Design out the box

Time 50-70 mins approx

Level of difficulty ★★★★☆

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

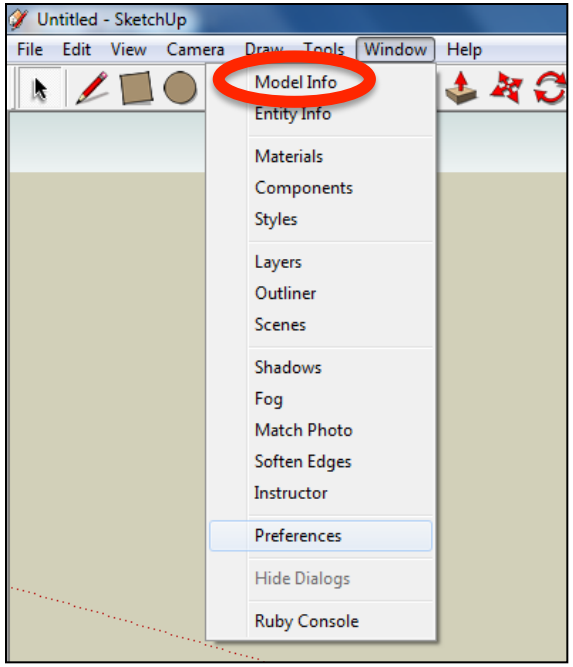
- Link basic shapes
- Use the Arc tool
- Use the Follow Me tool to produce a rounded edge
- Use construction lines/points
- Colour/render your finished toy boat

Skills to be used in this project…

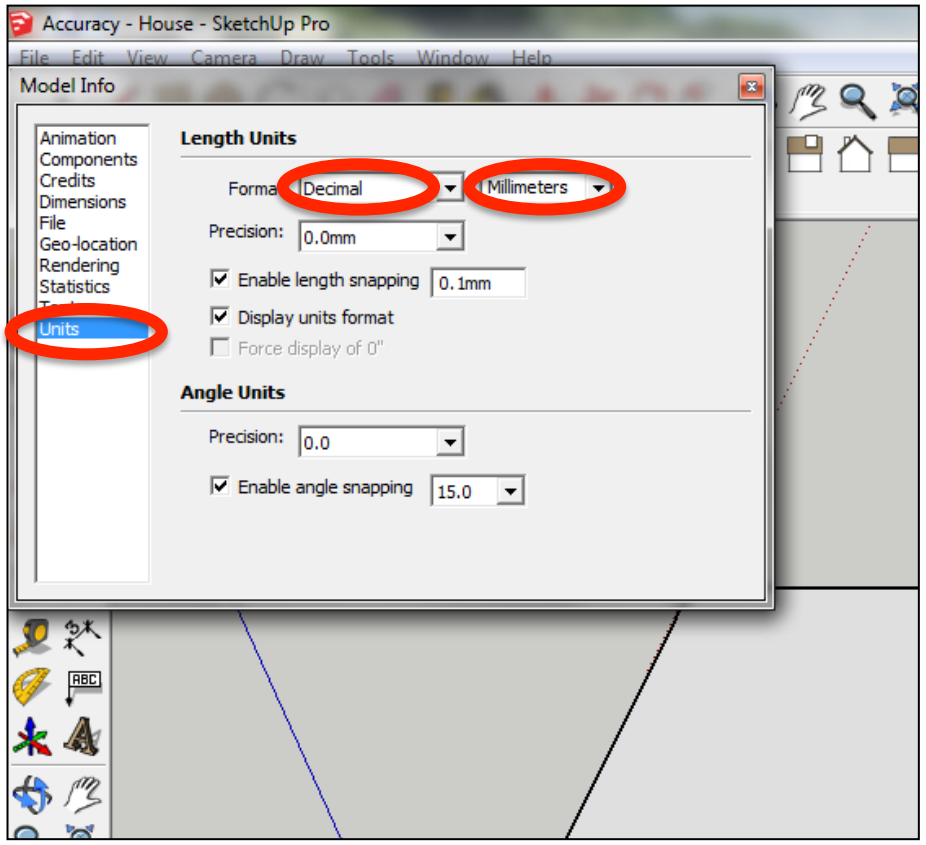
Basic Skills	New and Higher Skills
Zoom tool	Construction lines and points
Orbit tool	Tape Measure tool
Pan tool	Arc tool
Line tool	Follow Me tool
Rectangle tool	Loading new toolbars
Circle tool	Paint Bucket tool
Eraser tool	
Push/Pull tool	

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.



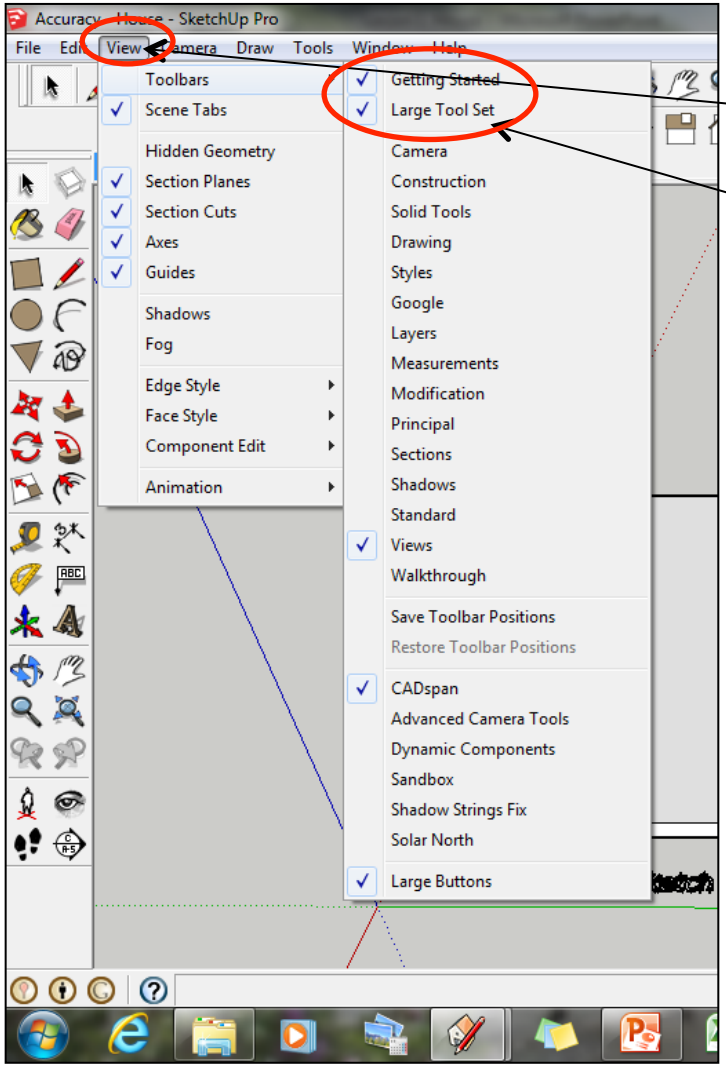
1. Open the sketch up drawing. Once you have opened SketchUp, go to **Window** and select **Model Info**



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**

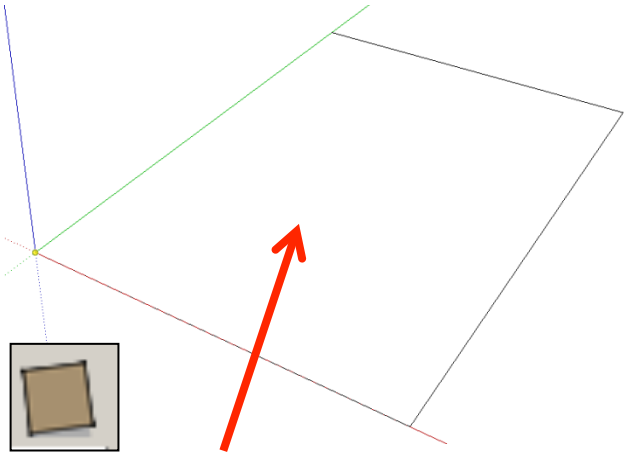
3b Tick Getting Started

3c Tick Large Tool Set

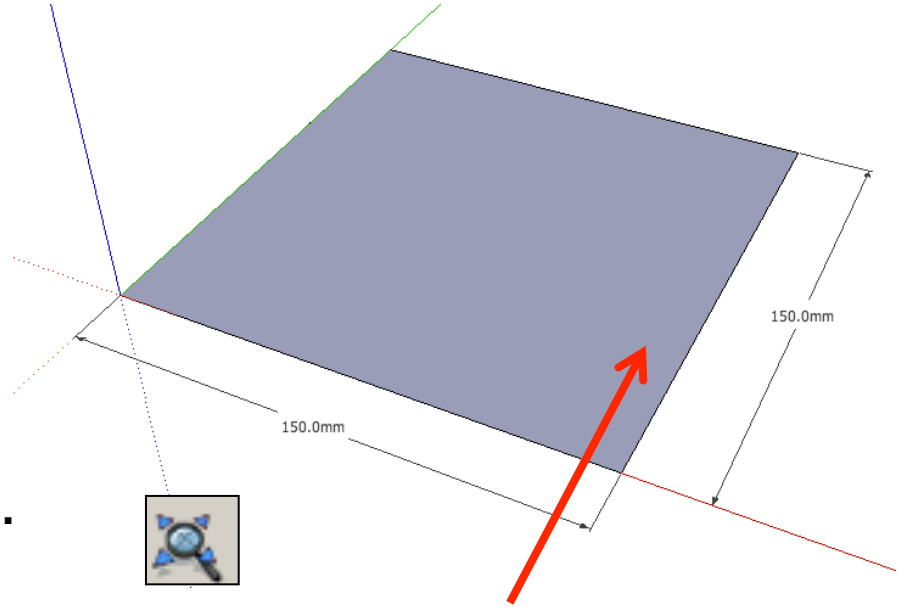
Note**: this will place a tool bar across the top **(getting started)** and the side **(Large Tool Set)

CAD Tutorial 19: Birdhouse

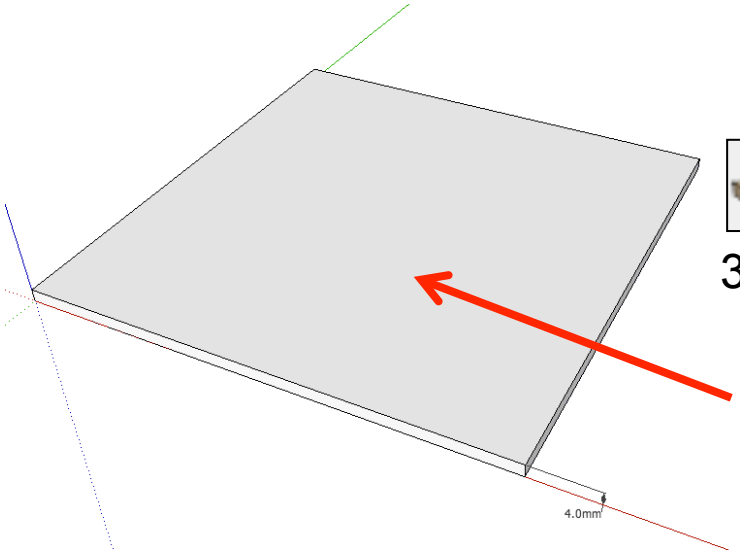
Flat Packed Wall Construction



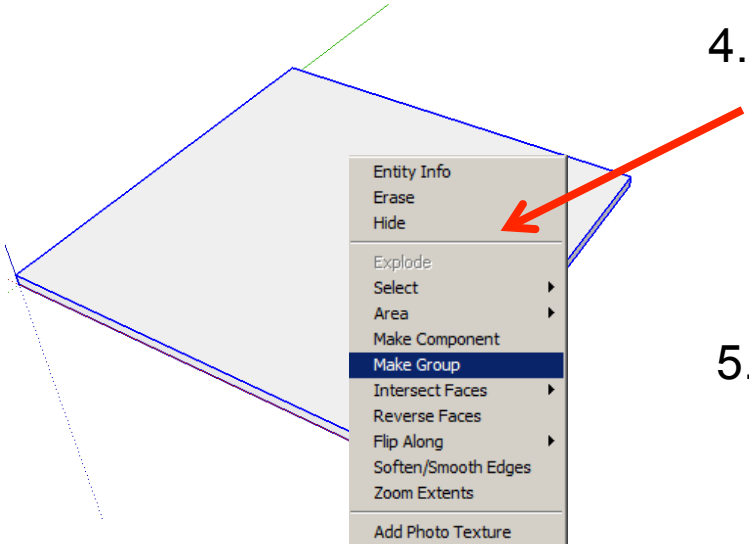
1. ***Click*** on the rectangle tool **.** Start drawing a square and type **150, 150.**



2. Press ***Enter*** **. Click on the zoom extents symbol.**

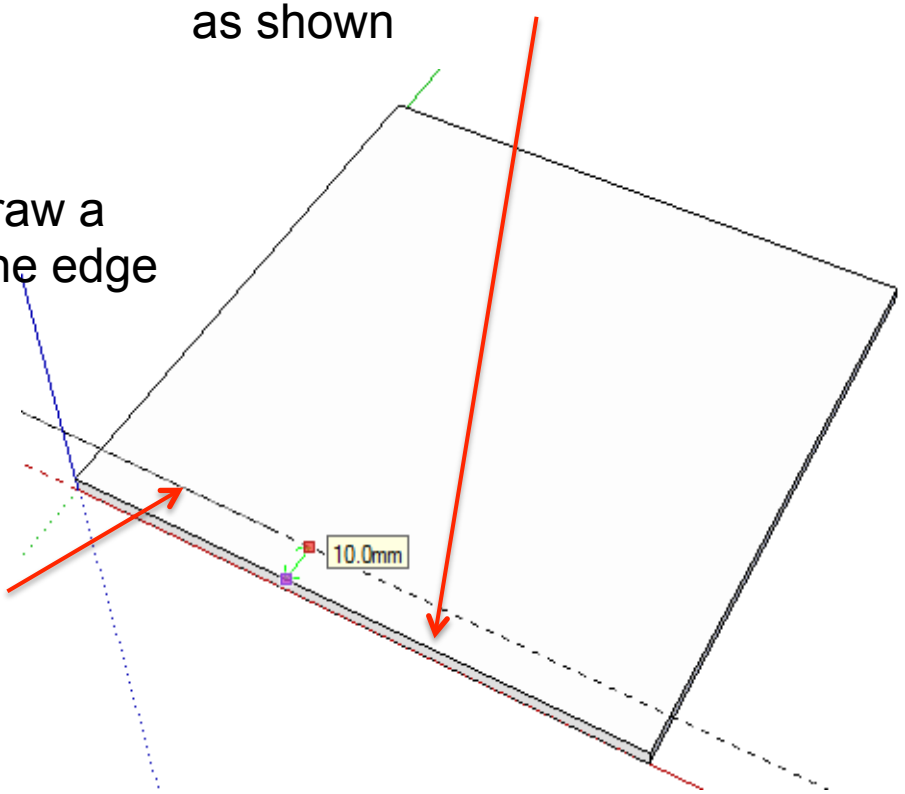


3. Using the ***push pull tool.*** Hover over the shape indicated. It will go ***dotted*** as you hover over it. Pull the shape up. Type in ***4 and press enter.***



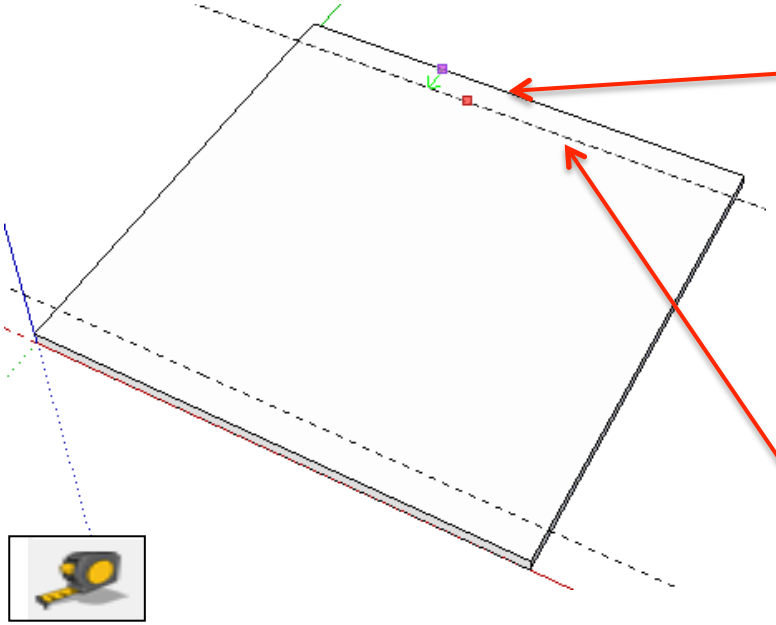
4. Using the ***select tool, click*** on the base piece three times and right click on the mouse and ***press make group***

5. Select the ***Tape measure tool*** and snap to the ***bottom edge*** as shown



6. ***Click once*** and it will draw a dotted guide line from the edge

7. ***Click a second time*** to set the guide line and ***type 10 and enter***. You will have a guide line ***10mm*** in from the ***bottom edge***



8. Select the ***Tape measure tool*** and snap to the ***top edge*** as shown

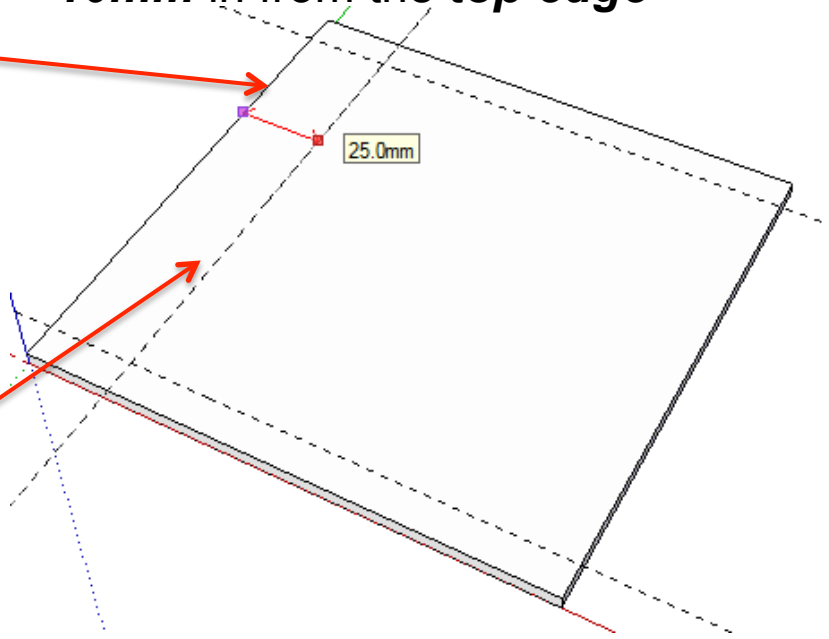
9. ***Click once*** and it will draw a dotted guide line from the edge

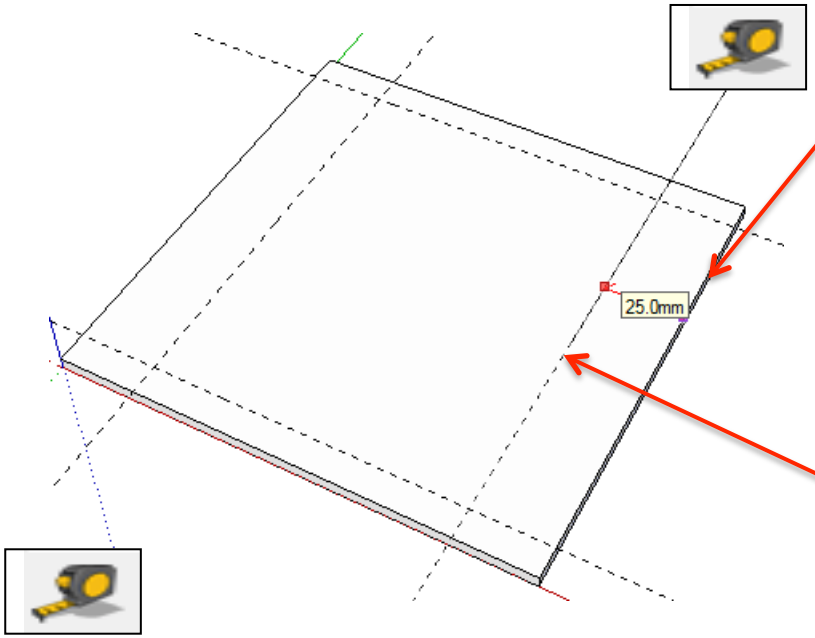
10. ***Click a second time*** to set the guide line and ***type 10 and enter***. You will have a guide line ***10mm*** in from the ***top edge***

11. Select the ***Tape measure tool*** and snap to the ***side edge*** as shown

12. ***Click once*** and it will draw a dotted guide line from the edge

13. ***Click a second time*** to set the guide line and ***type 25 and enter***. You will have a guide line ***25mm*** in from the ***side edge***





14. Select the ***Tape measure tool*** and snap to the ***side edge*** as shown

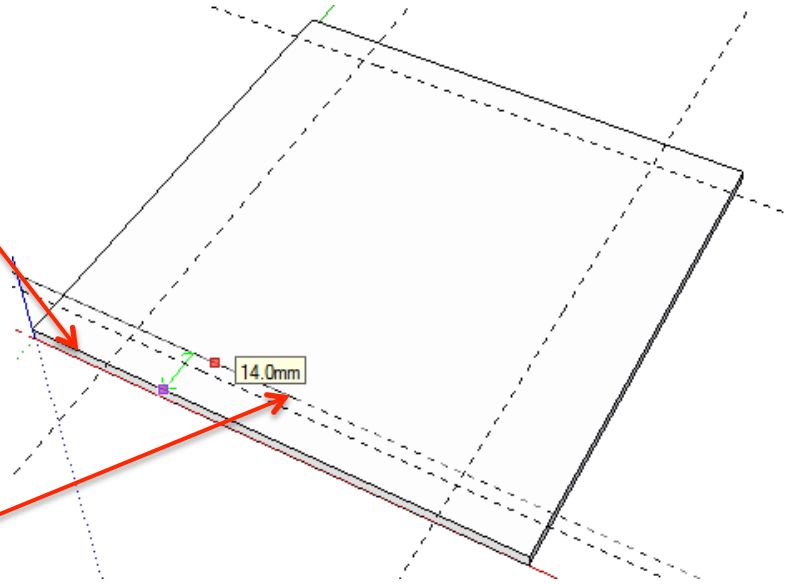
15. ***Click once*** and it will draw a dotted guide line from the edge

16. ***Click a second time*** to set the guide line and ***type 25 and enter***. You will have a guide line ***25mm*** in from the ***side edge***

17. Select the ***Tape measure tool*** and snap to the ***bottom edge*** as shown

18. ***Click once*** and it will draw a dotted guide line from the edge

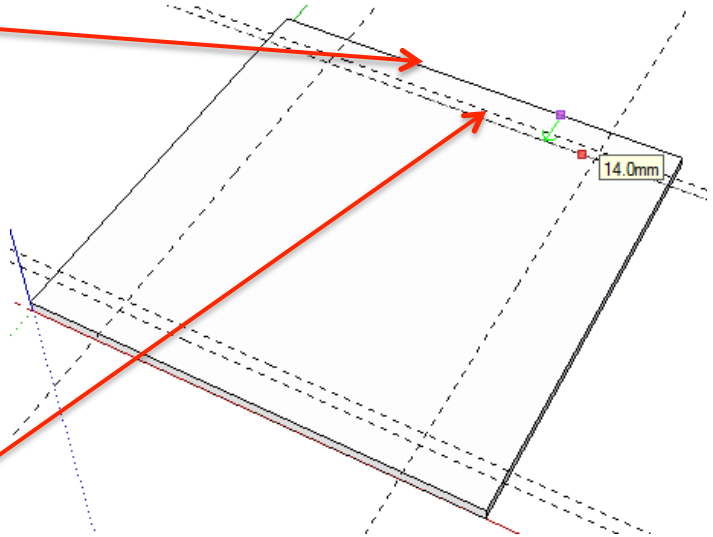
19. ***Click a second time*** to set the guide line and ***type 14 and enter***. You will have a guide line ***14mm*** in from the ***bottom edge***



20. Select the ***Tape measure tool*** and snap to the ***top edge*** as shown

21. ***Click once*** and it will draw a dotted guide line from the edge

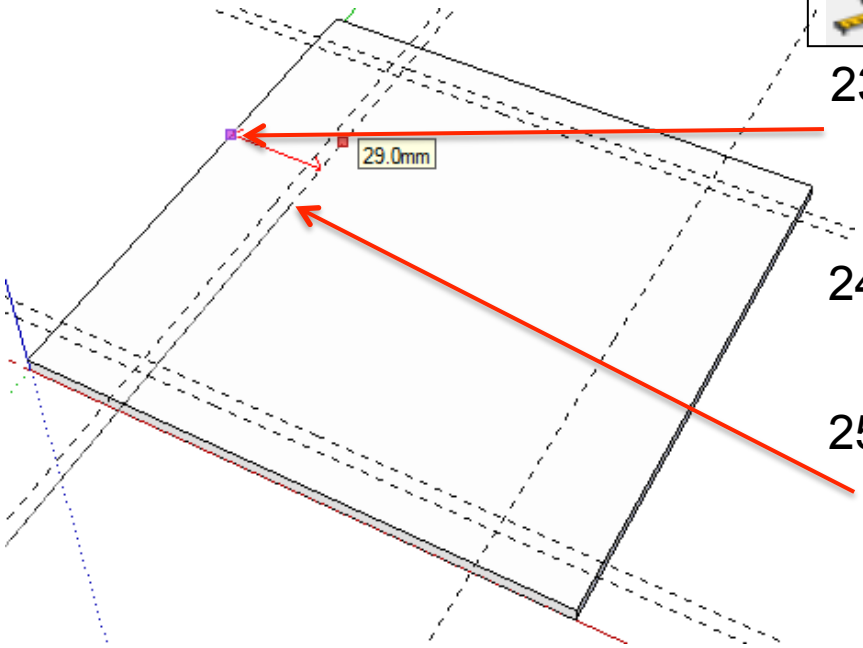
22. ***Click a second time*** to set the guide line and ***type 14 and enter***. You will have a guide line ***14mm*** in from the ***top edge***

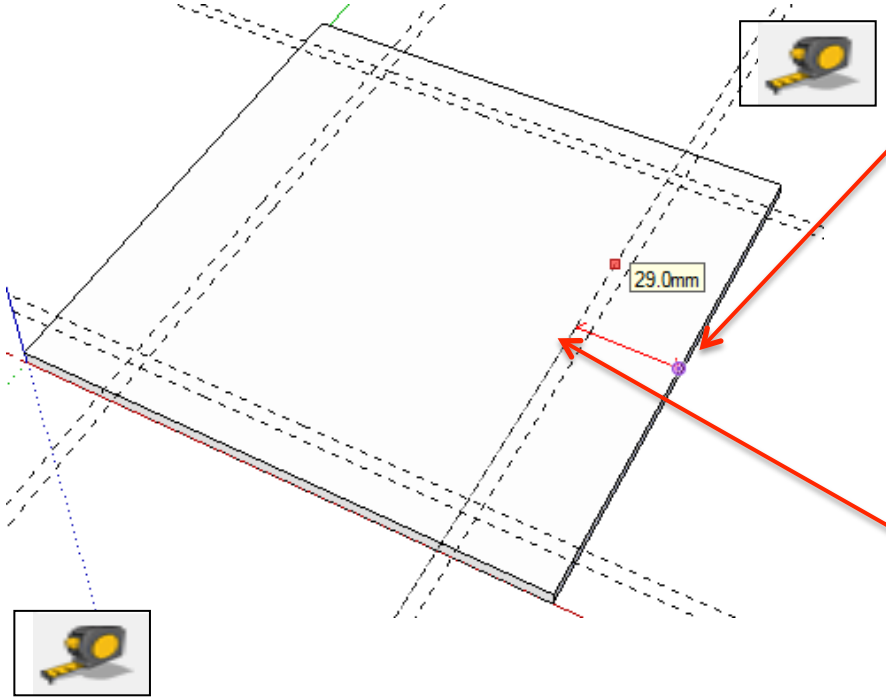


23. Select the ***Tape measure tool*** and snap to the ***side edge*** as shown

24. ***Click once*** and it will draw a dotted guide line from the edge

25. ***Click a second time*** to set the guide line and ***type 29 and enter***. You will have a guide line ***29mm*** in from the ***side edge***





26. Select the ***Tape measure tool*** and snap to the ***side edge*** as shown

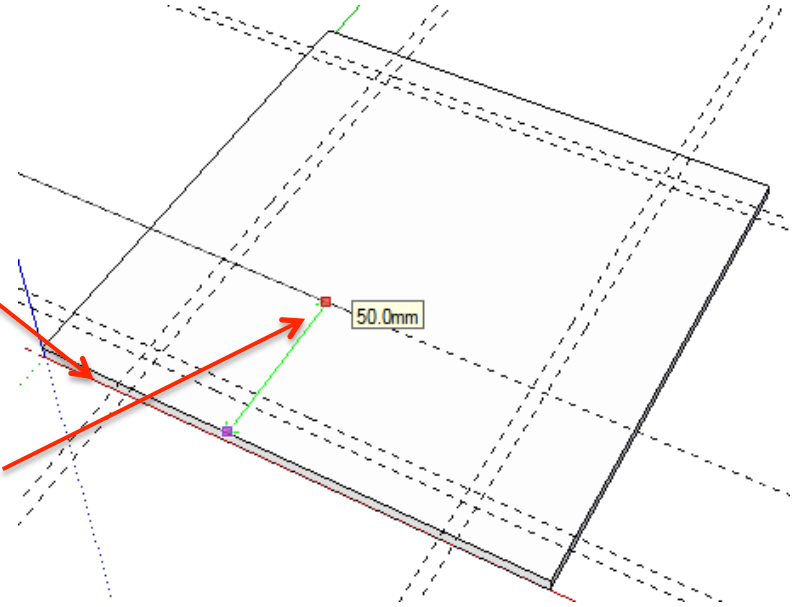
27. ***Click once*** and it will draw a dotted guide line from the edge

