Design out the box

Time 40-50 mins approx

Level of difficulty ★★★☆☆

Lesson Objectives…

- To understand the basic tools used in SketchUp.
- To understand the advantages of using CAD
- To be able to successfully use CAD independently to complete a range of tutorials in 2D and 3D
- To develop advanced skills and problem solving skills when using Sketch Up
- To use correct dimensions when using sketch up to draw models that can be 3D printed or manufactured using CAM machines in school (i.e. Laser Cutter, 3D Router).

Lesson Outcomes…

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

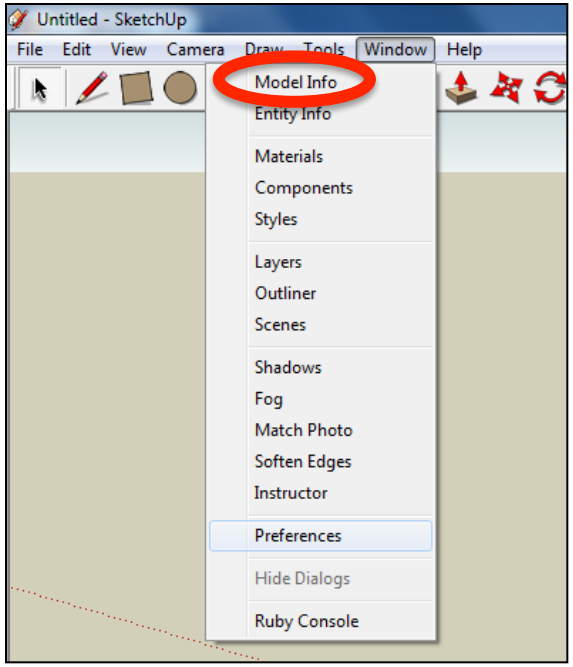
- Use the push pull and move tool
- Learn about centre lines
- Create, Move and Rotate components
- Use the offset tool to make objects and add detail
- Shape and form your design
- Draw your design to the correct size to enable it to be manufactured.

Skills to be used in this project…

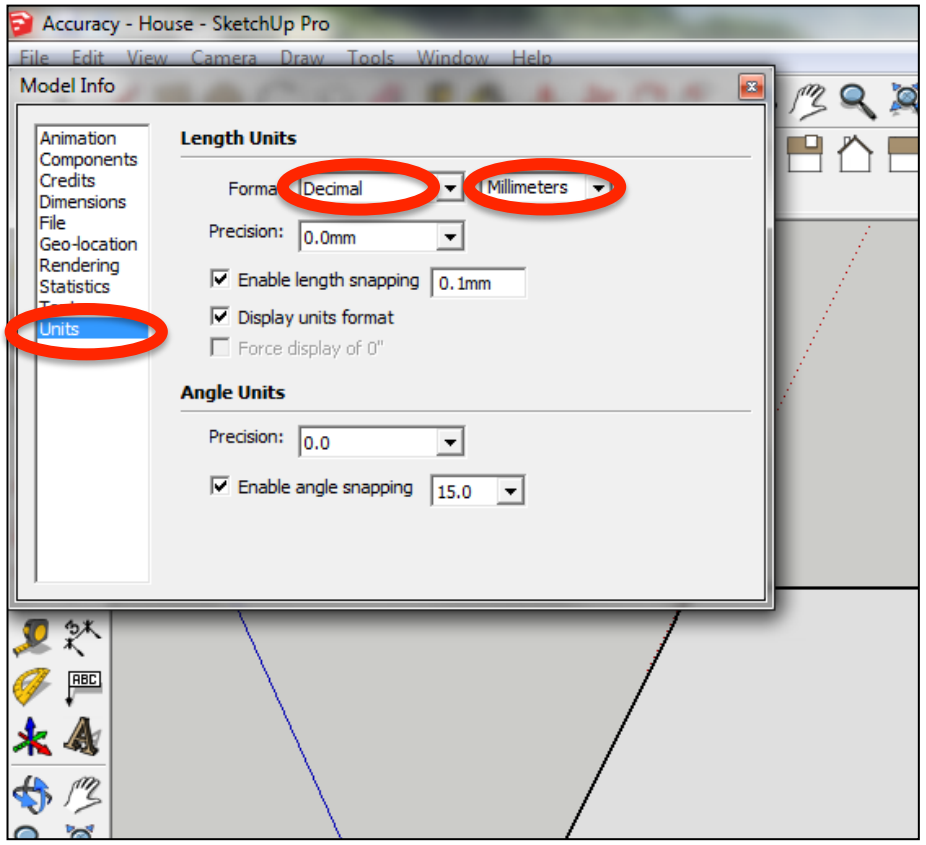
Basic Skills	New and Higher Skills
Zoom tool	Rotate tool
Orbit tool	Move tool
Pan tool	Offset tool
Line tool	Arc tool
Rectangle tool	Follow Me tool
Circle tool	Paint Bucket tool
Eraser tool	Dimensions tool
Push/Pull tool	Making Components

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.



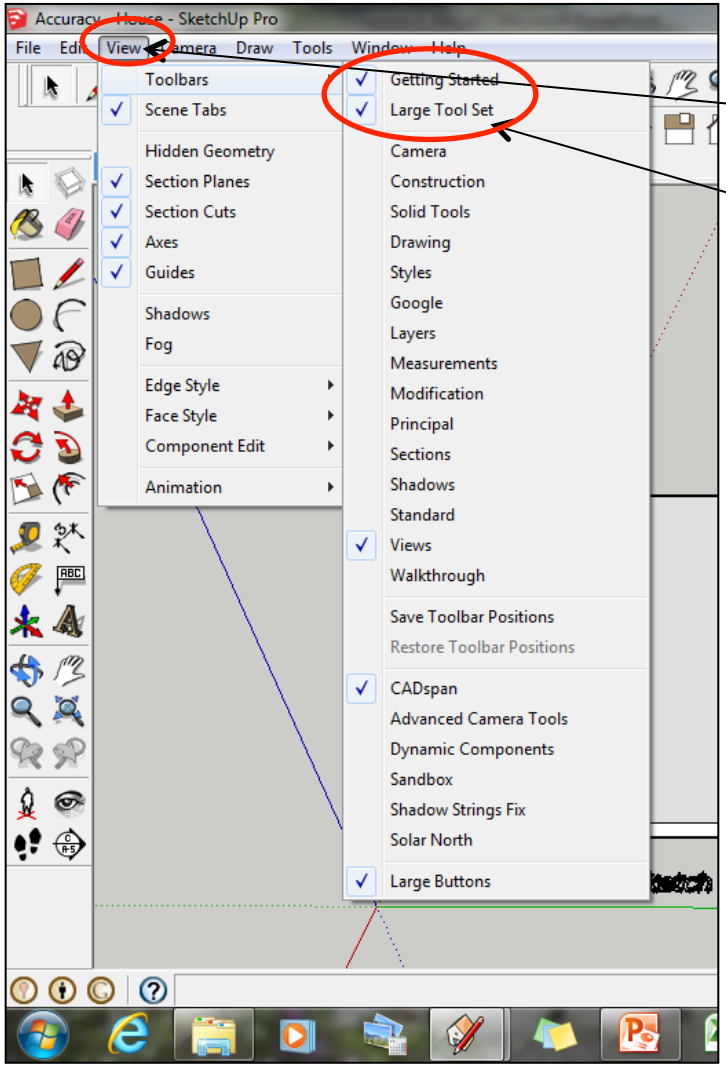
1. Open the sketch up drawing. Once you have opened SketchUp, go to **Window** and select **Model Info**



