Design out the box

Level of difficulty ★★★★☆

Starter

- Find out as much as you can about a designer called Dieter Rams:

    Who did he work for?
    What did he design?
    What did his products go on to inspire?
    What is his design style?

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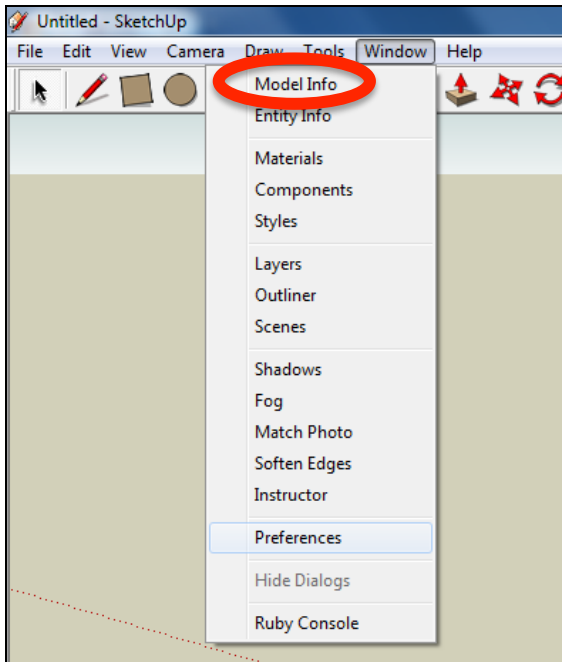
1. Open the sketch up drawing. Once you have opened SketchUp, go to **Window** and select **Model Info**

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.

6
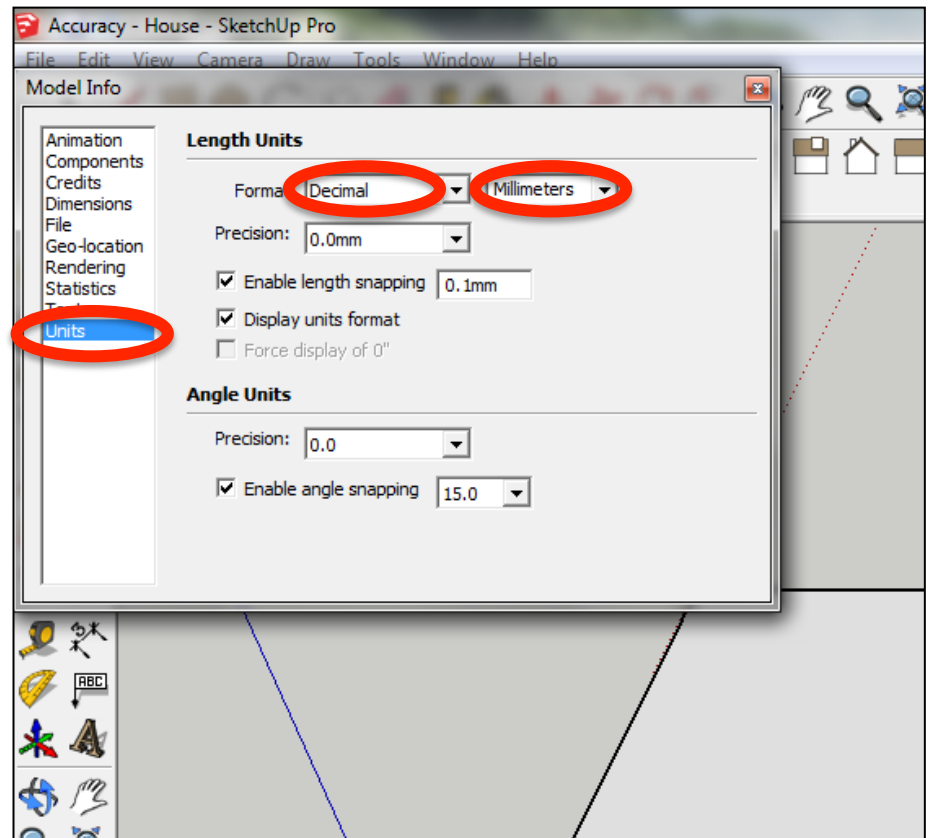
3. Now select the **View** then **toolbars** and ensure **Getting Started** and **Large Tool Set** are ticked
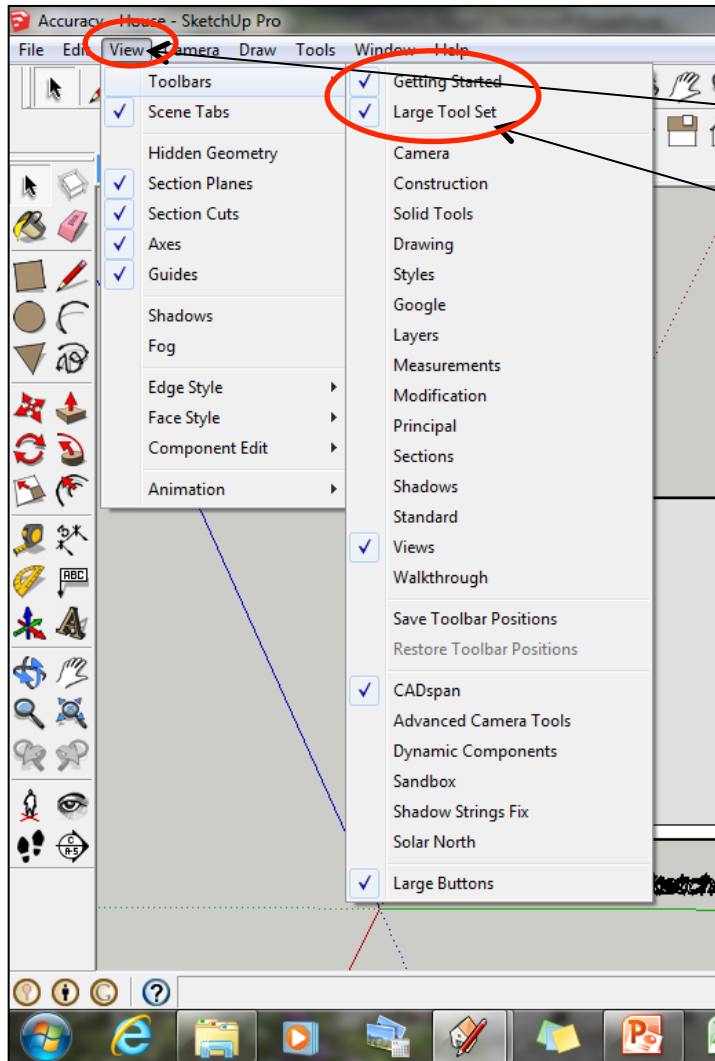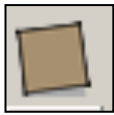

3a Select **View**

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
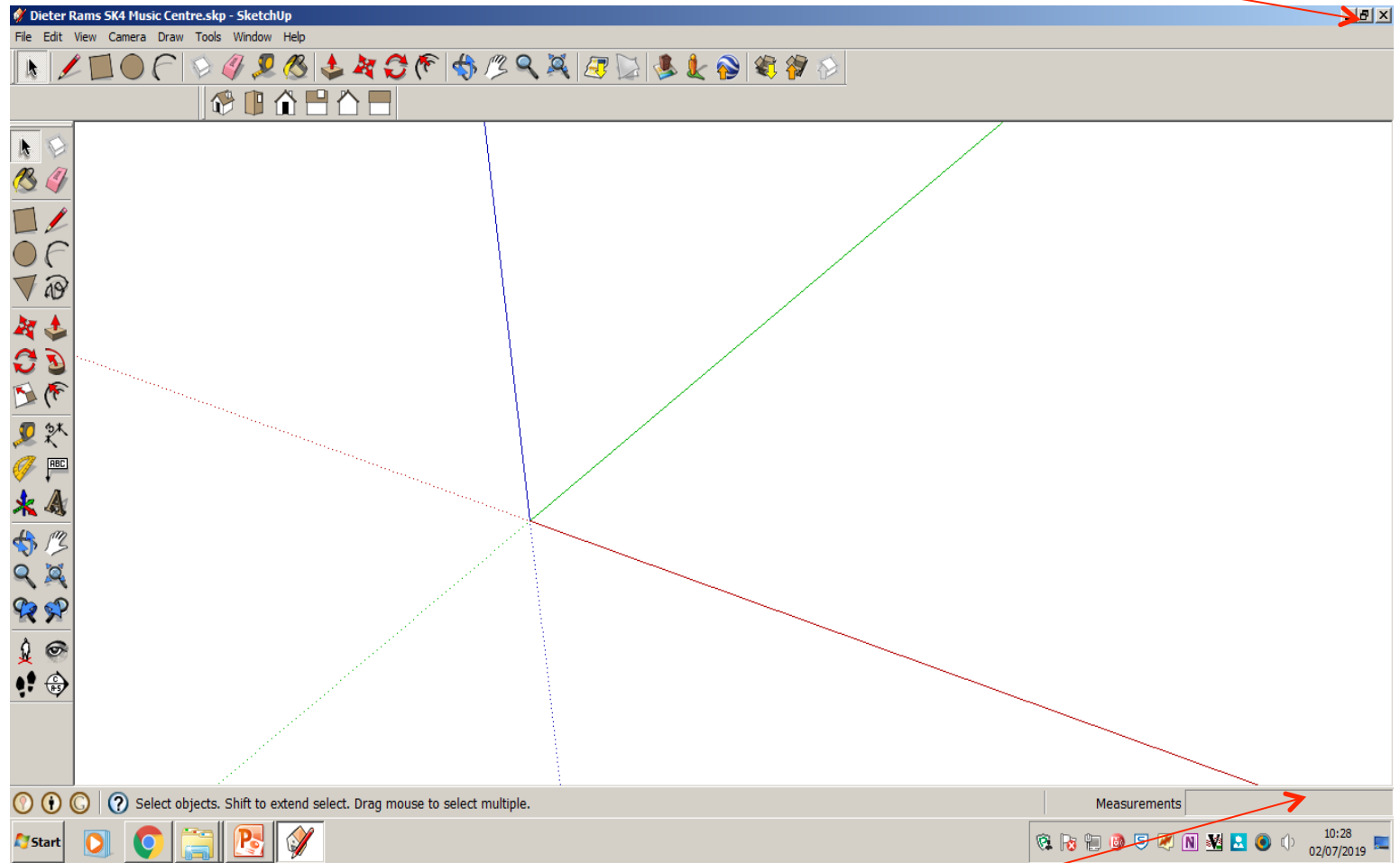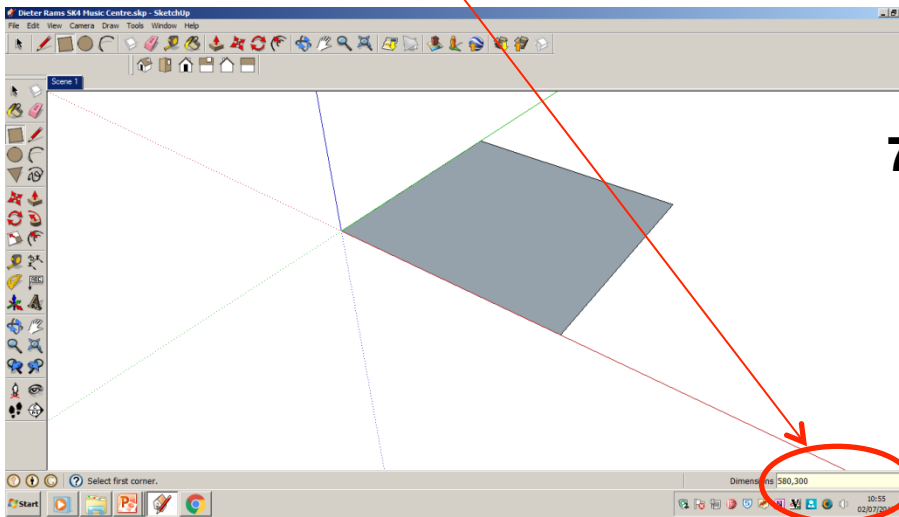