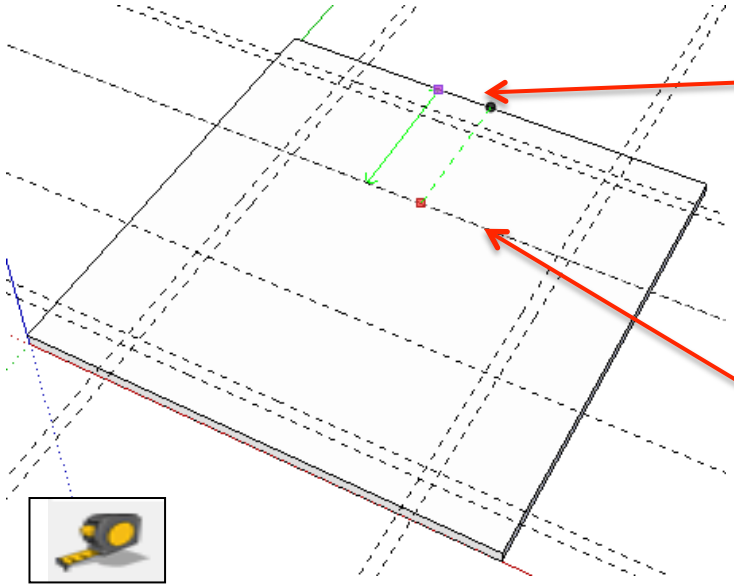
28. ***Click a second time*** to set the guide line and ***type 29 and enter***. You will have a guide line ***29mm*** in from the ***side edge***

29. Select the ***Tape measure tool*** and snap to the ***bottom edge*** as shown

30. ***Click once*** and it will draw a dotted guide line from the edge

31 Click a second time to set the guide line and ***type 50 and enter***. You will have a guide line ***50mm*** in from

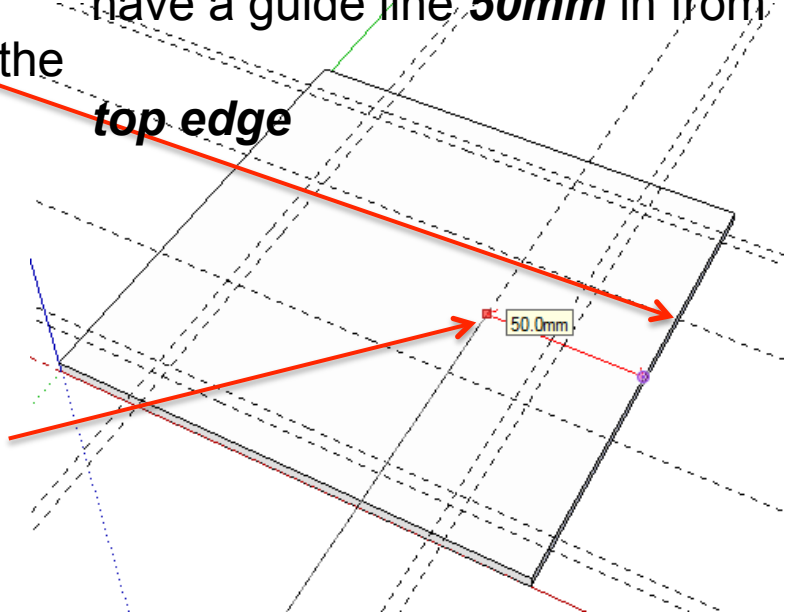




32. Select the ***Tape measure tool*** and snap to the ***top edge*** as shown

33. ***Click once*** and it will draw a dotted guide line from the edge

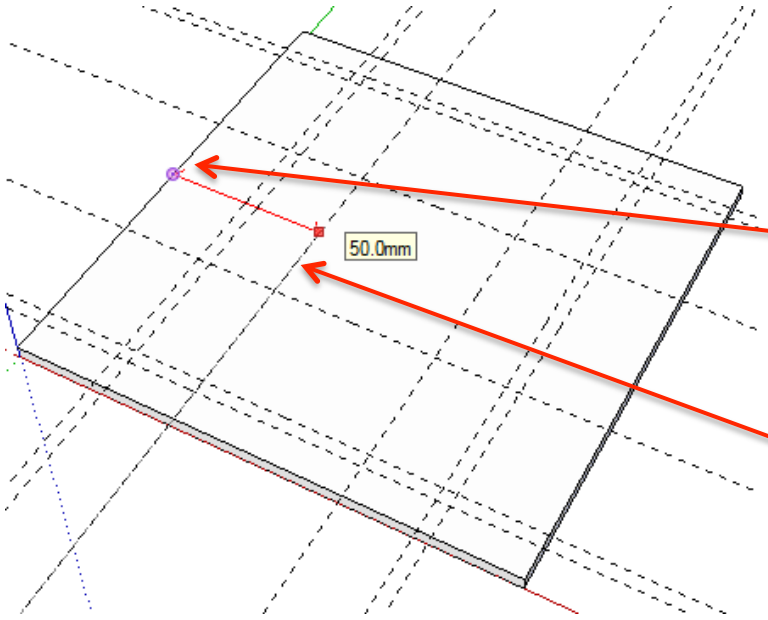
34 Click a second time to set the guide line and ***type 50 and enter***. You will have a guide line ***50mm*** in from the ***top edge***



35. Select the ***Tape measure tool*** and snap to the ***side edge*** as shown

37. ***Click once*** and it will draw a dotted guide line from the edge

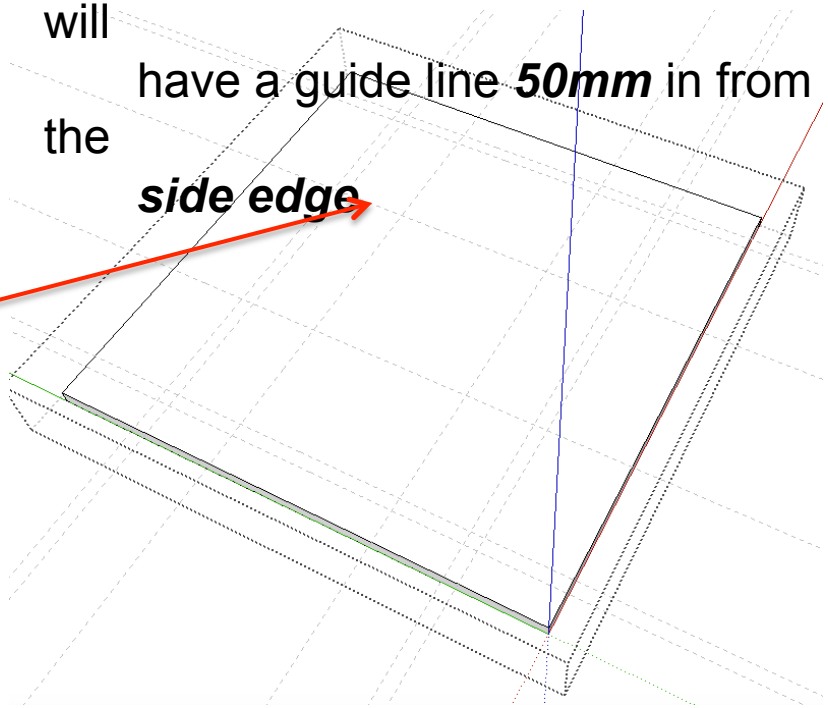
38 Click a second time to set the guide line and ***type 50 and enter***. You will have a guide line ***50mm*** in from the



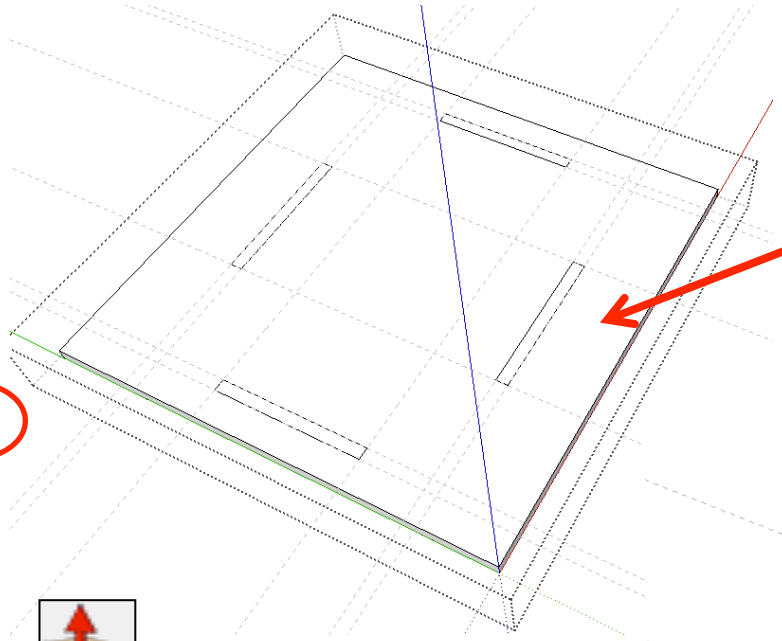
39. Select the ***Tape measure to***  and snap to the ***side edge*** as shown

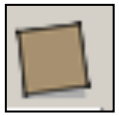
40. ***Click once*** and it will draw a dotted guide line from the edge

41 Click a second time to set the guide line and ***type 50 and enter***. You will have a guide line ***50mm*** in from the ***side edge***



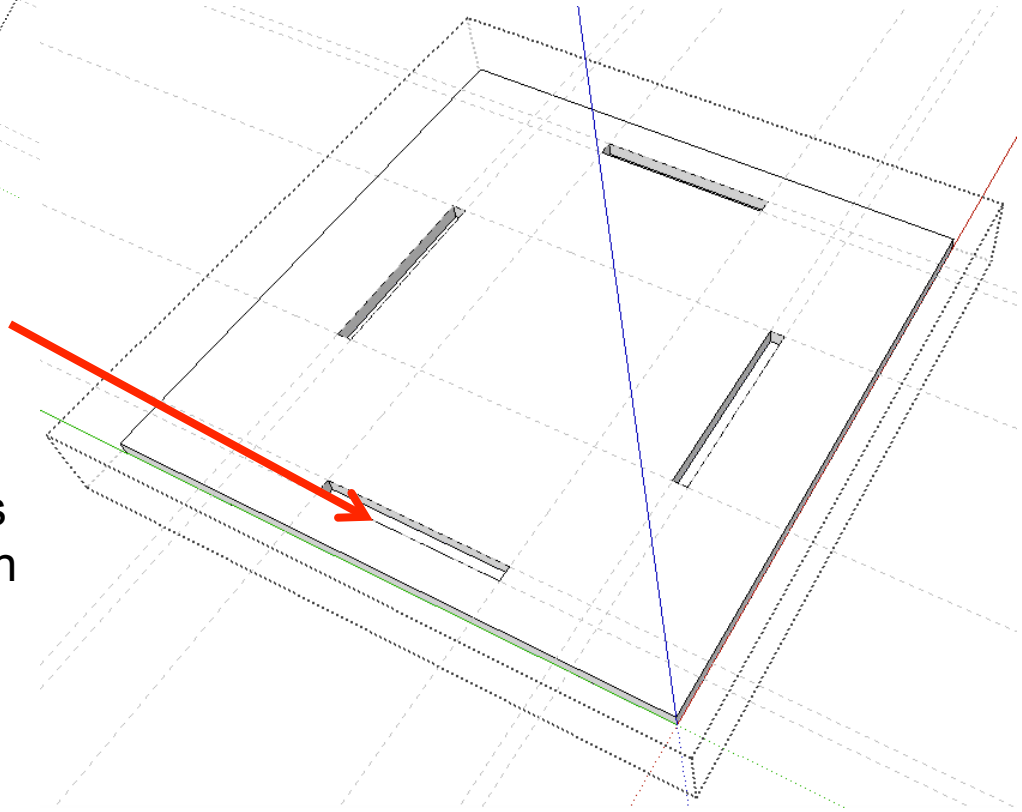
42. Using the ***select tool, double click*** on the piece shown to edit it. All the other pieces should be greyed out. Then click on the edge shown to highlight it in blue.

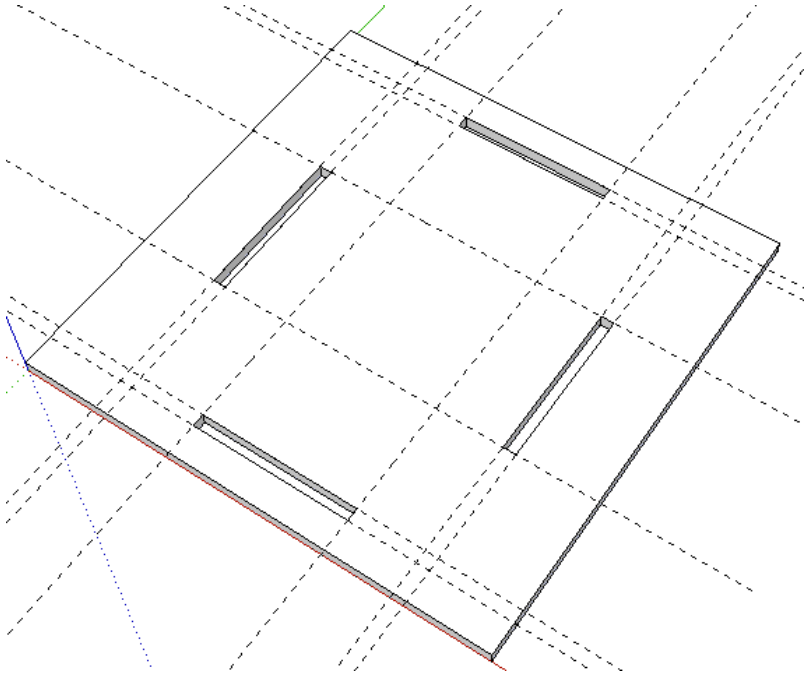




43. ***Click*** on the rectangle tool **.** Using the guide lines you have drawn previously. Draw the rectangles shown. ***They will say intersections***

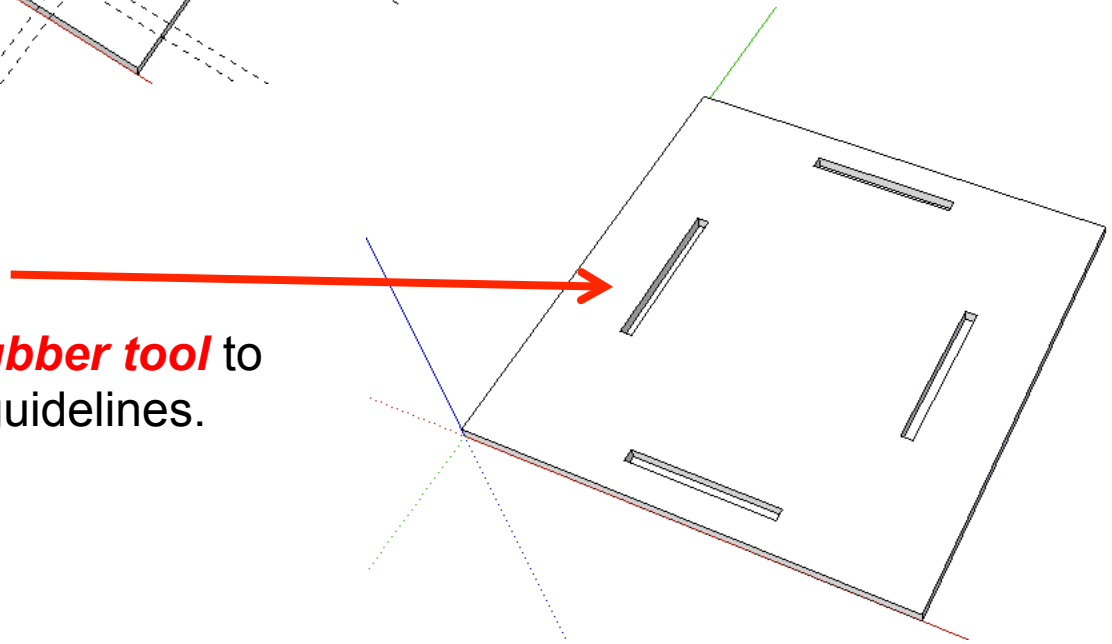
44. Using the ***push pull tool.*** Hover over the each of the rectangles you have just drawn. They will go ***dotted*** as you hover over them in turn. Push the shape down. Type in ***4 and press enter.***

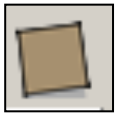




45. Using the ***select tool, click*** on the side of the piece shown to un-edit.

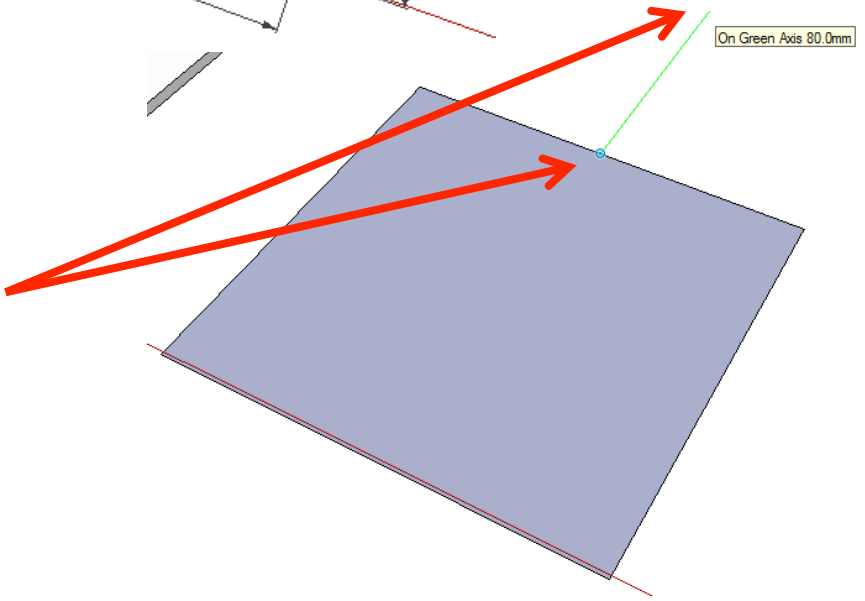
46. Use the ***rubber tool*** to erase the guidelines.



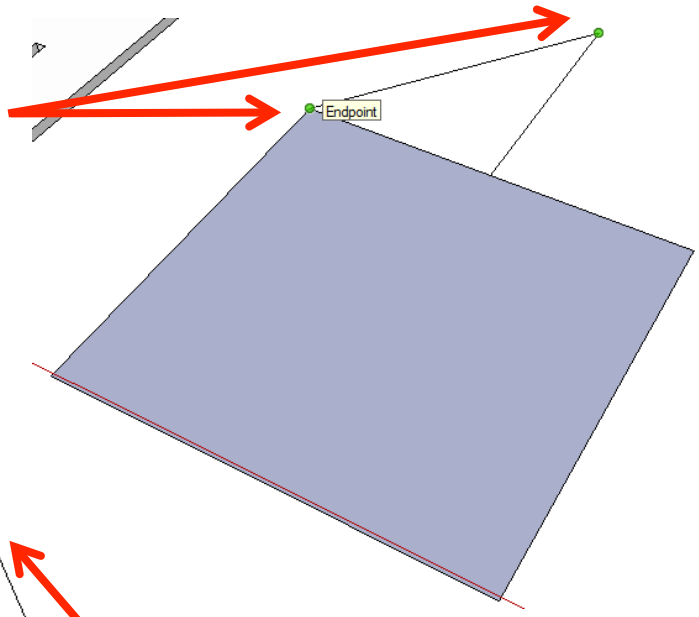


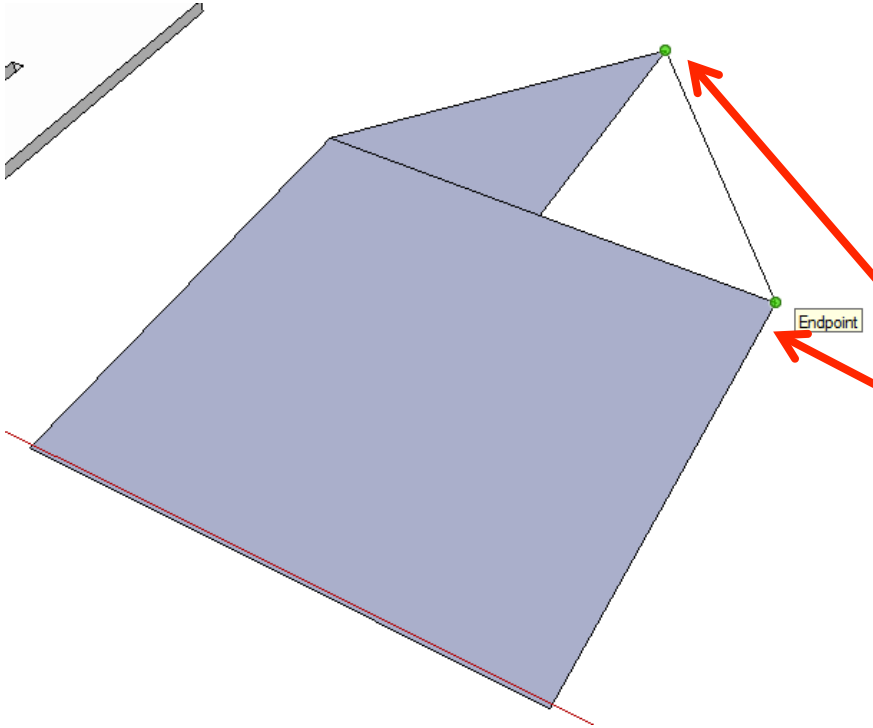
47. ***Click*** on the rectangle tool **.** Start drawing a square and type **130, 120.**

48. Using the ***line tool***. Snap to the midpoint on the top edge of the square. Draw a line up on the ***green*** axis. ***Type in 80 and press enter.***

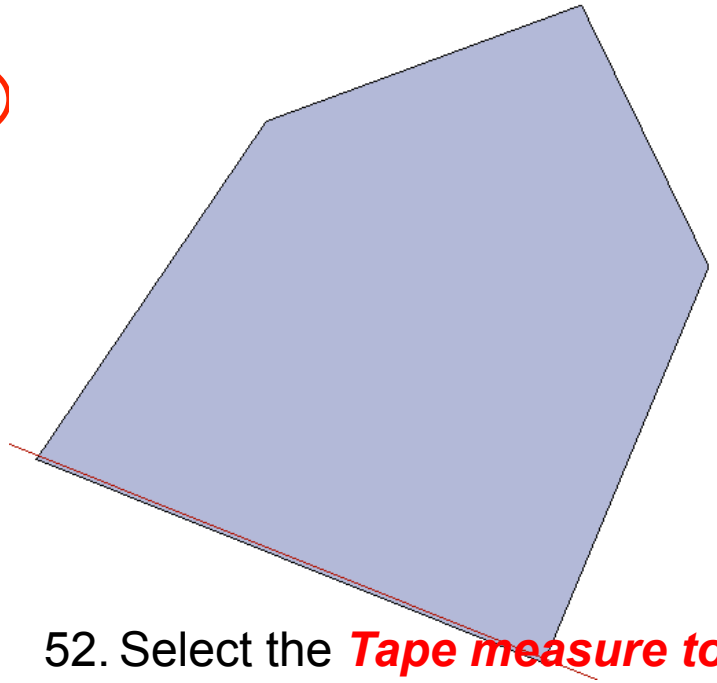


49. Using the ***line tool***. Snap to the endpoints shown to draw the triangle. It should fill in grey if drawn correctly.





50. Using the ***line tool***. Snap to the endpoints shown to draw the triangle on the opposite side. It should fill in grey if drawn correctly.

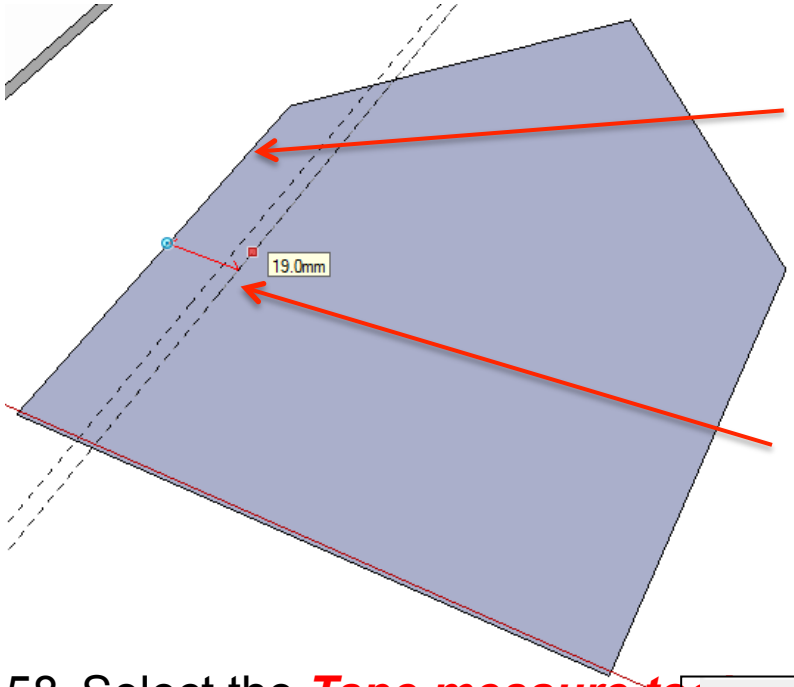


51. Use the ***rubber tool*** to erase the lines so you end up with a house shape.

52. Select the ***Tape measure to*** and snap to the ***side edge*** as shown

53. ***Click once*** and it will draw a dotted guide line from the edge

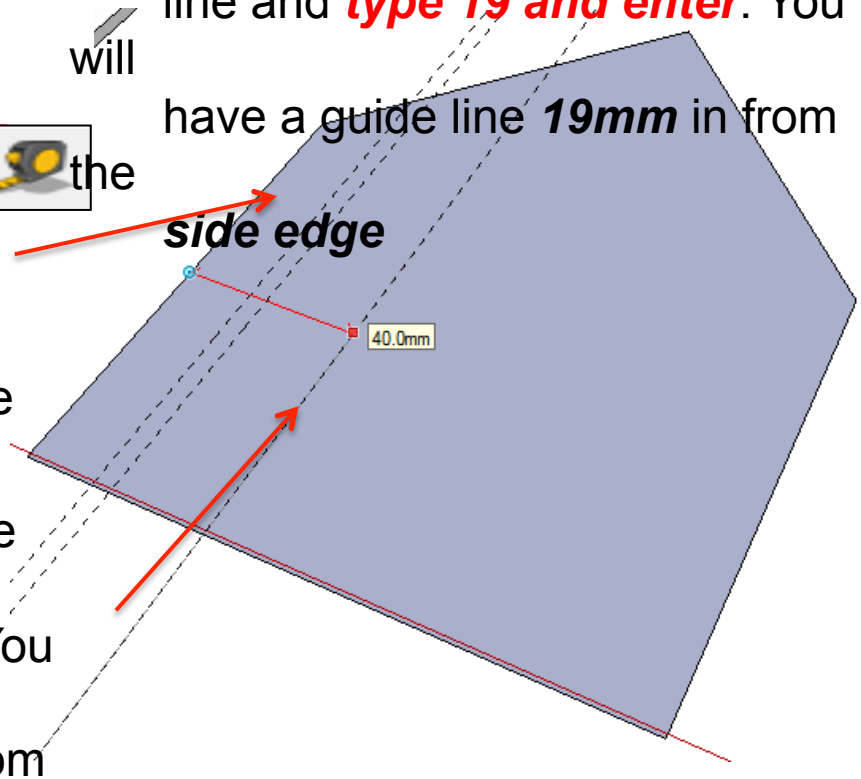
54 Click a second time to set the guide line and ***type 15 and enter***. You will have a guide line ***15mm*** in from the



55. Select the ***Tape measure tool*** and snap to the ***side edge*** as shown

56. ***Click once*** and it will draw a dotted guide line from the edge

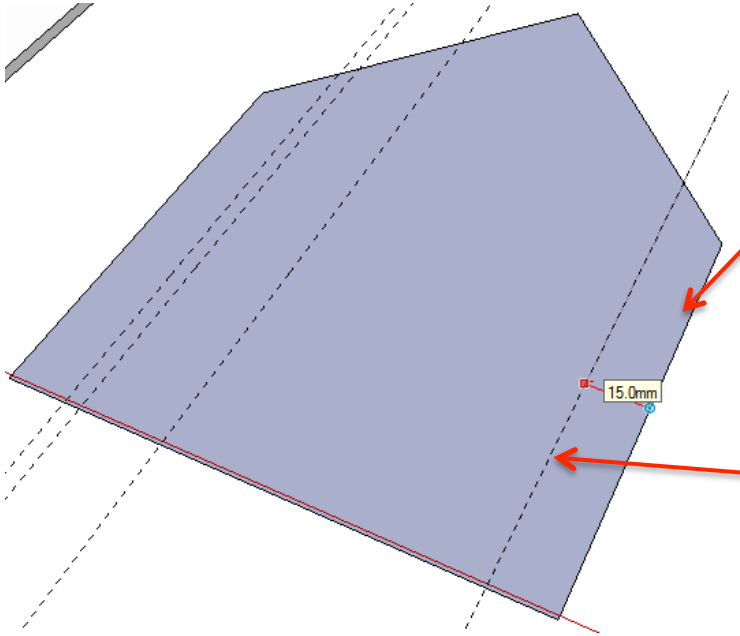
57 Click a second time to set the guide line and ***type 19 and enter***. You will have a guide line ***19mm*** in from the ***side edge***