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



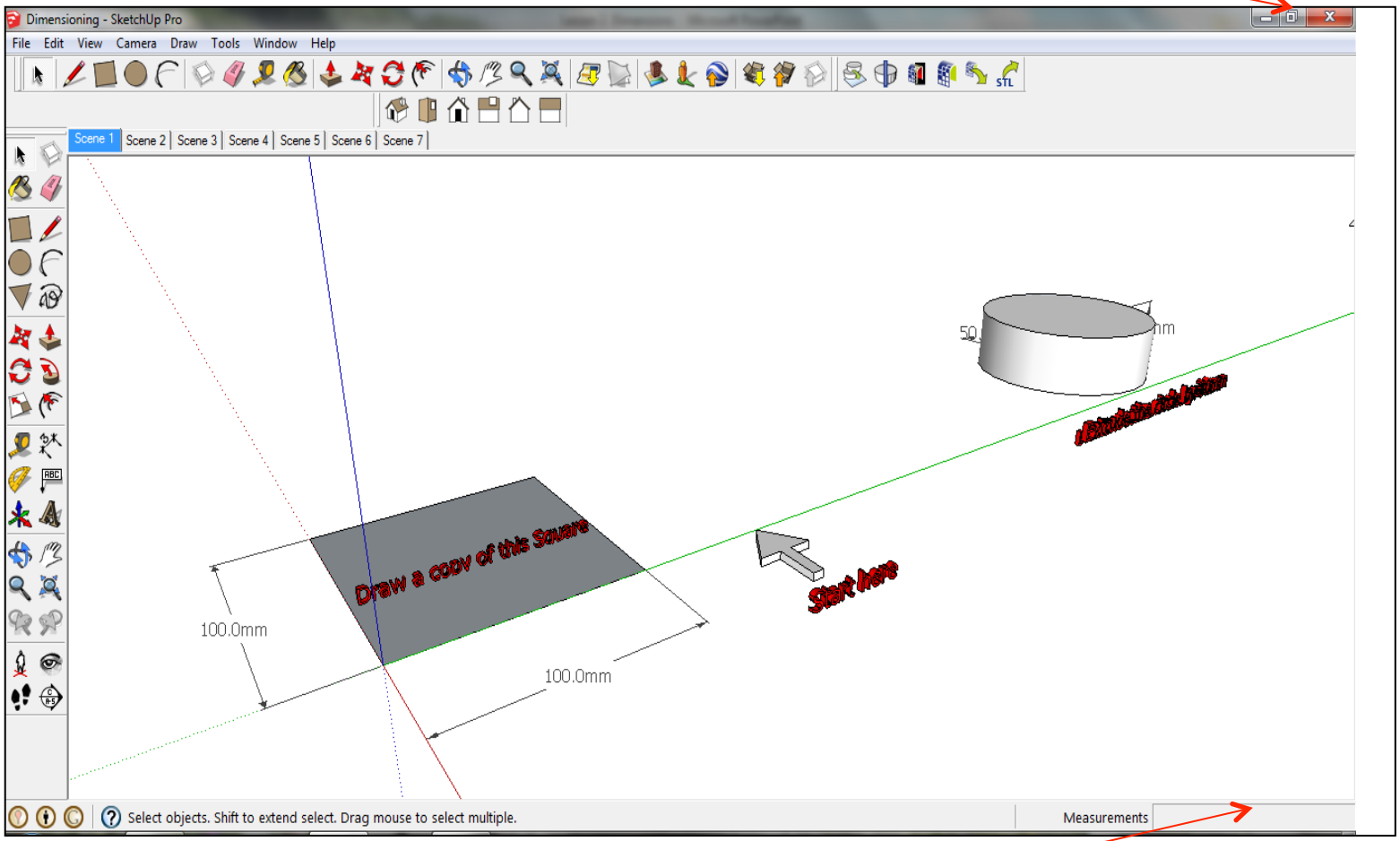
3a Select **View**

3b Tick Getting Started

3c Tick Large Tool Set

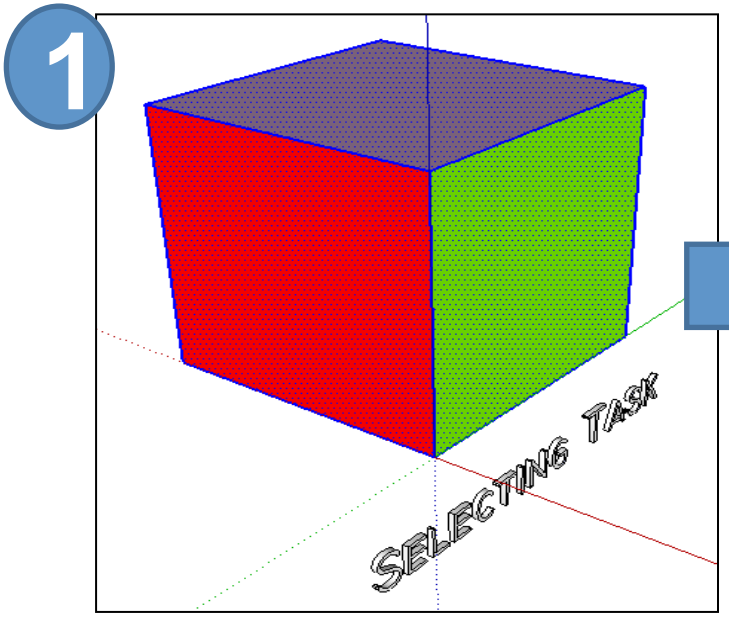
Note**: this will place a tool bar across the top **(getting started)** and the side **(Large Tool Set)

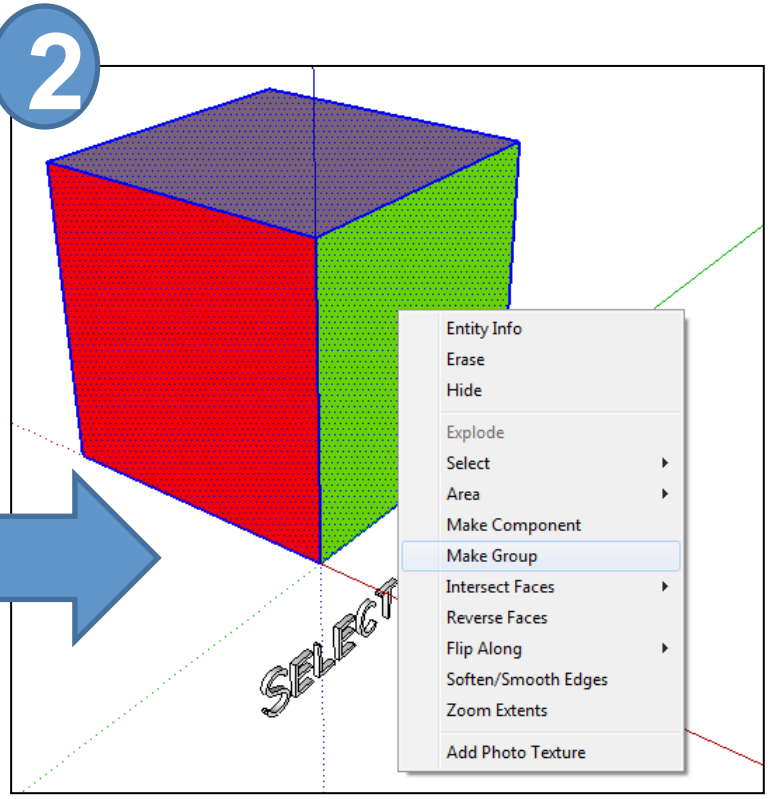
4. Ensure you can see the measurements / dimensions / tool bar in the **bottom right hand corner.** If not click on the **middle square** top right hand corner until it appears



Measurements tool bar

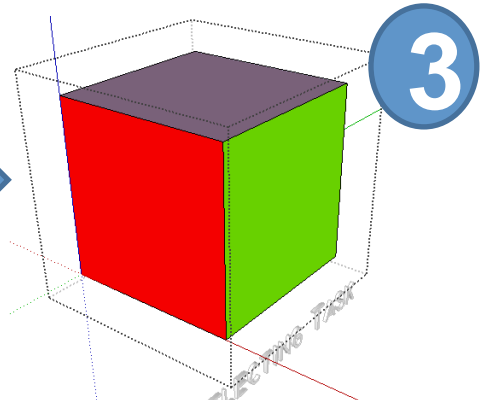
5. Click on **Scene 1.** To select an object click it 3 times. The entire object should be highlighted with dots as shown in 1.

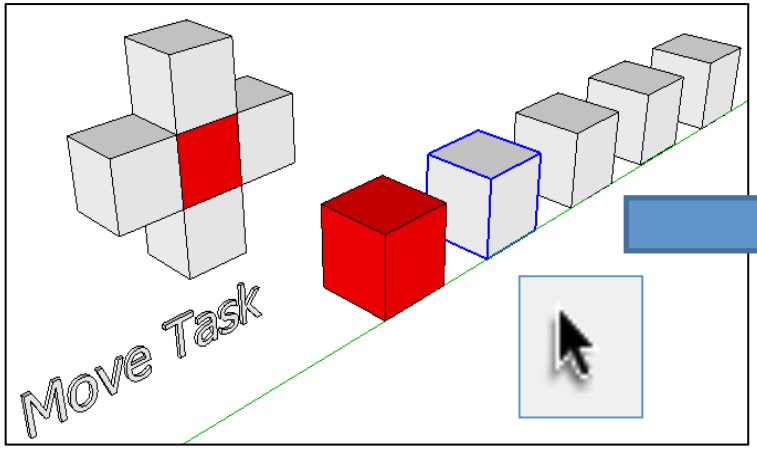




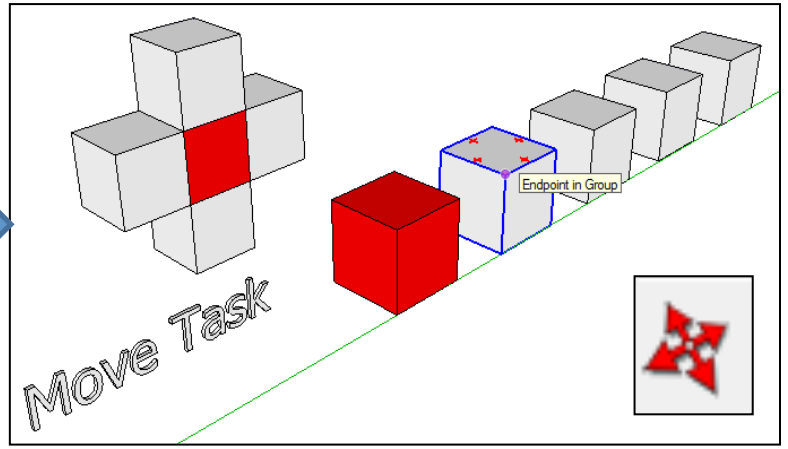
6. Right Click and make group

7. When an object is grouped you will notice you cannot edit it by using the push pull tool etc. **Double click** it and the try using the push pull tool. When finished click off the object and you will notice its still grouped

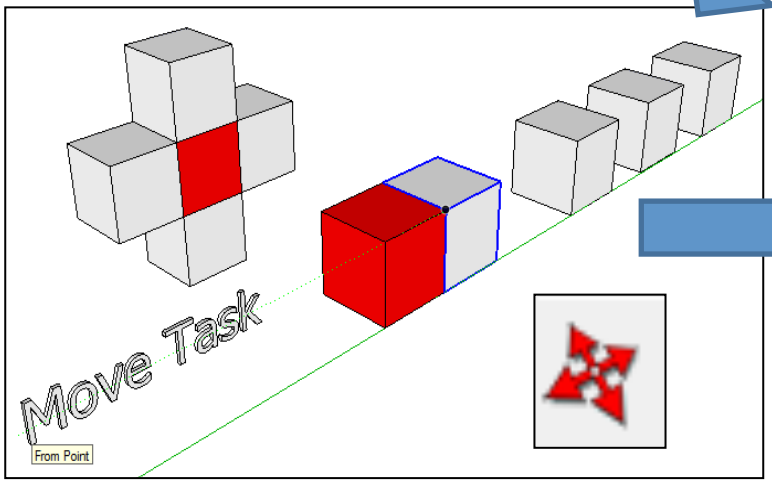




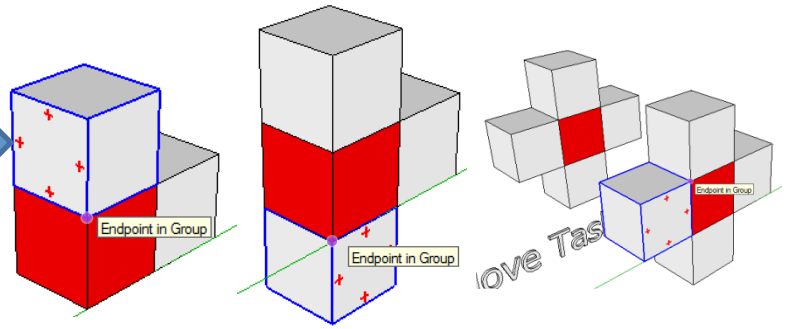
8. Click on **Scene 2. Move** the white squares around the red one to make a cross with the red square i the middle.