Measurements tool bar

5. Use the *rectangle tool* to start drawing a square from the corner of origin axis shown. (*Green* / *red* / *blue axis*)
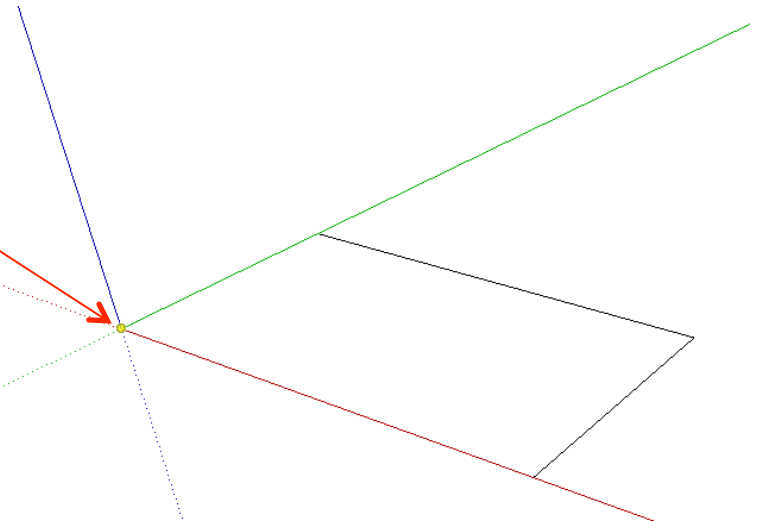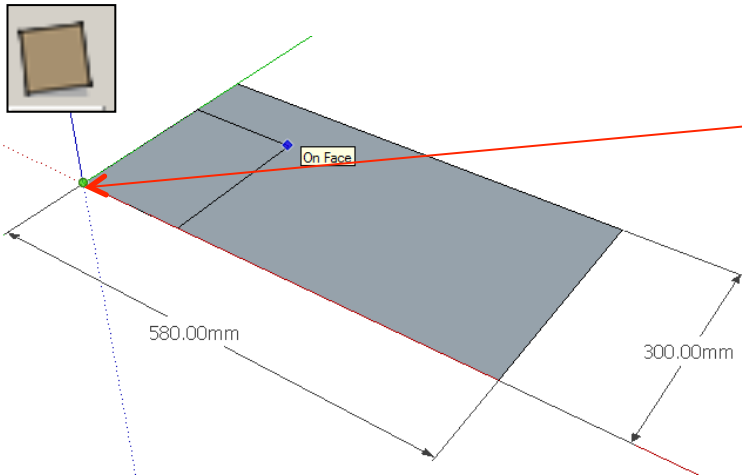
6. Let go of the mouse and start typing *580, 300* and then *press enter*. These sizes will appear in the bottom right hand corner shown.
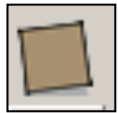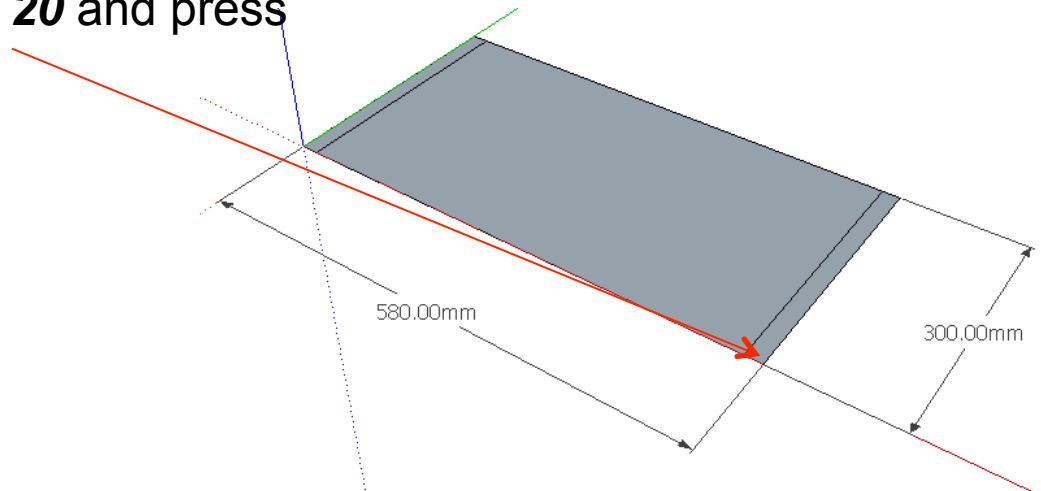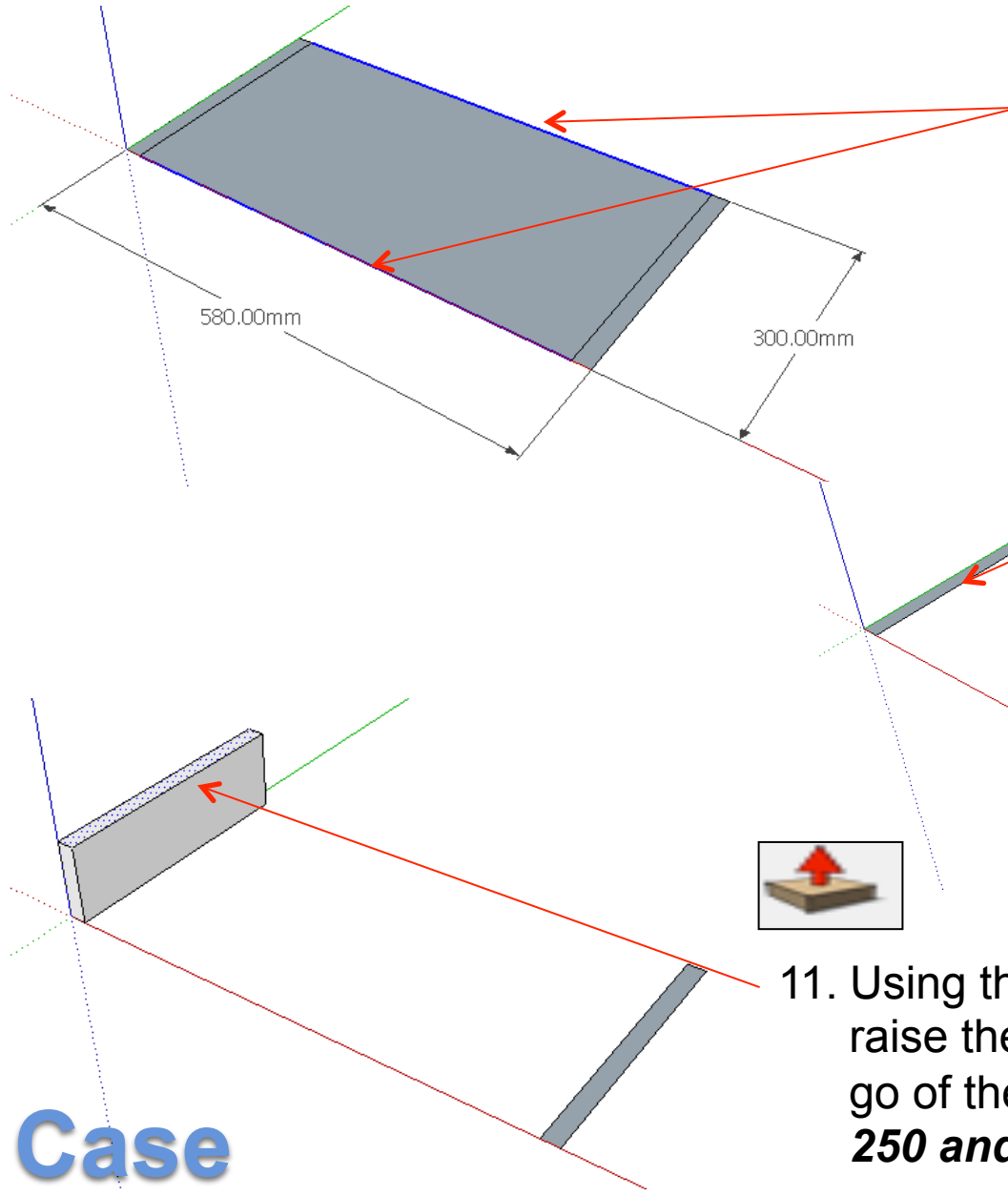
7. **Click on the zoom extents symbol.**

8. Use the *rectangle tool* to start drawing a square from the bottom left hand corner. Type in *300, 20* and press *enter*.

On Face

580.00mm

300.00mm

9. Use the *rectangle tool* to start drawing a square from the bottom right hand corner. Type in *300, 20* and press *enter*.
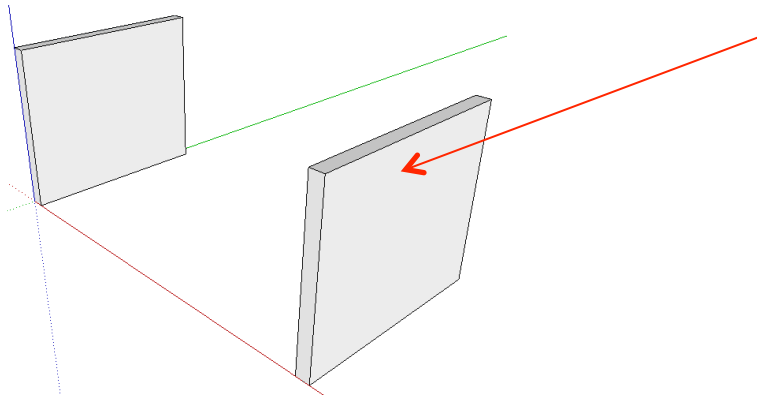
580.00mm

300.00mm

Rectang

Case

580.00mm

300.00mm

10. Use the *eraser tool* to delete the lines shown in blue. You should be left *with two rectangles* shown opposite.

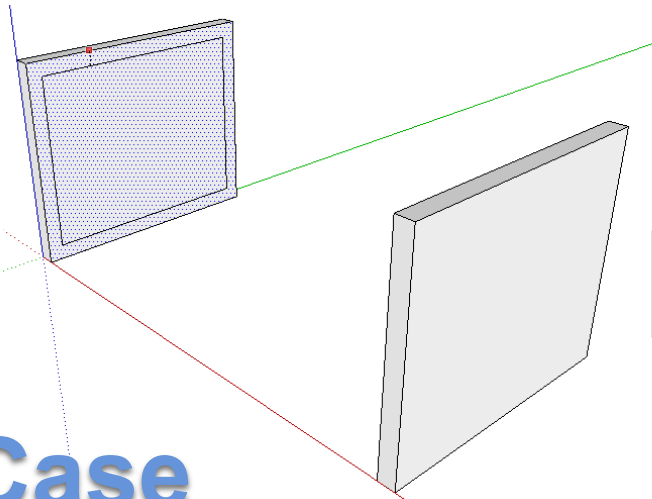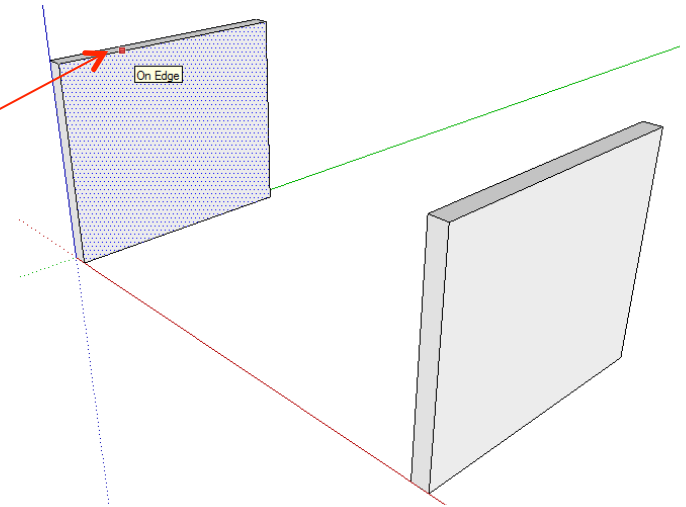11. Using the *push pull tool* raise the rectangle shown. Let go of the mouse and type in *250 and press enter.*

Case

Rectang

12. Using the *push pull tool* raise the other rectangle shown. Let go of the mouse and type in *250 and press enter.*
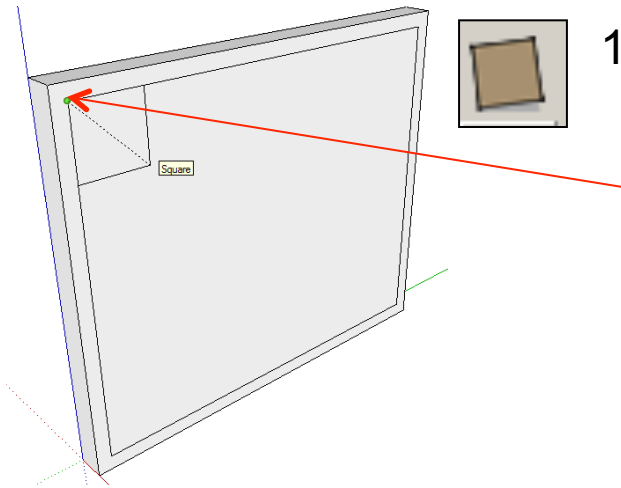
On Edge

13. Using the *contour tool* click on the *top edge* of the rectangle shown. The inside of the square should go dotted.
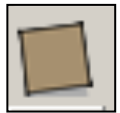
14. Pull the *contour tool* into the *centre* of the rectangle shown. Type in *10* and *press enter*
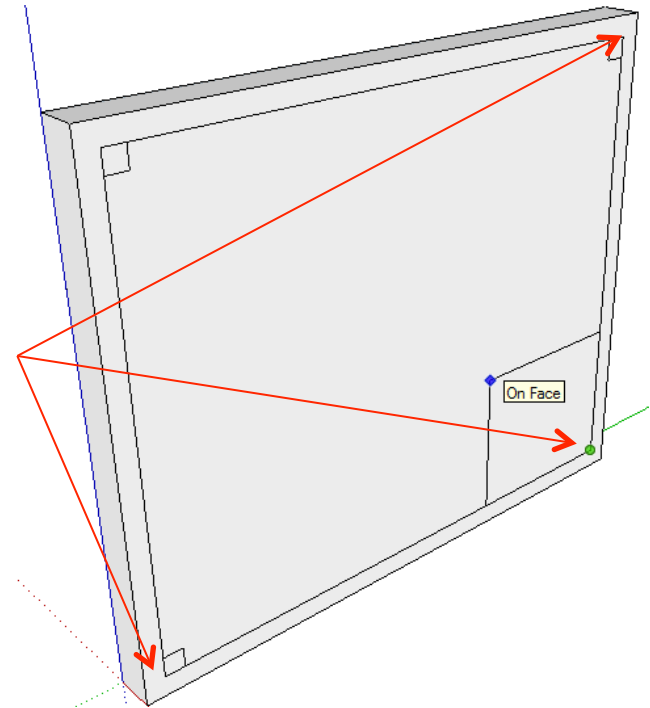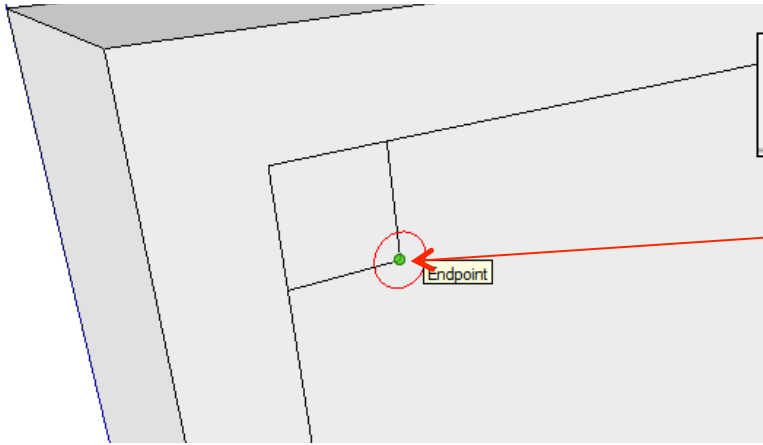
Rectang

Case

15. Use the *rectangle tool* to start drawing a square from the top left hand corner of the last rectangle you have just drawn. Type in *10, 10* and press *enter*.
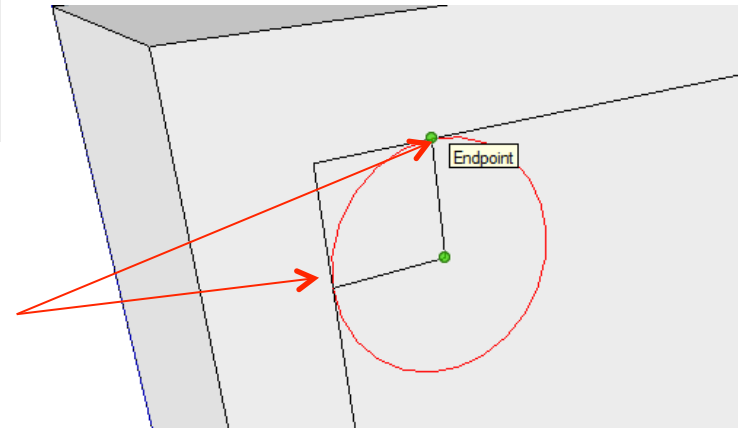
16. Using the *rectangle tool* repeat *step 15* drawing a square from the top right hand corner, bottom left and bottom right hand corner of the interior rectangle. Type in *10, 10* and press *enter*.
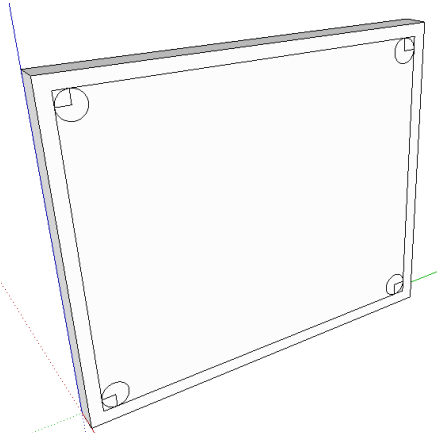
Case