58. Select the ***Tape measure tool*** and snap to the ***side edge*** as shown

59. ***Click once*** and it will draw a dotted guide line from the edge

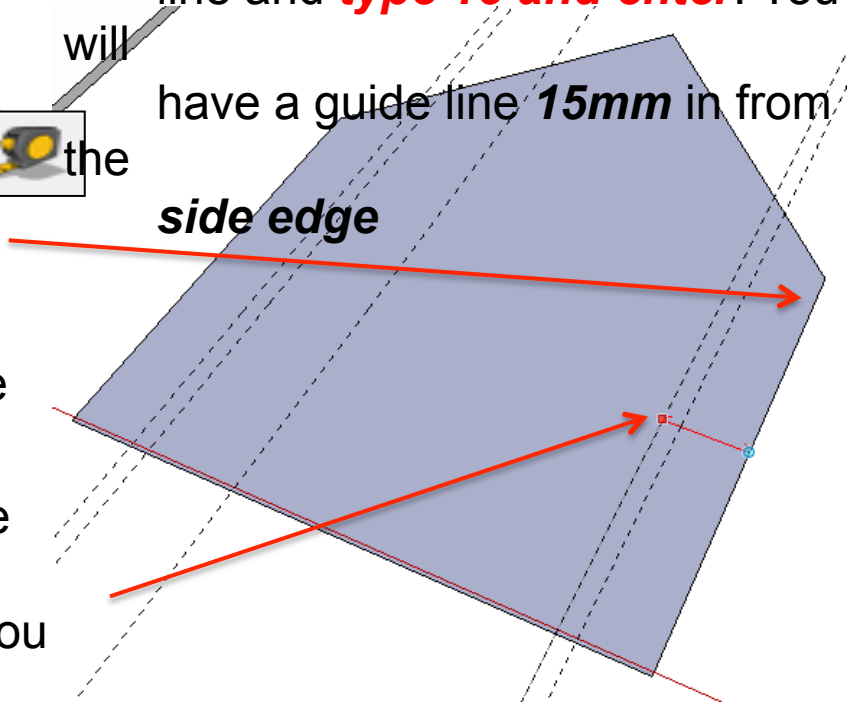
60 Click a second time to set the guide line and ***type 40 and enter***. You will have a guide line ***40mm*** in from the



61. Select the ***Tape measure tool***  and snap to the ***side edge*** as shown

62. ***Click once*** and it will draw a dotted guide line from the edge

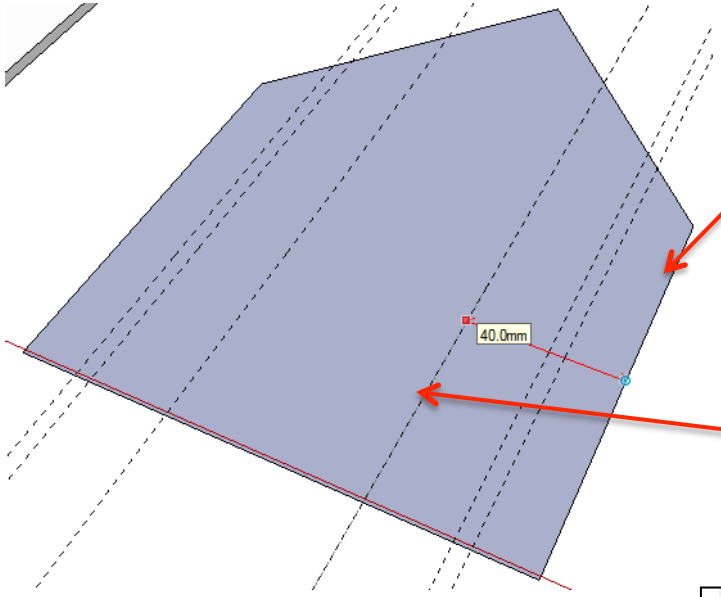
63 Click a second time to set the guide line and ***type 15 and enter***. You will have a guide line ***15mm*** in from the ***side edge***



64. Select the ***Tape measure tool*** and snap to the ***side edge*** as shown

65. ***Click once*** and it will draw a dotted guide line from the edge

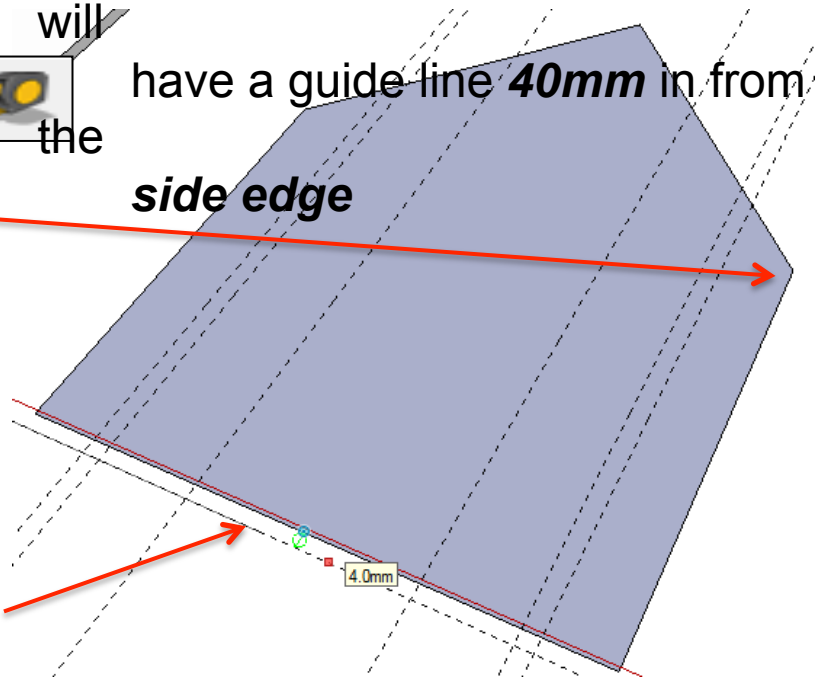
66 Click a second time to set the guide line and ***type 19 and enter***. You will have a guide line ***19mm*** in from the



67. Select the ***Tape measure tool*** and snap to the ***side edge*** as shown

68. ***Click once*** and it will draw a dotted guide line from the edge

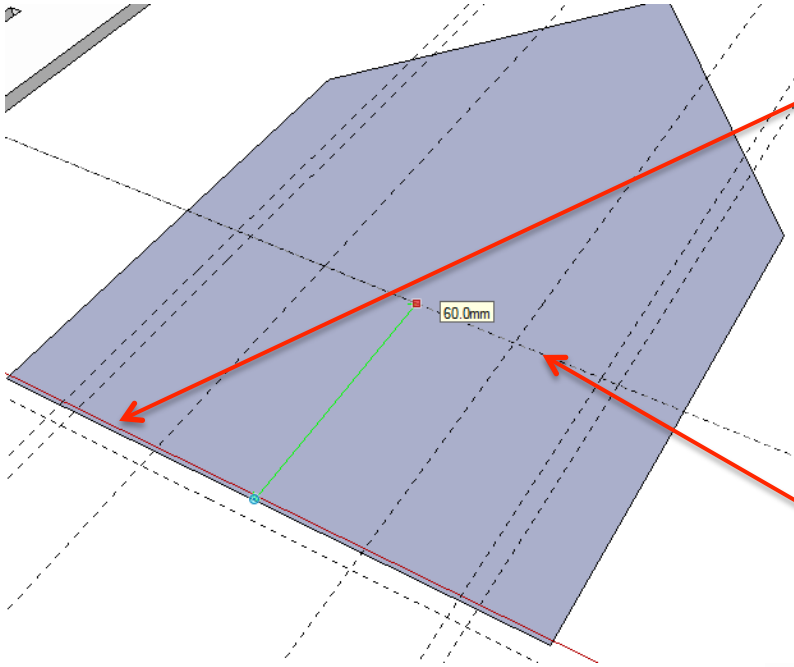
69 Click a second time to set the guide line and ***type 40 and enter***. You will have a guide line ***40mm*** in from the ***side edge***



70. Select the ***Tape measure tool*** and snap to the ***bottom edge*** as shown

71. ***Click once*** and it will draw a dotted guide line down from the edge

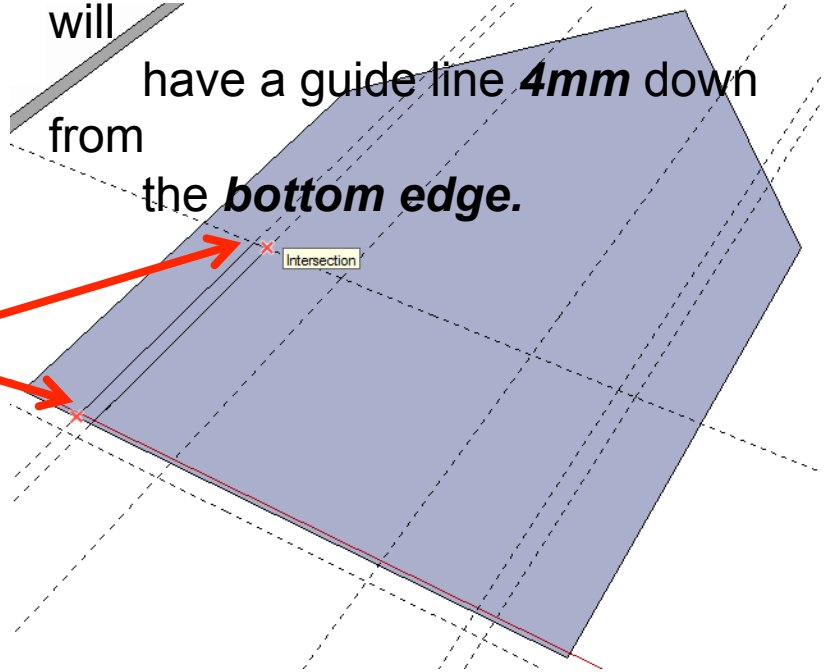
72 Click a second time to set the guide line and ***type 4 and enter***. You will have a guide line ***4mm*** down from

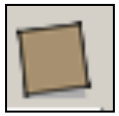


73. Select the ***Tape measure to*** and snap to the ***bottom edge*** as shown

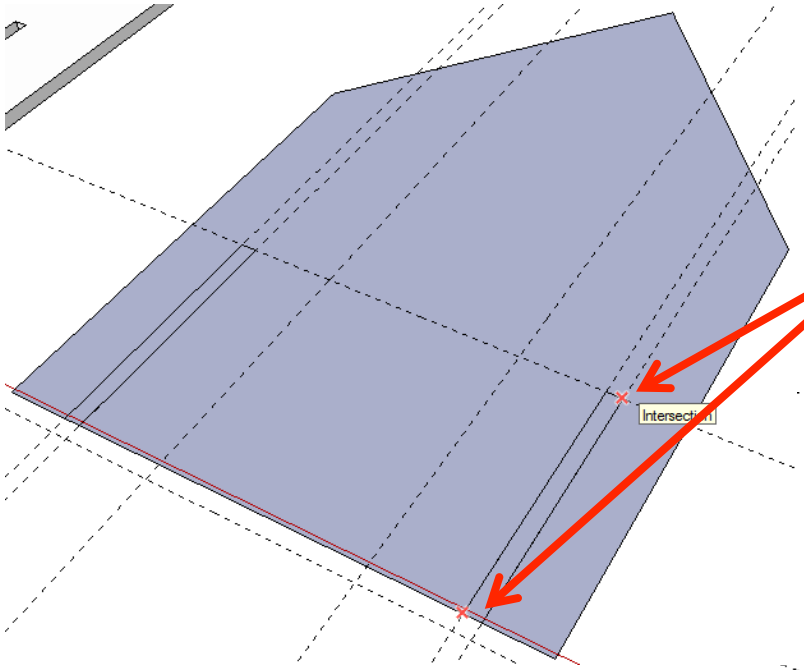
74. ***Click once*** and it will draw a dotted guide line down from the edge

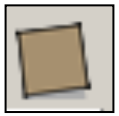
75 Click a second time to set the guide line and ***type 4 and enter***. You will have a guide line ***4mm*** down from the ***bottom edge.***



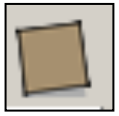


76. ***Click*** on the rectangle tool . Using the guide lines you have drawn preciously. Draw the rectangle shown. ***It will say intersections from the two points indicated.***

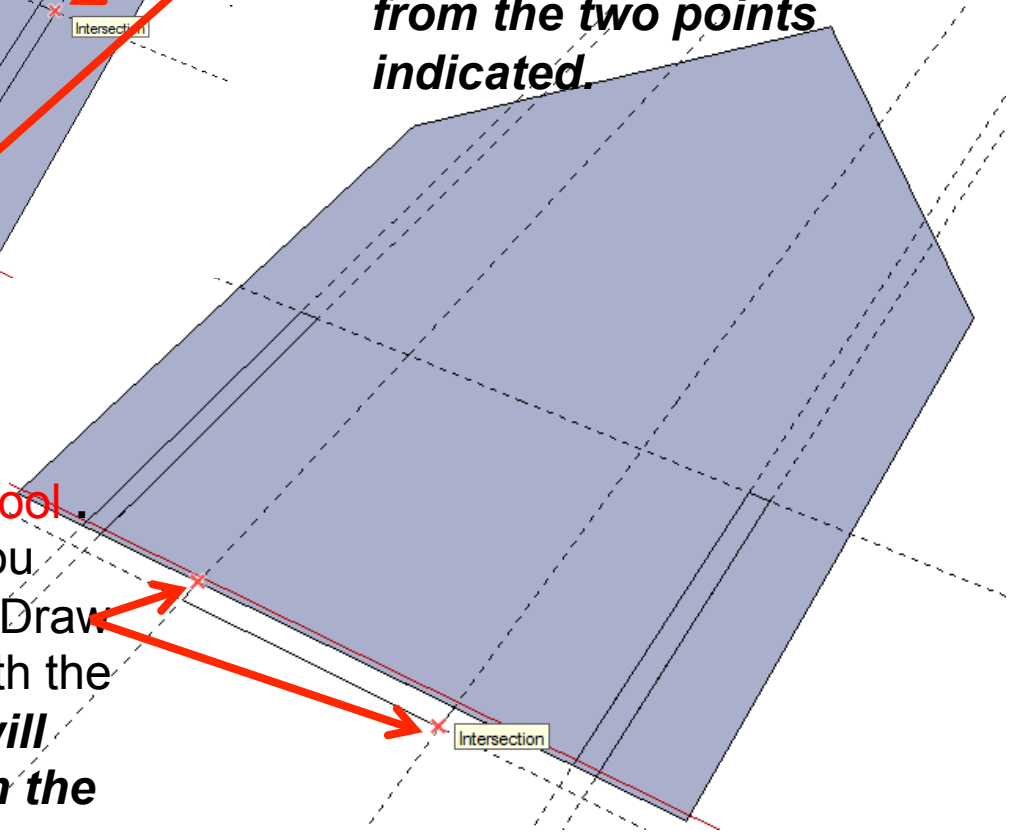


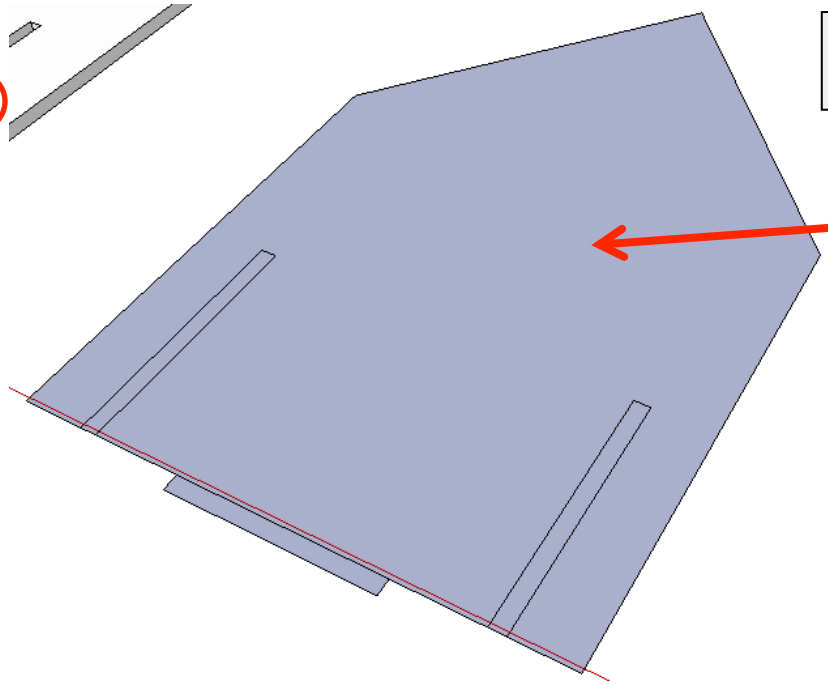


77. ***Click*** on the rectangle tool **.** Using the guide lines you have drawn preciously. Draw the rectangle shown. ***It will say intersections from the two points indicated.***



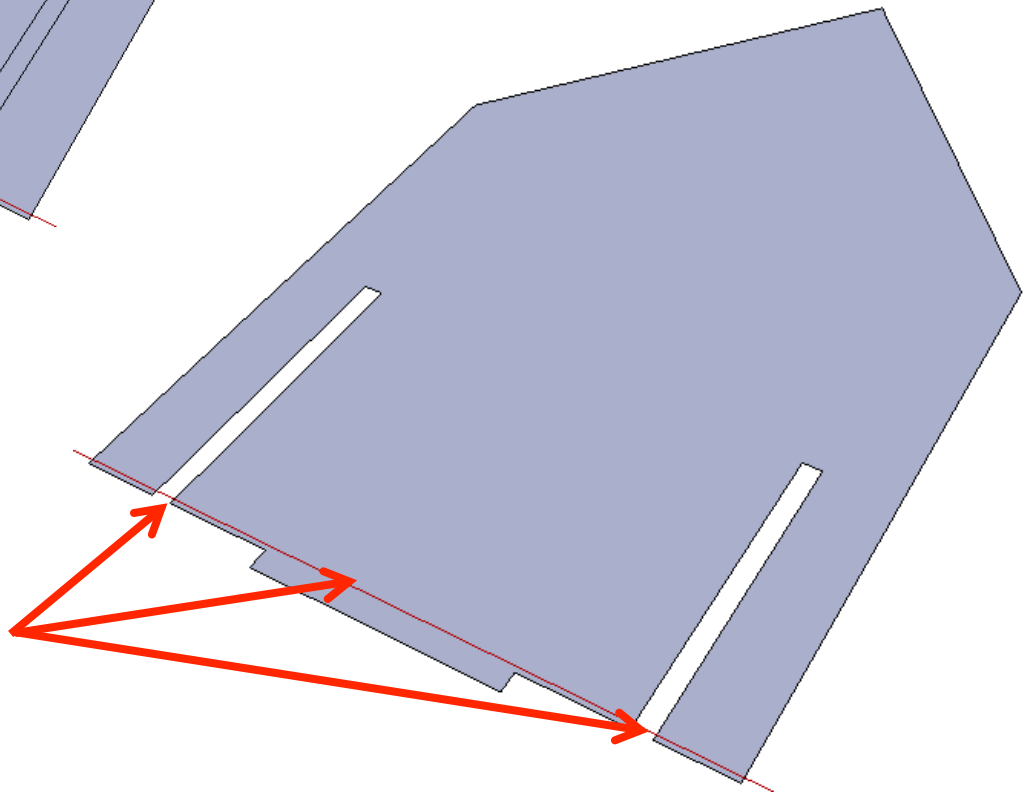
78. ***Click*** on the rectangle tool **.** Using the guide lines you have drawn previously. Draw the rectangle underneath the main shape shown. ***It will say intersections from the two points indicated.***

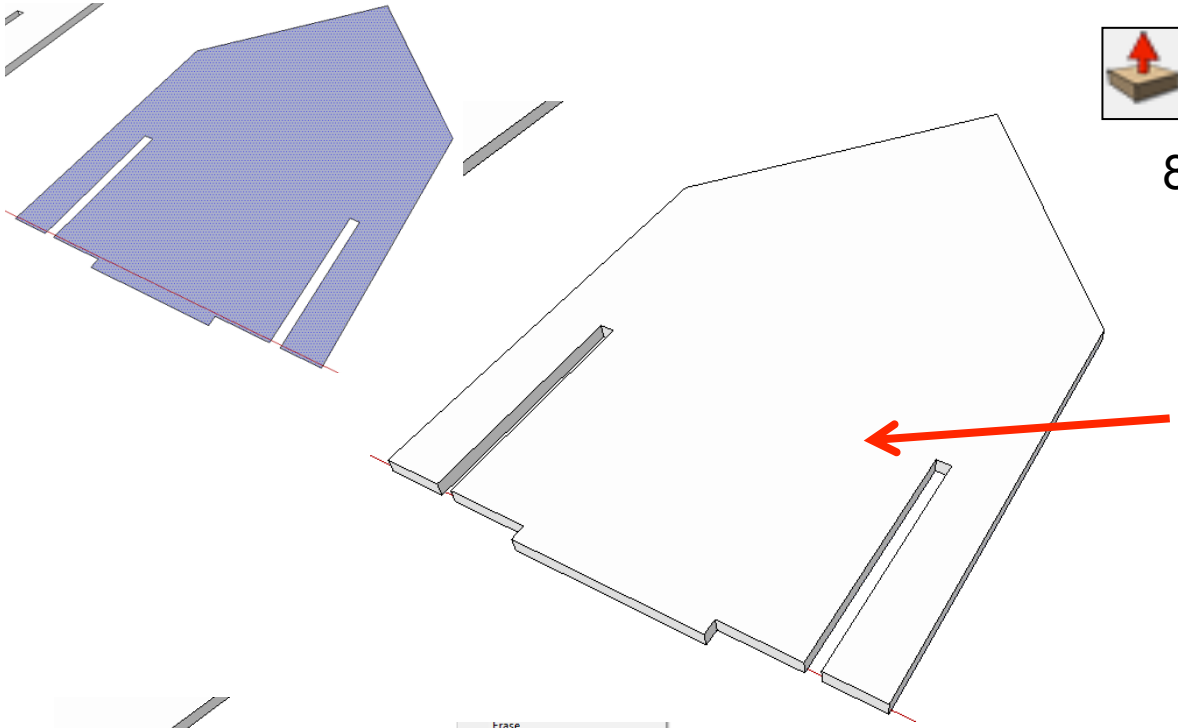




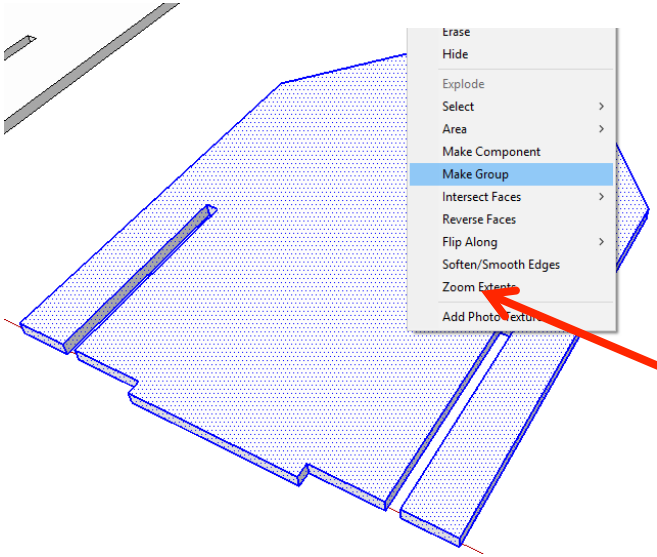
79. Use the ***rubber tool*** to erase the guidelines.

80. Use the ***rubber tool*** to erase the lines shown to be left with the following shape.

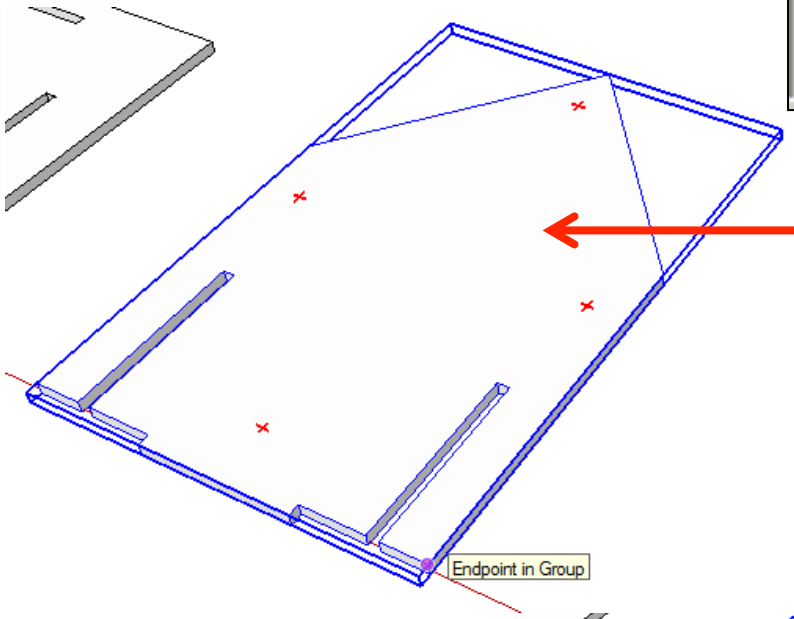




81. Using the ***push pull tool.*** Hover over the shape you have just drawn. They will go ***dotted*** as you hover over them in turn. Pull the shape up. Type in ***4 and press enter.***



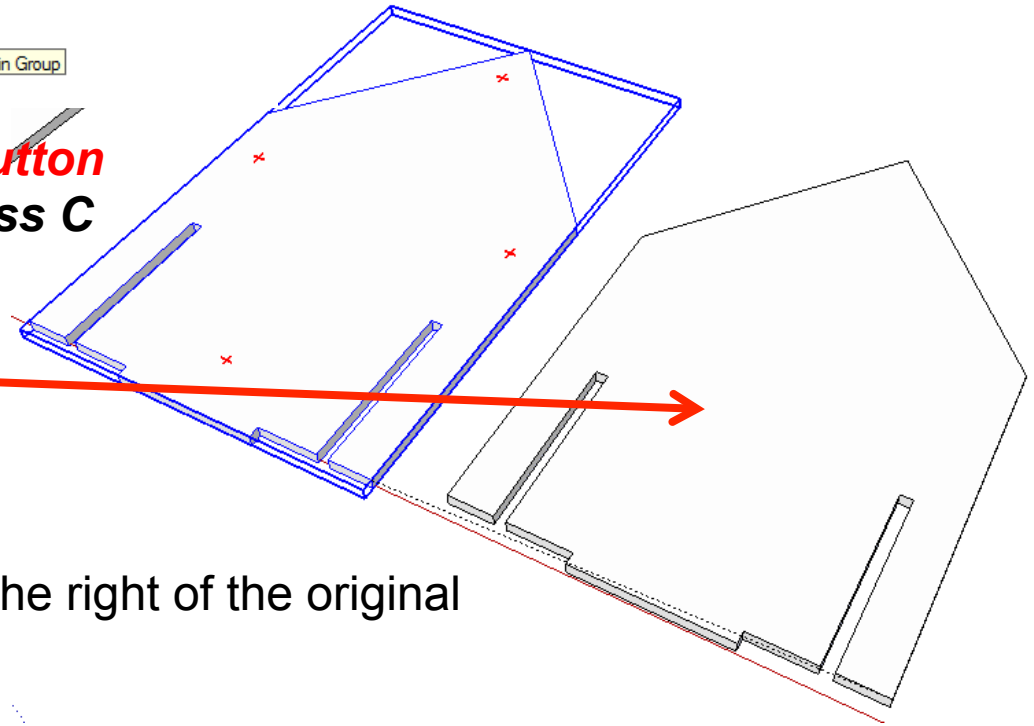
82. Use the ***select tool*** and keep clicking on the piece until it is all selected and highlighted in blue. ***Right click*** on the mouse to produce the menu shown above and ***click*** on ***make group.***



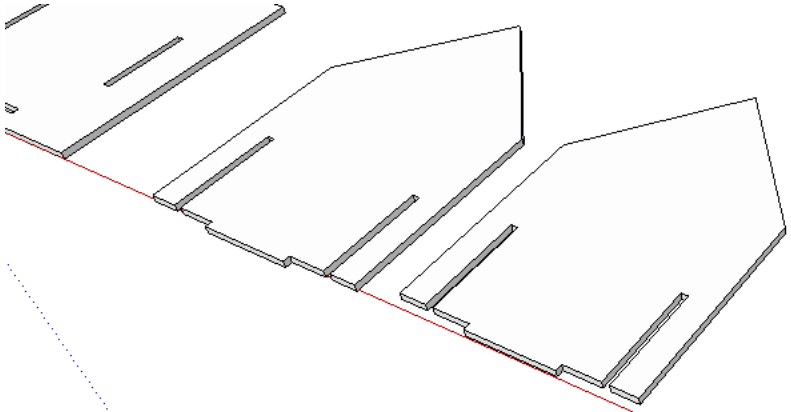
83. Use the ***select tool*** and click on the shape to select the entire object.