9. Using the move tool click on **corner of the square.** It will go **purple** and say endpoint in the group.

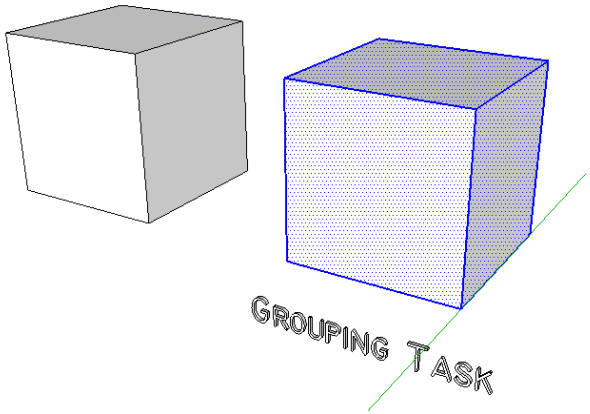


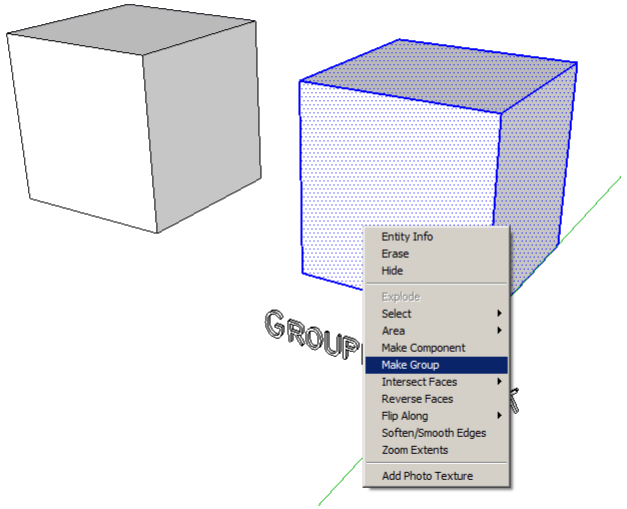
10. Move the white square to meet a corresponding corner on the red square.



11. You will need to click on different corners of the white squares and orbit around the red square to get them to fit in place.

12. Click on **Scene 3.**

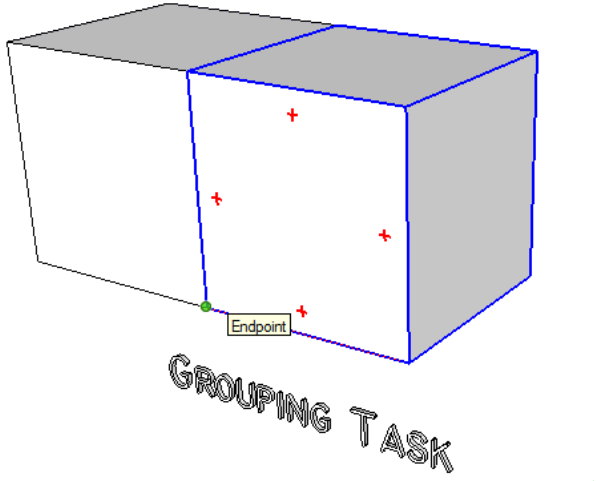




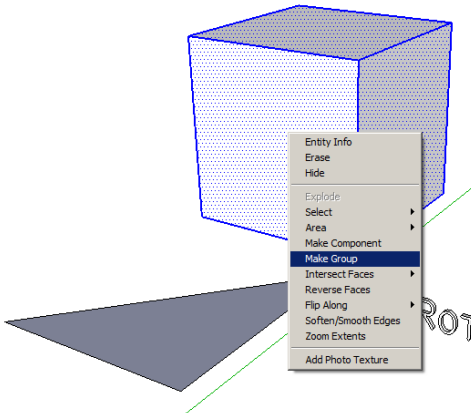
13. Click on square **three times and right click and group.**

14. Repeat the process for the other square

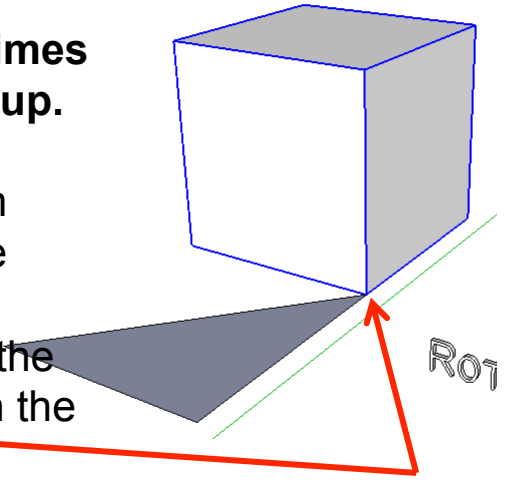
15. Click on **move tool bar**. Then click on the corner of one of the squares **(it should say endpoint**) and move to the corresponding corner on the other square.



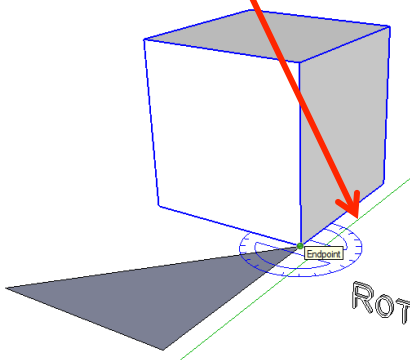
16. Click on **Scene 4.**



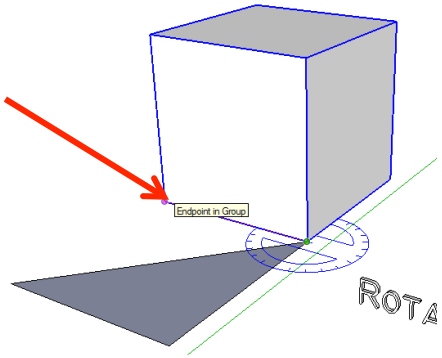
17. Click on square **three times and right click and group.** Click on **move tool bar**. Then click on the bottom right corner of one of the square **(it should say endpoint**) and move to the corresponding corner on the triangle



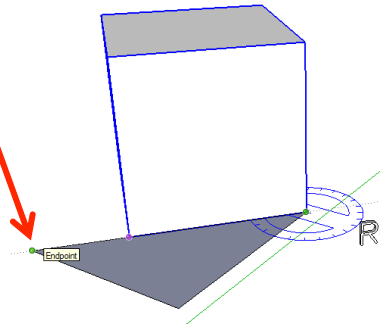
18. Click on **rotate tool bar**. Move it to the corner of the triangle where it touches the square and click to set it in place. The rotate protractor must be **BLUE when you click it into place**



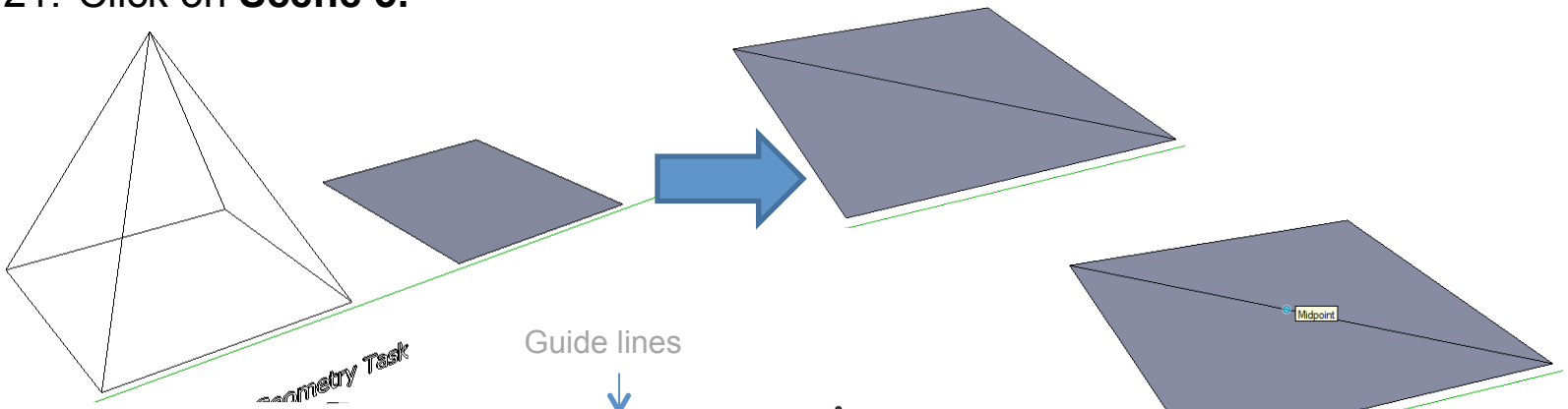
19. To start the rotate move the line coming out of the protractor to the **back corner (endpoint)** of the square and **click** to start rotating



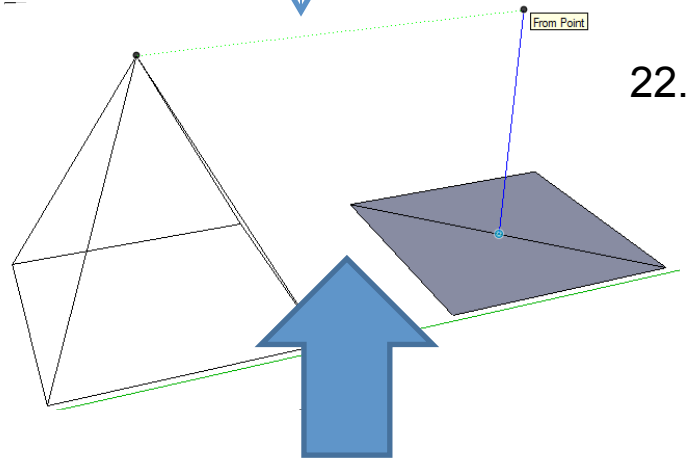
20. Rotate the square until the line coming out of the protractor touches the **top left hand corner** of the triangle **(endpoint)** and click to set place