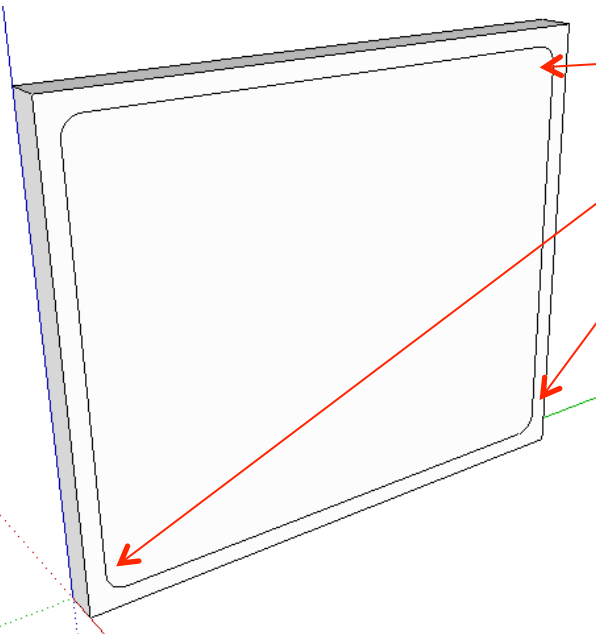17. *Click* on the *circle tool*. Position the centre on the corner of the square shown above

18. Extend the circumference of the circle out until it meets the either corner shown. It will say
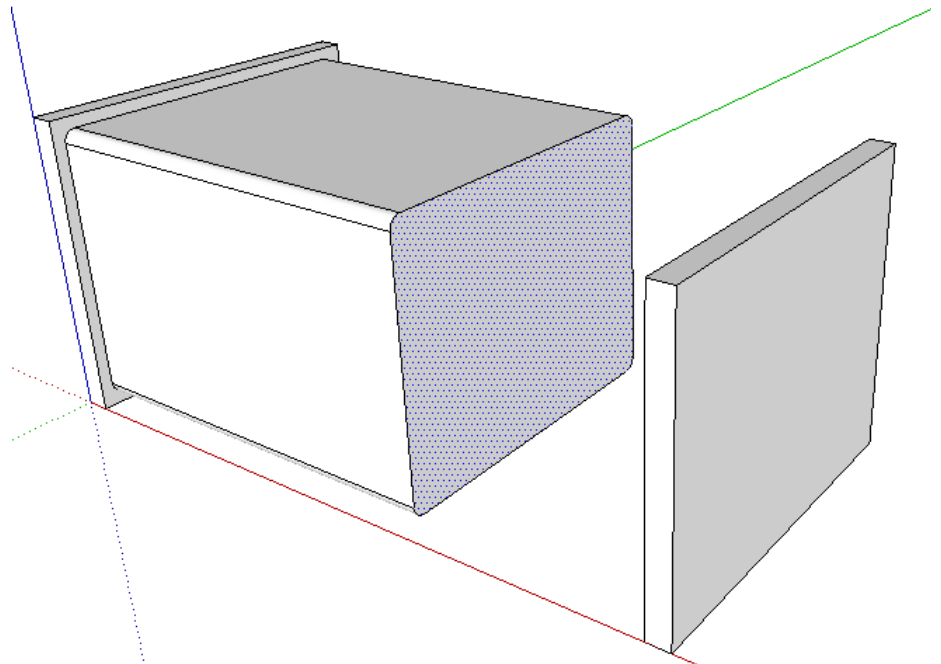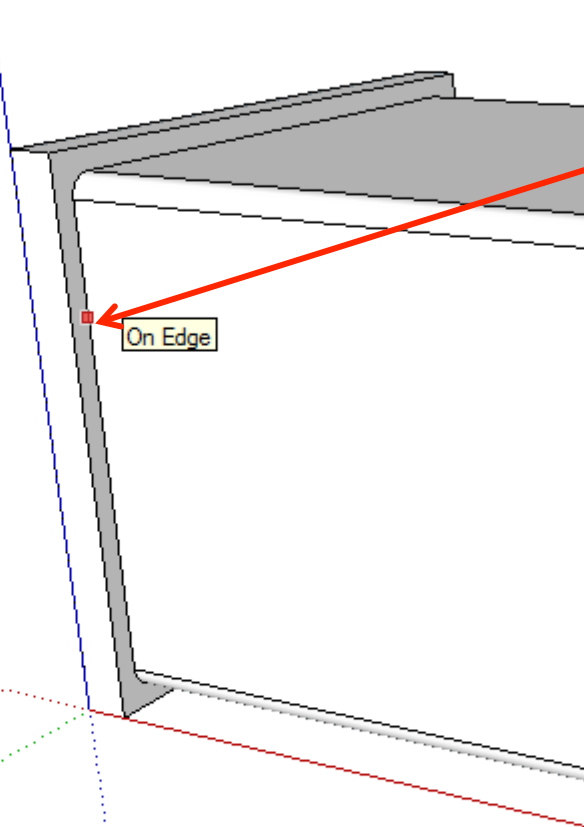
19. *Repeat* the process for the other 3 corners.

Case

20. Use the *eraser tool* to erase the corners so you are left with a radius as shown

21. *Erase* the remaining parts of the circle.

Case

22. *Repeat* the process for the other 3 corners.

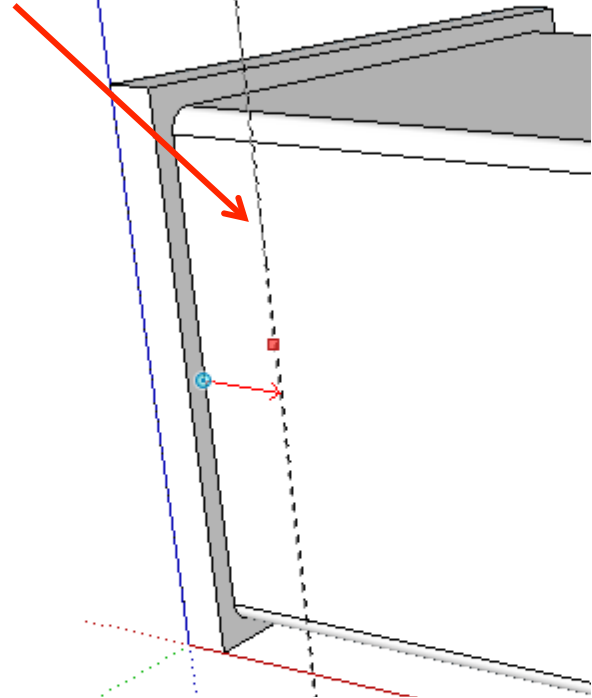23. Using the *push pull tool* pull the middle shape shown out. Let go of the mouse and type in *540 and press enter.*
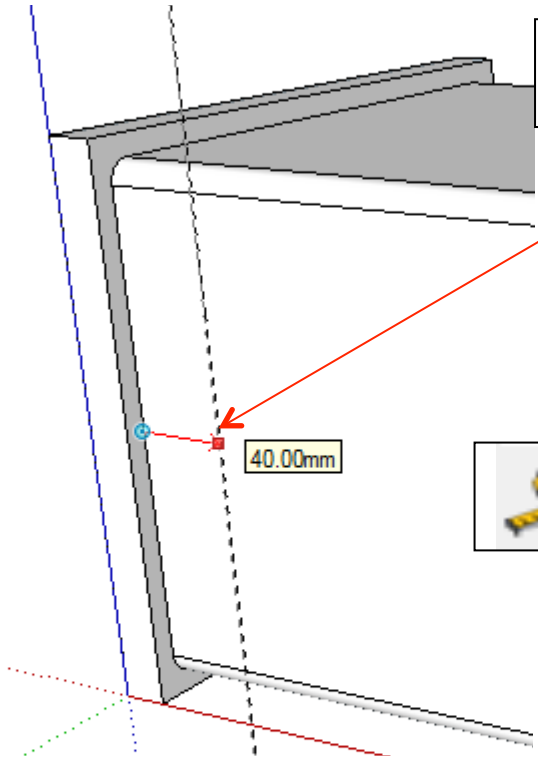
Case

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

On Edge

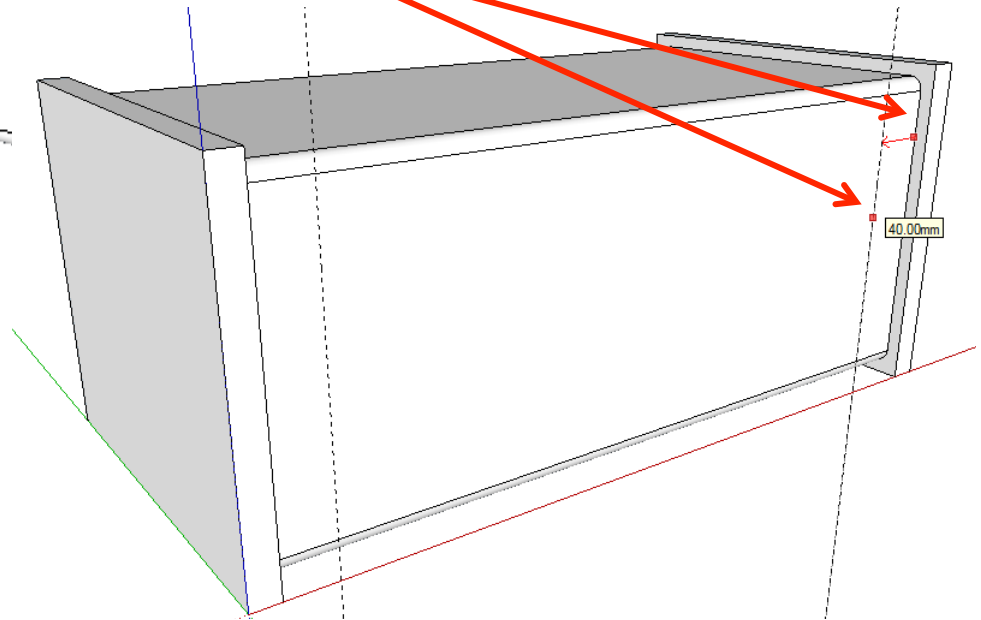25. *Click once* and it will draw a dotted guide line inwards from the edge
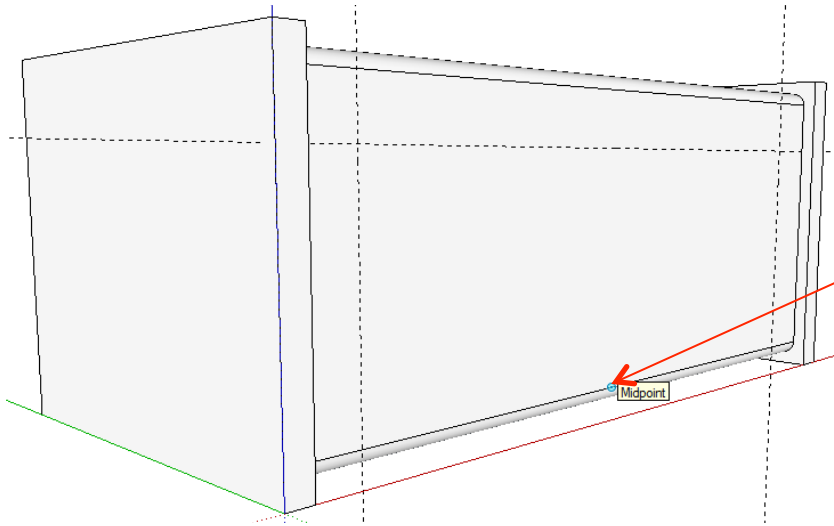
Rectang

Speakers

26. ***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***

40.00mm

27. ***Repeat*** the process on the opposite right hand side

40.00mm

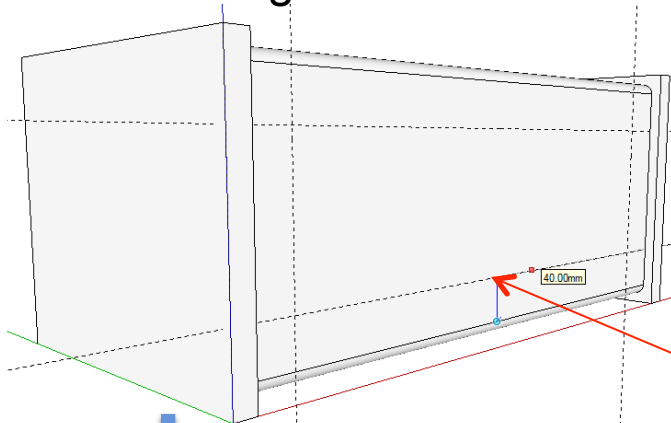**Speakers**

28. Select the *Tape measure tool* and snap to the *centre point on the top line* shown. You must be accurate and click on that line.

Midpoint

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

30. *Click a second time* to set the guide line and *type 40 and enter*. You will have a guide line *40mm* in from the *top edge*
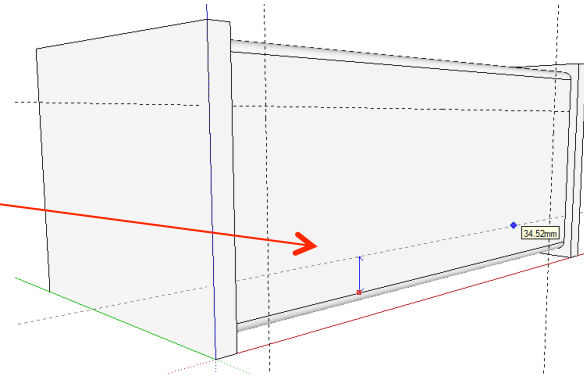
40.00mm

Speakers
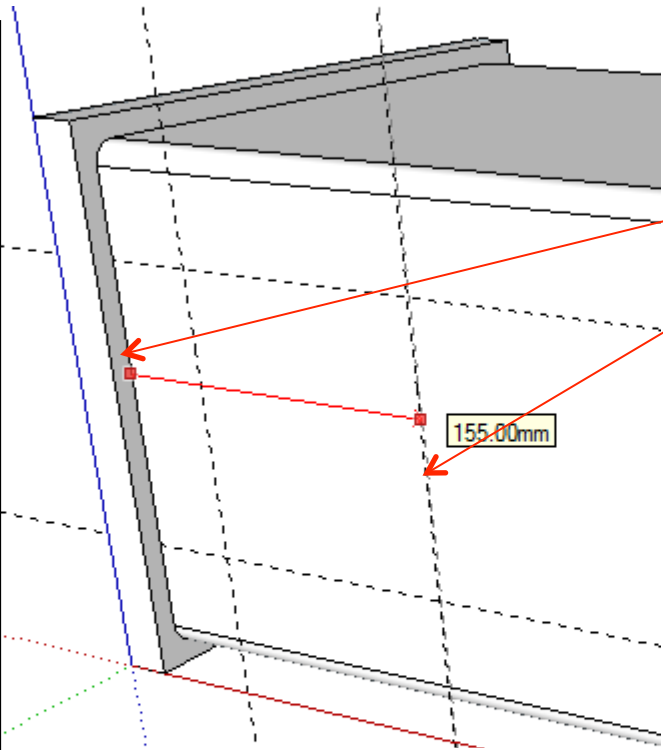
31. Select the *Tape measure tool* and snap to the *centre point on the bottom line* shown. You must be accurate and click on that line.