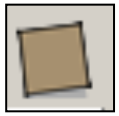
84. Hold the ***Control button down*** and then ***press C (copy)***

85. Hold the ***Control button down*** and then ***press V (paste)***

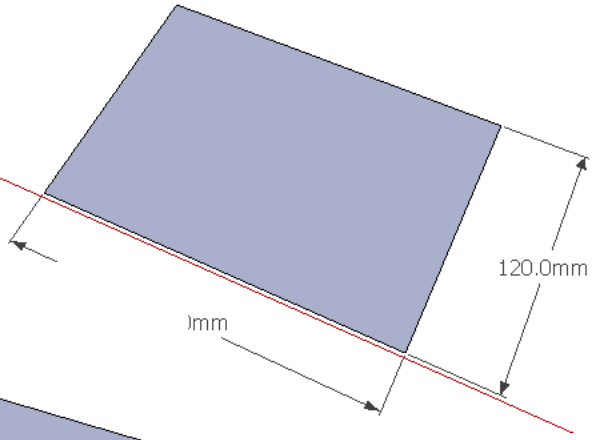


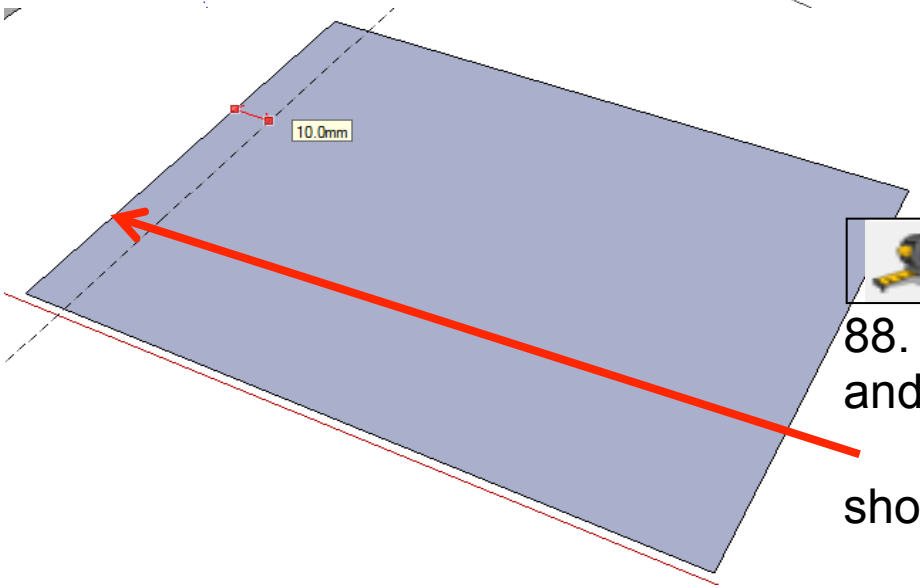
86. Move the piece to the right of the original



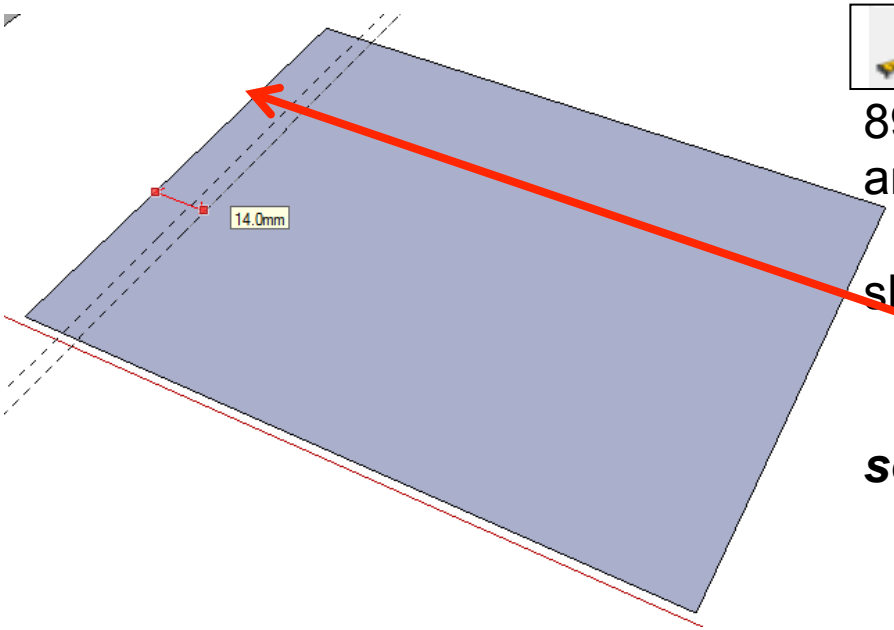


87. ***Click*** on the rectangle tool **.**
Start drawing a square and type **150, 120.**





88. Select the ***Tape measure tool*** and
snap to the ***side edge*** as shown.
Click once and it will draw a dotted guide line. ***Click a second***
time to set the guide line and



89. Select the ***Tape measure tool*** and

snap to the ***side edge*** as shown.

Click once and it will draw a dotted guide line. ***Click a second***

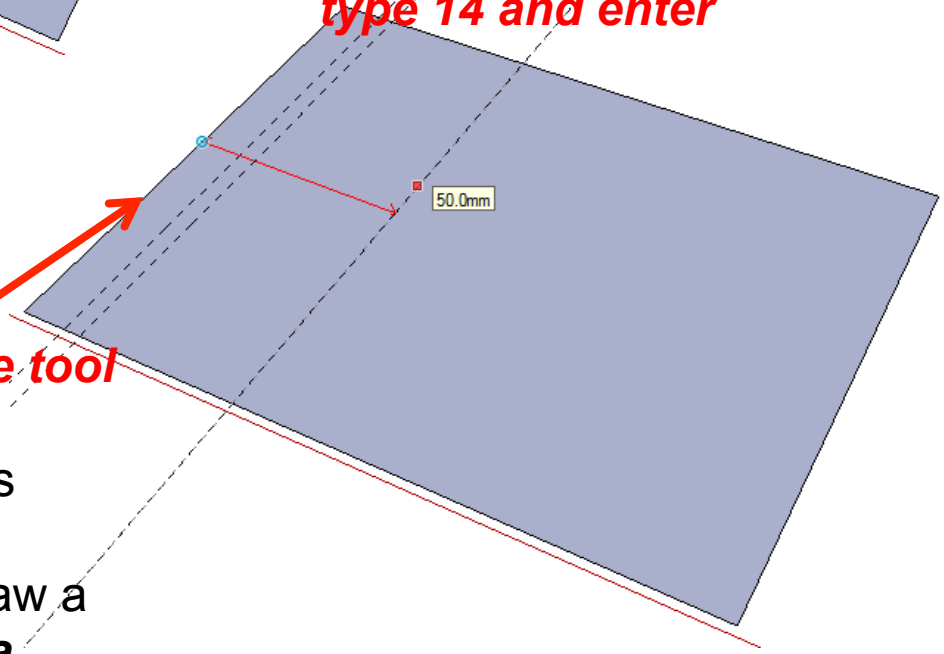
time to set the guide line and ***type 14 and enter***

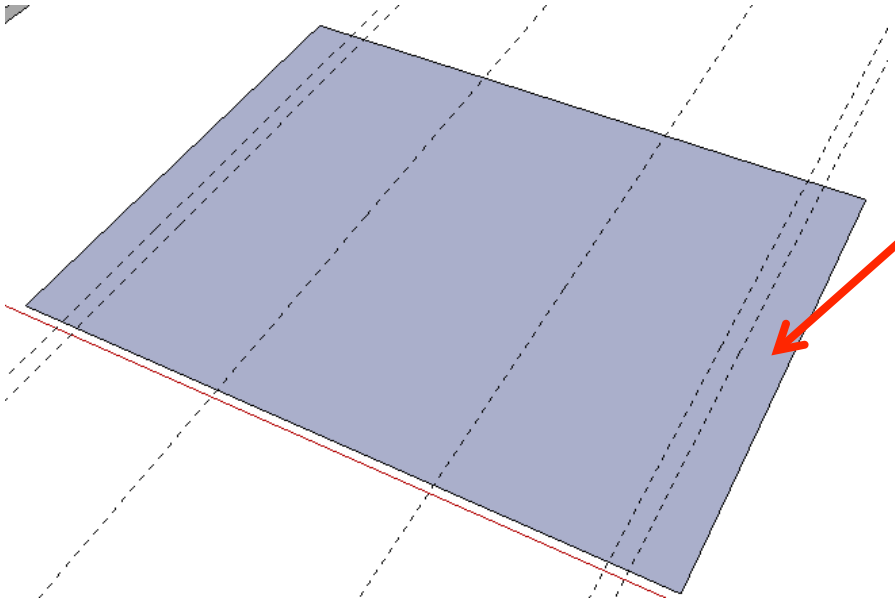
90. Select the ***Tape measure tool*** and

snap to the ***side edge*** as shown.

Click once and it will draw a dotted guide line. ***Click a second***

time to set the guide line and

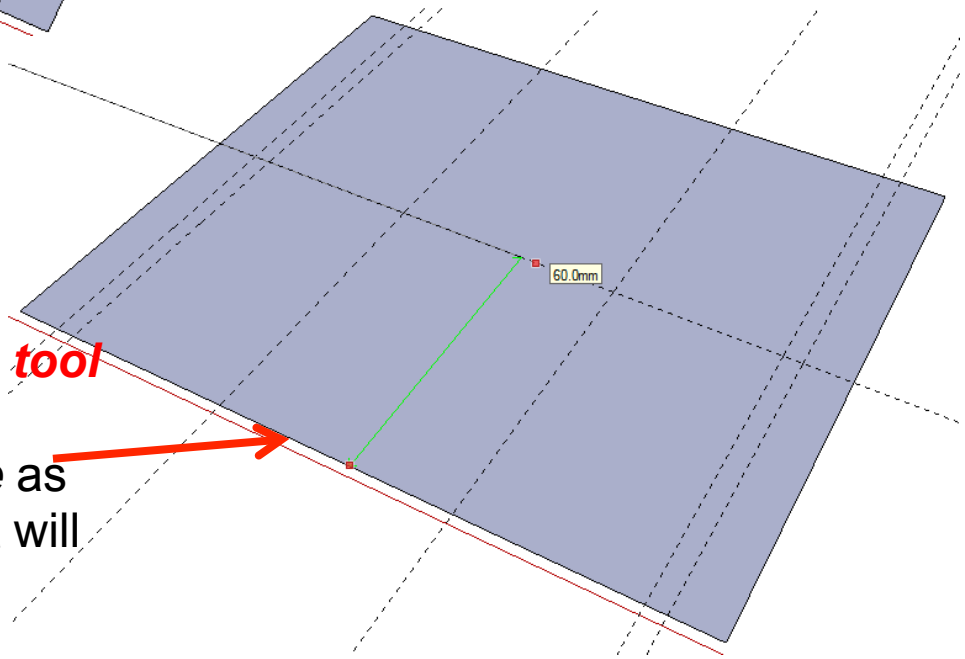




91. Repeat steps ***88, 89 and 90***

on the opposite side. The guide lines ***should measure***

10, 14 and 50.

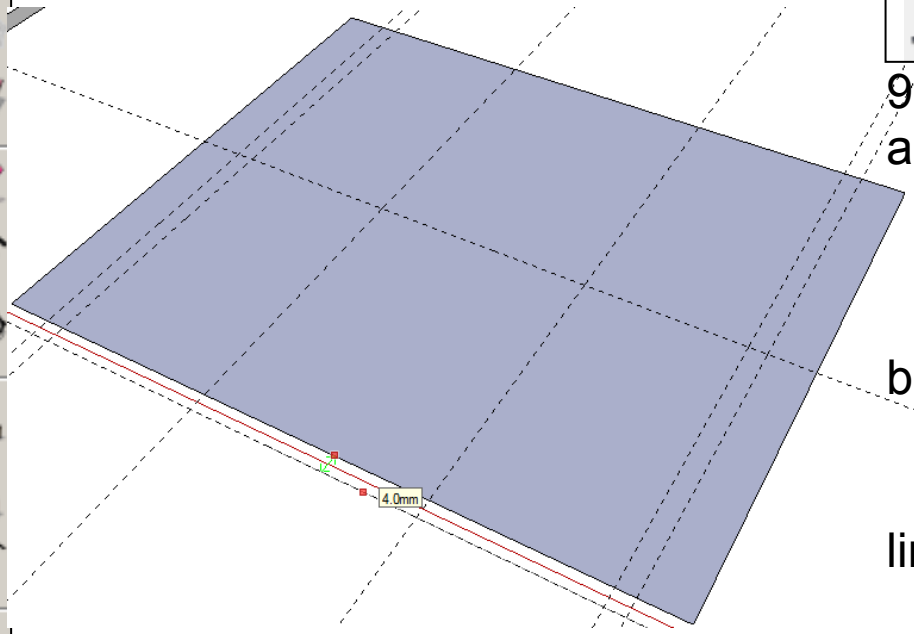


92. Select the ***Tape measure tool*** and

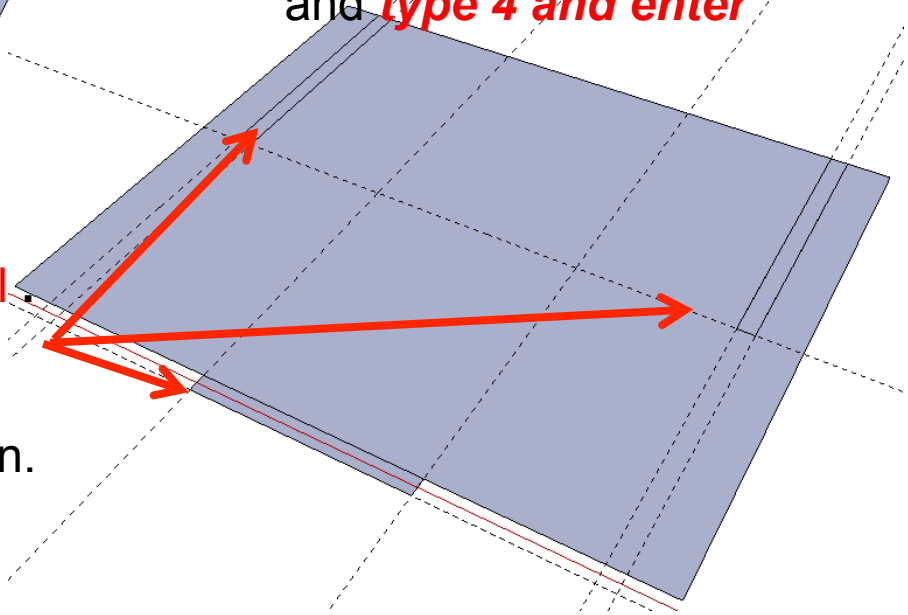
snap to the ***bottom edge*** as shown. ***Click once*** and it will draw a dotted guide line.

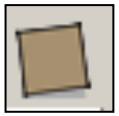
Click a

second time to set the guide line

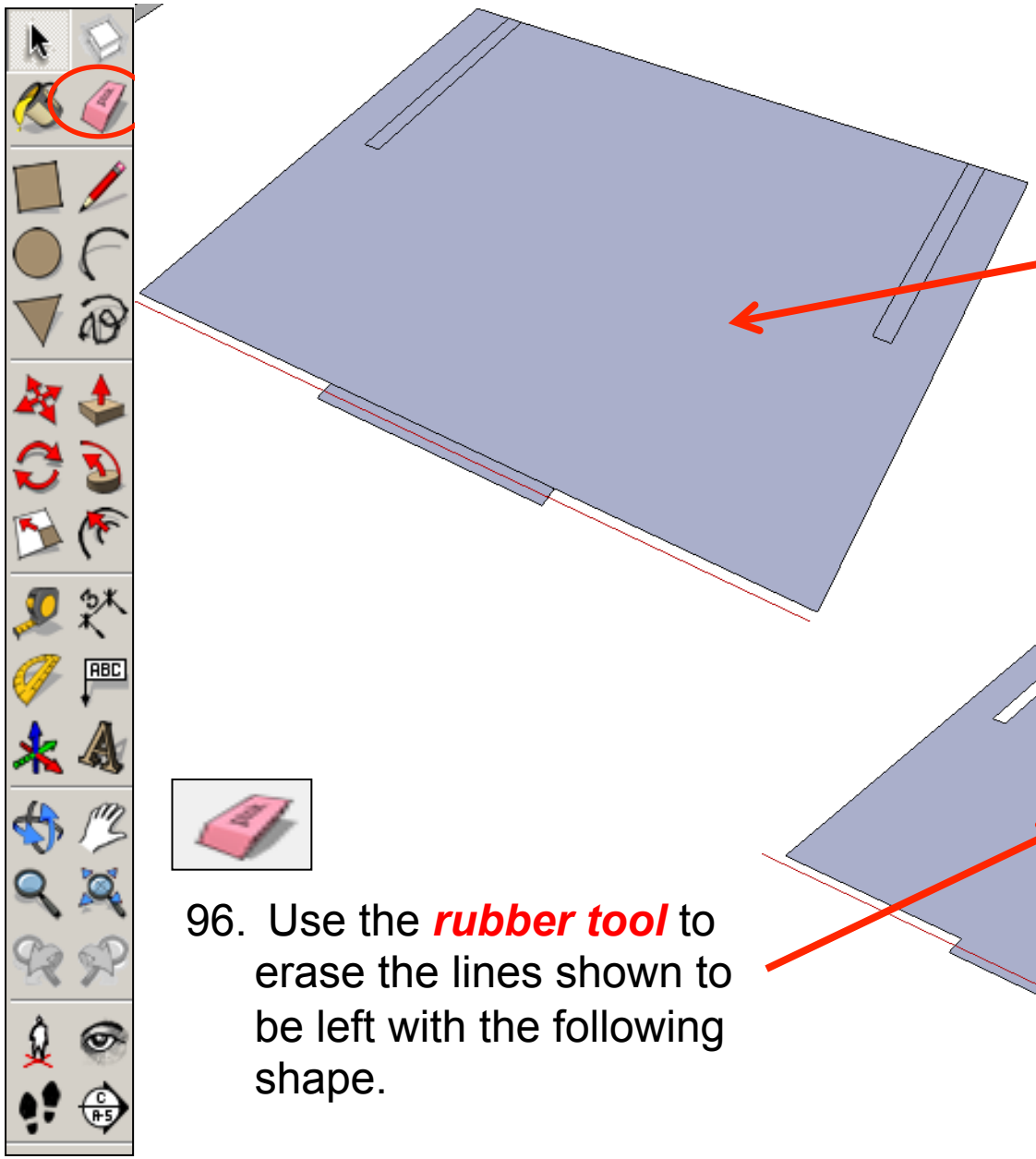


93. Select the ***Tape measure tool*** and
snap to the ***bottom edge*** as shown. ***Click once*** and it will draw a dotted guide line below the main shape. ***Click a second time*** to set the guide line and ***type 4 and enter***



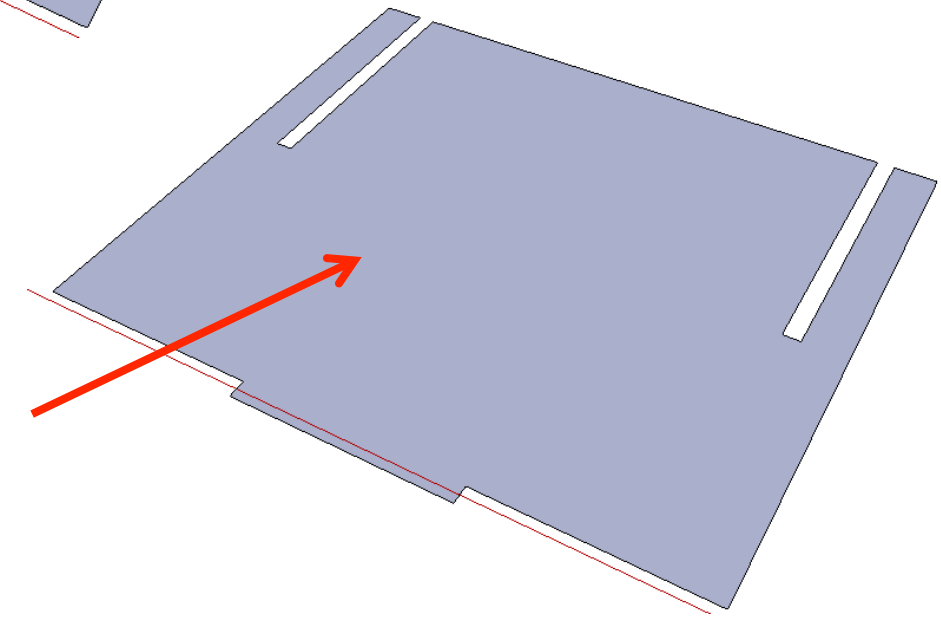


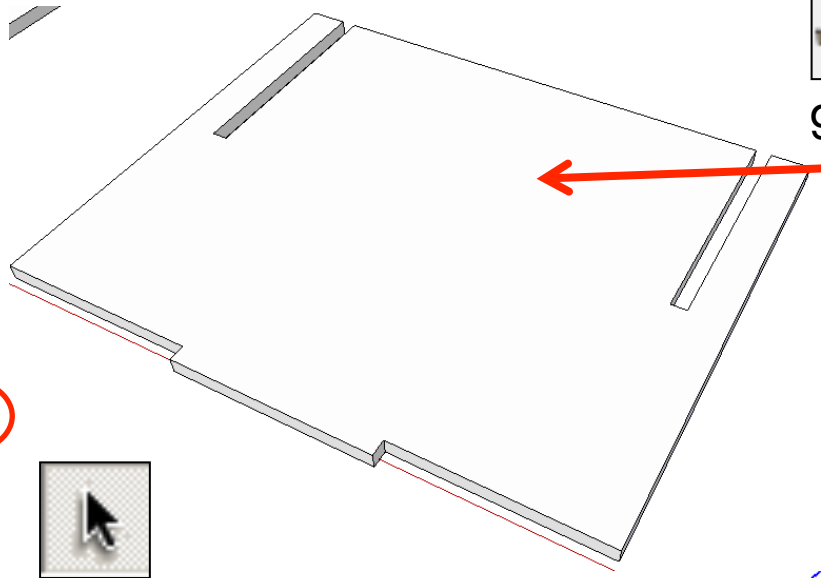
94. ***Click*** on the rectangle tool.
Using the guide lines you have drawn previously.
Draw the rectangles shown.



95. Use the ***rubber tool*** to erase the guidelines.

96. Use the ***rubber tool*** to erase the lines shown to be left with the following shape.



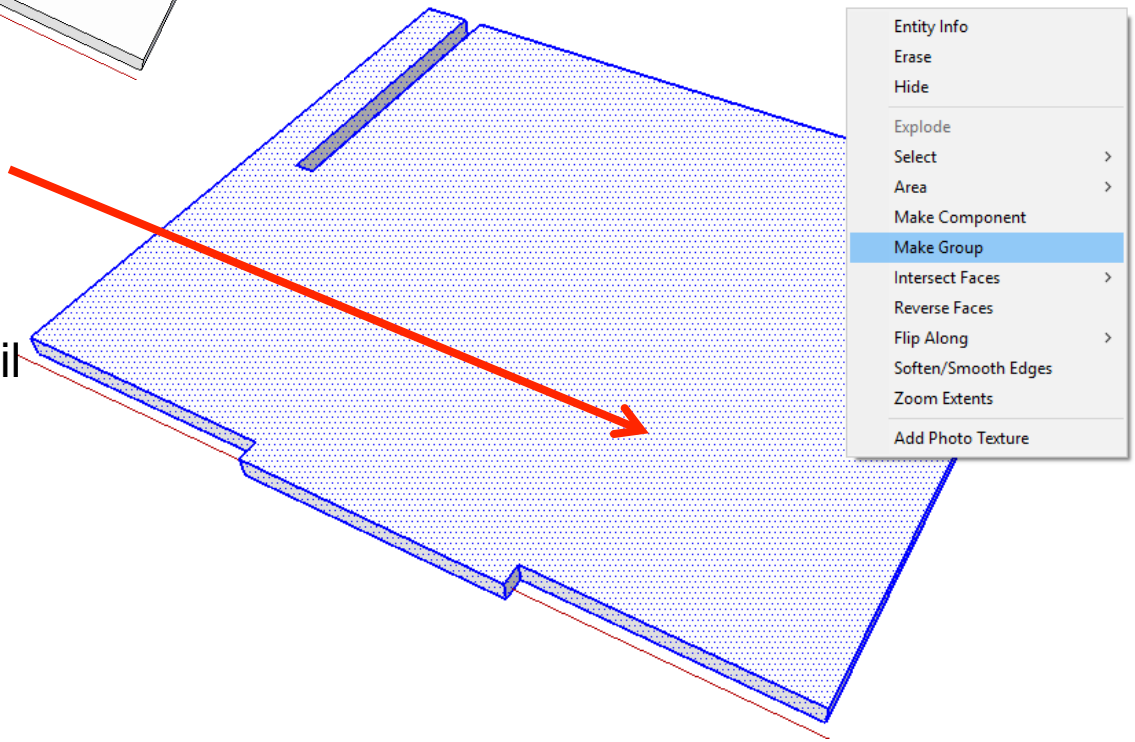


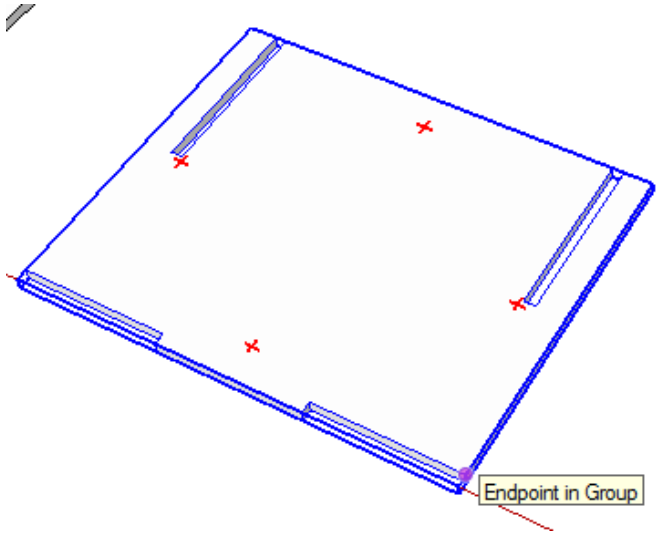
97. Using the ***push pull tool.*** Hover over the shape you have just drawn. They will go ***dotted*** as you hover over them in turn. Pull the shape up. Type in ***4 and press enter.***

98. Use the ***select tool***

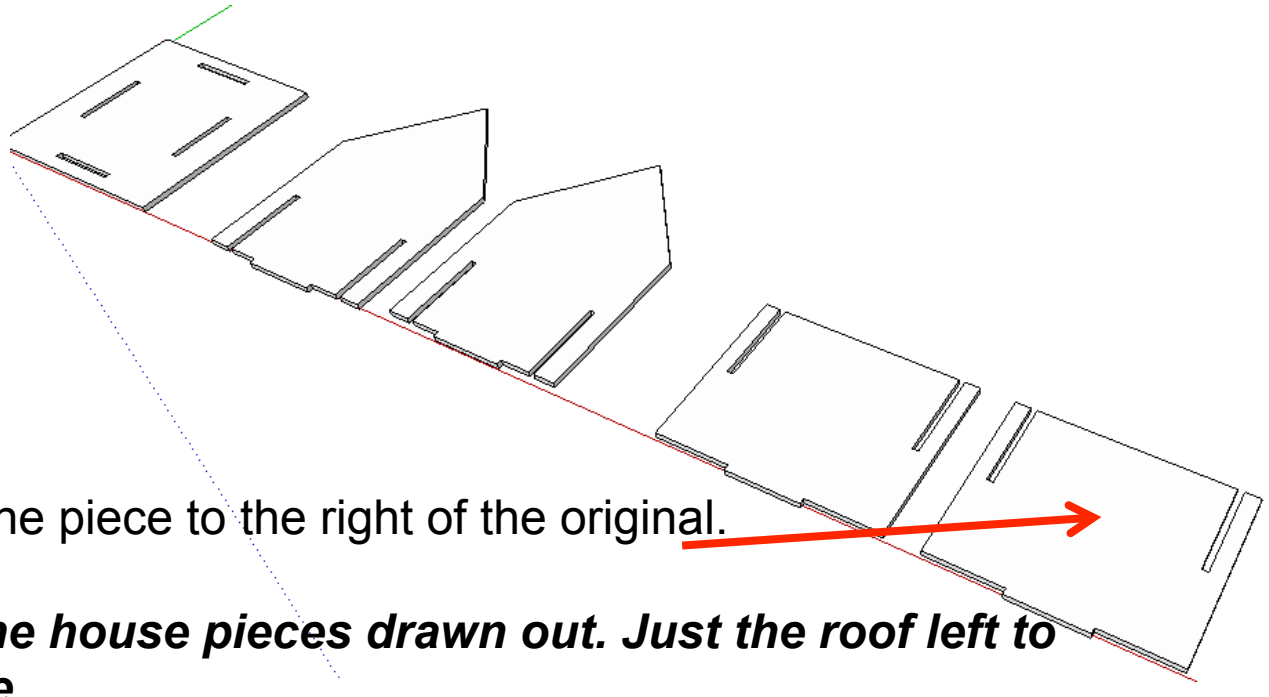
and keep clicking on the piece until it is all selected and highlighted in blue.