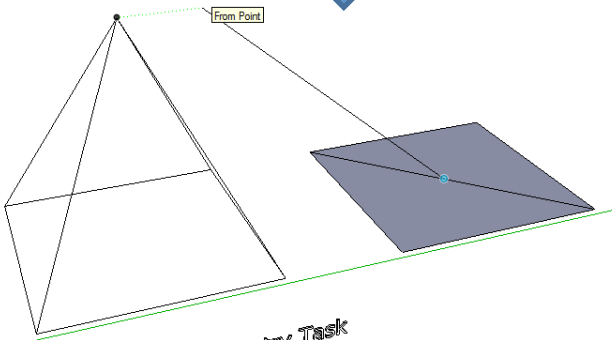
21. Click on **Scene 5.**



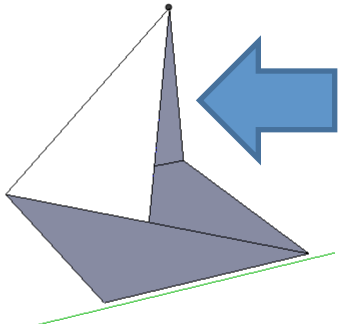
Guide lines



22. Using the **pencil tool. Draw a line from corner to corner.** Find the **centre point** and start drawing a line upwards

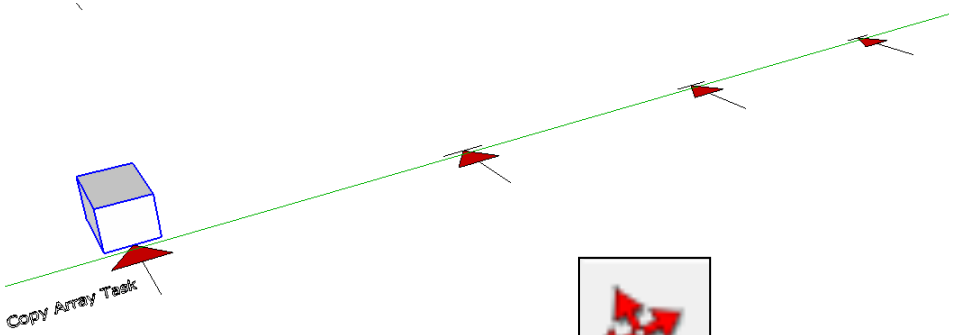


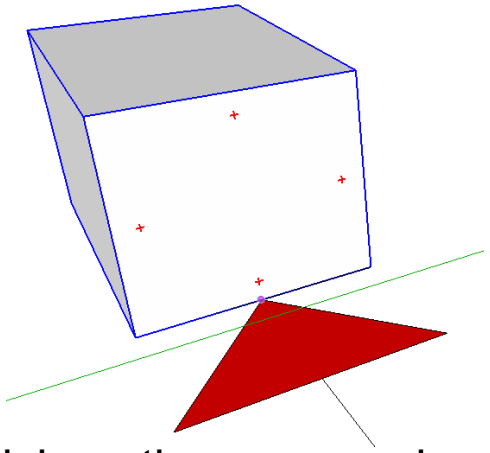
23. Touch the top of the pyramid next to the square and pull the line back. It will provide you with dotted guidelines for the height you need. Pull the line back until it goes blue and click to set in place



24. Draw lines down from the top of the line to each of the four corners to complete

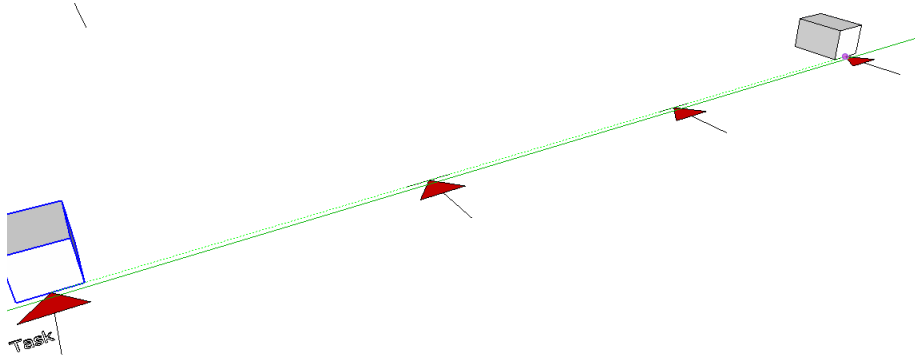
25. Click on **Scene 6. Highlight the square**

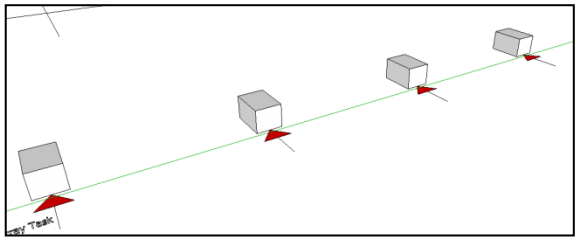




26. Click on **move tool ba**  then click on the square where it touches the point of the arrow.

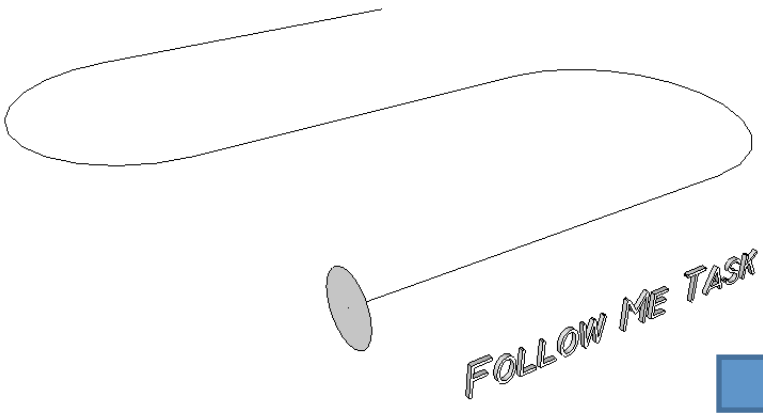
27. Press **Ctrl (copy)** on your keyboard. Move it to the centre of the last



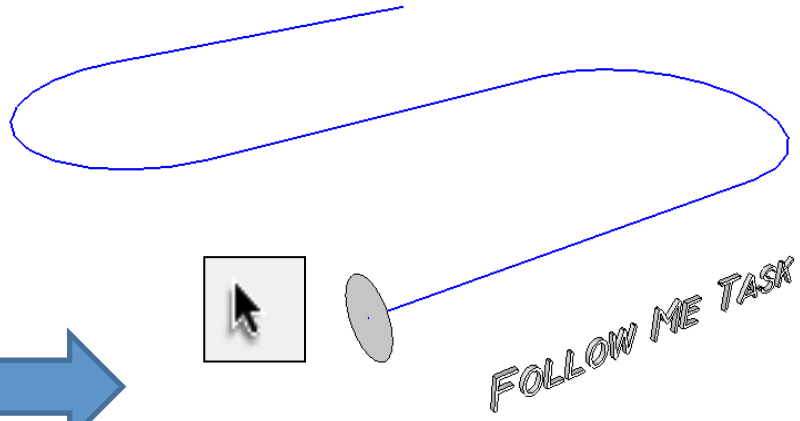


28. Start typing **/3** and press **enter**. It will then space 3 squares out in front of the last one you have just drawn. This is known as a copy array and can be done in the same fashion with the rotation tool.

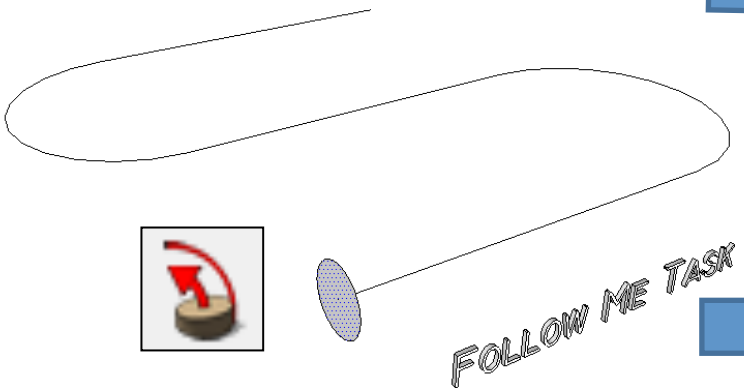
29. Click on **Scene 7.**



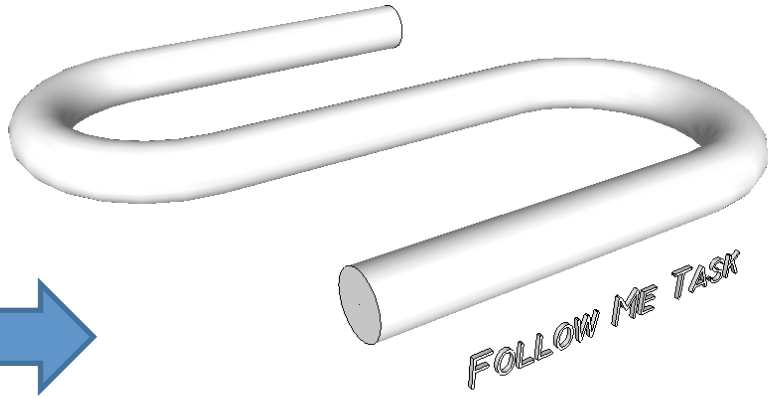
30. Click 3 times on the path (line) to highlight it all**. It should go BLUE**



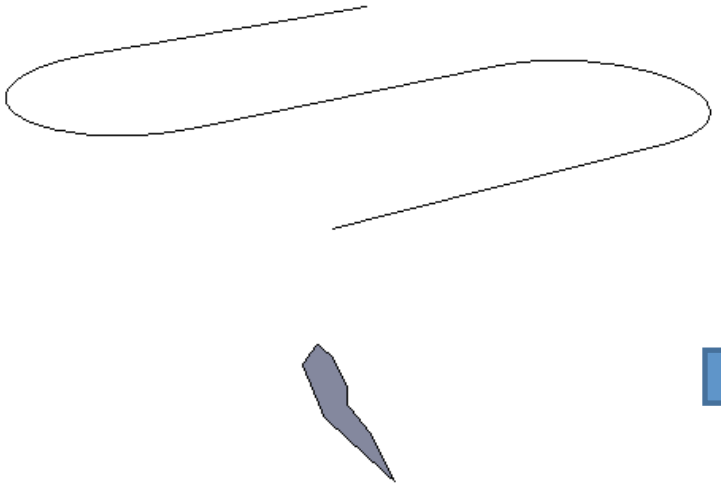
31. Click on the **follow me tool bar** and then the circle.