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

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

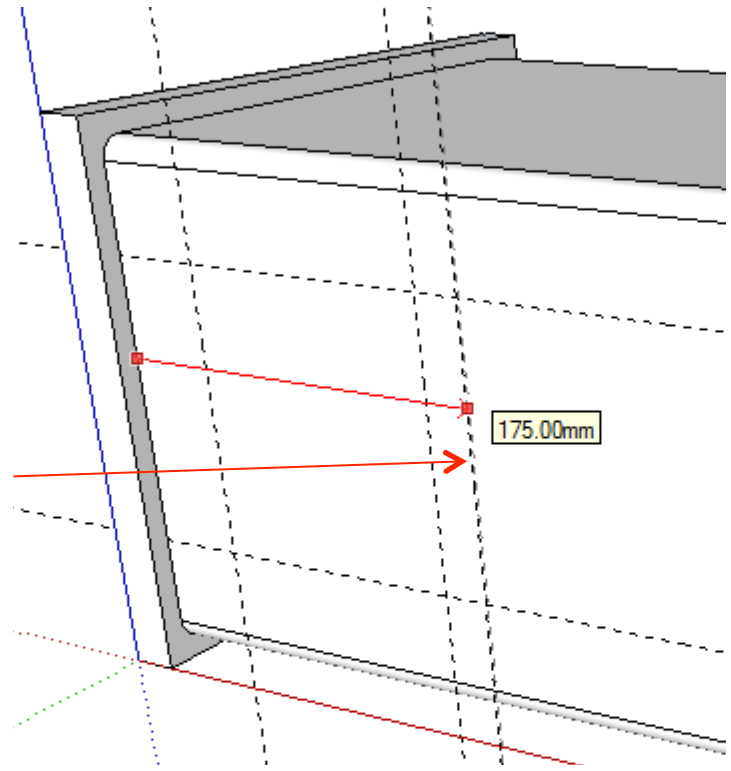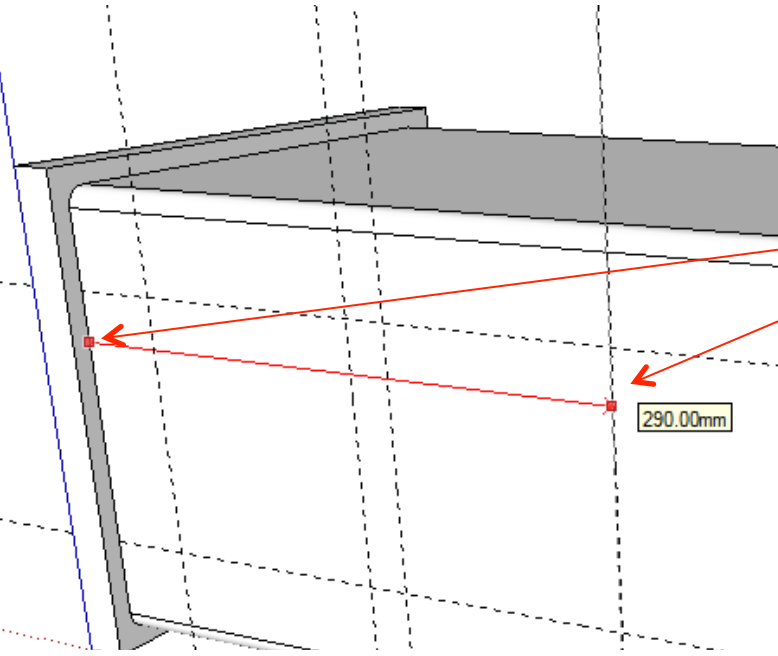**Speakers**

34. Select the *Tape measure tool* and snap to the left *side edge* as shown. Pull the guide in and type *155* and *press enter*

155.00mm

35. Select the *Tape measure tool* and snap to the left *side edge* as shown. Pull the guide in and type *155* and *press enter*
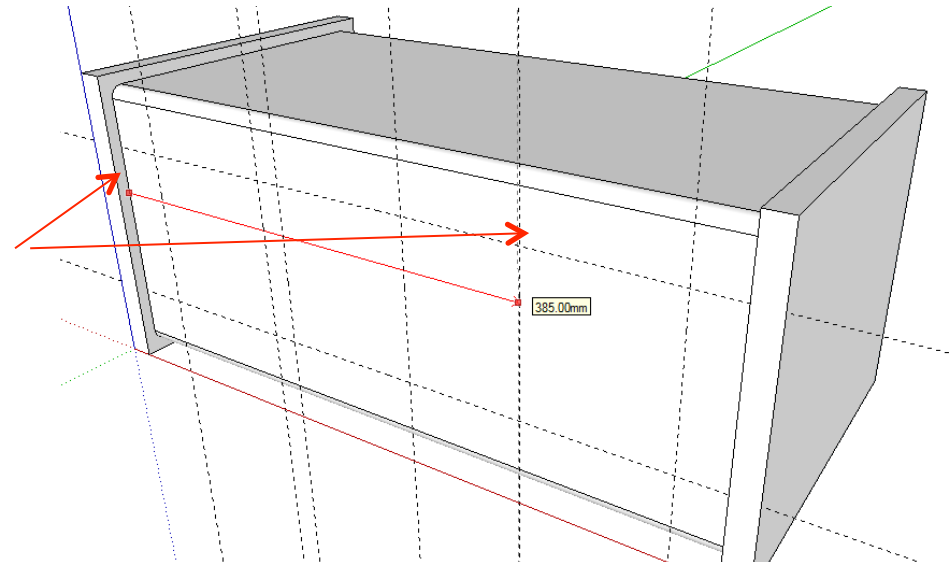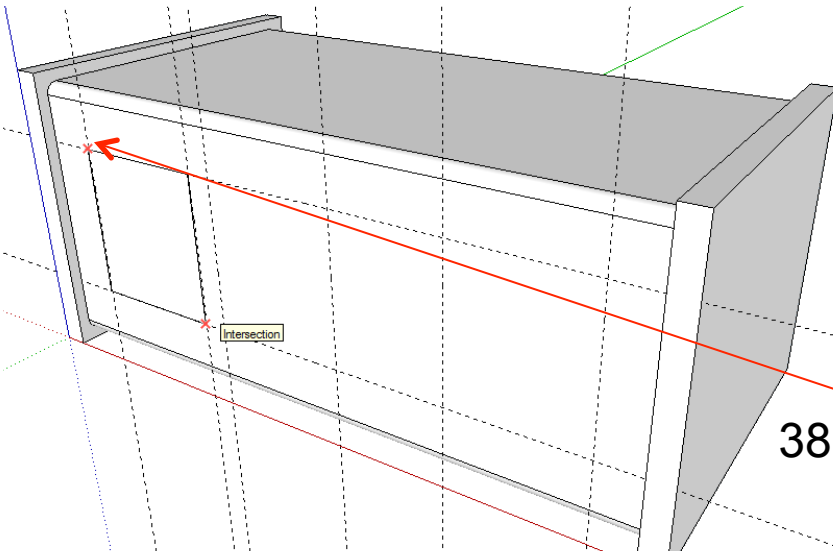
175.00mm

Speakers

36. Select the *Tape measure tool* and snap to the left *side edge* as shown. Pull the guide in and type *290* and *press enter*

290.00mm
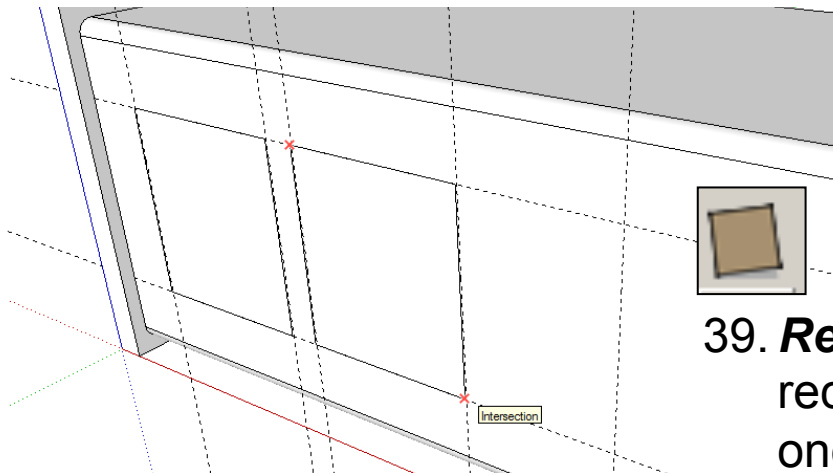
37. Select the *Tape measure tool* and snap to the left *side edge* as shown. Pull the guide in and type *385* and *press enter*
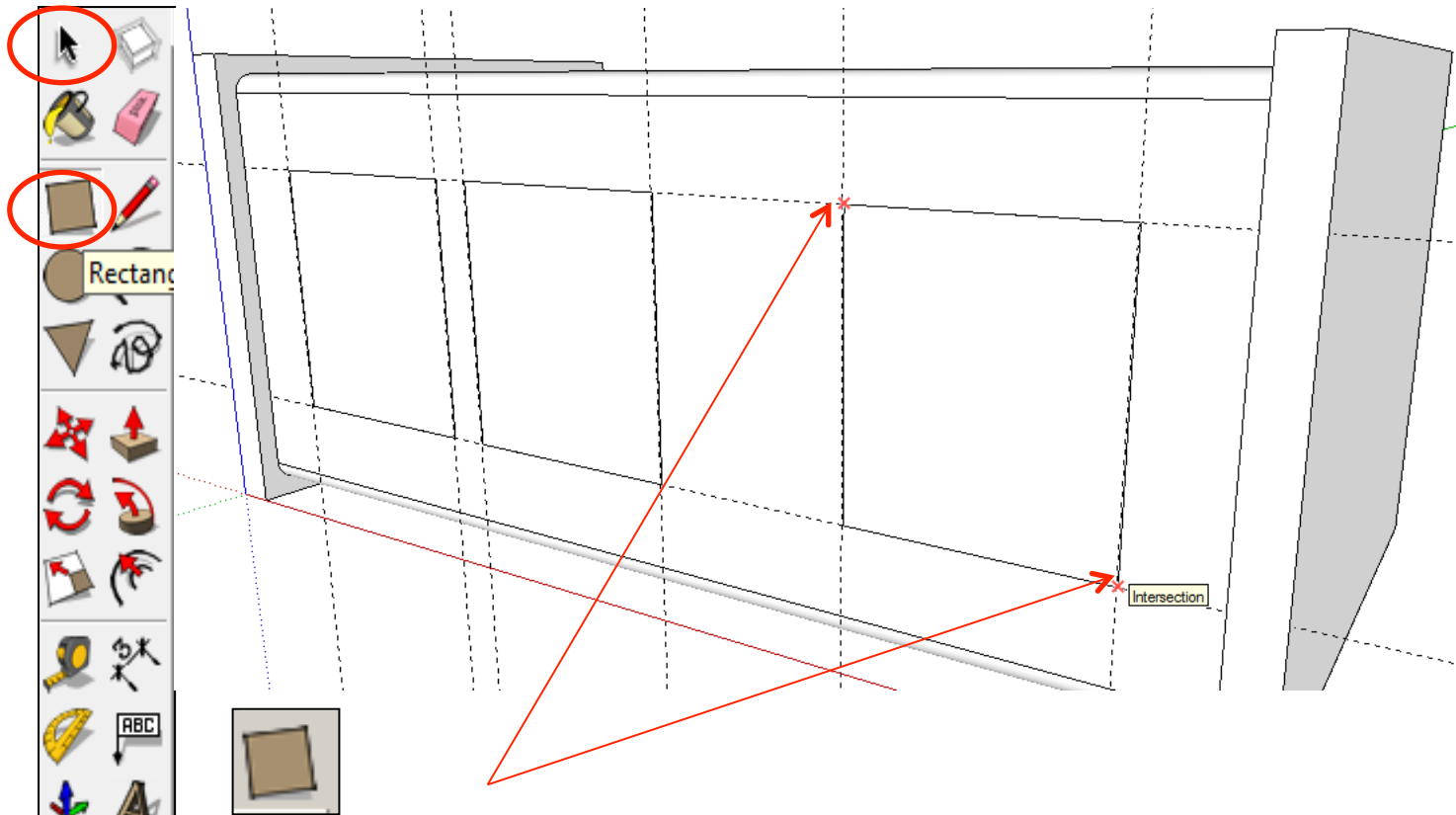
385.00mm