Right click on the mouse to produce





99. Use the ***select tool*** and click on the shape to select the entire object. Hold the ***Control button down*** and then ***press C (copy).*** Hold the ***Control button down*** and then ***press V (paste)***

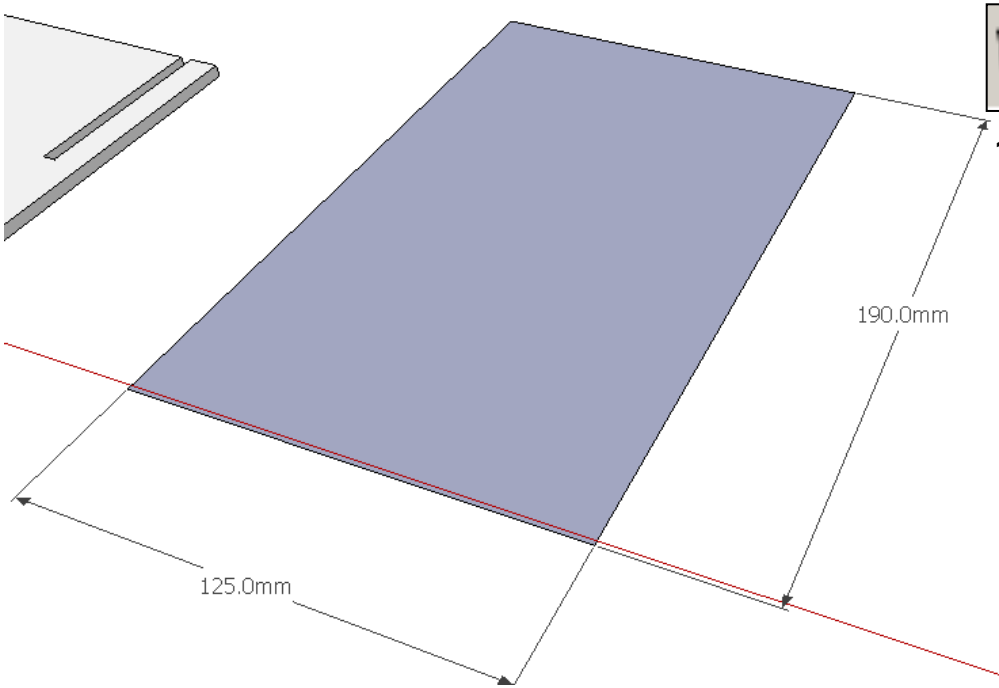


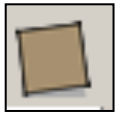
100. Move the piece to the right of the original.

That is all the house pieces drawn out. Just the roof left to complete.

CAD Tutorial 19: Birdhouse

Roof Construction





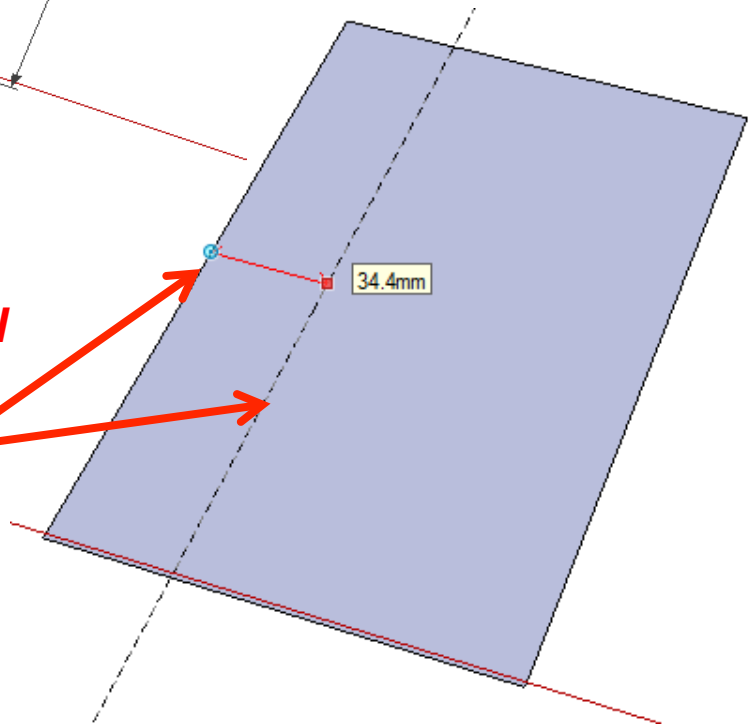
1. ***Click*** on the rectangle tool . Start drawing a square and type **150, 120.**

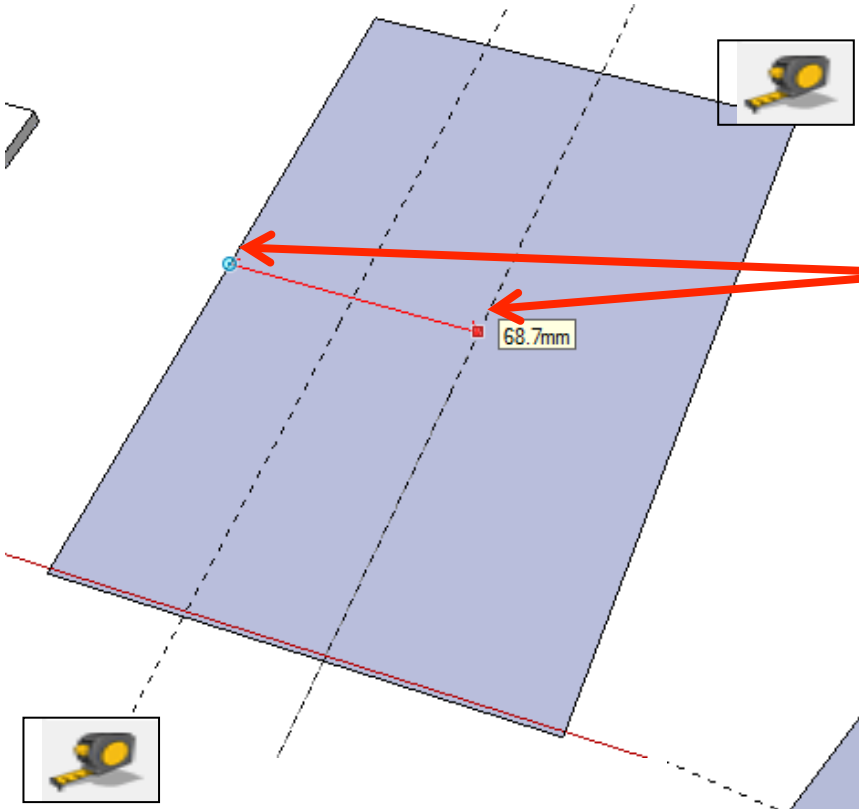
2. Select the ***Tape measure tool*** and

snap to the ***side edge*** as shown.

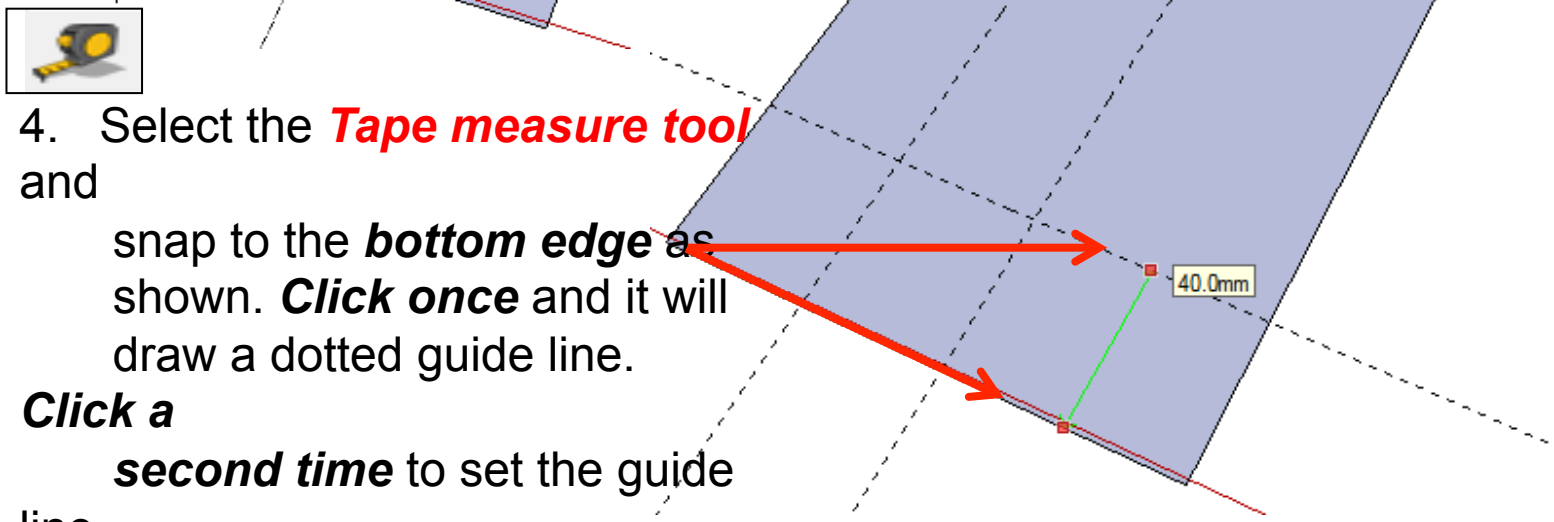
Click once and it will draw a dotted guide line. ***Click a second***

time to set the guide line and ***type 34.4 and enter***

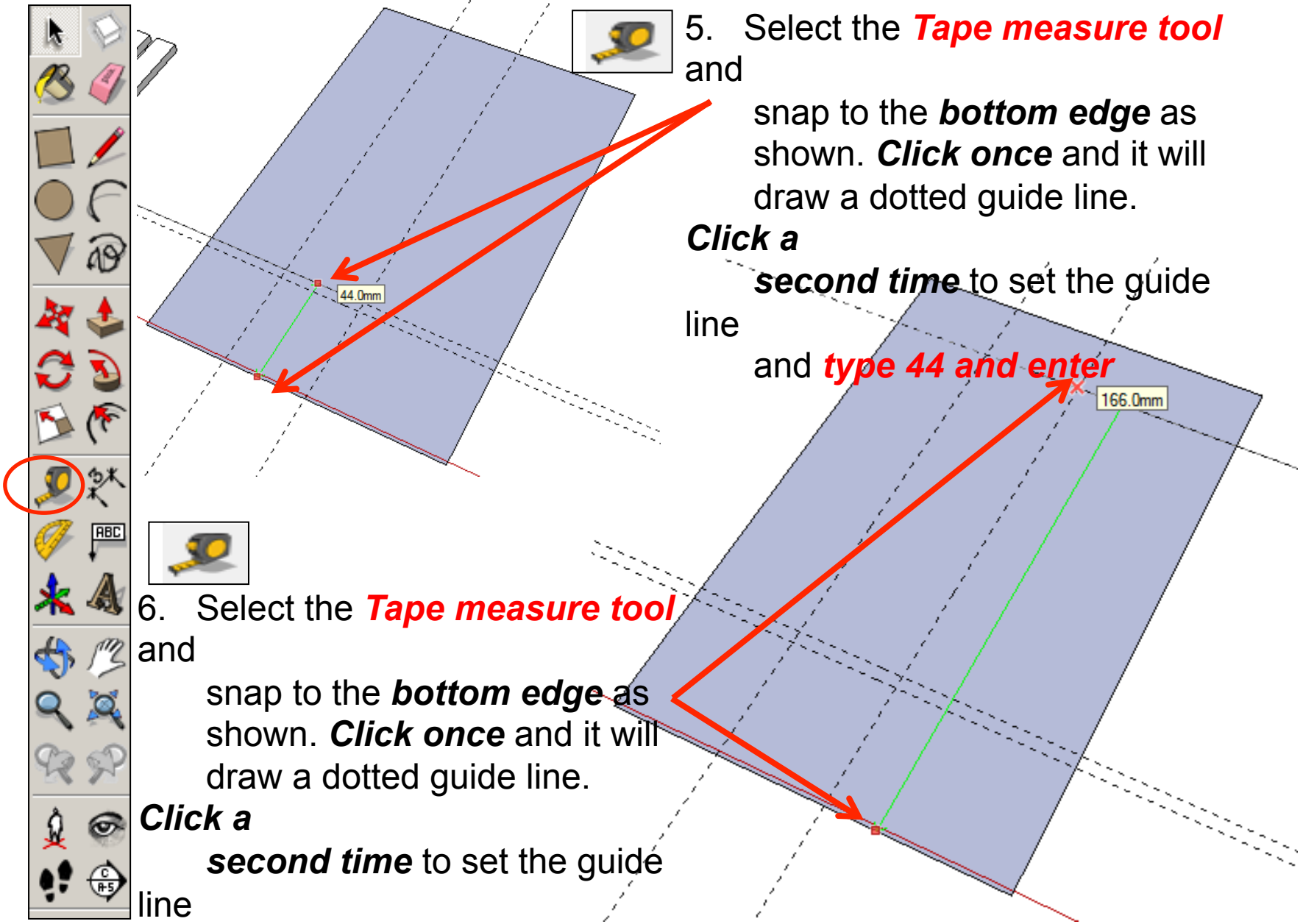




3. Select the ***Tape measure tool*** and snap to the ***side edge*** as shown. ***Click once*** and it will draw a dotted guide line. ***Click a second time*** to set the guide line and ***type 68.7 and enter***



4. Select the ***Tape measure tool*** and snap to the ***bottom edge*** as shown. ***Click once*** and it will draw a dotted guide line. ***Click a second time*** to set the guide line and ***type 40 and enter***



5. Select the ***Tape measure tool*** and

snap to the ***bottom edge*** as shown. ***Click once*** and it will draw a dotted guide line.

Click a

second time to set the guide line

and ***type 44 and enter***

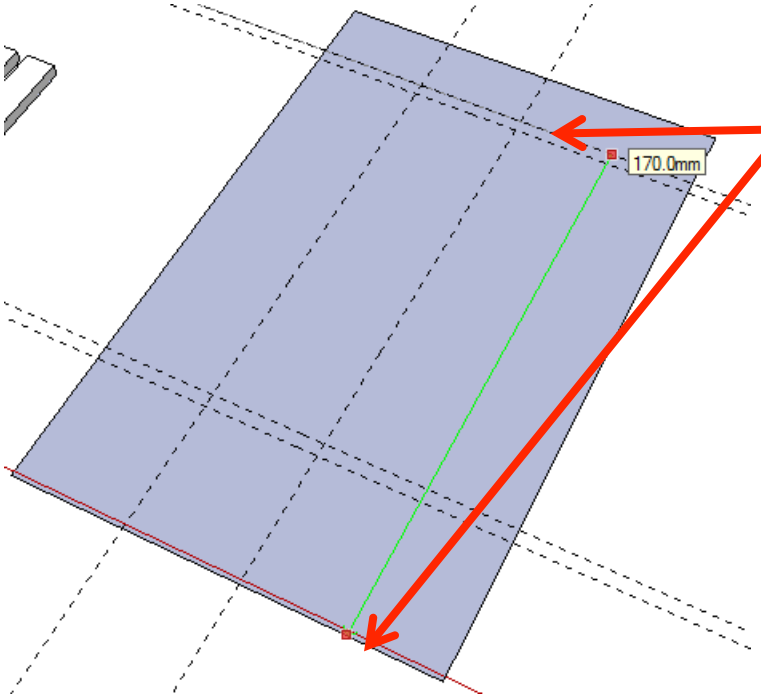
6. Select the ***Tape measure tool*** and

snap to the ***bottom edge*** as shown. ***Click once*** and it will draw a dotted guide line.

Click a

second time to set the guide line

and ***type 166 and enter***



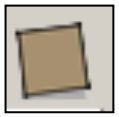
7. Select the ***Tape measure tool*** and

snap to the ***bottom edge*** as shown. ***Click once*** and it will draw a dotted guide line.

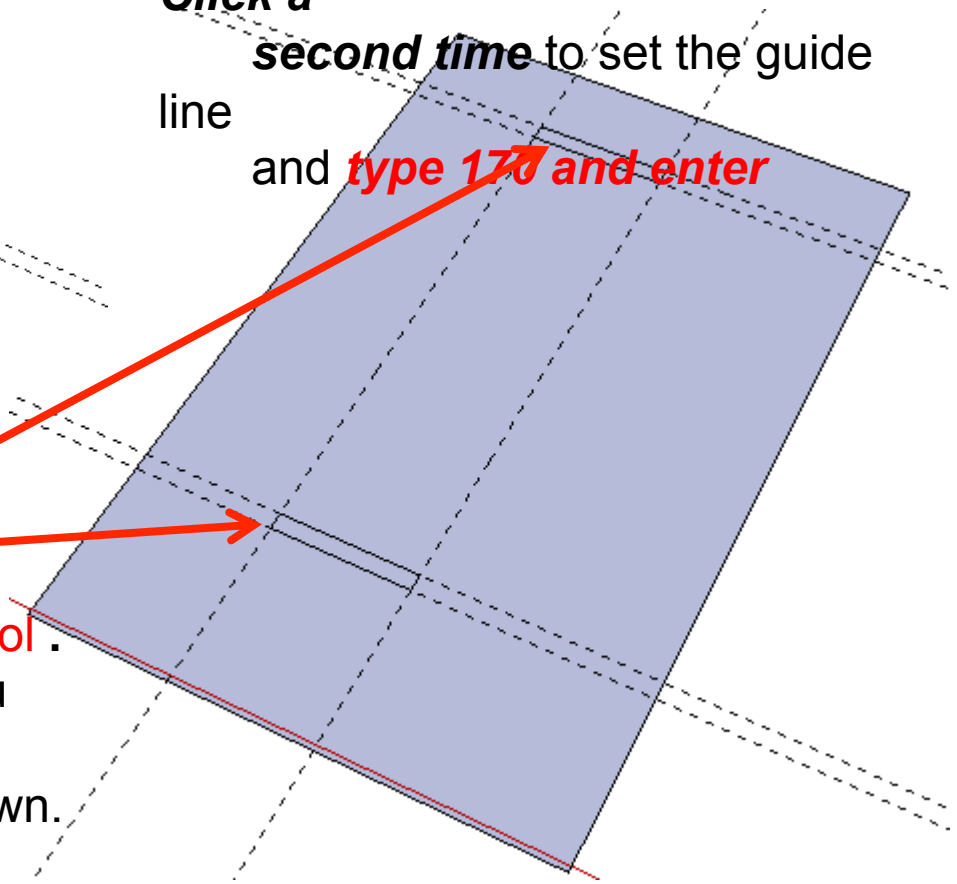
Click a

second time to set the guide line

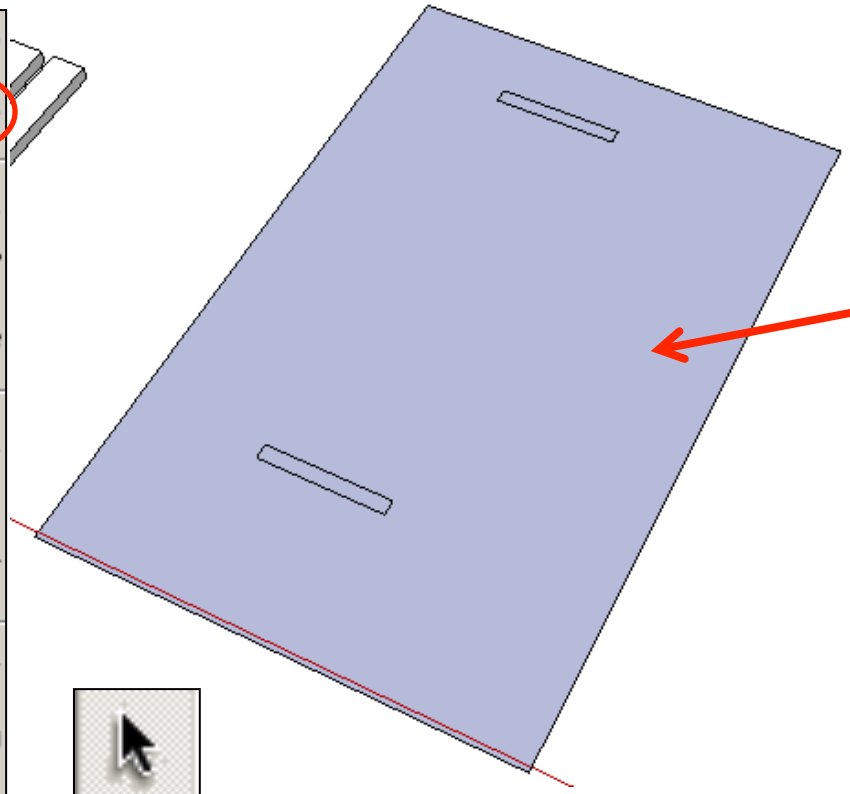
and ***type 170 and enter***



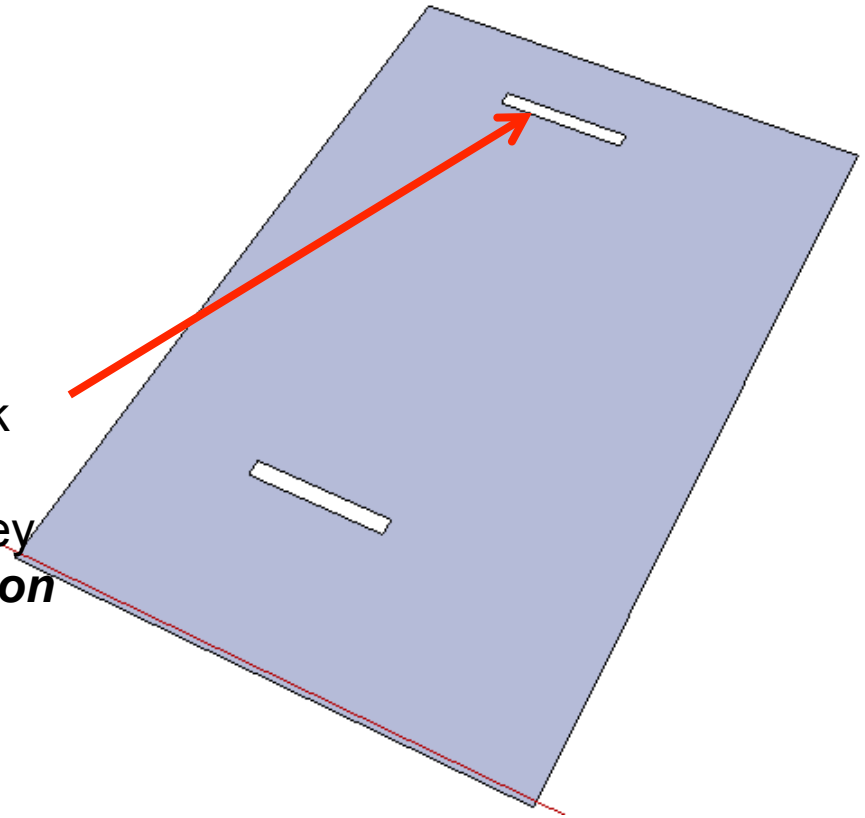
8. ***Click*** on the rectangle tool **.** Using the guide lines you have drawn previously. Draw the rectangles shown.

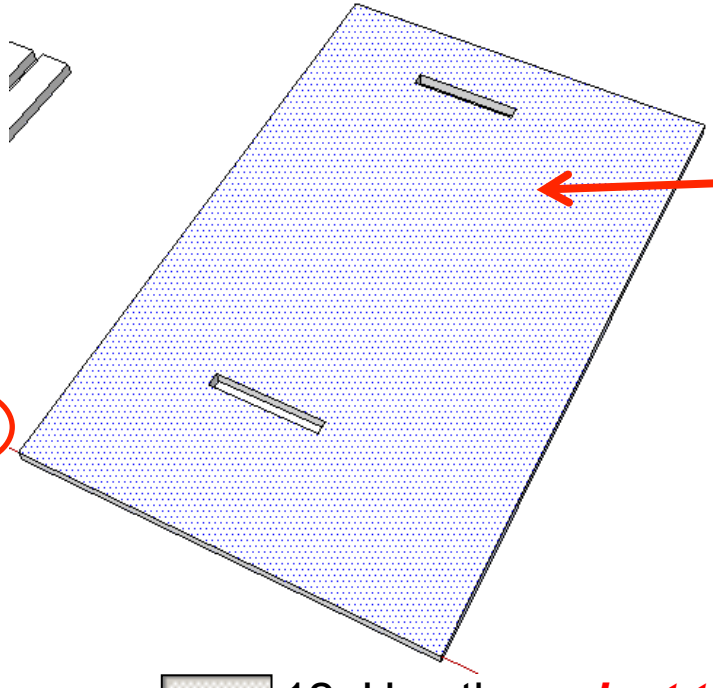


9. Use the ***rubber tool*** to erase the guidelines.

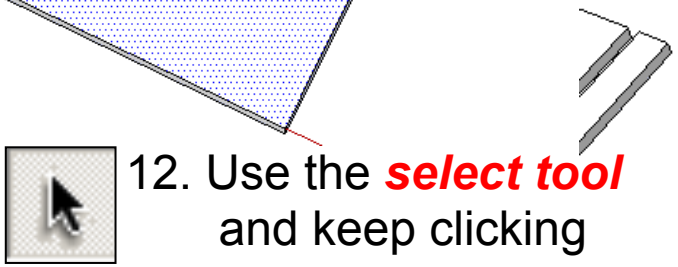


10. Use the ***select tool*** and click on the shape to select the middle of the rectangles. They will go dotted. ***Press delete on the keyboard*** to erase them as shown.

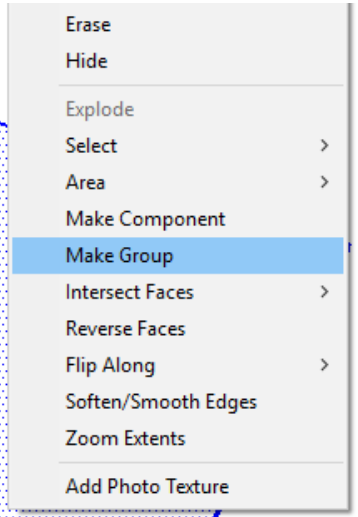


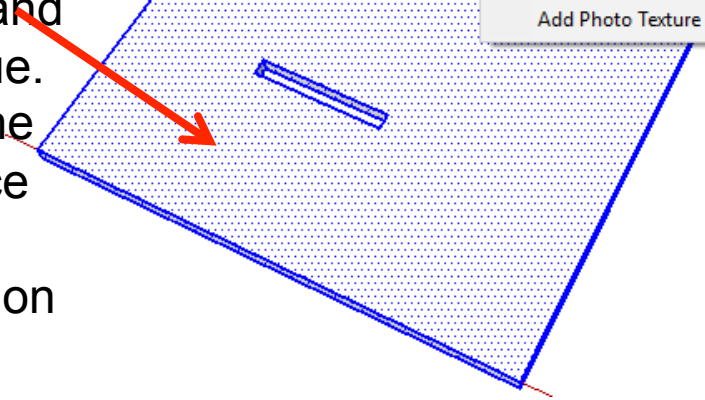


11. Using the ***push pull tool.*** Hover over the shape you have just drawn. They will go ***dotted*** as you hover over them in turn. Pull the shape up. Type in ***4 and press enter.***



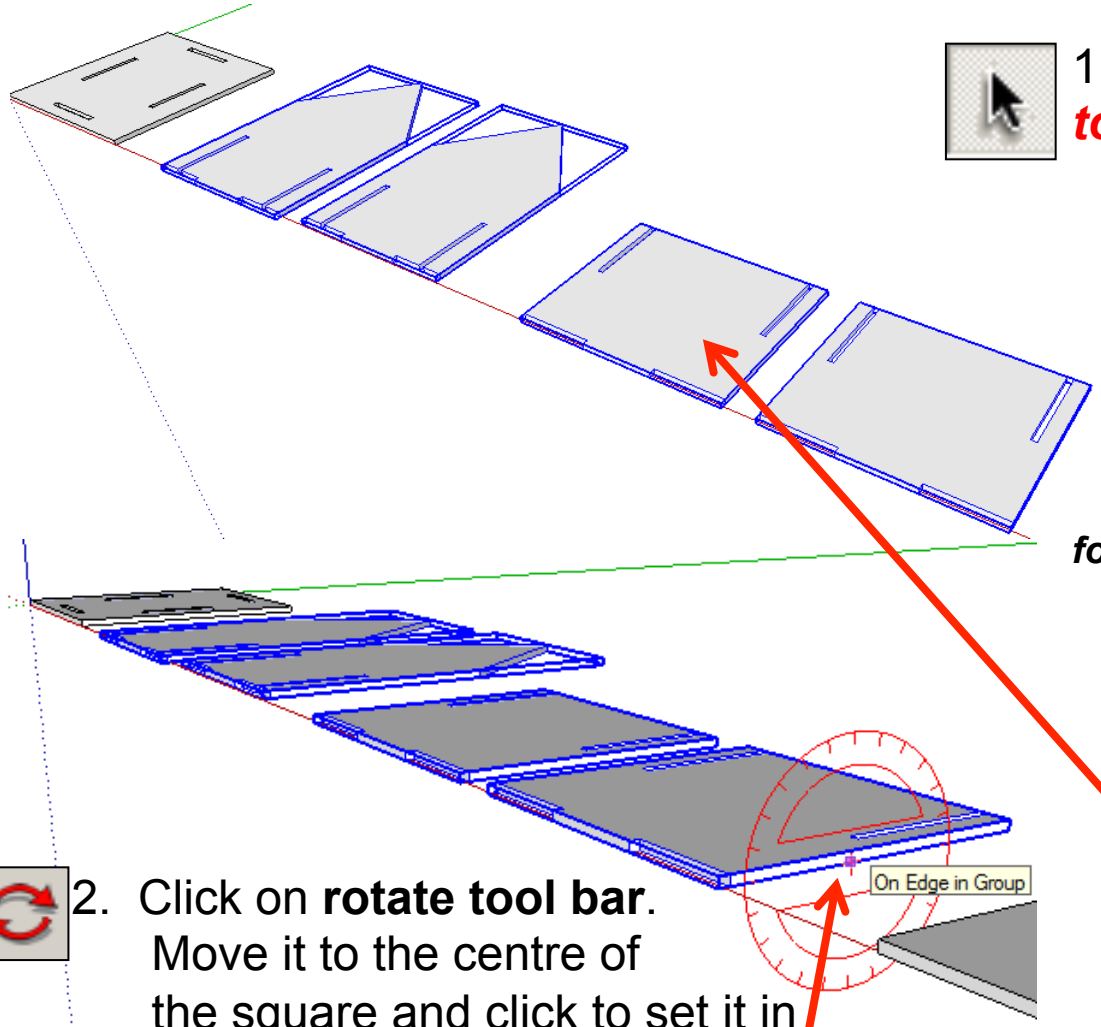
12. Use the ***select tool*** and keep clicking on the roof until it is all selected and highlighted in blue. ***Right click*** on the mouse to produce the menu shown above and ***click*** on ***make group.***





13. Use the ***select tool*** and click on the shape to select the entire object. Hold the ***Control button down*** and then ***press C (copy).*** Hold the ***Control button down*** and then ***press V (paste)***
14. Move the piece to the right of the original.