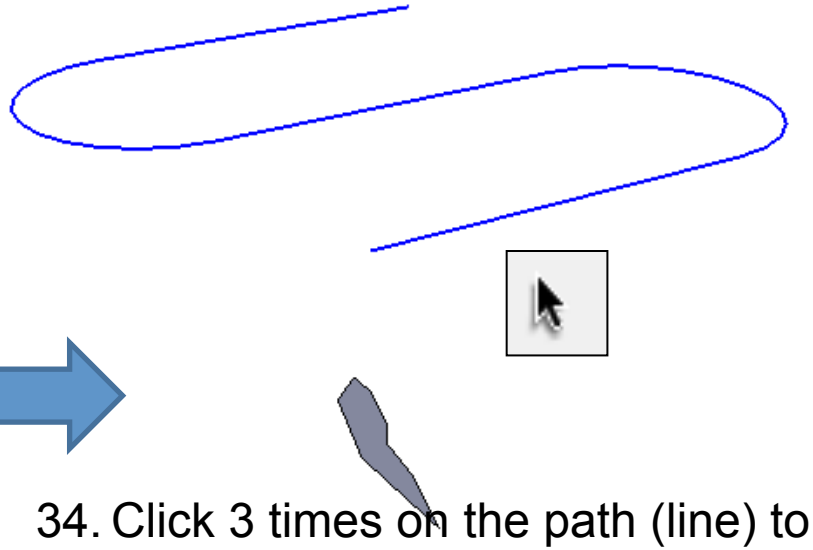
32. The circle should follow the path you highlighted earlier

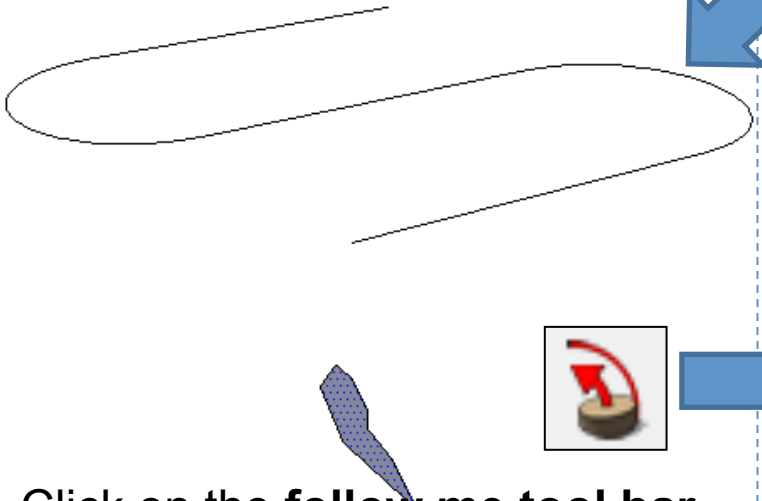


33. Click on **Scene 8.**

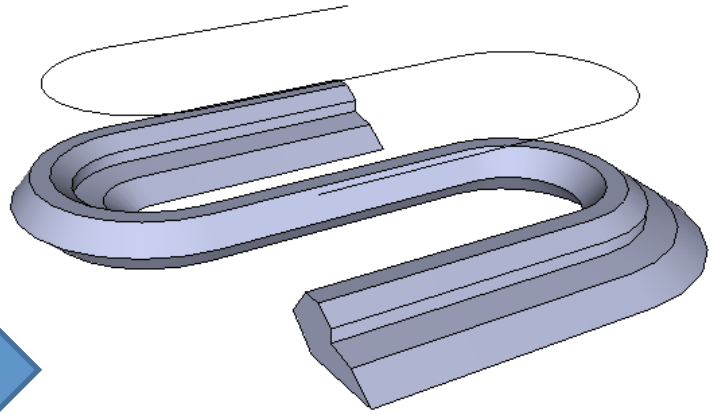


34. Click 3 times on the path (line) to highlight it all**. It should go BLUE**

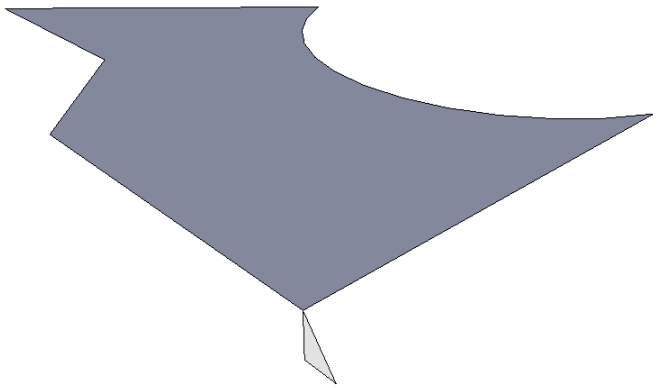




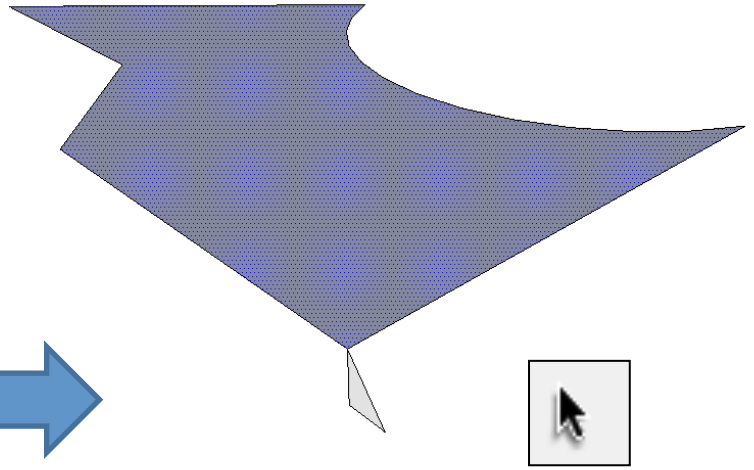
35. Click on the **follow me tool bar** and then the shape.



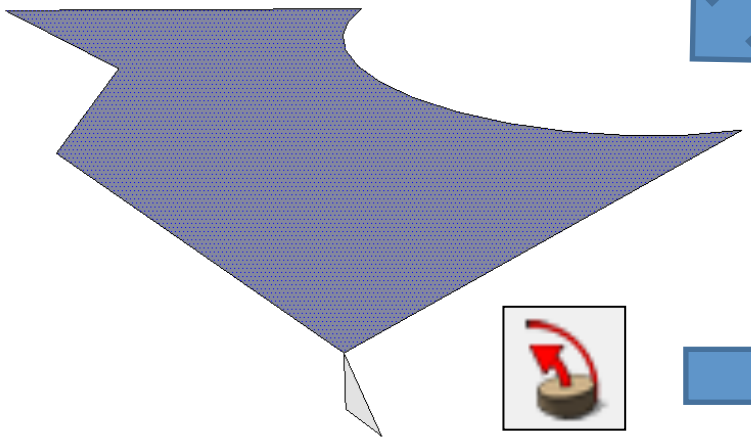
36. The shape should follow the path you highlighted earlier



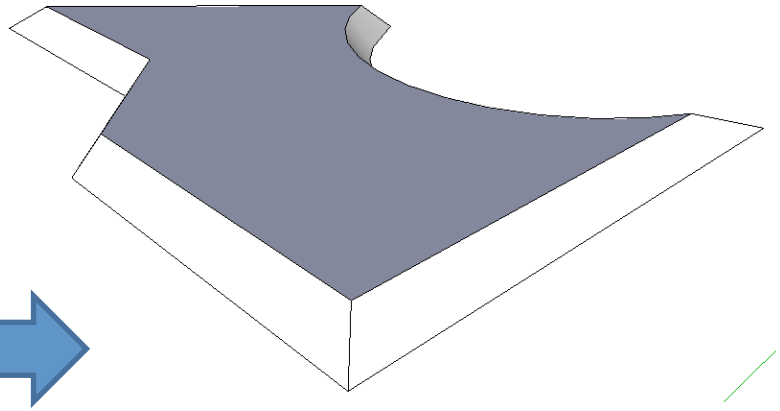
37. Click on **Scene 9.**



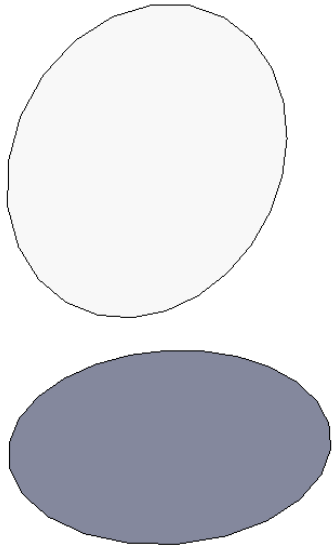
38. Click on the large grey shape to highlight it all**. It should go dotted**



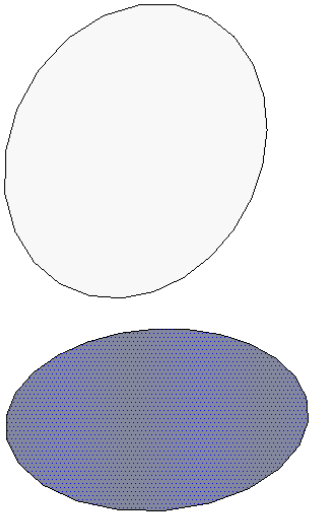
39. Click on the **follow me tool bar** and then the triangle shape.