Speakers

38. Using the *rectangle tool* click on the *intersection* where two dotted guidelines meet in the *top left hand corner*. Pull the rectangle down to the *bottom right hand corner intersection* shown.
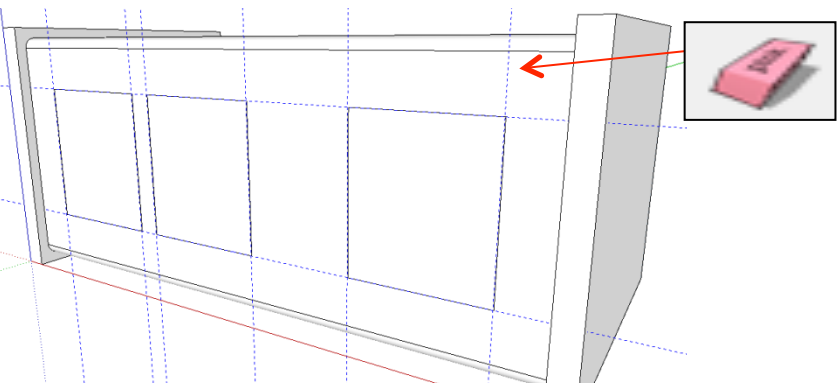
39. *Repeat* the process on the rectangle shown next to the last one you have drawn. Leave a gap in between them.
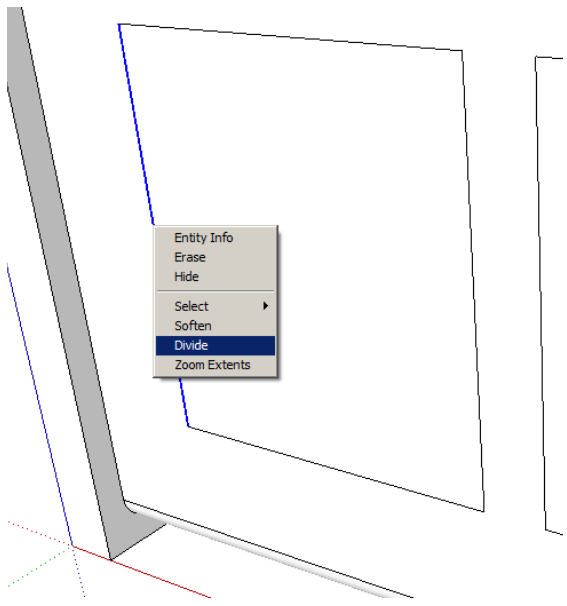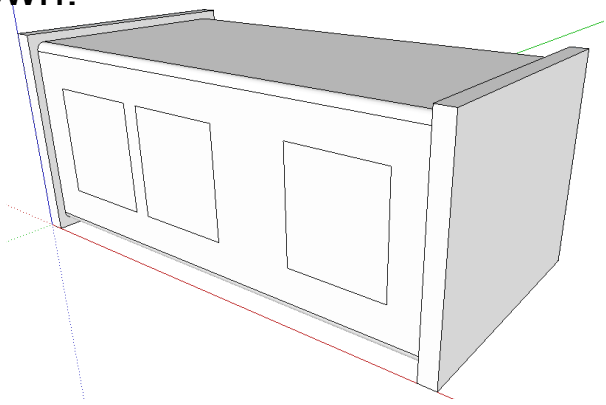
Speakers

Intersection

40. **Repeat** the process on the rectangle shown next to the last one you have drawn. Leave a gap in between them.
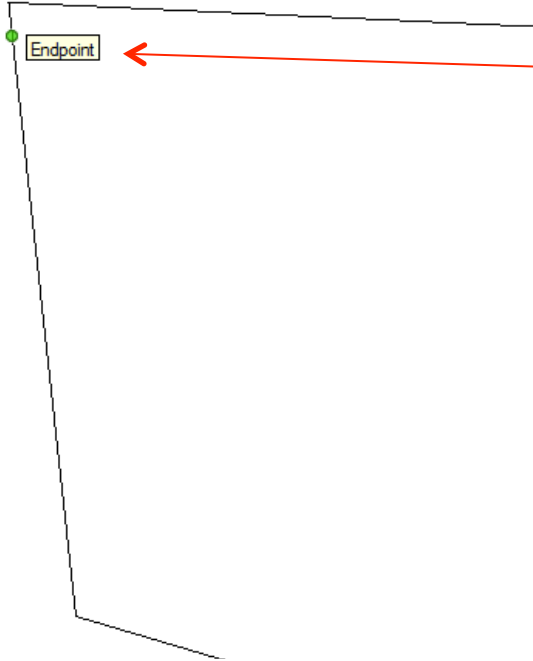
Speakers

41. Use the *eraser tool* to erase the guidelines so you are left with the three rectangles shown.

42. Use the *select tool* right click on the left hand line shown. Select the divide tool. This will *divide the line into segments.*

Type in 21 and press enter.

Rectang

Entity Info
Erase
Hide
Select
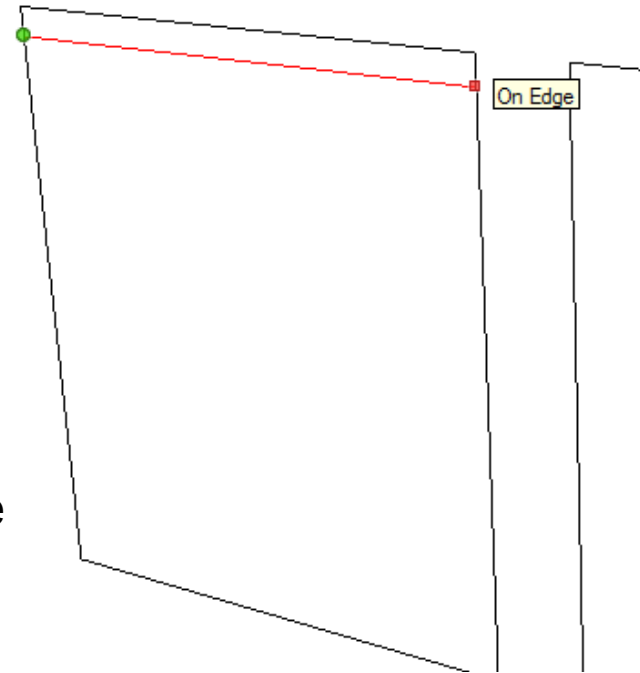Soften
Divide
Zoom Extents

Speakers

Endpoint

43. Select the *pencil tool* run it down

    the line you have just divided into 21 segments. When you come to the first segment *it will*
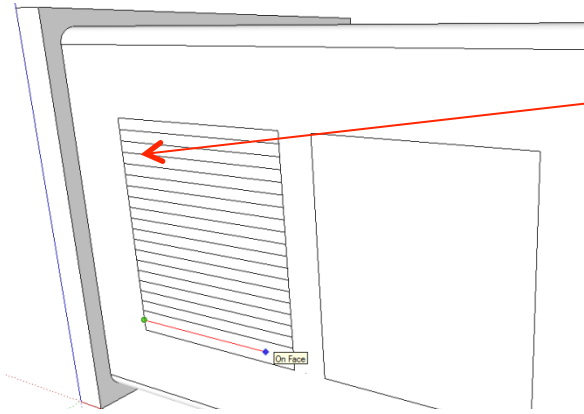
    say endpoint. Ignore the

On Edge

44. Click the *pencil tool* to start drawing. Ensure you draw along the *red axis* to ensure the line is straight and perfectly square. Click when you get to the opposite line. It will say on edge.
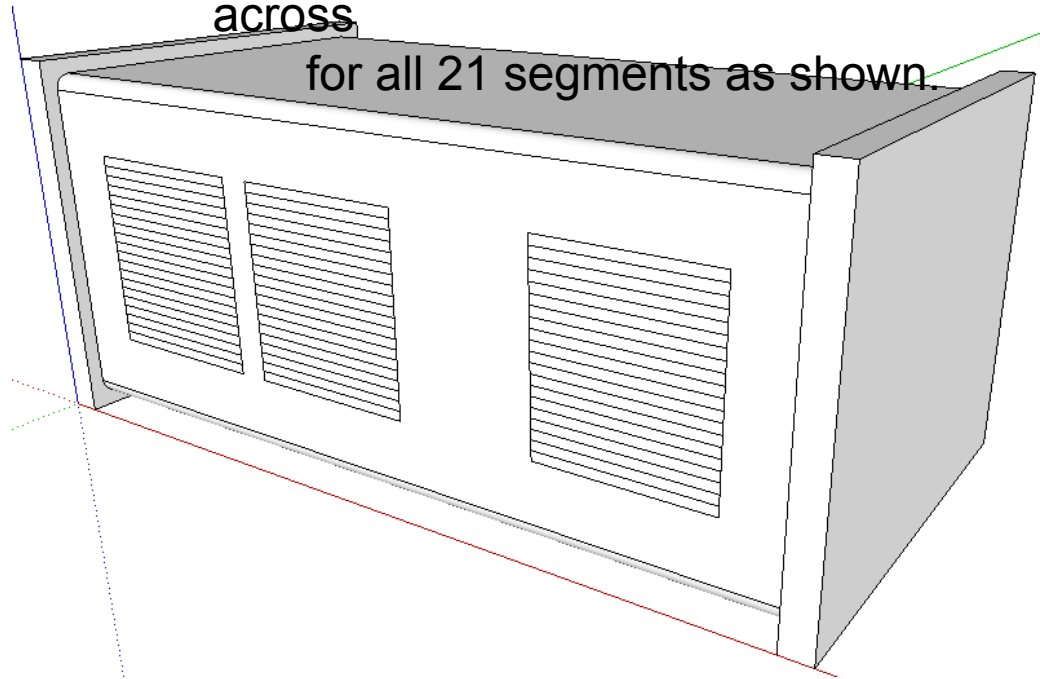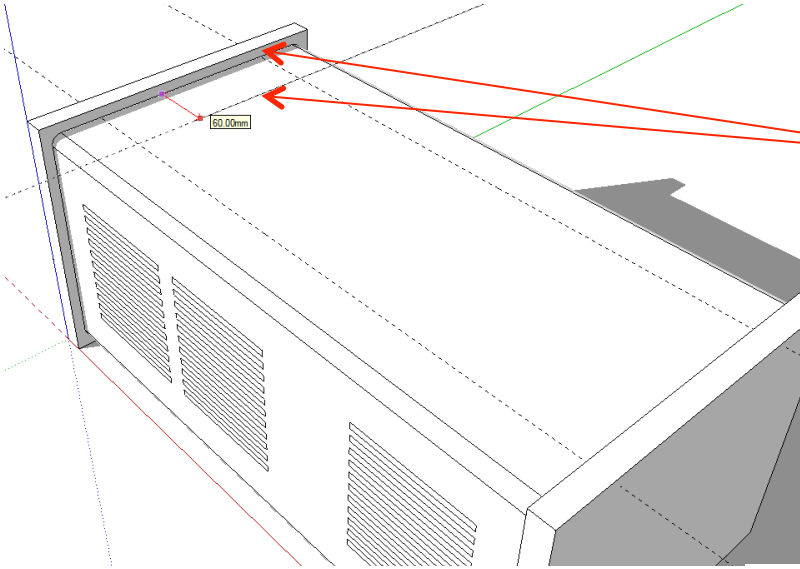
Speakers

45. Using the *pencil tool* run it down

the line you have just divided into 20 segments. When you come to the each segment *it will*

say endpoint. Ignore the midway point. Draw a line across

for all 21 segments as shown.

46. *Repeat* steps *42 to 45* on the other *two rectangles* shown *dividing* each one into *21 segments* and drawing lines across each *endpoint.*

Speakers

47. Use the *eraser tool* to erase every other segment shown to leave speaker design.

48. Use the *eraser tool* to erase every other segment shown to leave speaker design.

Speakers

49. Use the *tape measure tool* and draw a guideline in from the top edge shown. Type in *40* and *press enter*

50. Use the *tape measure tool* and draw a guideline in from the back edge shown. Type in *40* and *press enter*

Turn Table

51. Use the *tape measure tool* and draw a guideline in from the left hand side edge shown. Type in *60* and *press enter*

60.00mm

52. Use the *tape measure tool* and draw a guideline in from the left hand side edge shown. Type in *350* and *press enter*

350.00mm
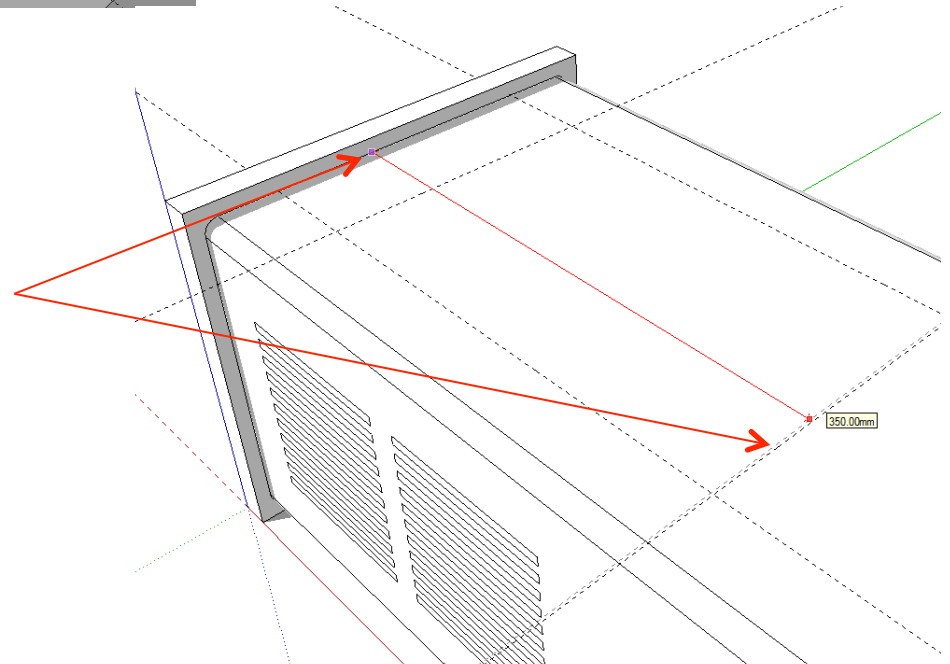
Rectang

Turn Table
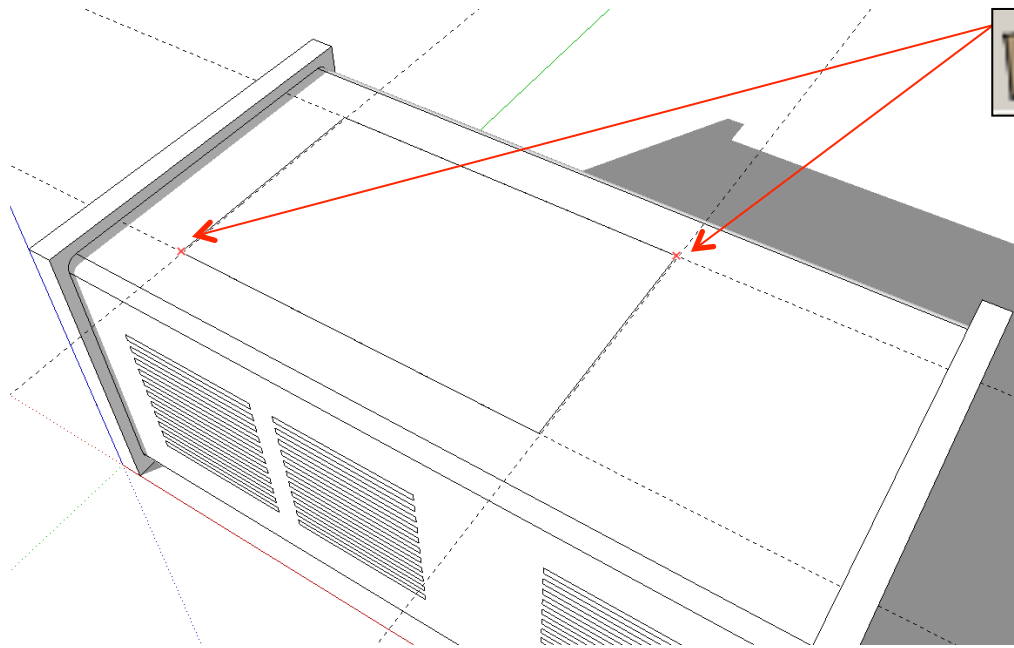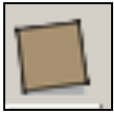
53. Using the *rectangle tool* click on the *intersection* where two dotted guidelines meet in the *bottom left hand corner*. Pull the rectangle down to the *top right hand corner intersection* shown.