CAD Tutorial 19: Birdhouse Final Assembly

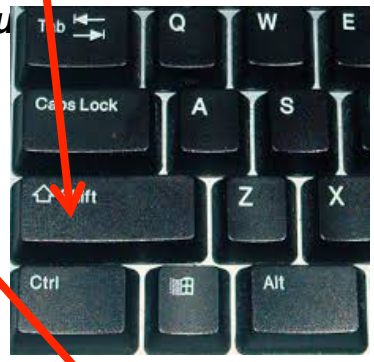


1. Using the ***select tool,***

click on one of the side pieces

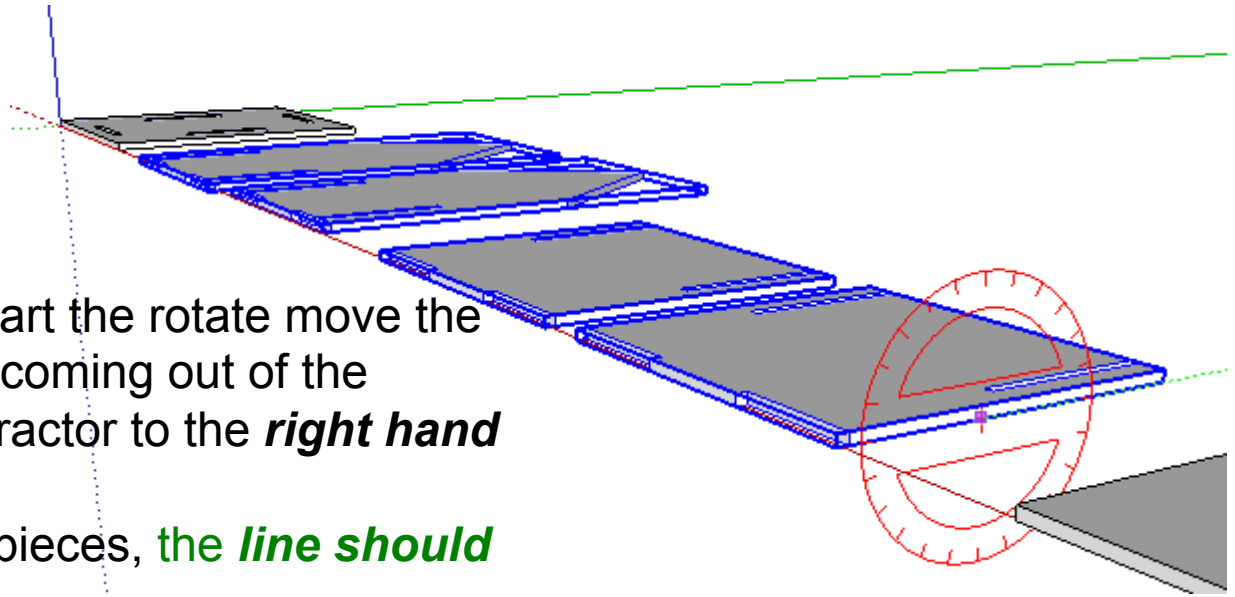
Hold the shift key down

(arrow pointing up found u

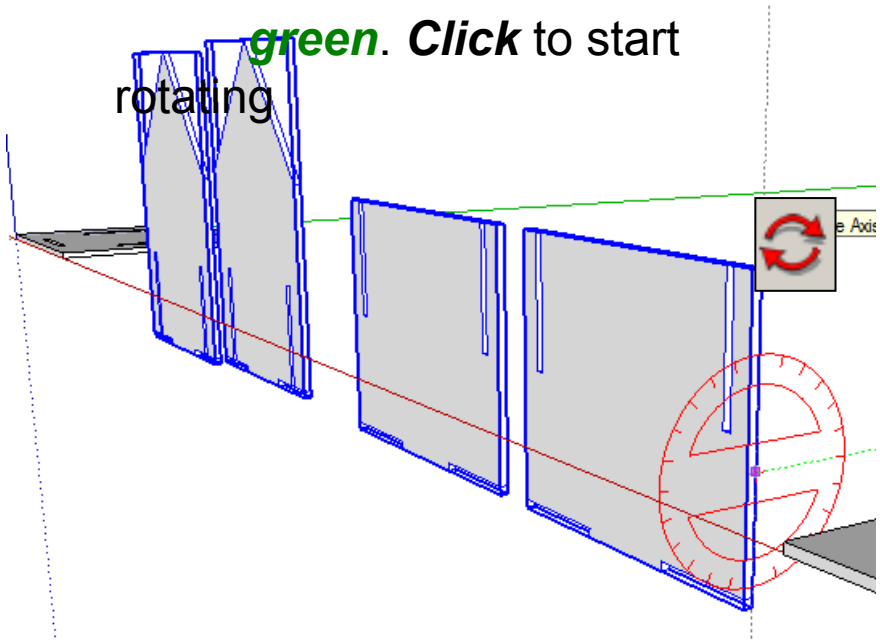


2. Click on **rotate tool bar**. Move it to the centre of the square and click to set it in place on the edge or endpoint of one of the pieces. The rotate protractor must be **RED when you click it into place.**

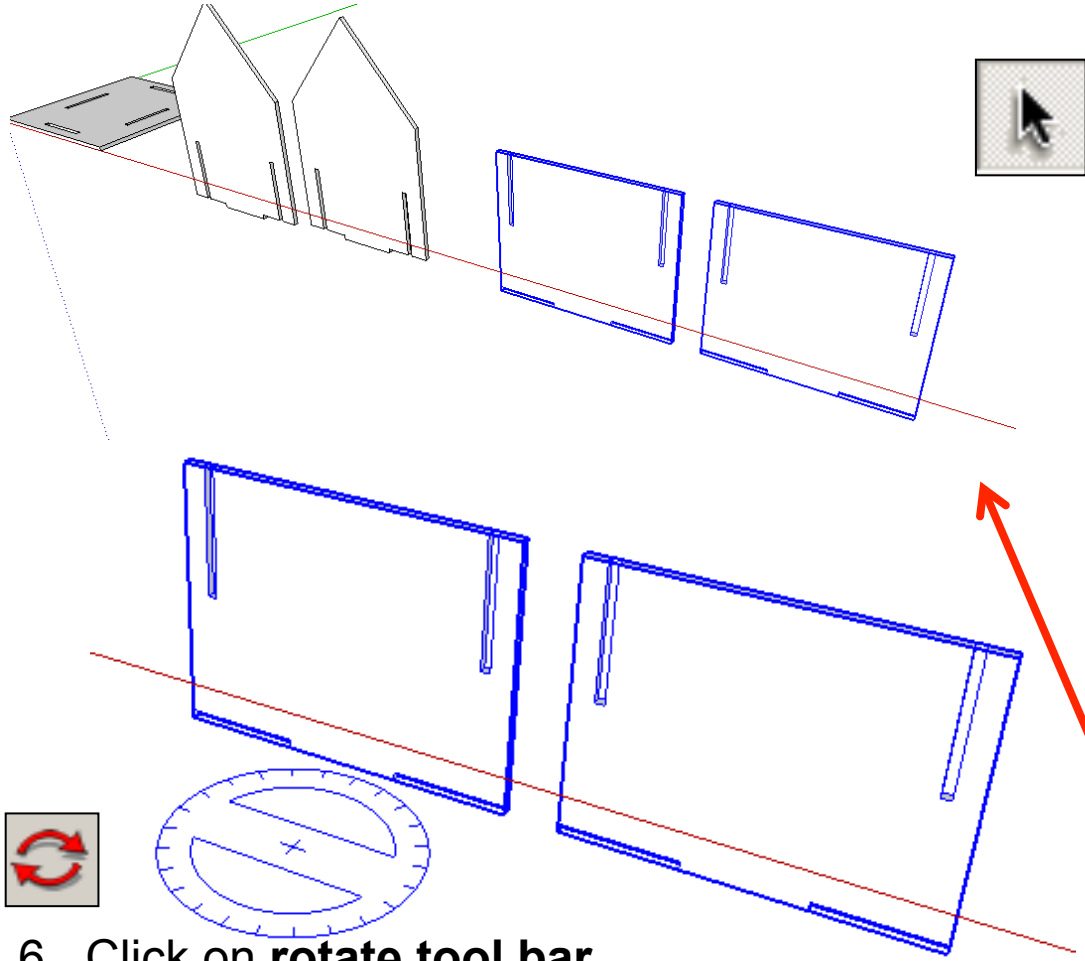
Click on the other three pieces so they are highlighted as shown.



3. To start the rotate move the line coming out of the protractor to the ***right hand*** of the pieces, the ***line should be green***. ***Click*** to start rotating



4. Rotate the square until the number in the bottom right hand-side says ***'90'*** or type ***'90'***and ***enter.*** ***Alternatively rotate until the line goes blue.***



5. Using the ***select tool,***

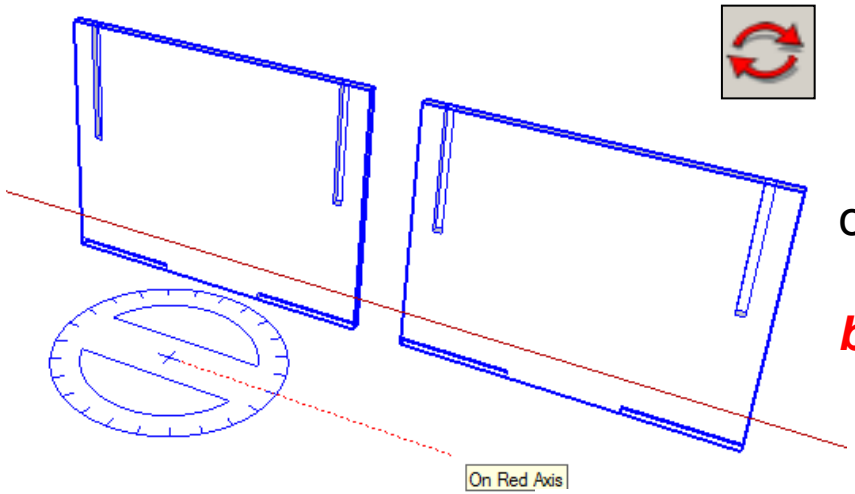
click on one of the side pieces

Hold the shift key down

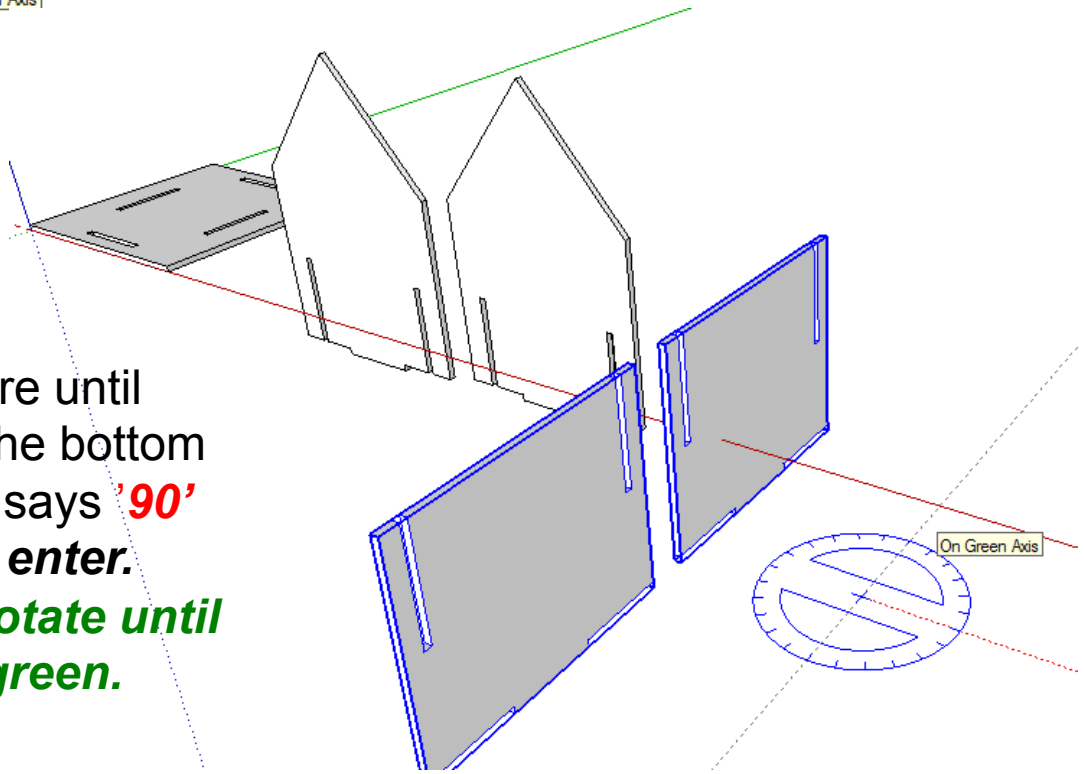
(arrow pointing up found u

6. Click on **rotate tool bar**.
Move it to the front of the pieces and click to set it in place as shown. The rotate protractor must be **Blue when you click it into place.**

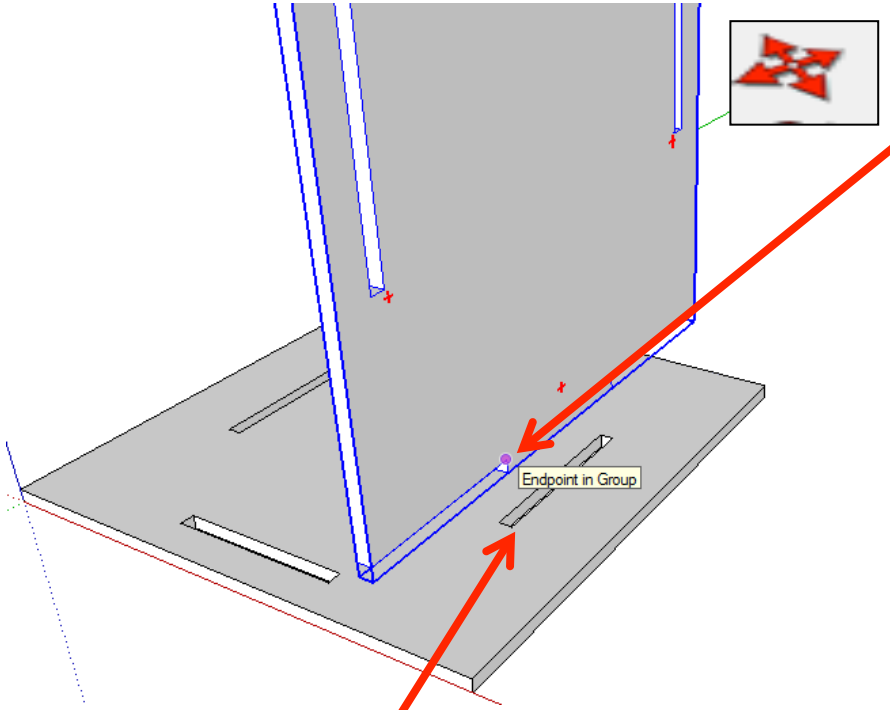
Click on the other piece so they are highlighted as shown.



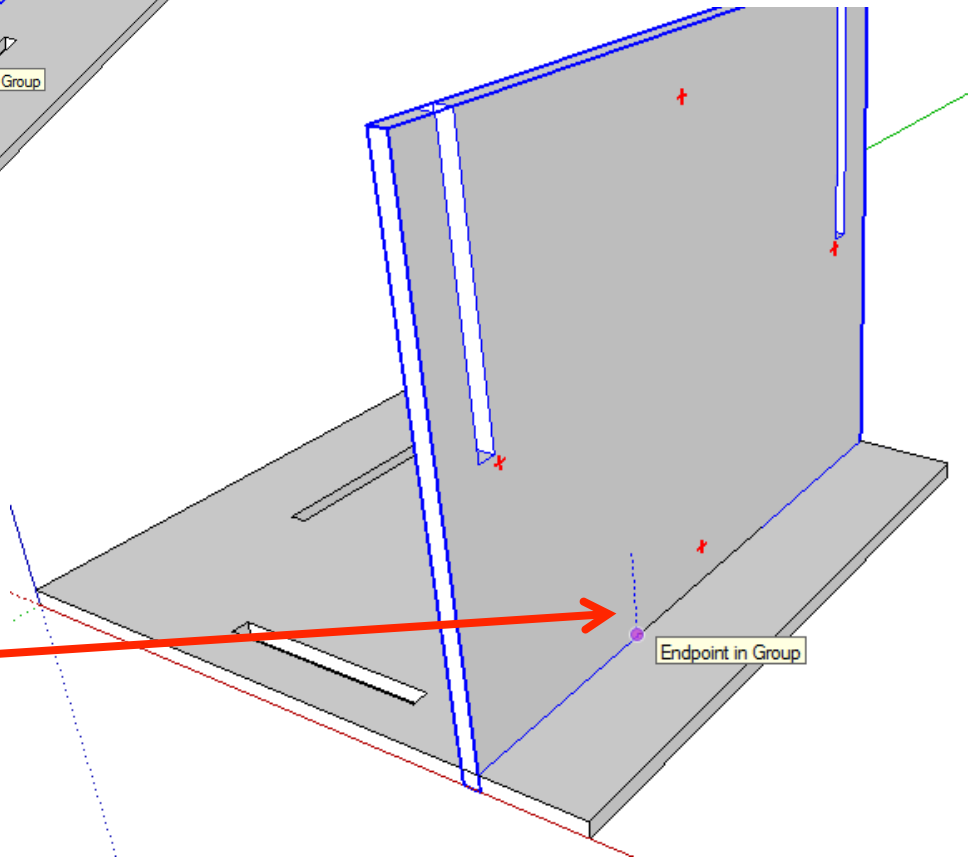
7. To start the rotate move the line coming out of the protractor to the ***right hand*** of the pieces, ***the line should be red***. ***Click*** to start rotating



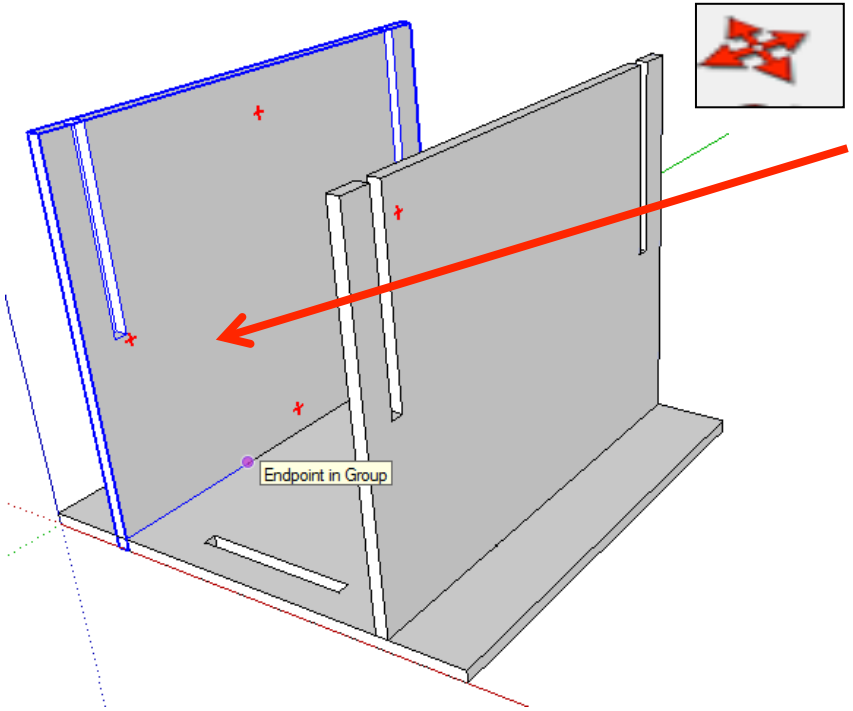
8. Rotate the square until the number in the bottom right hand-side says ***'90'*** or type ***'90'***and ***enter.*** ***Alternatively rotate until the line goes green.***



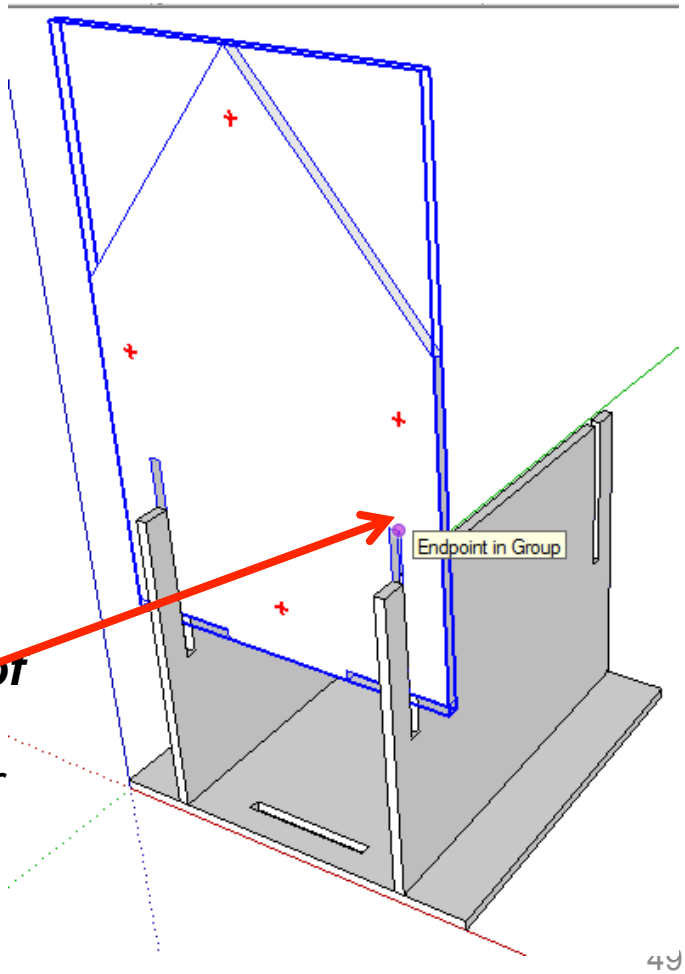
9. Using the ***move tool***, click on the ***end point on one of the pieces*** shown. Move it over the base piece



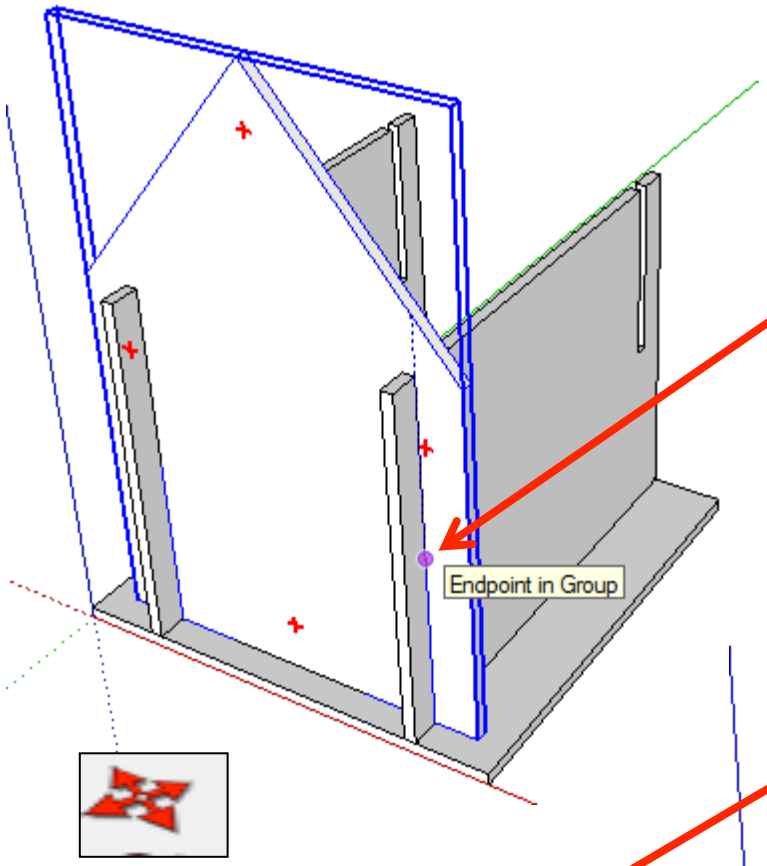
10. Using the ***move tool***, snap it into place with the endpoint of the rectangle below.



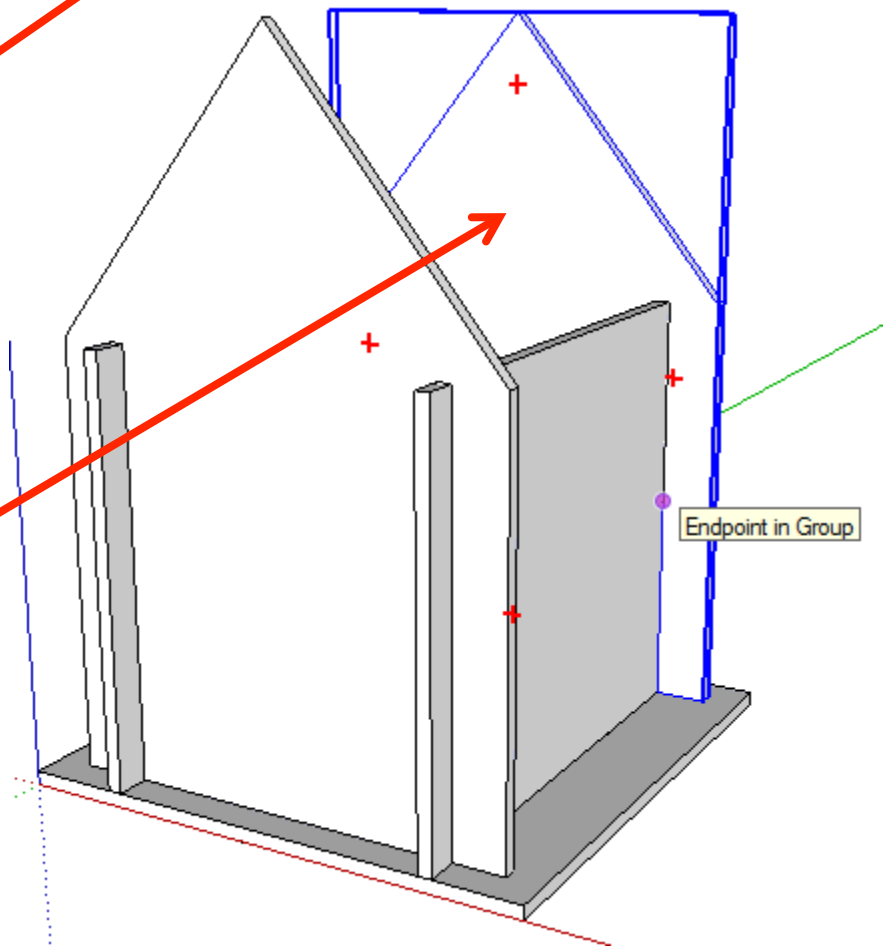
11. Using the ***move tool***, repeat steps 9 and 10 on the opposite side as shown.



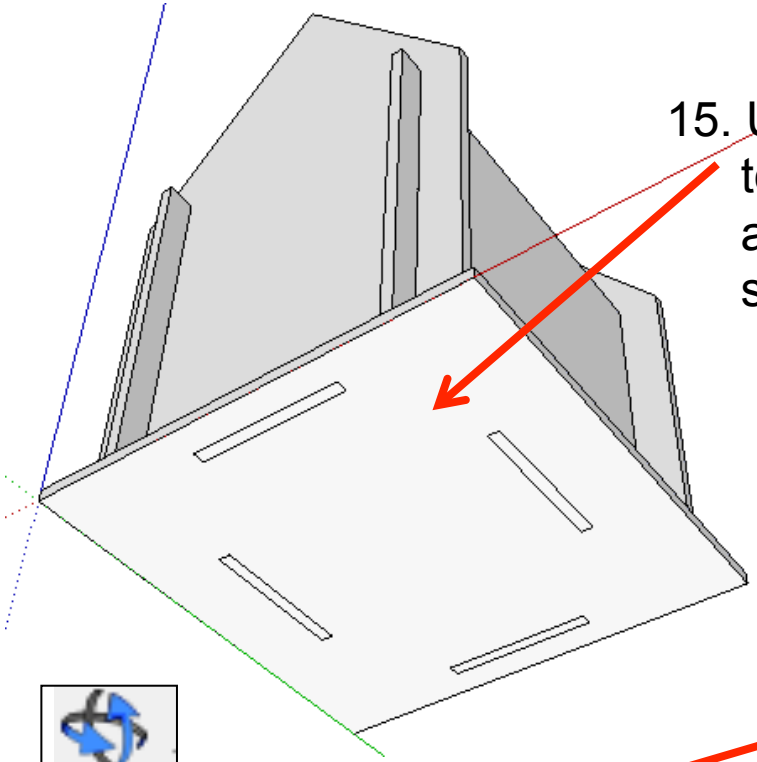
12. Using the ***move tool***, click on the ***end point on one of the front pieces*** shown. Move it over the base piece and the slots of the side piece.