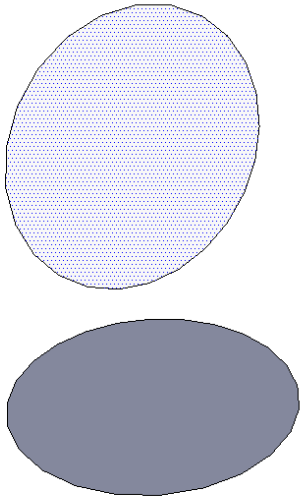
40. The Triangle shape should follow the path you highlighted earlier



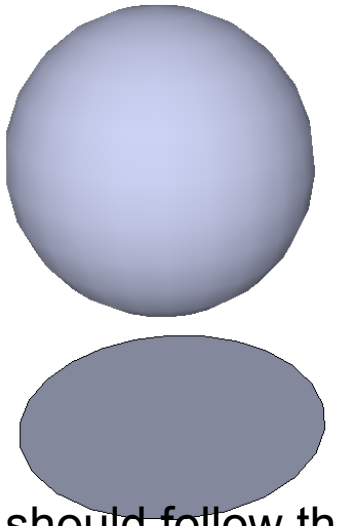
41. Click on **Scene 10.**



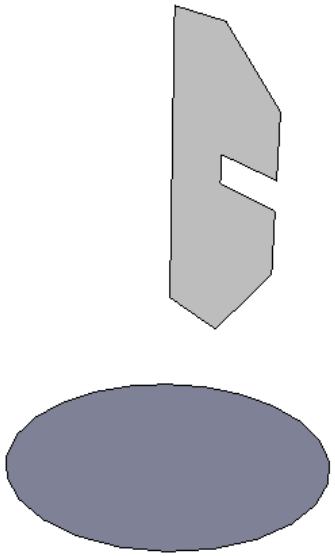
42. Click on the dark grey circle to highlight it all**. It should go dotted**



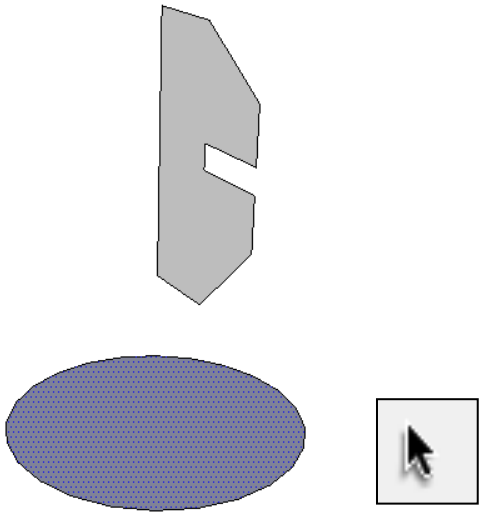
43. Click on the **follow me tool bar** and then the lighter grey circle.



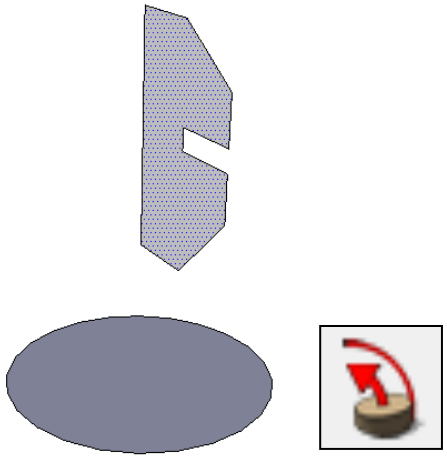
44. The circle should follow the path you highlighted earlier



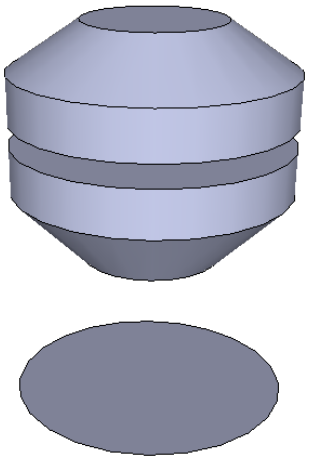
45. Click on **Scene 11.**



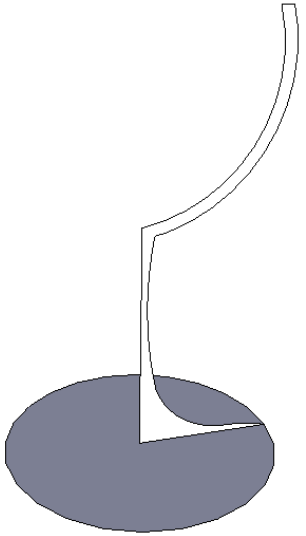
46. Click on the dark grey circle to highlight it all**. It should go dotted**



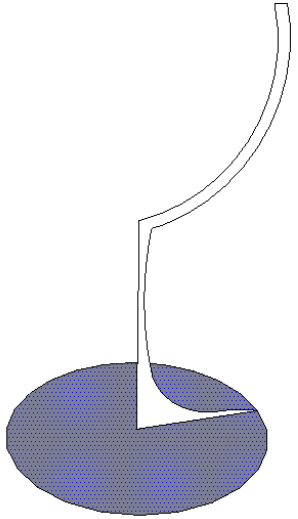
47. Click on the **follow me tool bar** and then the lighter shape above.



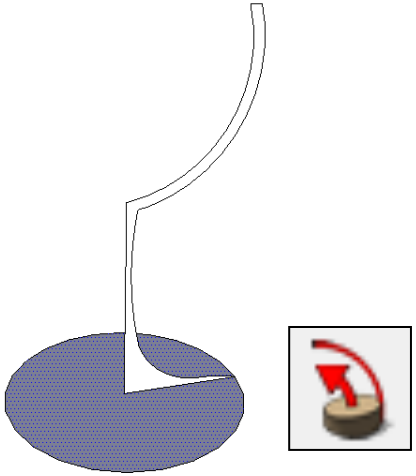
48. The shape should follow the path you highlighted earlier



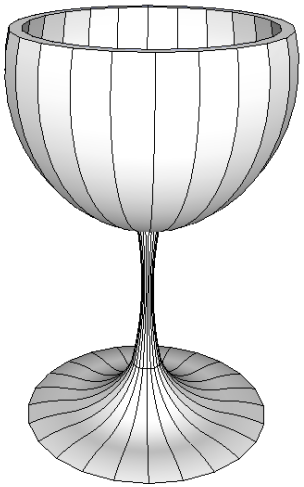
49. Click on **Scene 12.**



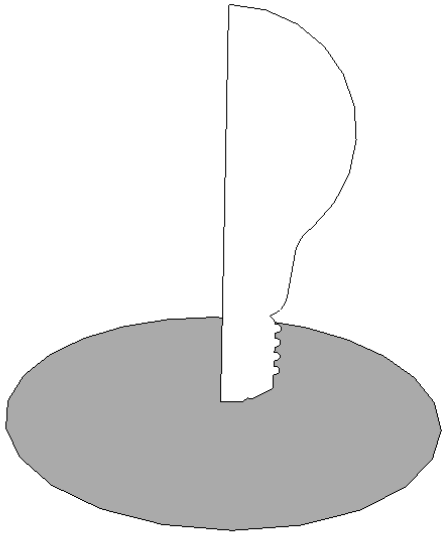
50. Click on the dark grey circle to highlight it all**. It should go dotted**



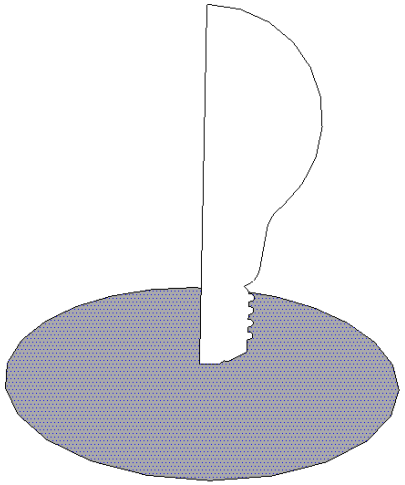
51. Click on the **follow me tool bar** and then the lighter shape above.



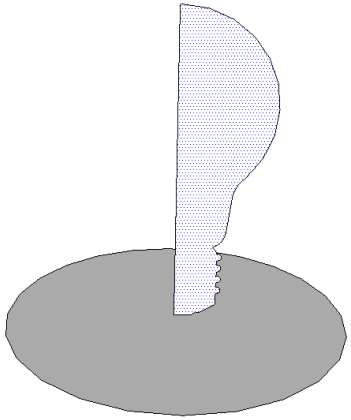
52. The shape should follow the path you highlighted earlier



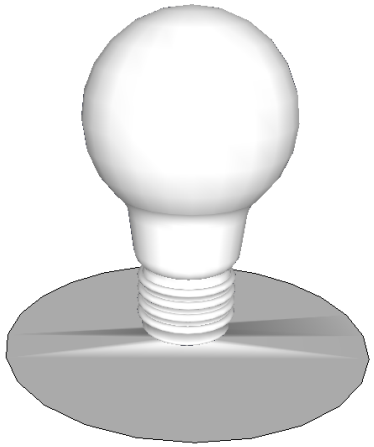
53. Click on **Scene 13.**



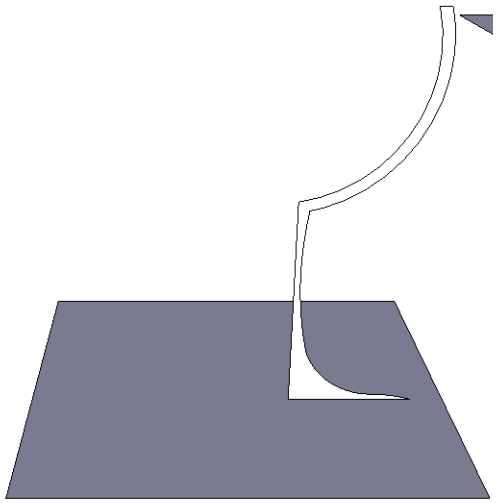
54. Click on the dark grey circle to highlight it all**. It should go dotted**



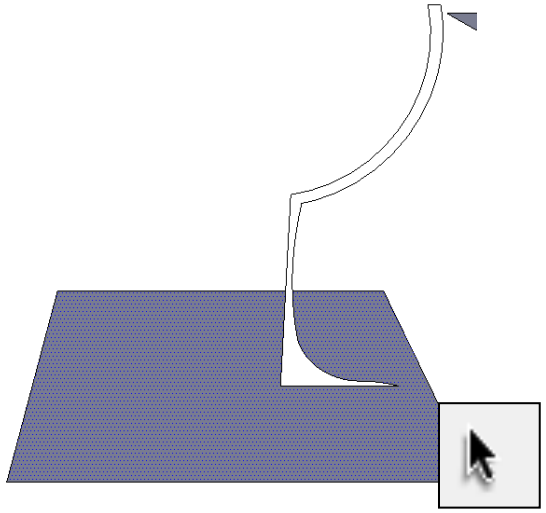
55. Click on the **follow me tool bar** and then the light bulb shape above.