54. Use the *rectangle tool* to start drawing a square from the bottom left hand corner of the last rectangle you have just drawn. Type in *20, 20* and press *enter*.

Turn Table

On Face in Group
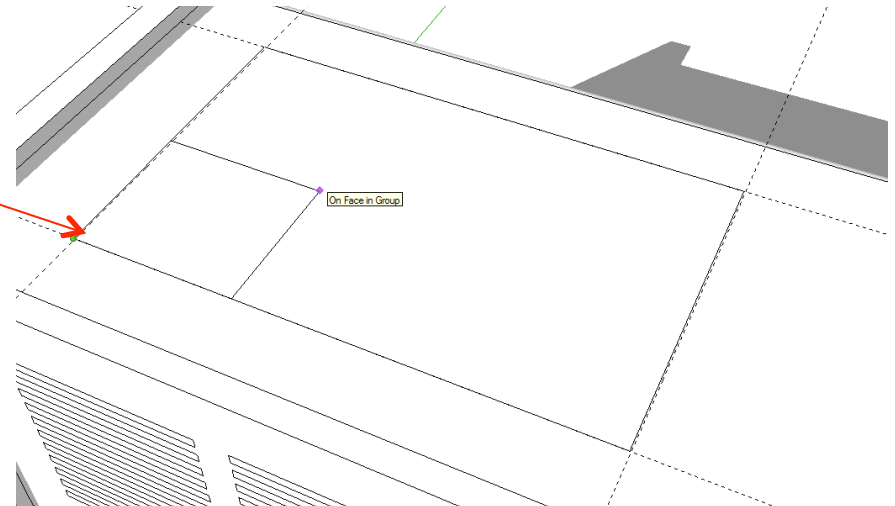
Rectang
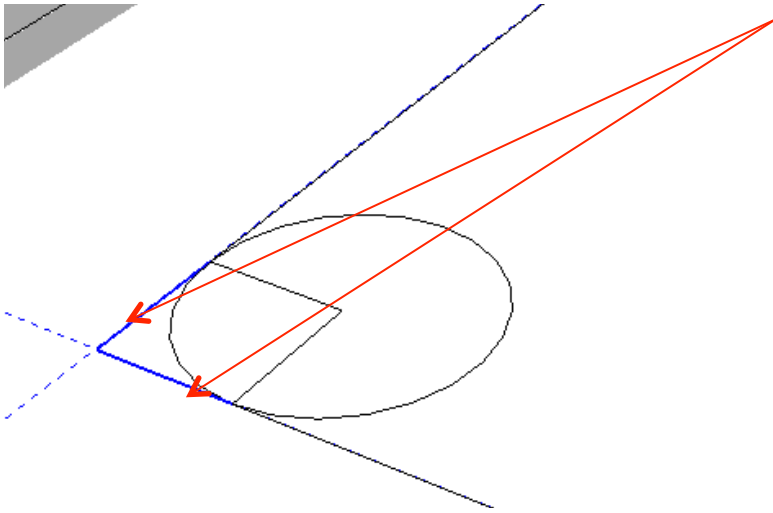
55. Using the *rectangle tool* repeat **step 15** drawing a square from the top right hand corner, top left and bottom right hand corner of the interior rectangle. Type in *20, 20* and press **enter**.
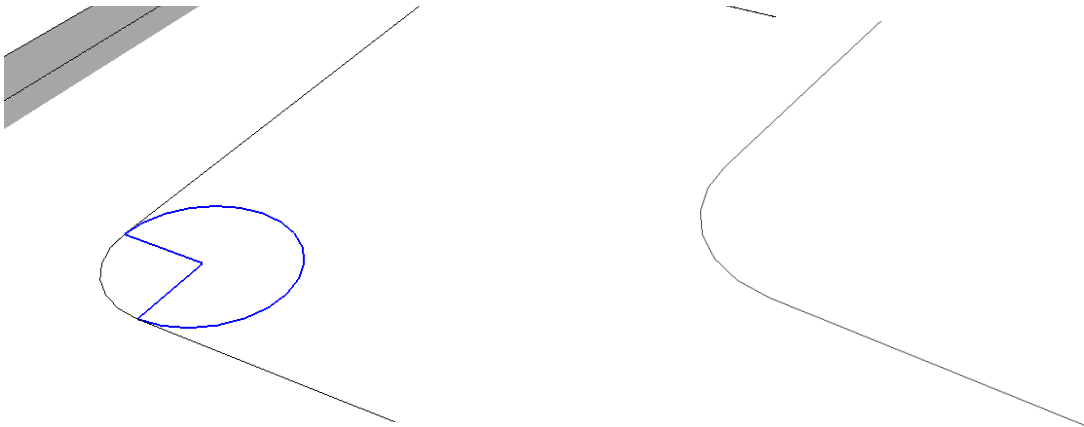
From Point
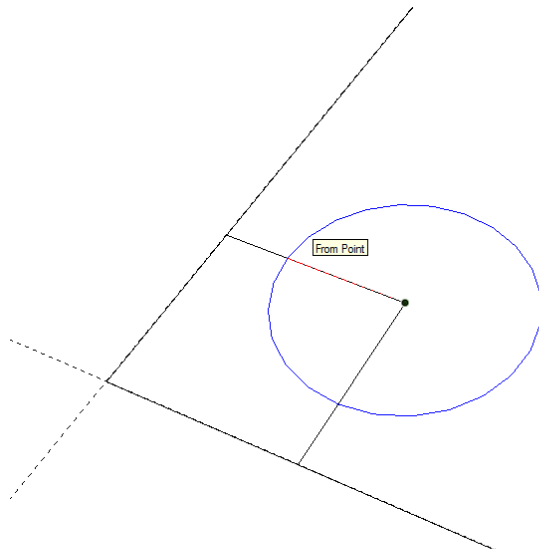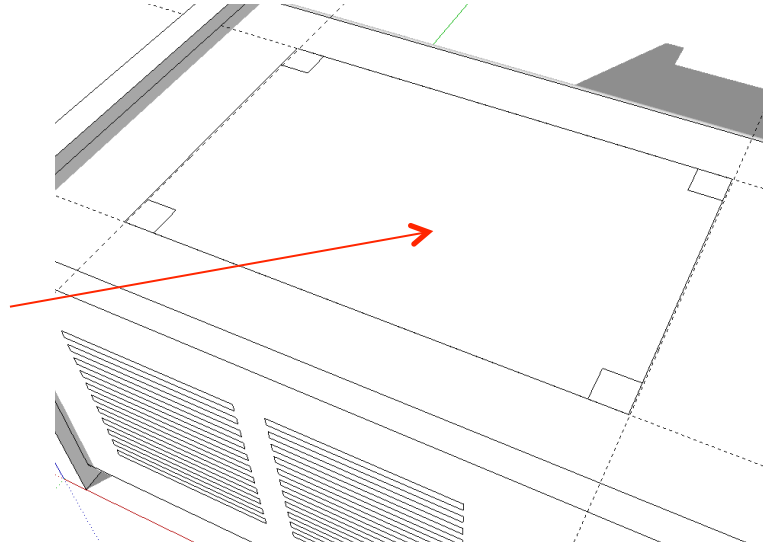
56. **Click** on the *circle tool*. Position the centre on the corner of the square shown left.

Turn Table

57. Extend the circumference of the circle out until it meets the either corner shown. It will say *endpoint*

Endpoint

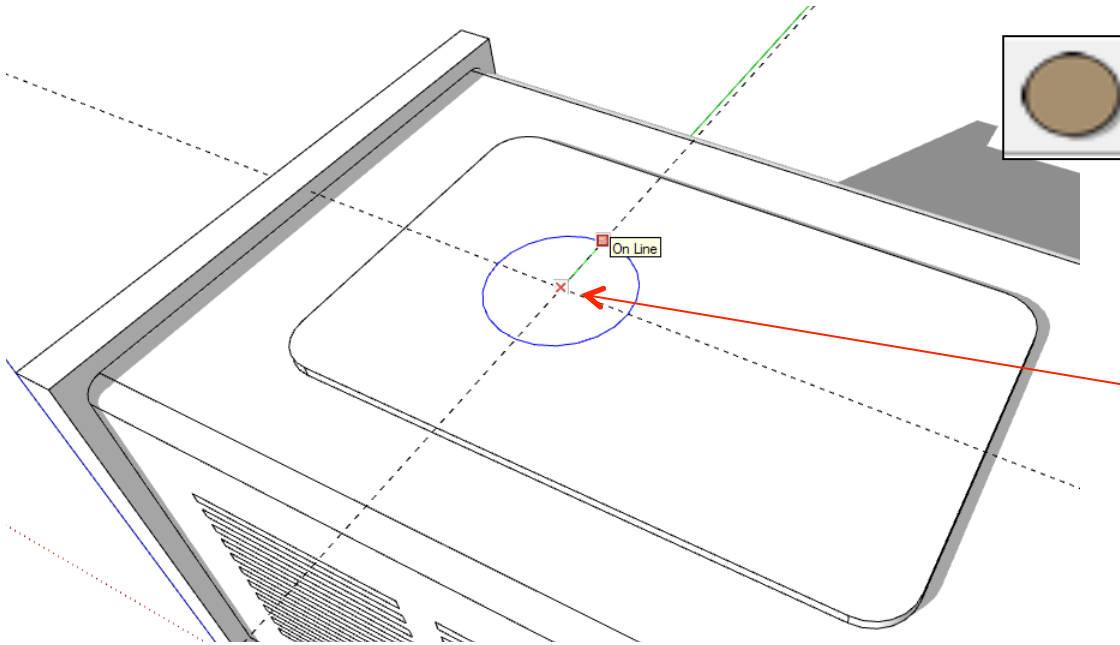58. *Repeat* the process for the other 3 corners.

Turn Table

59. Use the ***eraser tool*** to erase the corners so you are left with a radius as shown

60. ***Erase*** the remaining parts of the circle.

Turn Table

61. *Repeat* the process for the other 3 corners.

62. Using the *push pull tool* raise the shape shown. Let go of the mouse and type in *5 and press enter.*

Turn Table

63. Use the *tape measure tool* and draw a guideline in from the left hand side edge shown. Type in *90* and *press enter*

64. Use the *tape measure tool* and draw a guideline in from the bottom edge. Type in *90* and *press enter*

Turn Table

65. **Click** on the **circle tool**. Position the centre on the **intersection** where the two guidelines meet.

On Line

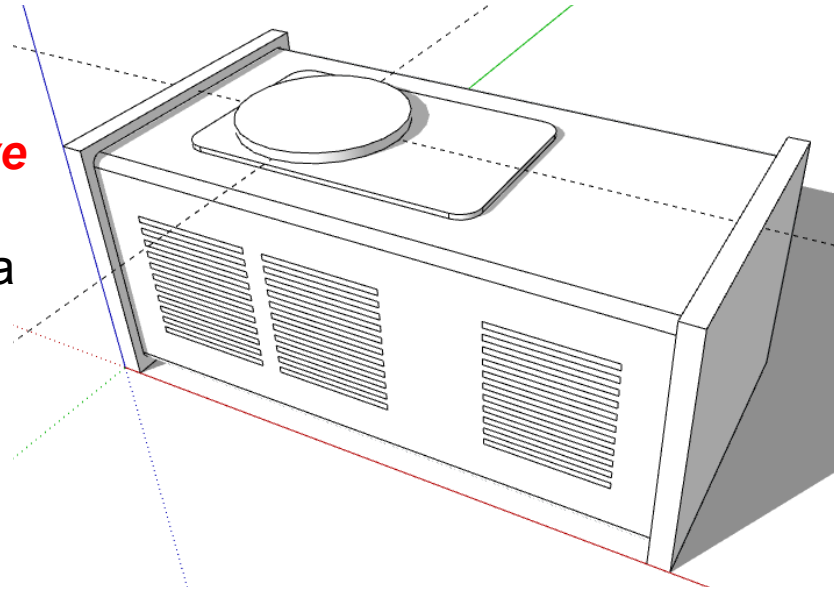66. **Pull** the circle out and type in **80** and press **enter**
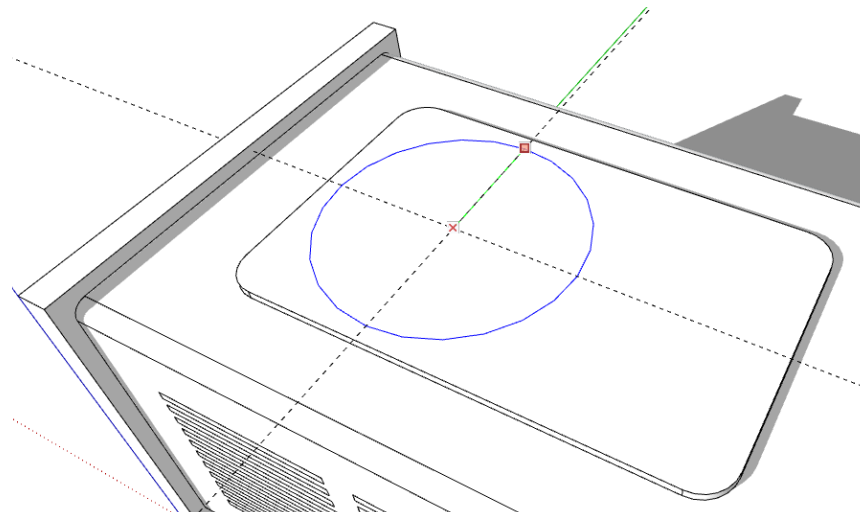
Turn Table
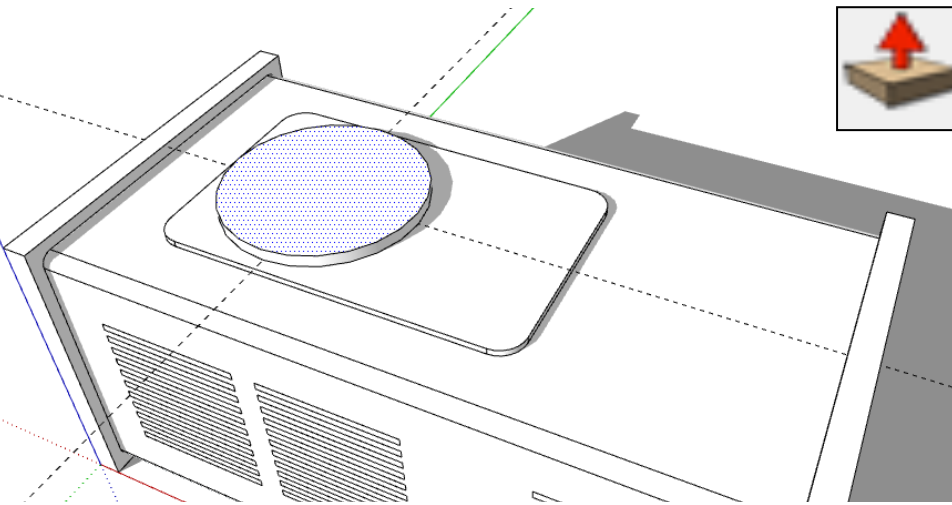
67. **Select** the ***push pull tool***. Pull the circle up and type 10 and press enter.