13. Using the ***move tool***, snap it into place with the endpoint of the rectangle below.



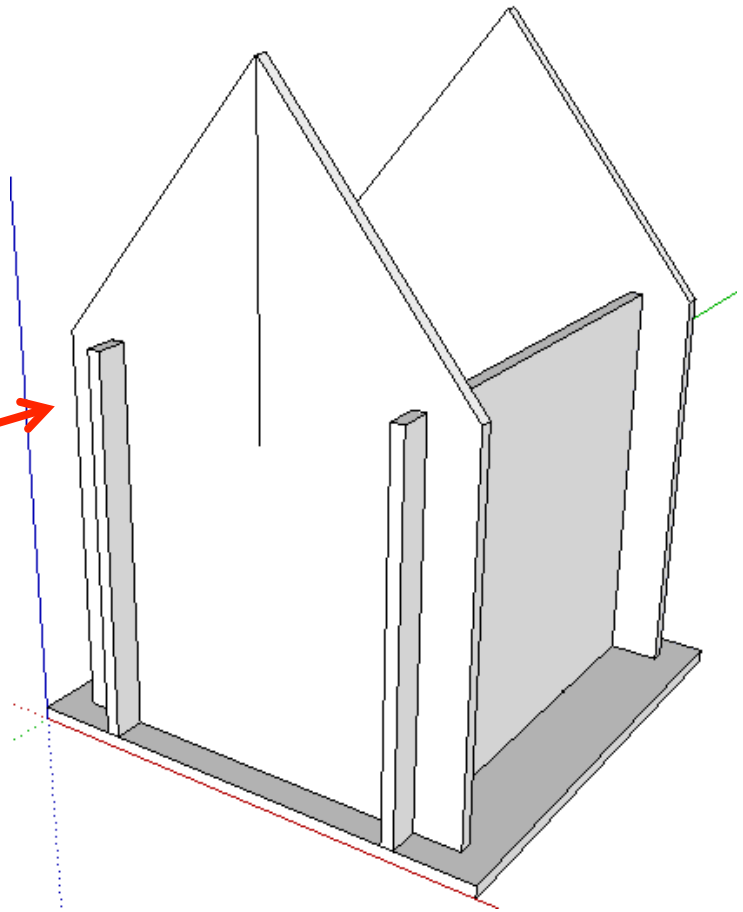
14. Using the ***move tool***, repeat steps 12 and 13 on the opposite side as shown.

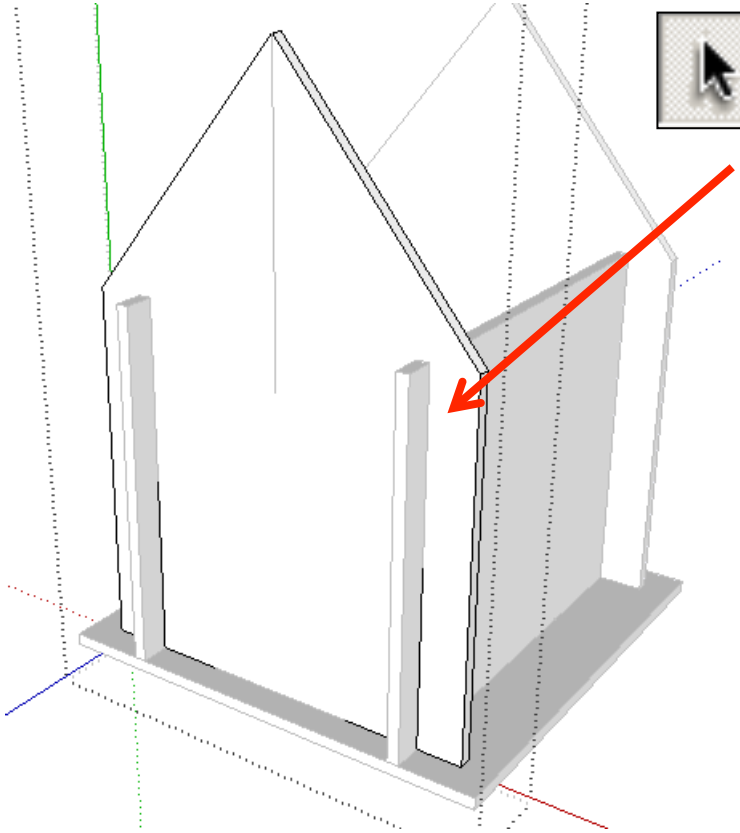


15. Use the ***orbit tool*** and move around to the underneath so you can check all four slot joints line up with the holes shown.

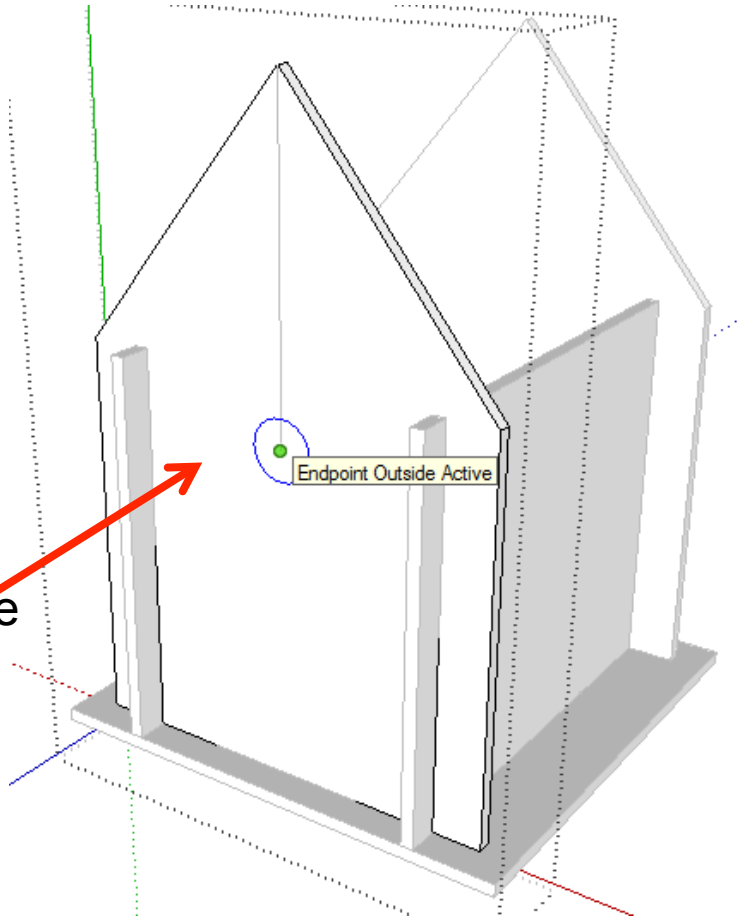
16. Use the ***orbit tool*** and move around to the front.

17. Use the ***pencil tool***. Snap to the top point and draw a line down on the blue axis. Type in 100 and press enter.

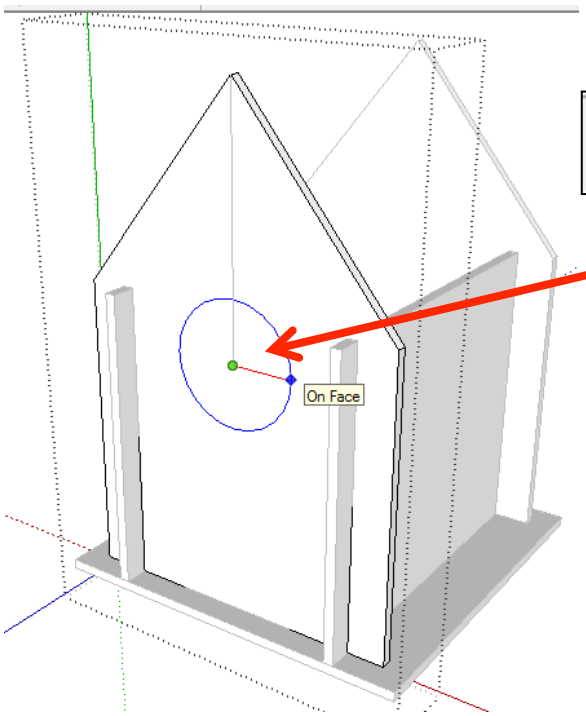




18. Using the ***select tool,*** ***double click*** on a front piece shown. All the other pieces should be greyed out.

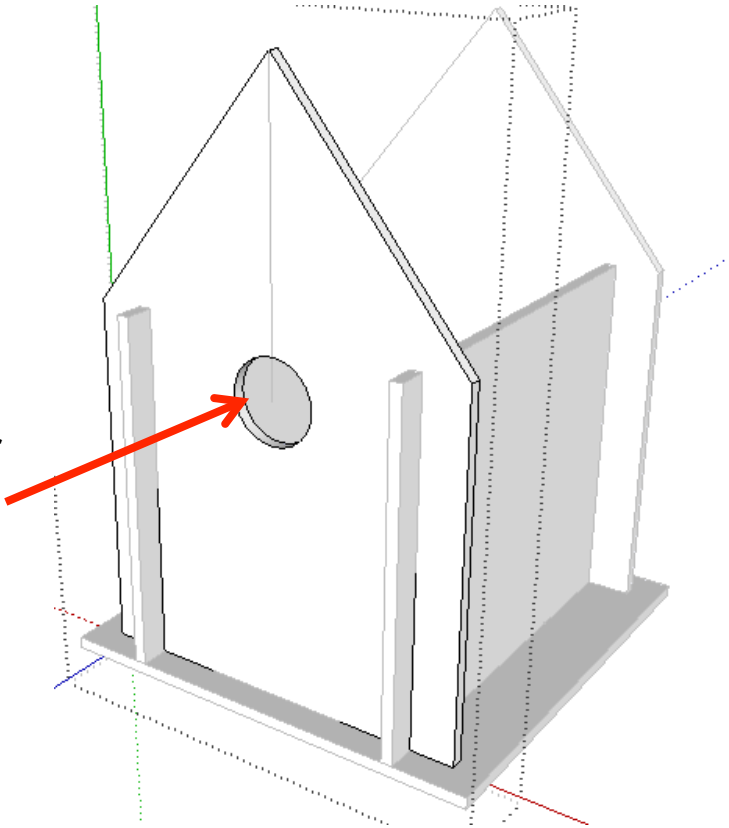


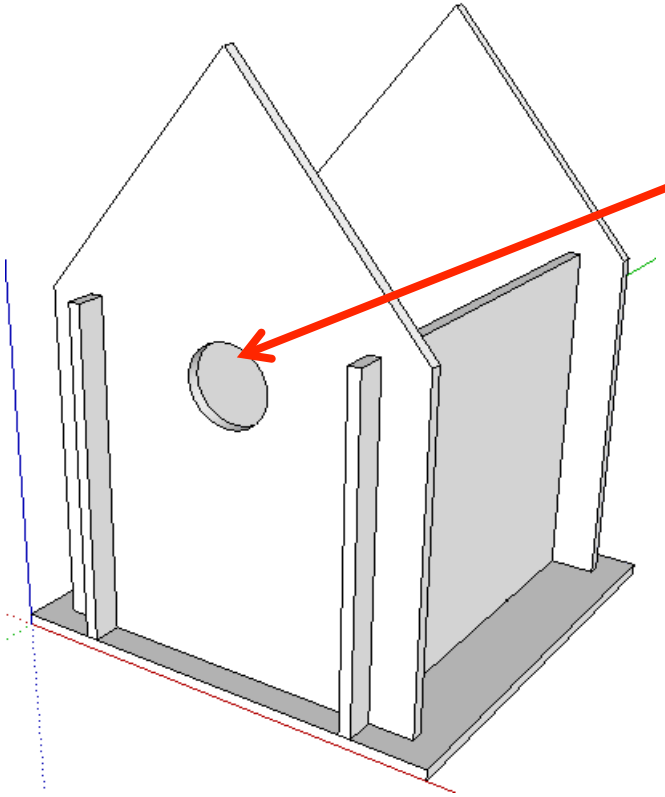
19. Using the ***rotate tool,*** snap the centre of the circle on the end of the line you have just drawn



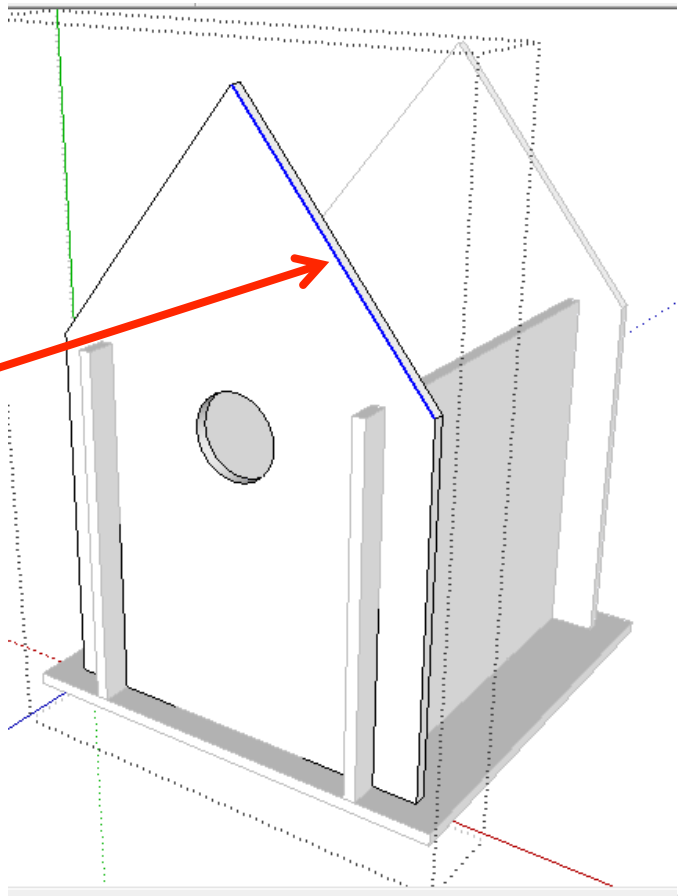
20. Using the ***rotate tool,*** pull the circle outwards. Type in ***14 and press enter.***

21. Using the ***push pull tool.*** Hover over the circle you have just drawn. It will go ***dotted*** as you hover it. Push the shape back. Type in ***4 and press enter.***

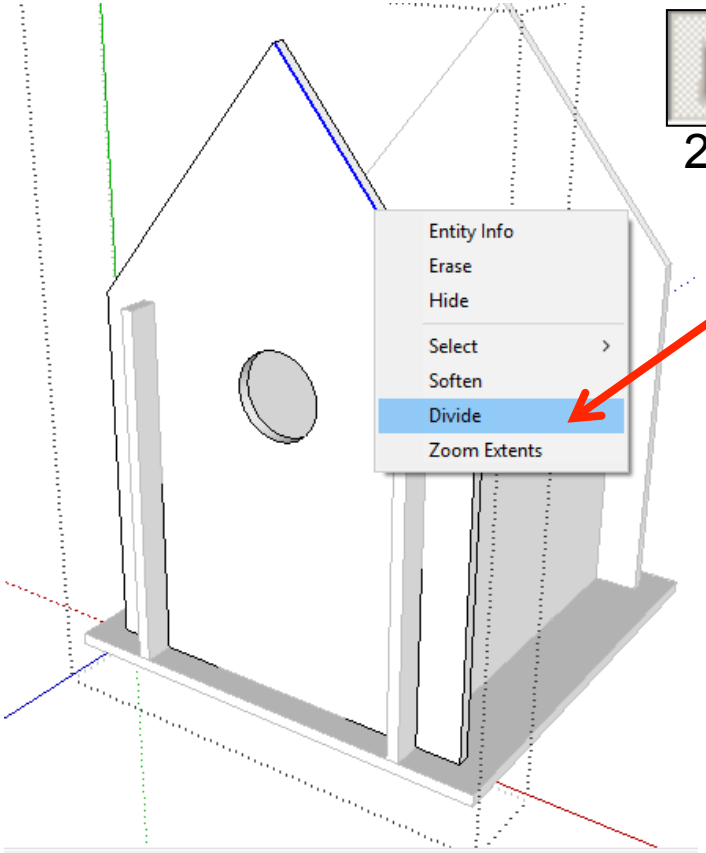




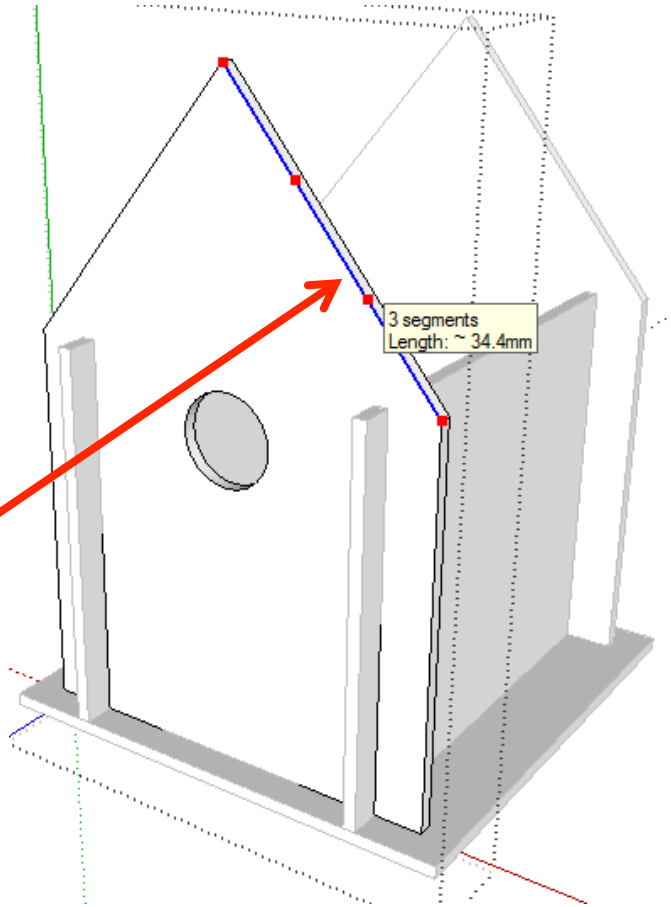
22. You should now have a bird house with a base, front with a correctly sized entrance, a back piece and two sides all slotted together. **Now time for the roof.**



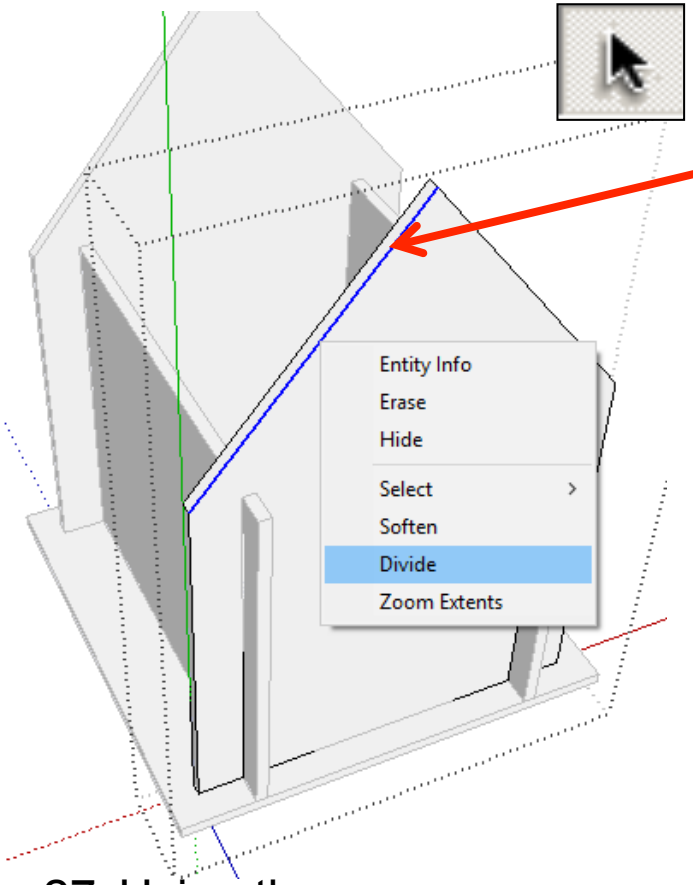
23. Using the ***select tool, double click*** on a front piece shown. All the other pieces should be greyed out. Then click on the edge shown to highlight it in blue.



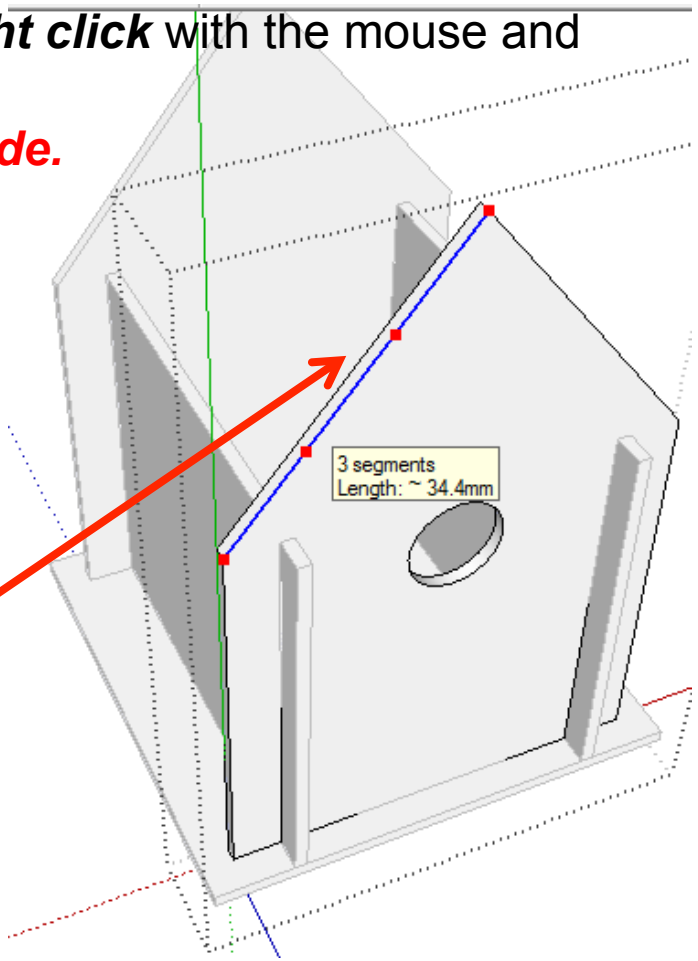
24. Whilst on the selected ***blue*** line, ***right click*** with the mouse and select ***divide.***



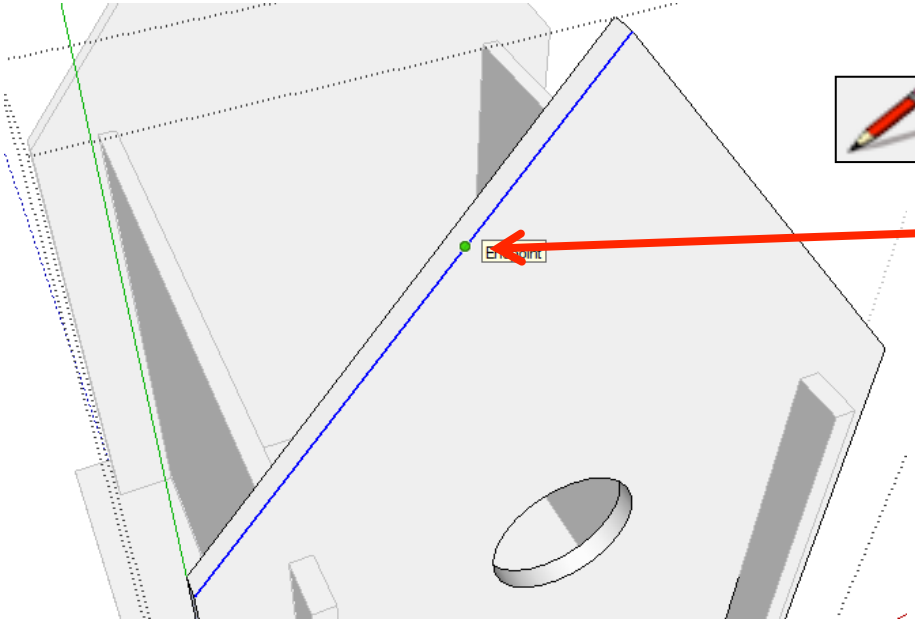
25. Using the ***mouse,*** you can move it up and down the blue line to divide it into 3 segments or you can type ***3 and press enter.***



26. Using the ***select tool,*** click on the opposite edge shown to highlight it in blue. Whilst on the selected ***blue*** line, ***right click*** with the mouse and select ***divide.***

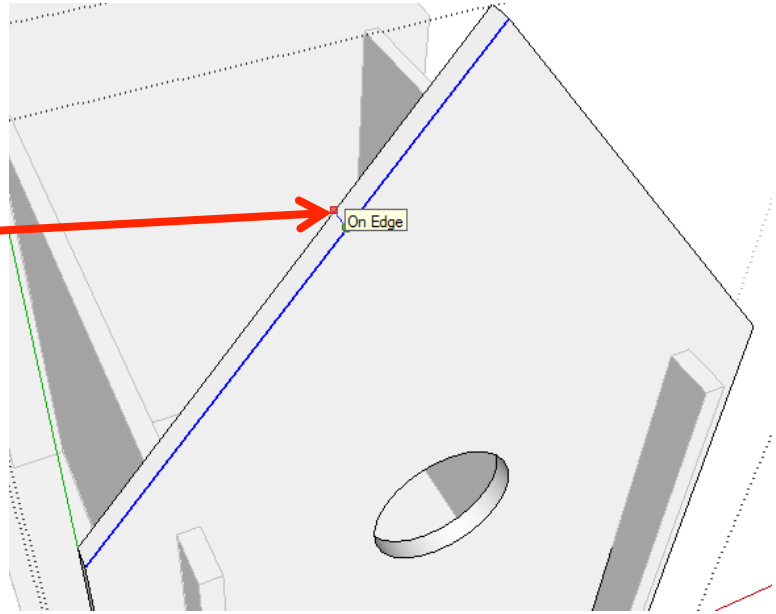


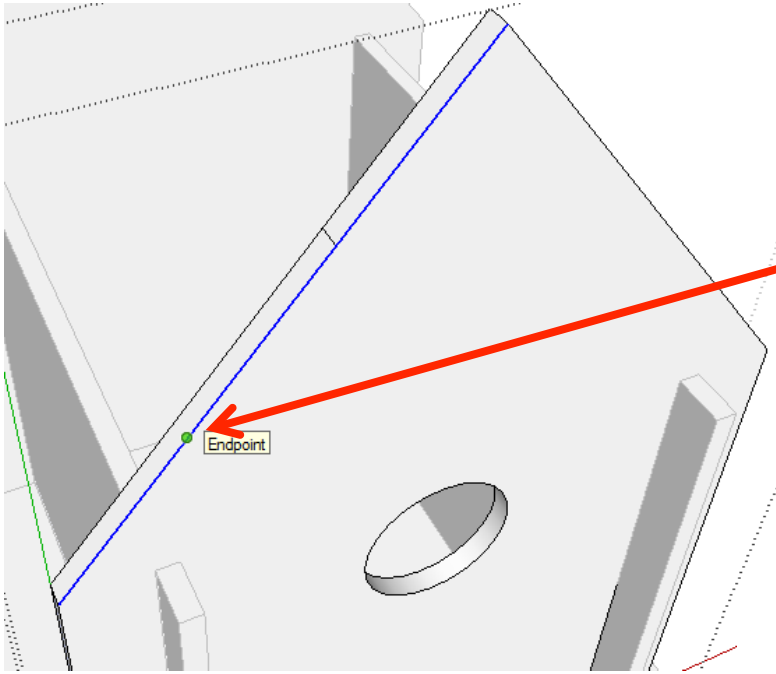
27. Using the ***mouse,*** you can move it up and down the blue line to divide it into 3 segments or you can type ***3 and press enter.***



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

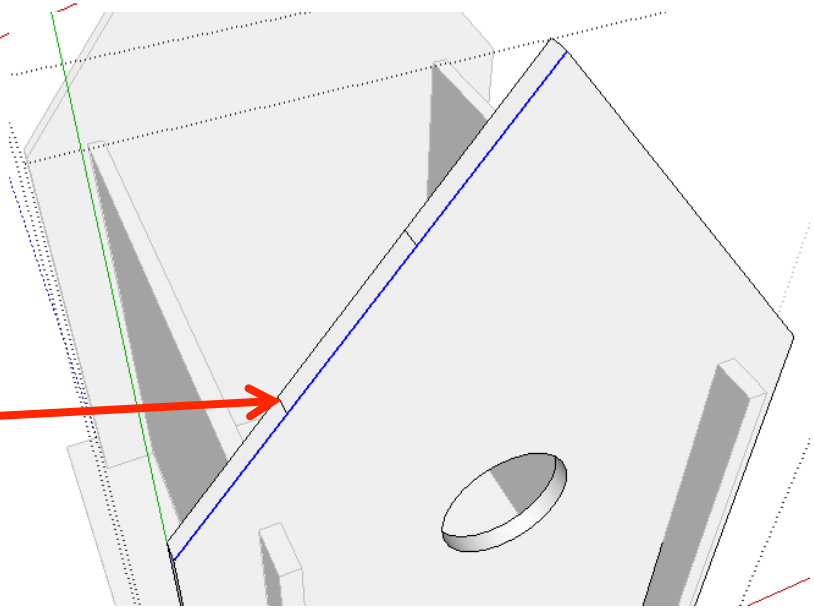
29. Using the ***pencil tool,*** draw you line across to the opposite edge as shown.