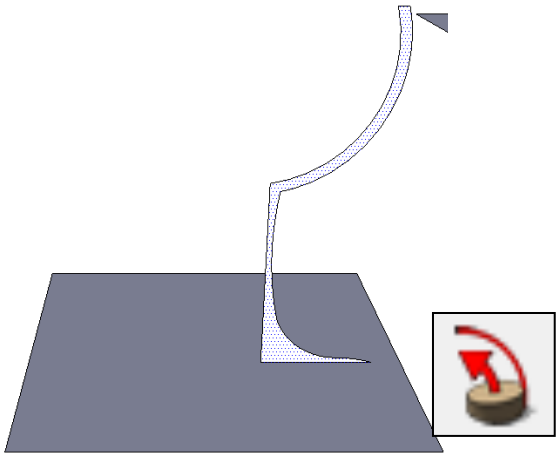
56. The shape should follow the path you highlighted earlier



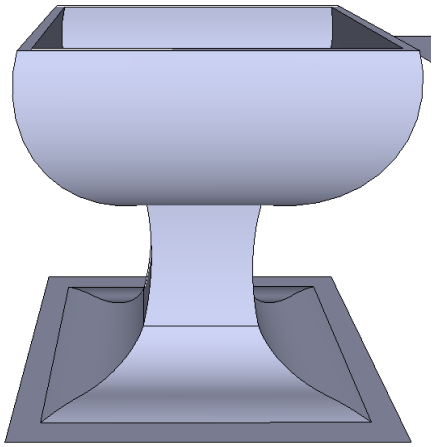
57. Click on **Scene 14.**



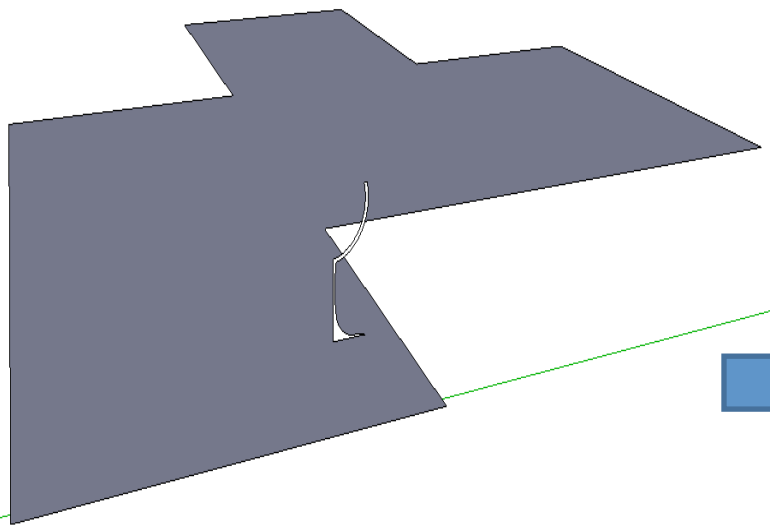
58. Click on the dark grey square to highlight it all**. It should go dotted**



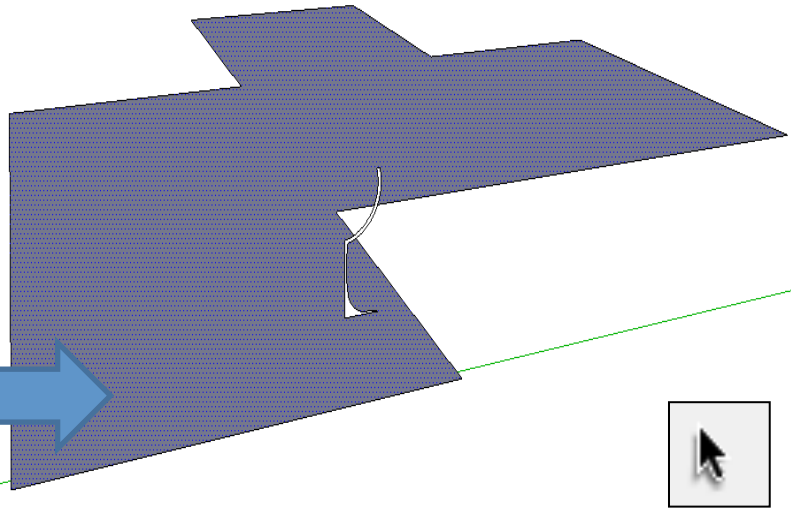
59. Click on the **follow me tool bar** and then the lighter shape above.



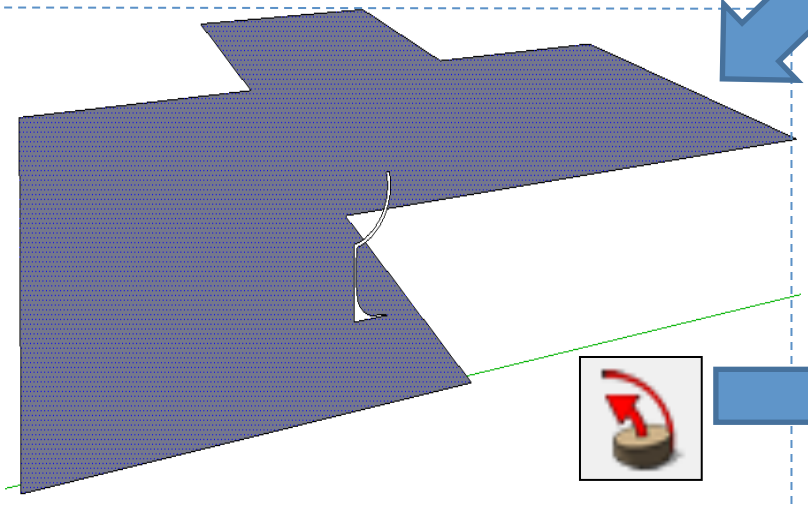
60. The shape should follow the path you highlighted earlier



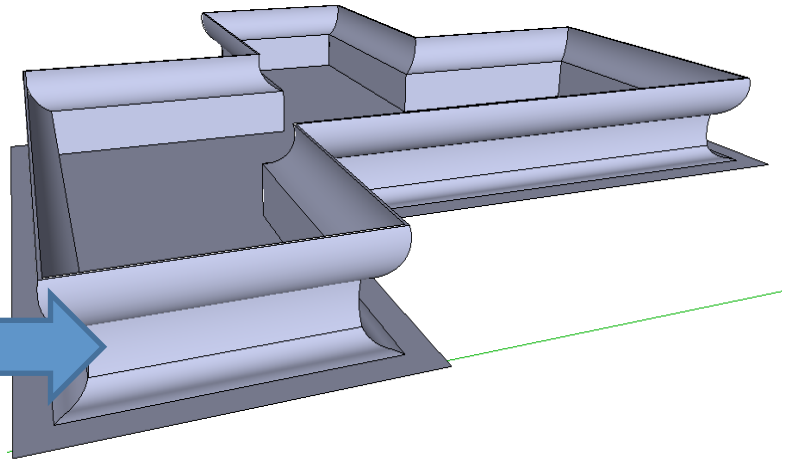
61. Click on **Scene 15.**



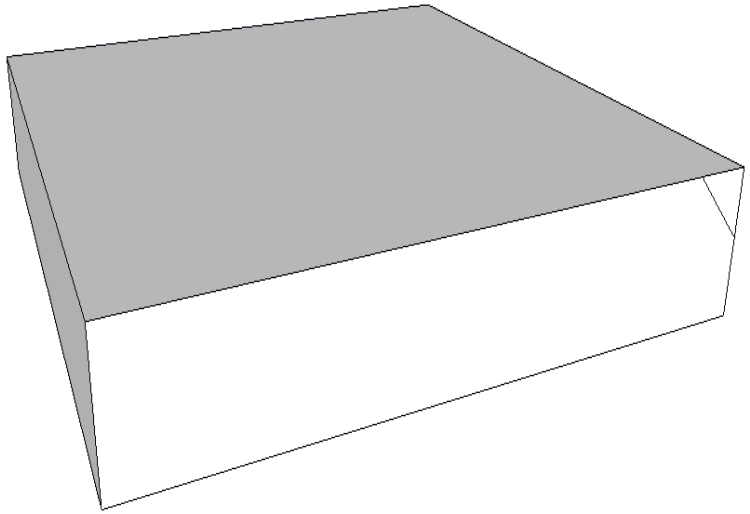
62. Click on the large dark shape to highlight it all**. It should go dotted**



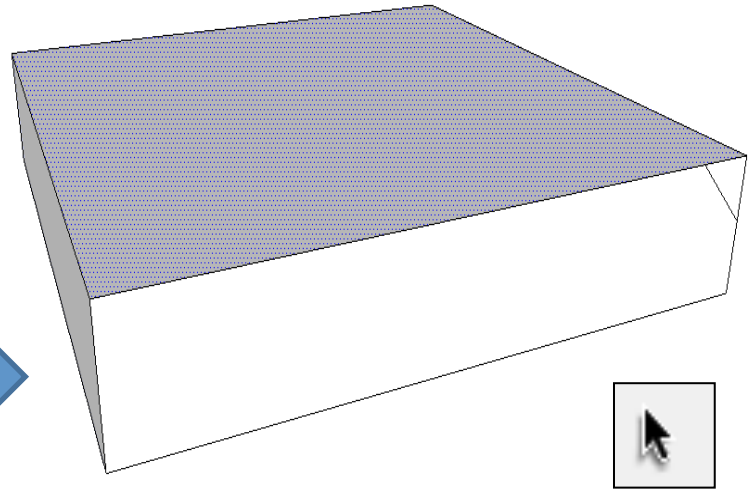
63. Click on the **follow me tool bar** and then the lighter shape above.