68. ***Using*** the ***skills you have learnt*** complete the top with volume buttons and a radio dial. Use the guidelines to layout the position of the items. Use the images on the next pages to assist
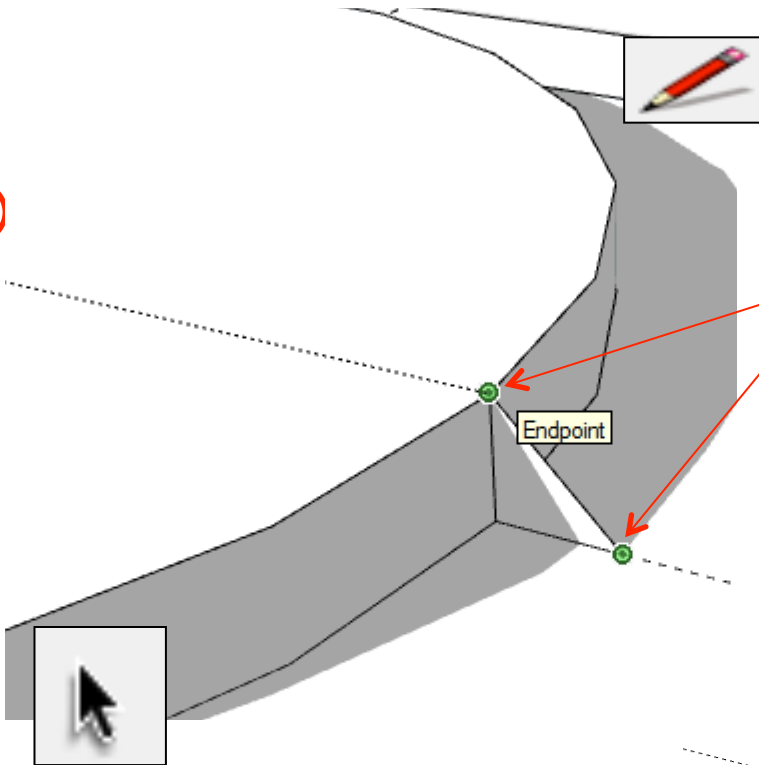
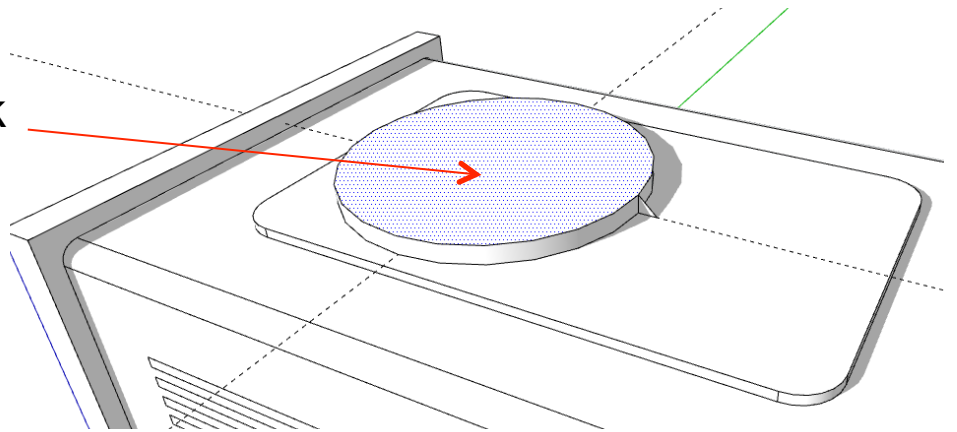**Turn Table**

*If you need guidance continue reading.*

Turn Table

69. *Select* the *pencil tool*.
Draw a line from where the
guide line touches the base
of the circle to the top edge
of the circle along the *blue
axis*.

70. *Select* the *pencil tool*.
Draw a line from along the
guide line from the base of
the circle along the *red
axis.* Type in *10 and press
enter.*

Endpoint

Endpoint

Rectang

Turn Table

71. **Select** the **pencil tool**. Draw a line from along the endpoint at the **end** of the **10mm line** you have just drawn to the top of the **vertical line you drawn previously.**

Endpoint

72. **Use** the **select tool**. Click on top of the circle just drawn.

Turn Table
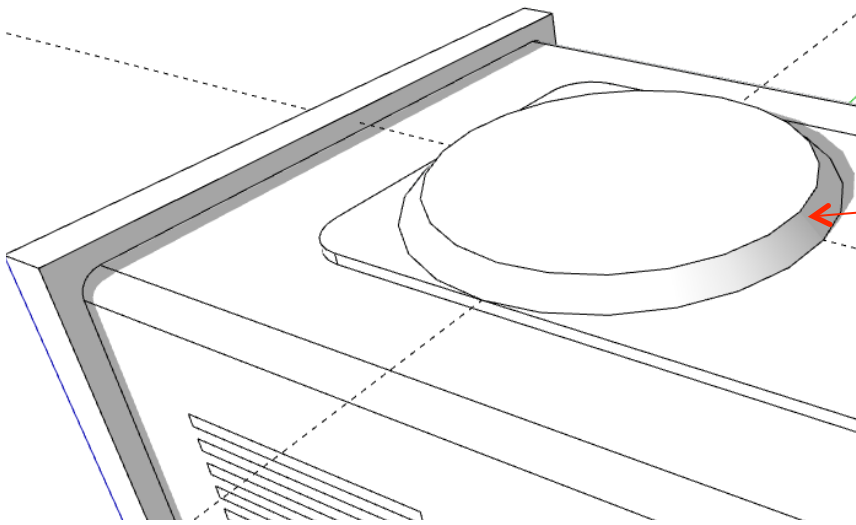
73. *Use* the *follow me tool*. Click on triangle on the side of the circle.
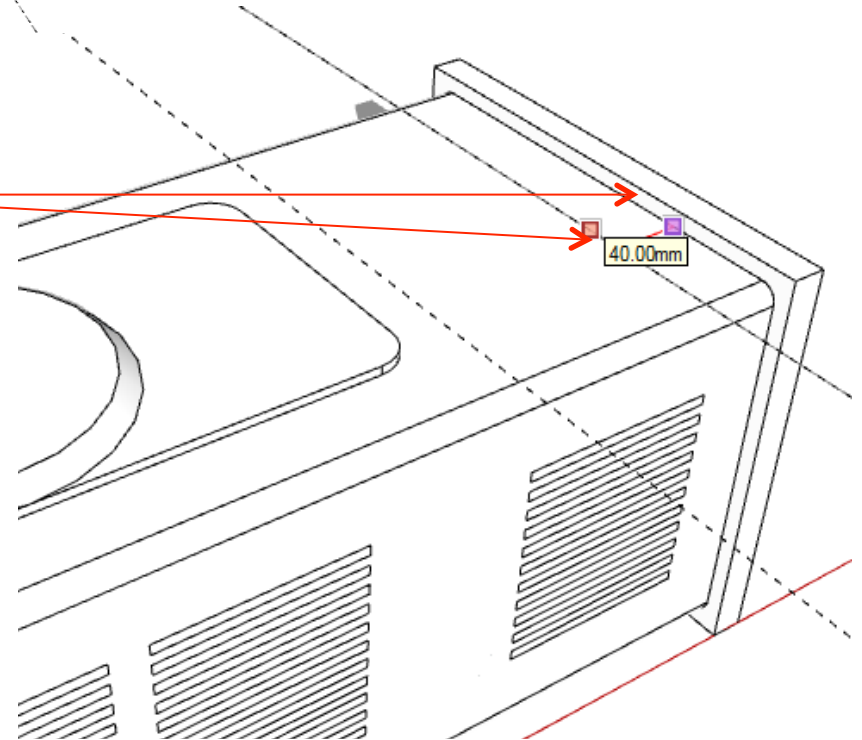
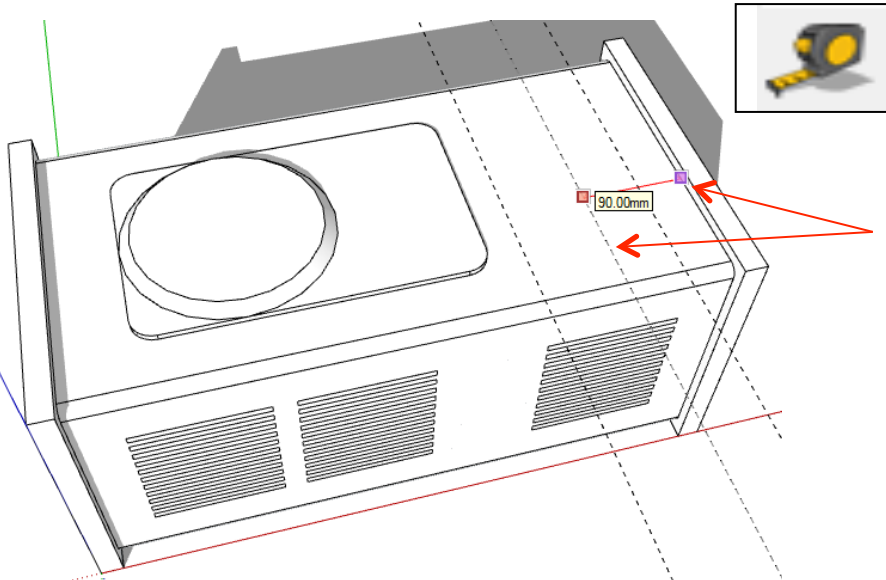74. *Use* the *eraser tool*. Delete all guide lines.
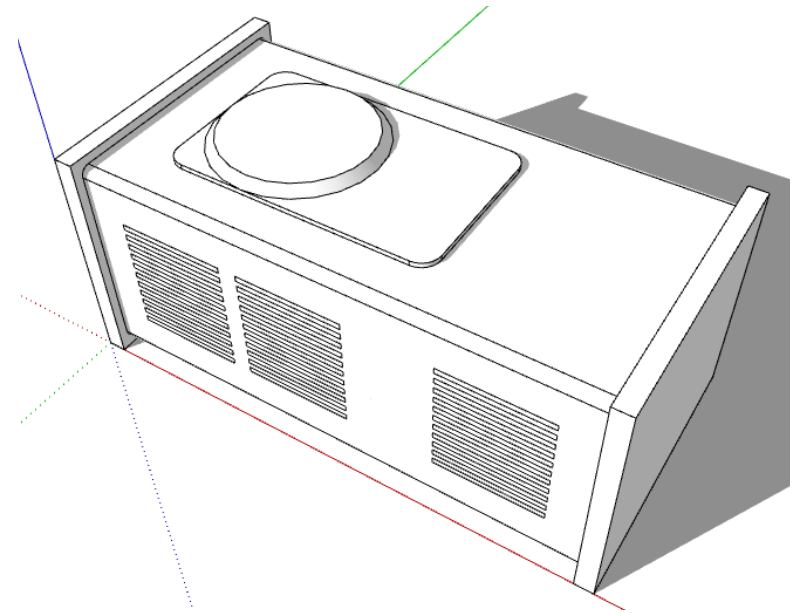
Turn Table
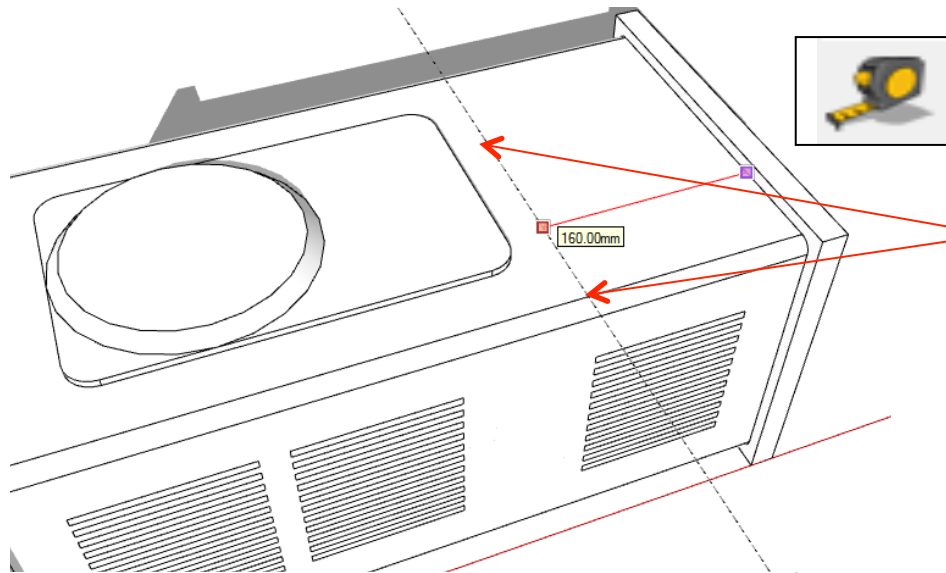
75. Use the ***tape measure tool*** and draw a guideline in from the right hand edge shown. Type in ***160*** and ***press enter***

160.00mm

76. Use the ***tape measure tool*** and draw a guideline in from the right hand edge shown. Type in ***40*** and ***press enter***
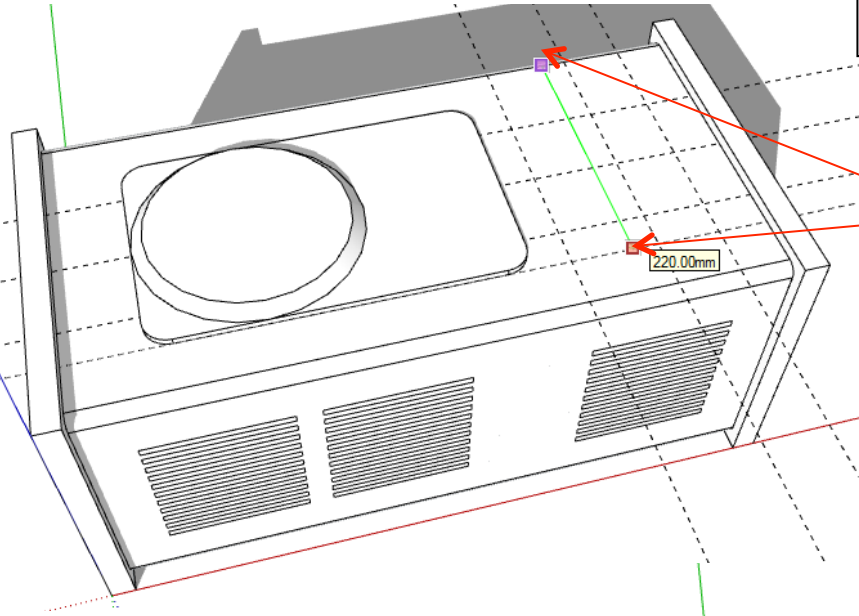
40.00mm