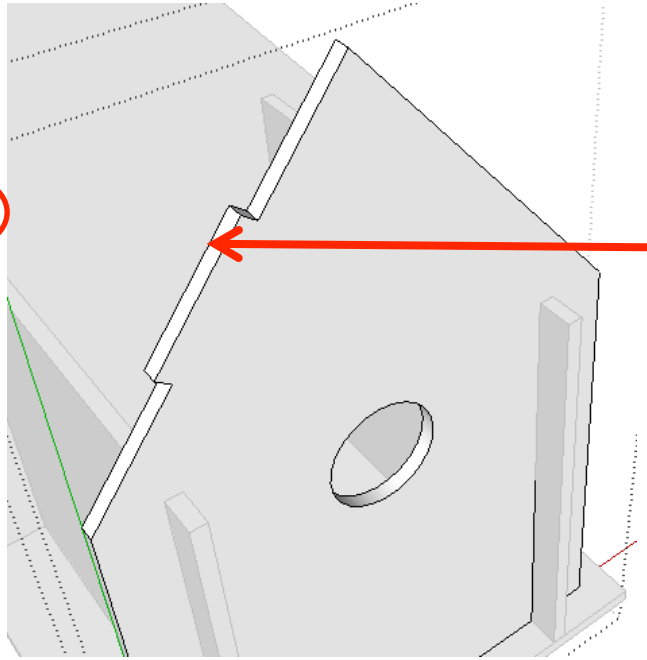




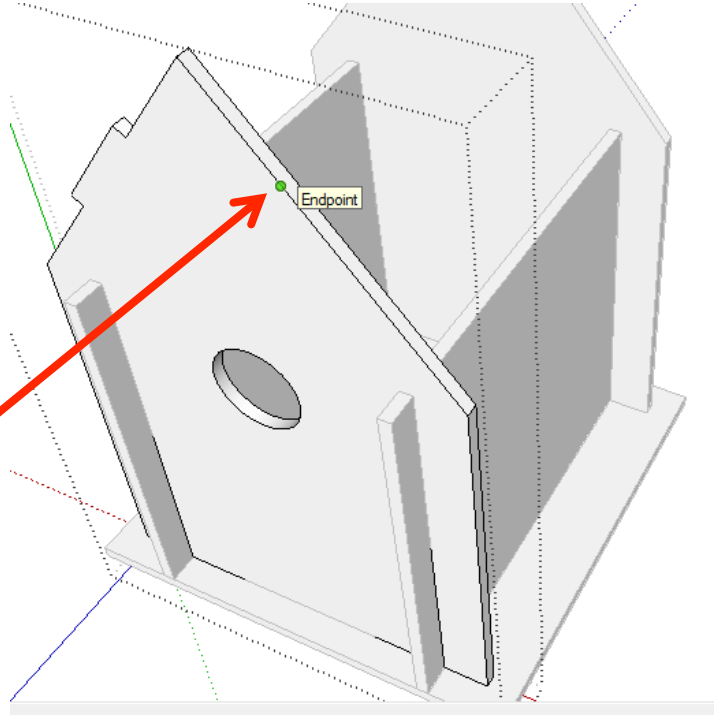
30. Using the ***pencil tool,*** move your pencil along the blue line until it snaps to the other ***endpoint***.

31. Using the ***pencil tool,*** draw you line across to the opposite edge as shown.

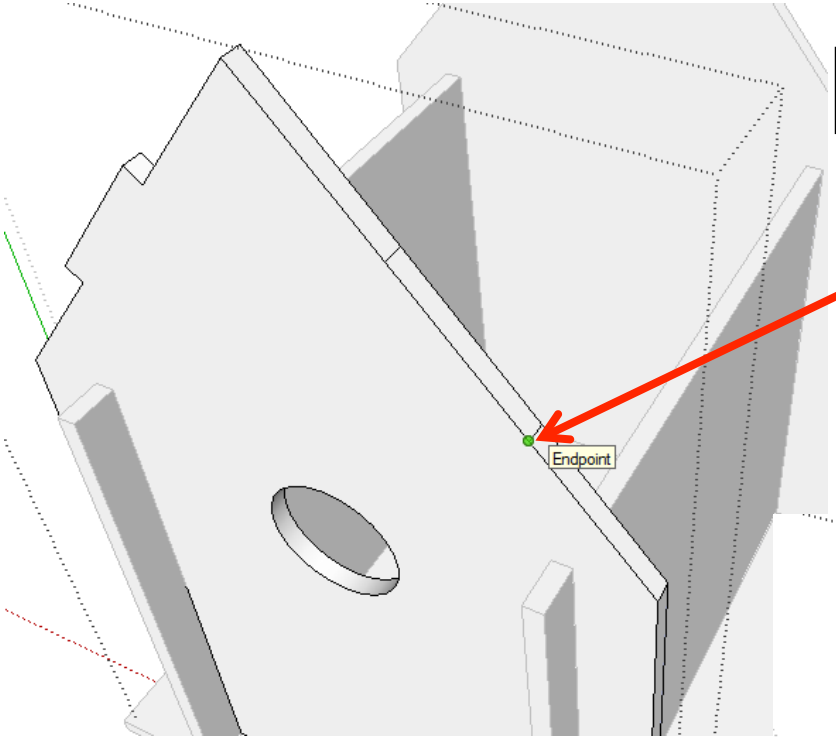




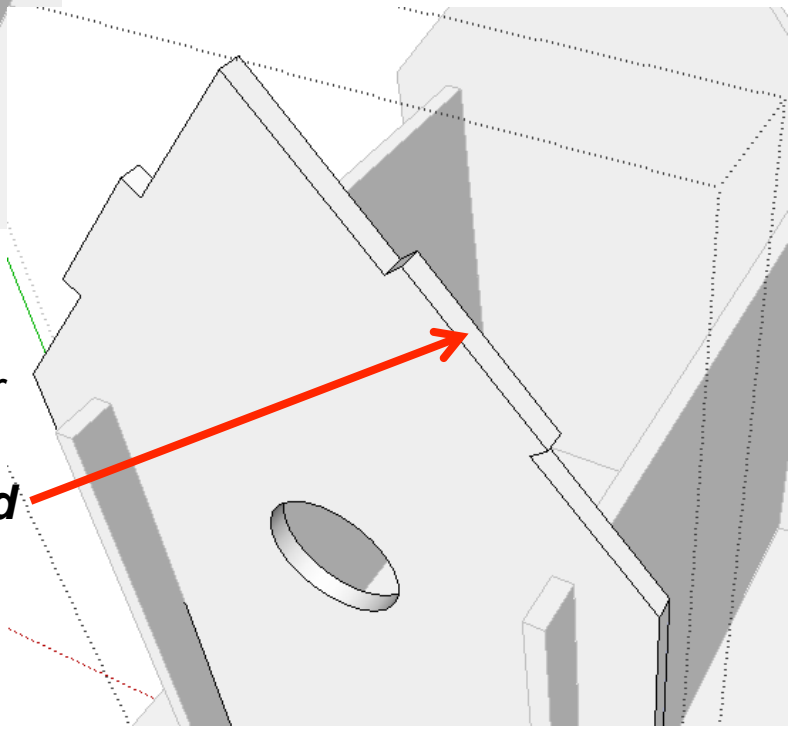
32. Using the ***push pull tool.*** Hover over the middle rectangle you have just drawn. It will go ***dotted*** as you hover it. Pull the shape up. Type in ***4 and press enter.***



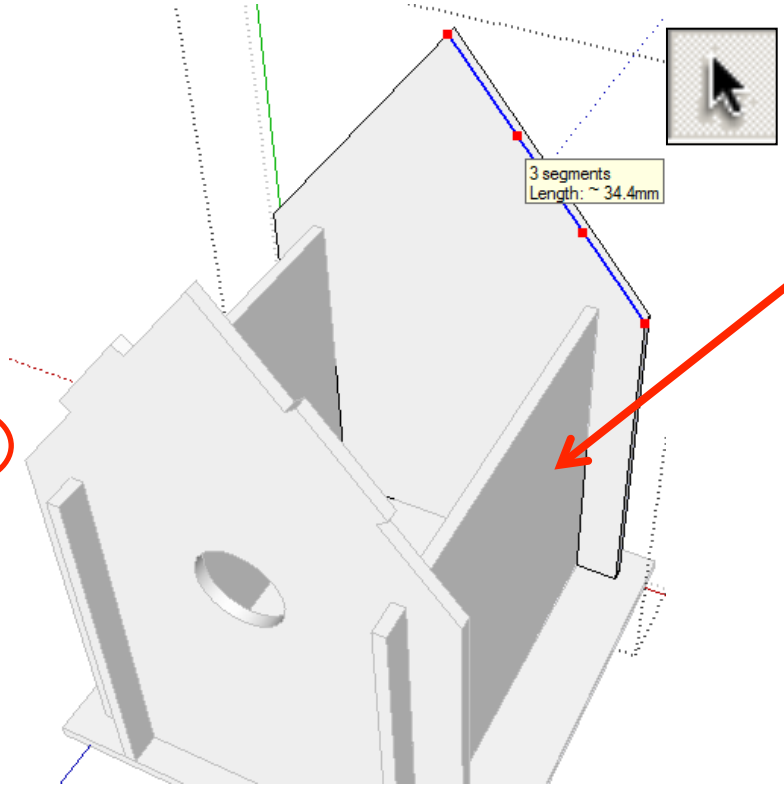
33. Using the ***pencil tool,*** move your pencil along the blue line until it snaps to the other ***endpoint***. Draw a line across to the opposite edge.



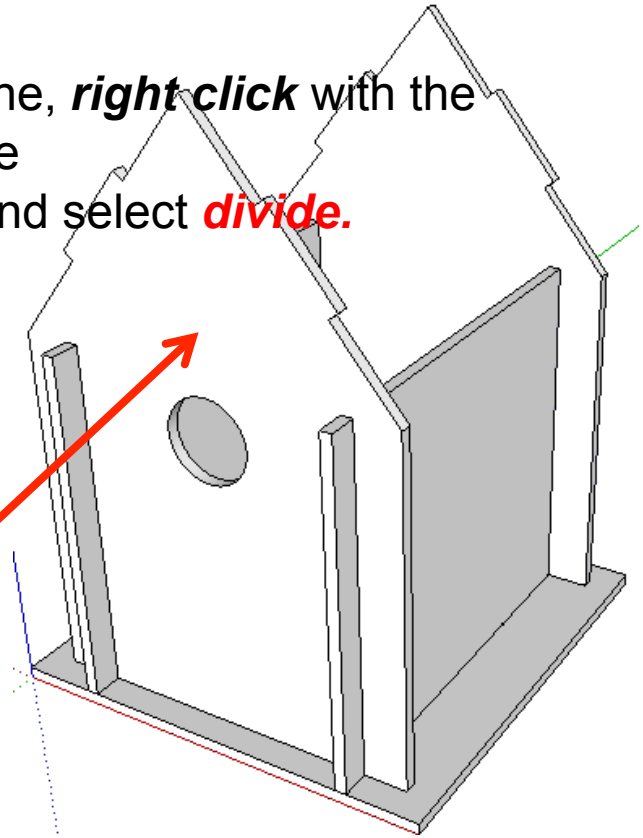
34. Using the ***pencil tool,*** move your pencil along the blue line until it snaps to the other ***endpoint***. Draw a line across to the opposite edge.



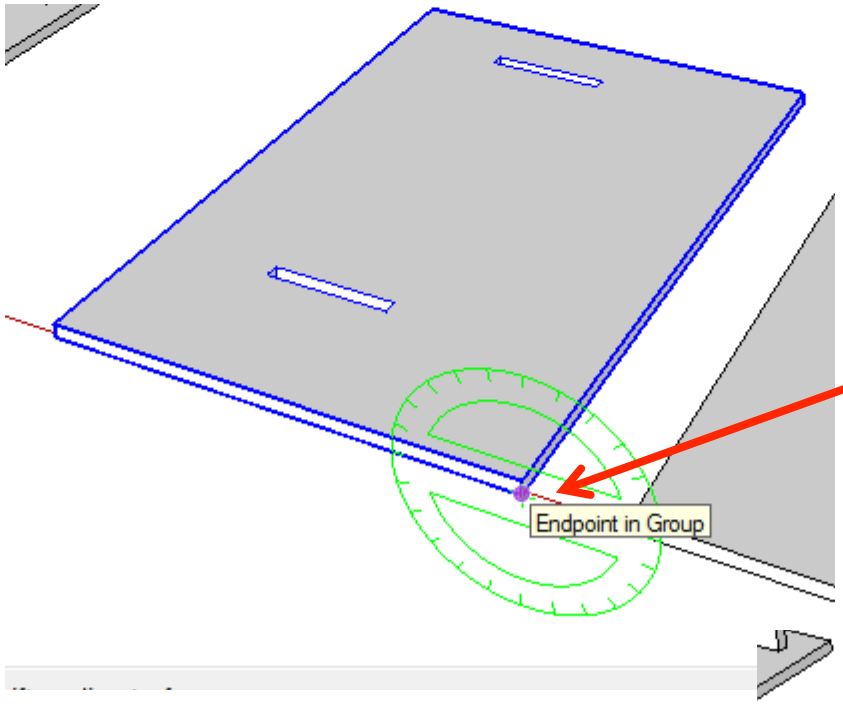
35. Using the ***push pull tool.*** Hover over the middle rectangle you have just drawn. It will go ***dotted*** as you hover it. Pull the shape up. Type in ***4 and press enter.***



36. Using the ***select tool, double click*** on a back piece shown. All the other pieces should be greyed out. Then click on the edge shown to highlight it in blue. Whilst on the selected ***blue*** line, ***right click*** with the mouse and select ***divide.***



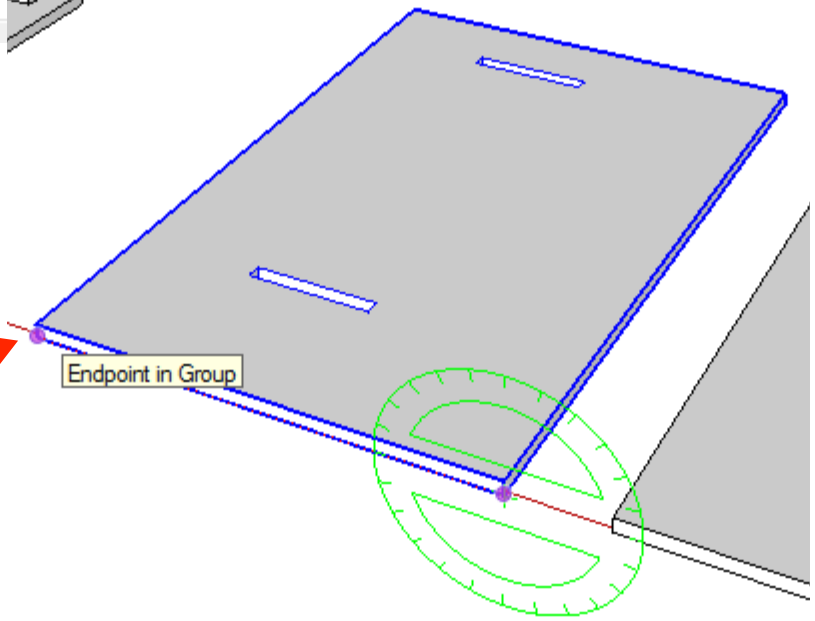
37. Using the ***mouse,*** you can move it up and down the blue line to divide it into 3 segments or you can type ***3 and press enter.*** Draw your lines across and use the push pull tool to add you raised slot joint***. Repeat on both sides as you birdhouse.***

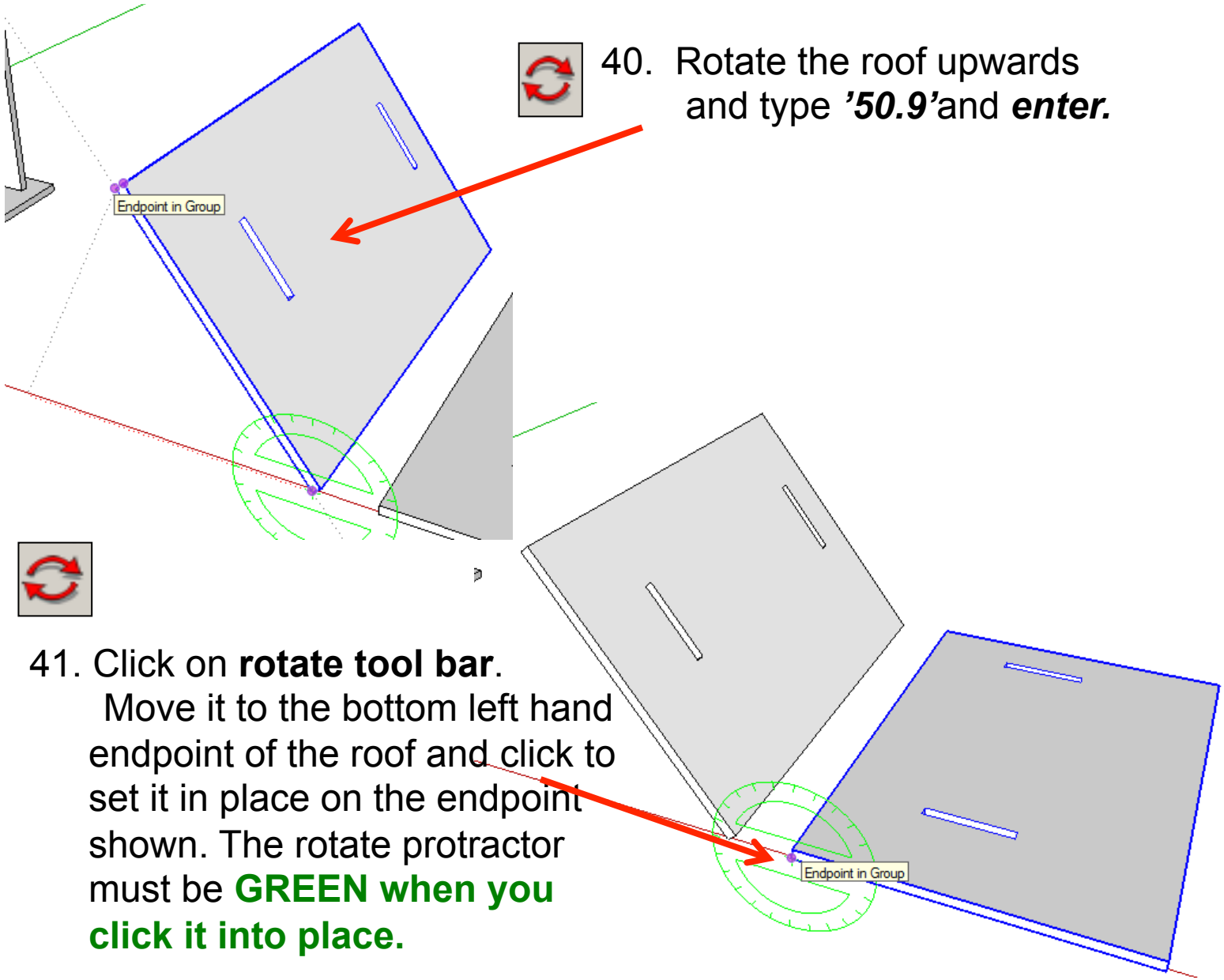


38. Click on **rotate tool bar**. Move it to the bottom right hand endpoint of the roof and click to set it in place on the endpoint shown. The rotate protractor must be **GREEN when you click it into place.**

39. To start the rotate move the line coming out of the protractor to the bottom ***left hand endpoint*** shown.

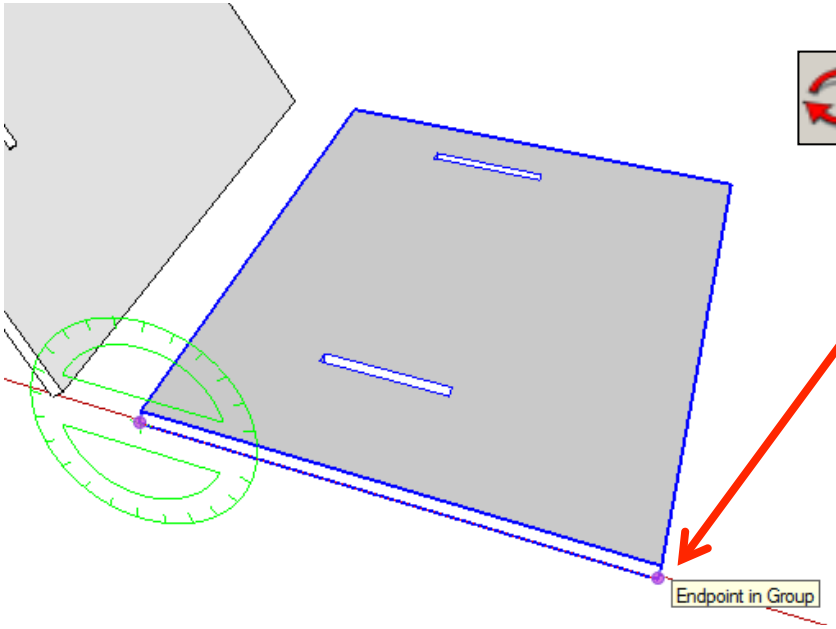
Click to start rotating



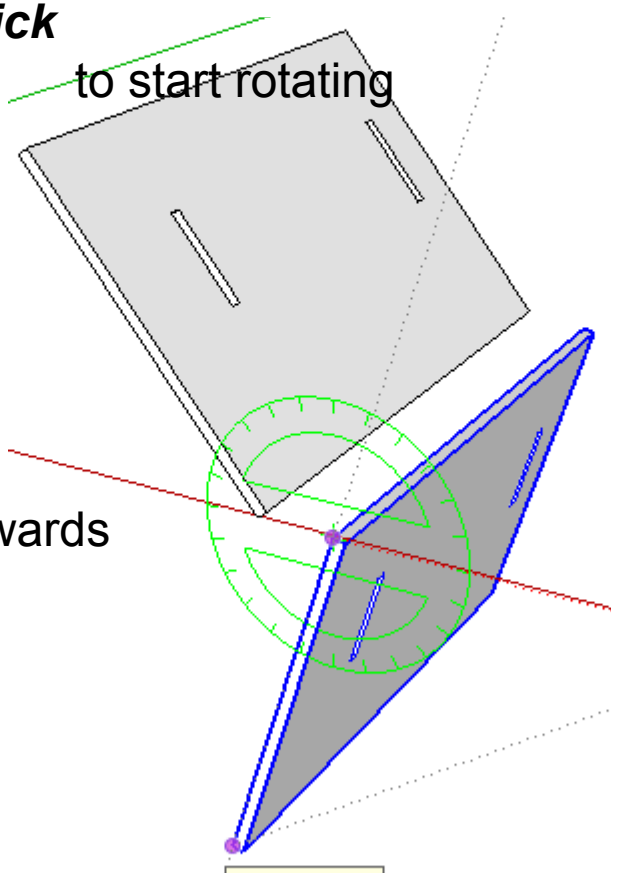


40. Rotate the roof upwards and type ***'50.9'*** and ***enter.***

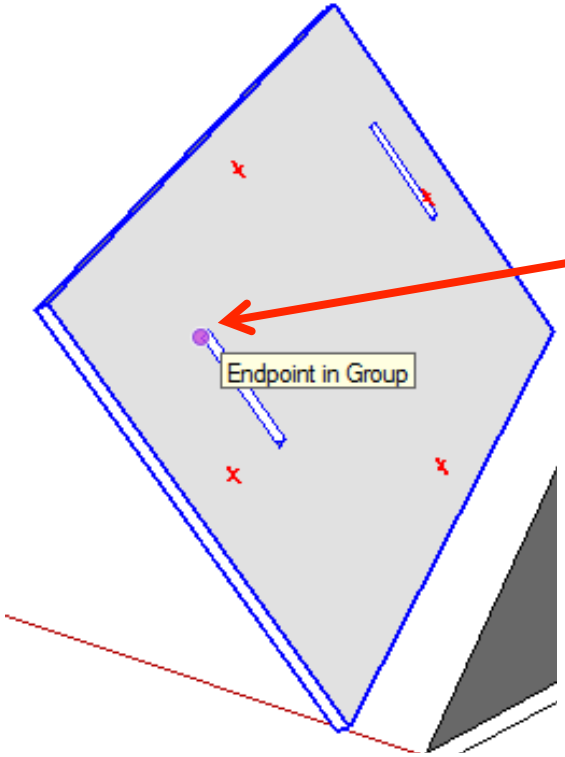
41. Click on **rotate tool bar**. Move it to the bottom left hand endpoint of the roof and click to set it in place on the endpoint shown. The rotate protractor must be **GREEN when you click it into place.**



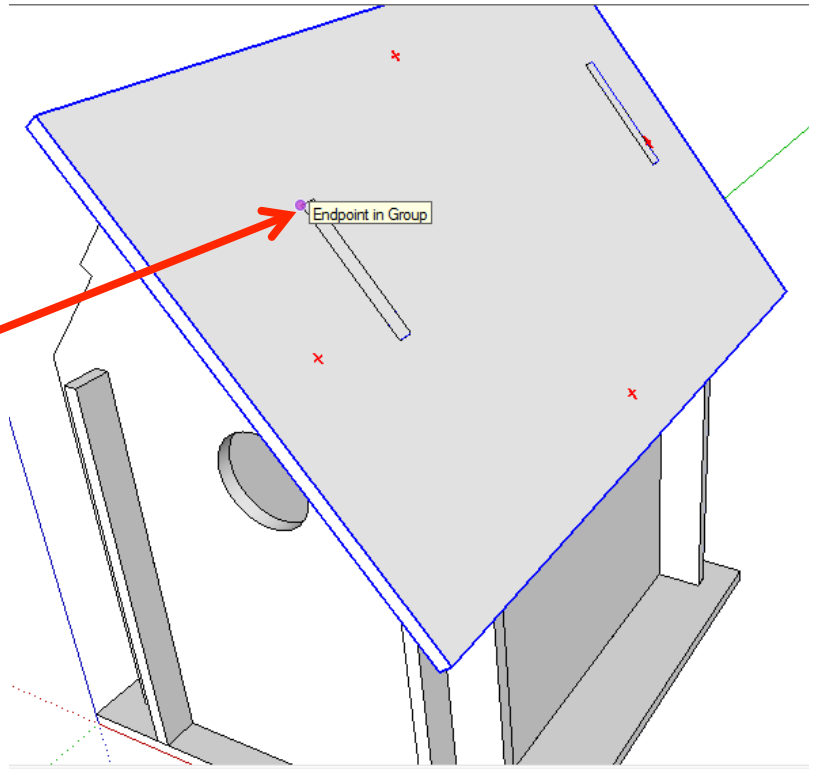
42. To start the rotate move the line coming out of the protractor to the bottom ***right hand endpoint*** shown. ***Click*** to start rotating



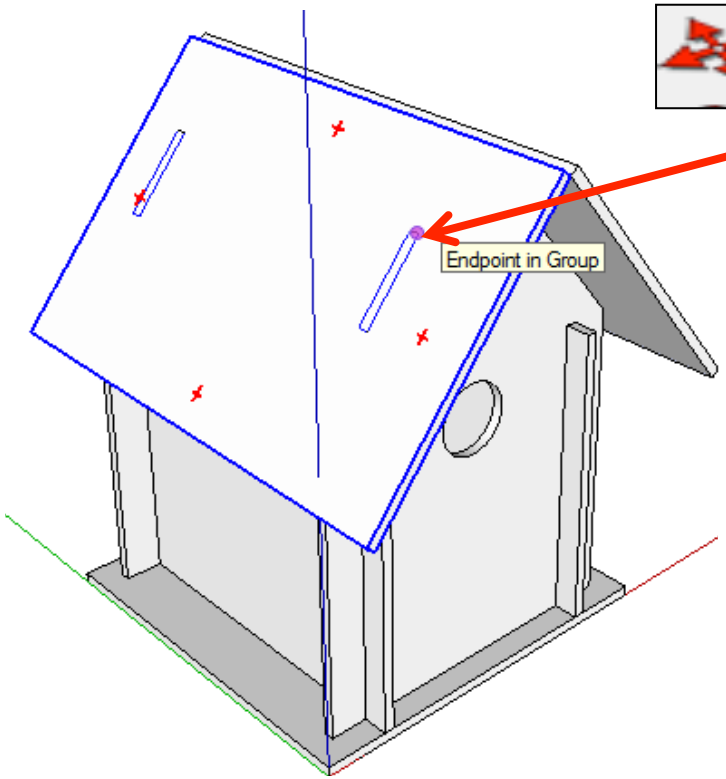
43. Rotate the roof downwards and type ***'129.1'*** and ***enter.***



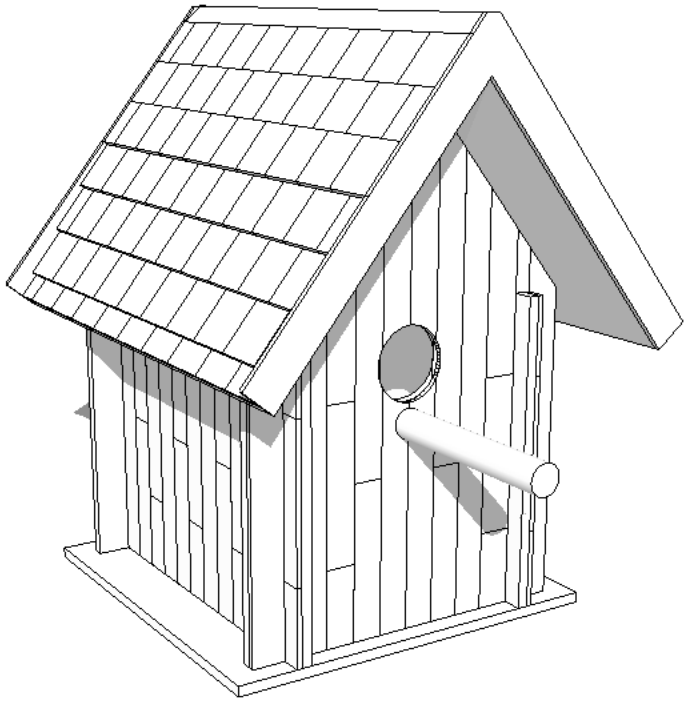
44. Using the ***move tool***, click on the ***end point on one of the roof*** shown. Move it over the base piece of the birdhouse



45. Using the ***move tool***, snap it into place with the endpoint of the rectangle you previously drew on the birdhouse below.



46. Using the ***move tool***, snap the other roof into place with the endpoint of the rectangle you previously drew on the birdhouse shown opposite.



47. Use your own skills to add more details

Click ***View – toolbars*** and un-tick

axis. Place a tick next to shadows

Tasks:

- Put other details on the birdhouse such as a perch, wooden sides, bird bath etc.
- Experiment with colours and materials for rendering.