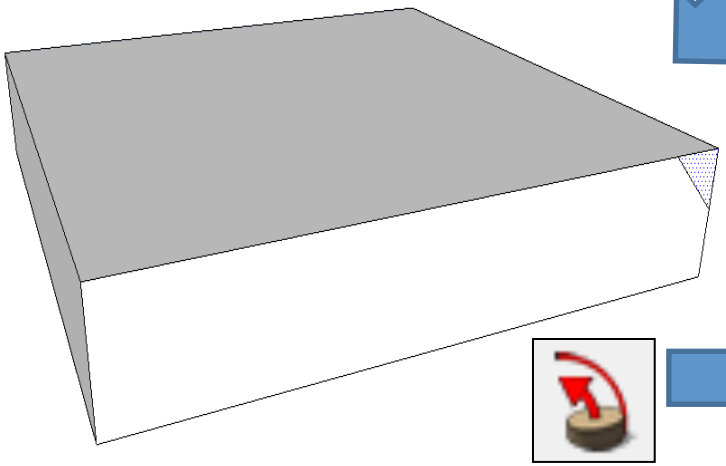
64. The shape should follow the path you highlighted earlier



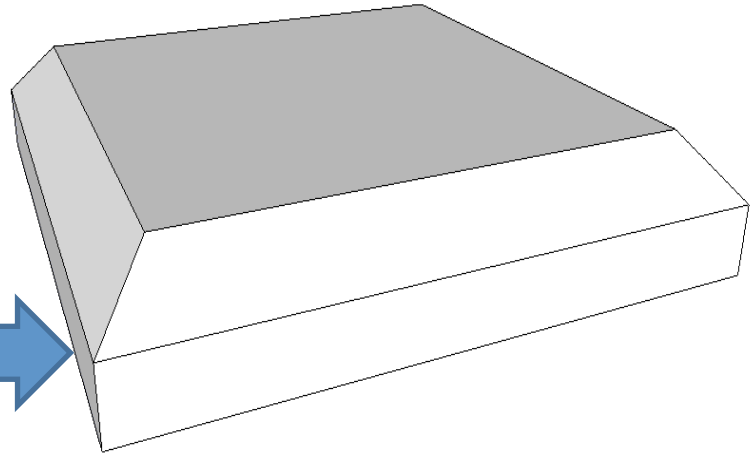
65. Click on **Scene 16.**



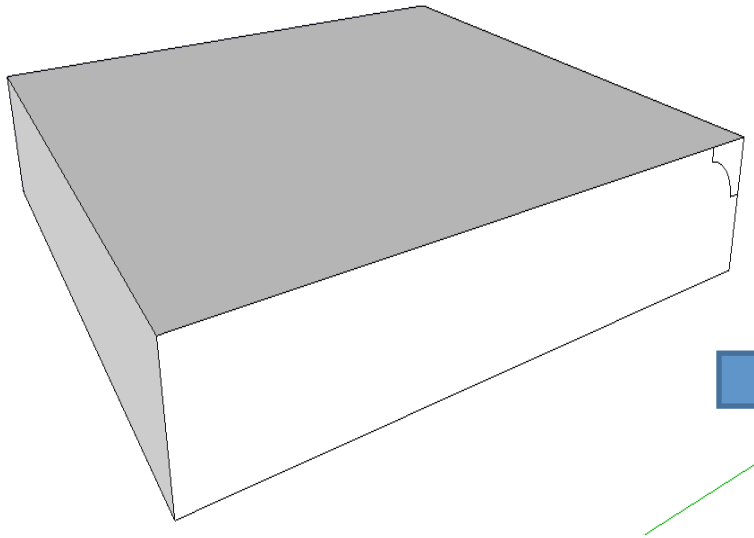
66. Click on the top of the shape to highlight it all**. It should go dotted**



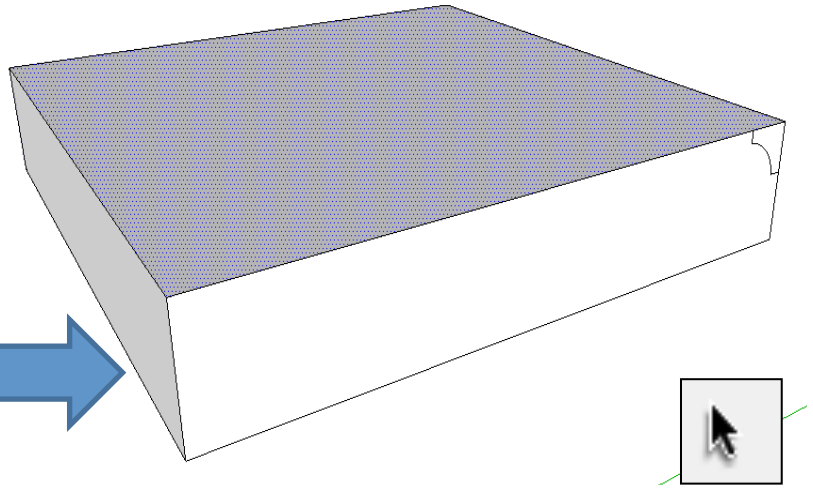
67. Click on the **follow me tool bar** and then the small shape on the side.



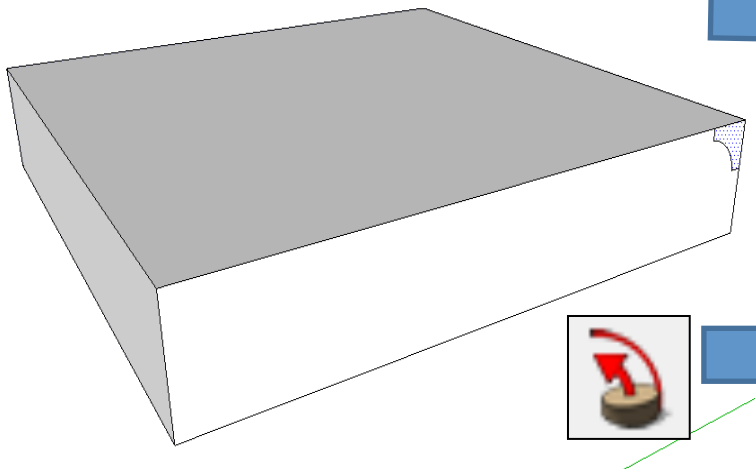
68. The shape should follow the path you highlighted earlier



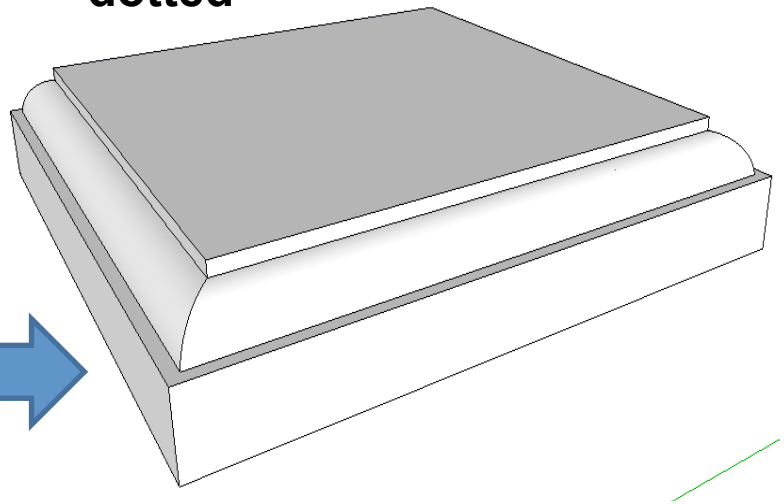
69. Click on **Scene 16.**



70. Click on the top of the shape to highlight it all**. It should go dotted**



71. Click on the **follow me tool bar** and then the small shape on the side.



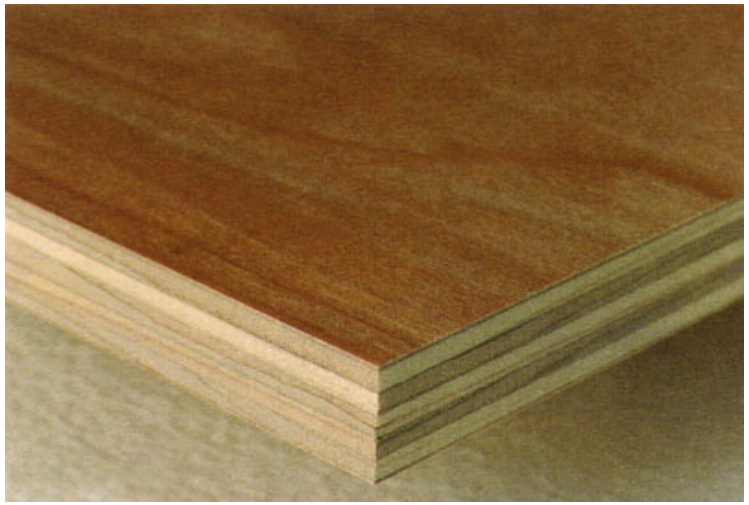
72. The shape should follow the path you highlighted earlier

Extension

- Sketch Up can be used to design in the same way that Sculptor uses a peace of stone to produce a statue

Design Task

- To Design a contemporary arm chair. The chair will be made entirely from 20mm thick plywood.
- You will use SketchUp to develop your Ideas and present your final idea. The final presentation will include a verity of drawings including a plan, elevation, exploded and 3D views.



Plywood

Plywood

Plywood

Plywood

Plywood

Plywood

Plywood

Plywood

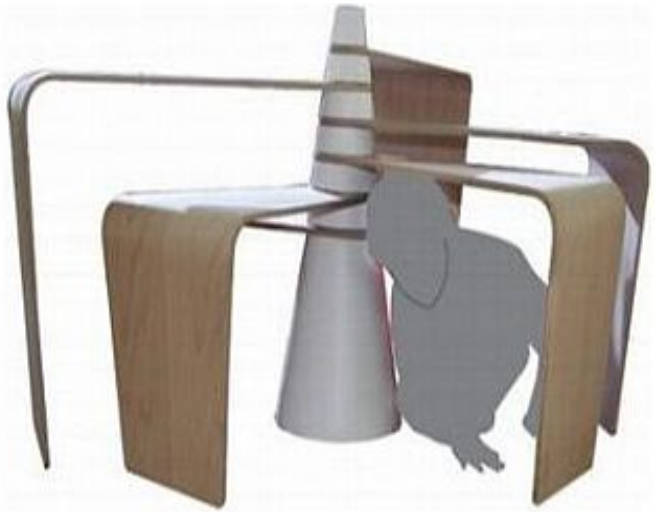
Plywood

Plywood

Plywood

Plywood

Assembling & Disassembling



Playing

Folding

Desk & Chair

Plywood