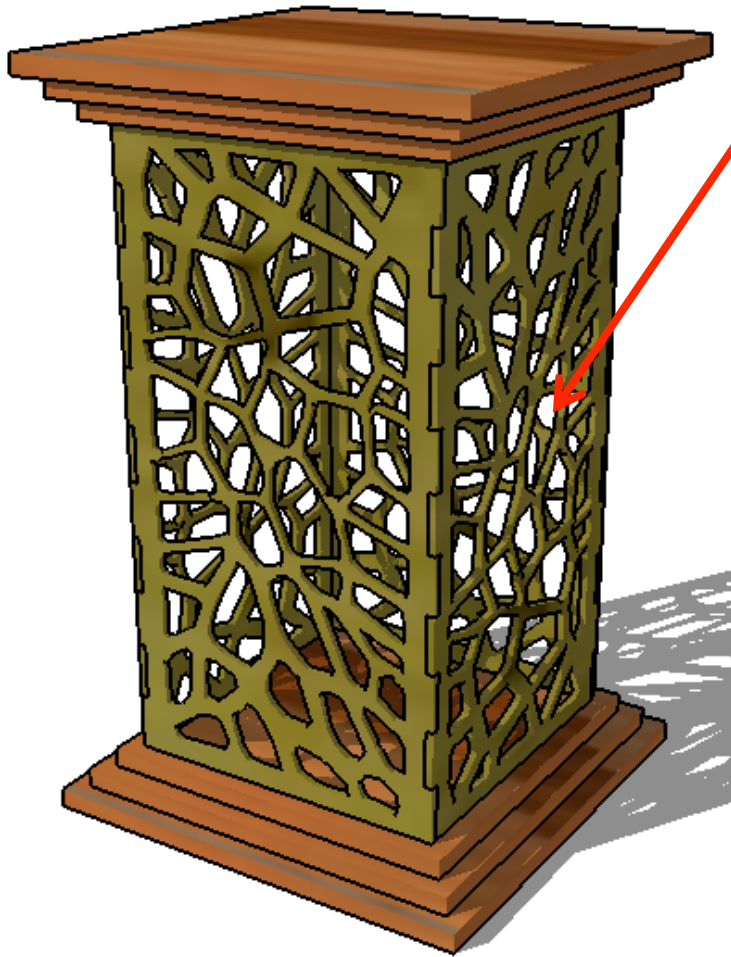
68. Use the ***colour bucket*** to render your design and add shadows etc.