Turn Table

77. Use the *tape measure tool* and draw a guideline in from the right hand edge shown. Type in *90* and *press enter*

90.00mm

78. Use the *tape measure tool* and draw a guideline in from the top edge shown. Type in *130* and *press enter*

130.00mm

Rectang

Turn Table

79. Use the *tape measure tool* and draw a guideline in from the top edge shown. Type in *70* and *press enter*

80. Use the *tape measure tool* and draw a guideline in from the top edge shown. Type in *190* and *press enter*
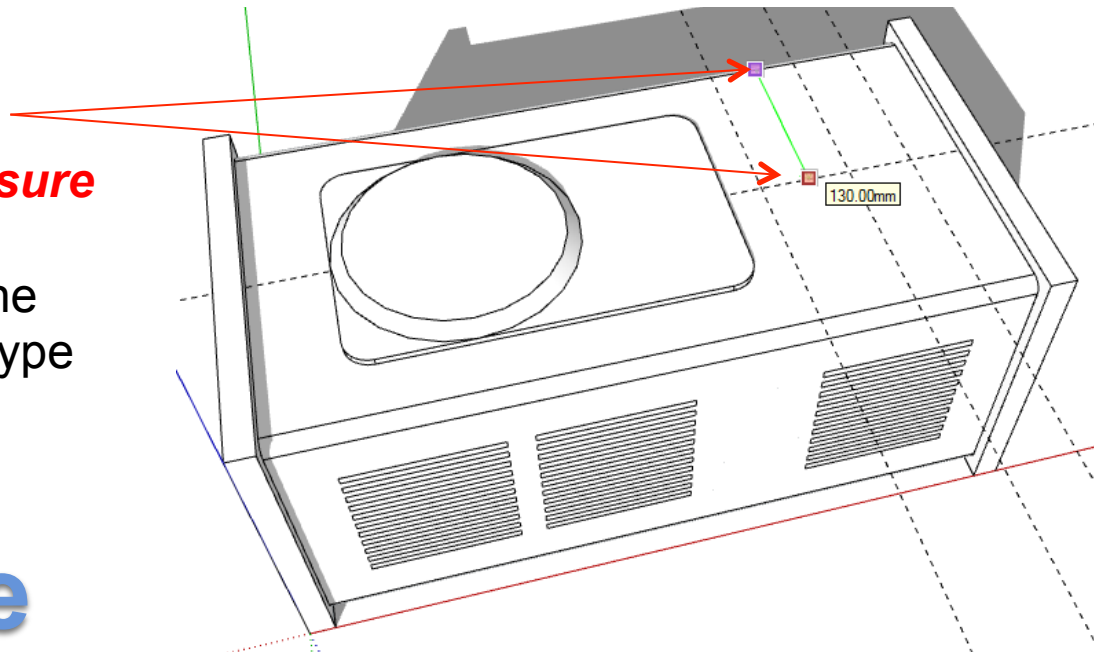
Turn Table

81. Use the *tape measure tool* and draw a guideline in from the top edge shown. Type in *220* and *press enter*

220.00mm

82. Use the *tape measure tool* and draw a guideline in from the top edge shown. Type in *240* and *press enter*

240.00mm
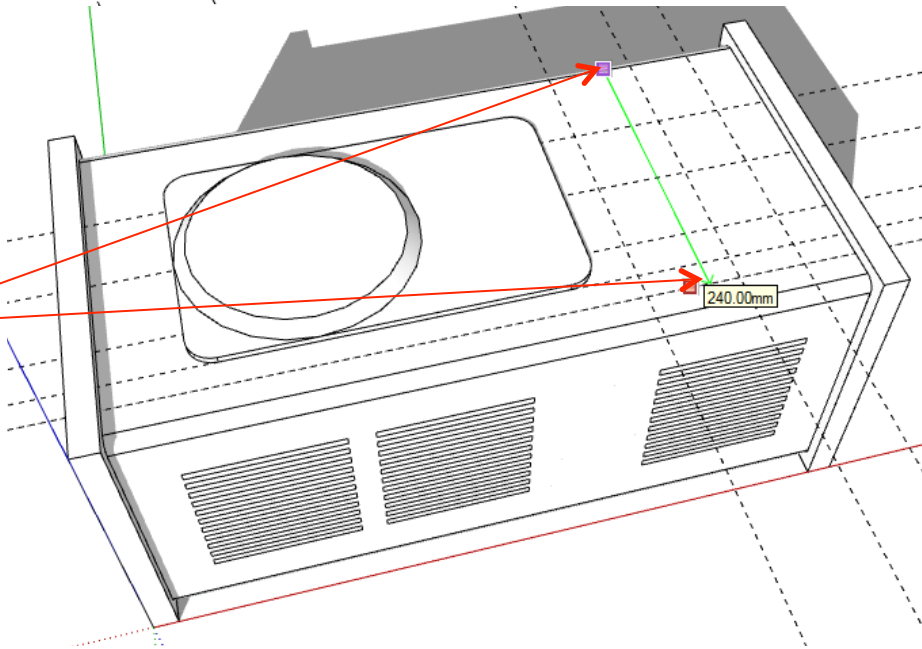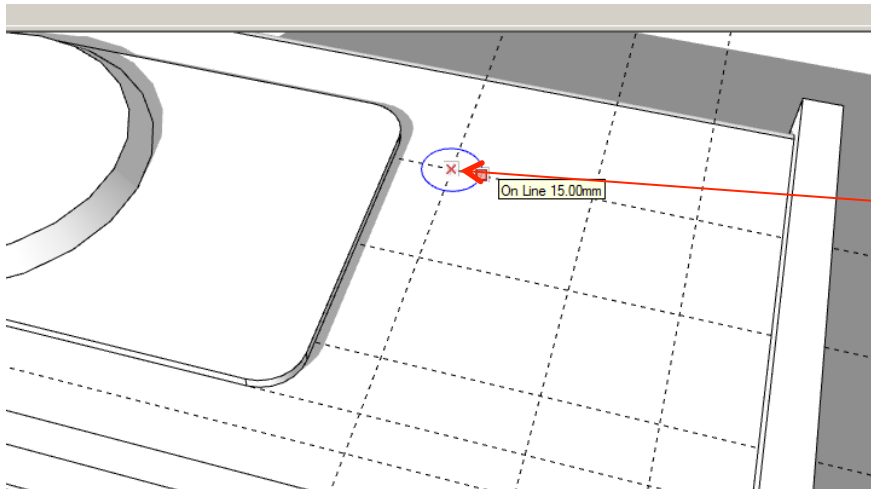
Rectang

Turn Table

83. **Click** on the **circle tool**. Position the centre on the **intersection shown** where the two guidelines meet. Pull out and type **15 and press enter**
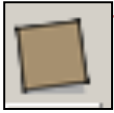
84. Repeat for the next two circles shown opposite

On Line 15.00mm
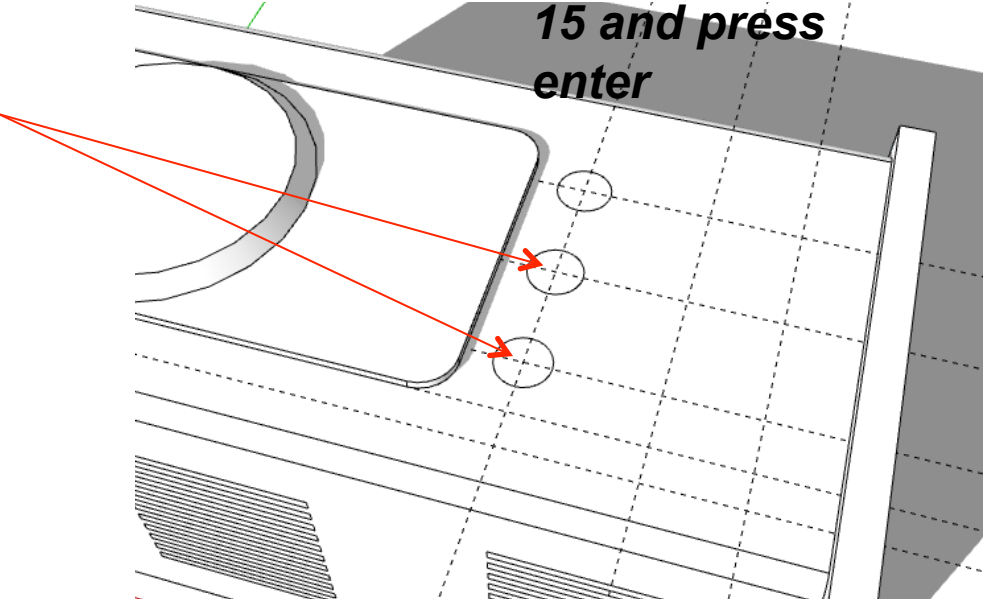
Turn Table
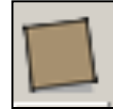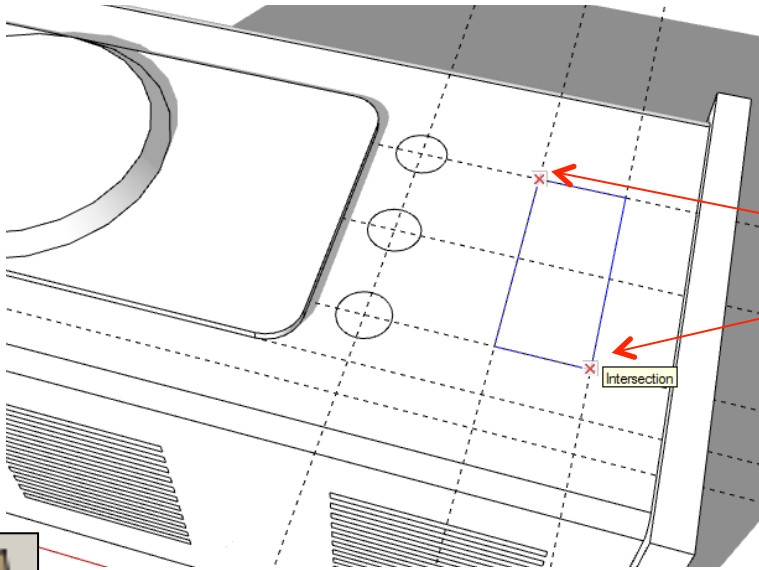
85. Using the ***rectangle tool*** click on the ***intersection*** where two dotted guidelines meet in the ***top left hand corner***. Pull the rectangle down to the ***bottom right hand corner intersection*** shown.

86. Using the ***rectangle tool*** click on the ***intersection*** where two dotted guidelines meet in the ***top left hand corner***. Pull the rectangle down to the ***bottom right hand corner intersection*** shown.

Intersection
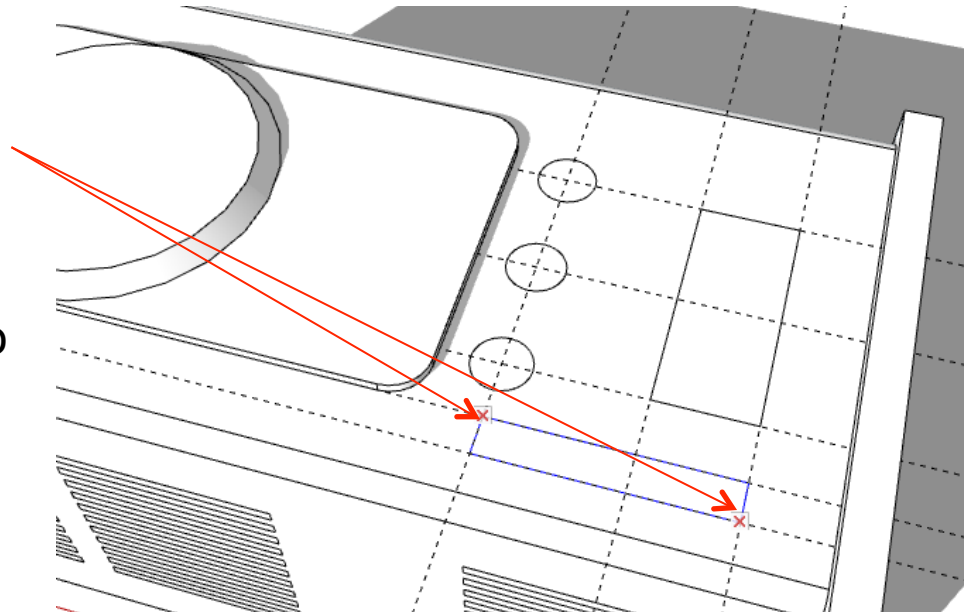
Turn Table
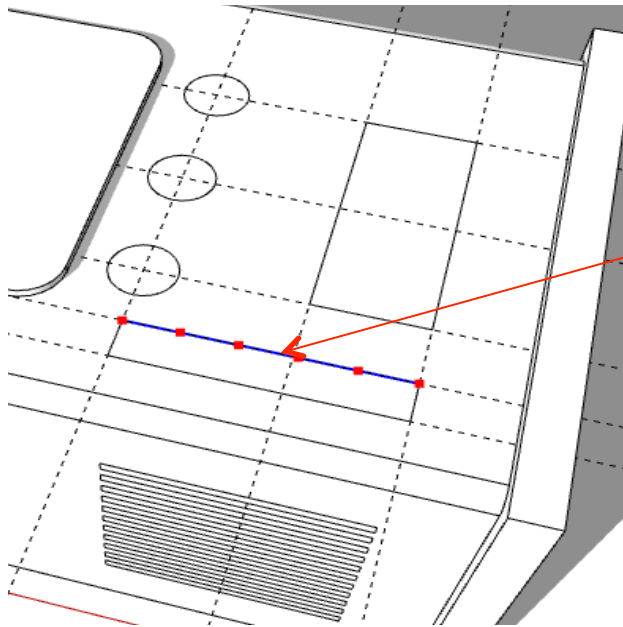
87. Use the *select tool* right click on
    the left hand line shown. Select
    the divide tool. This will *divide*
    the line into segments.
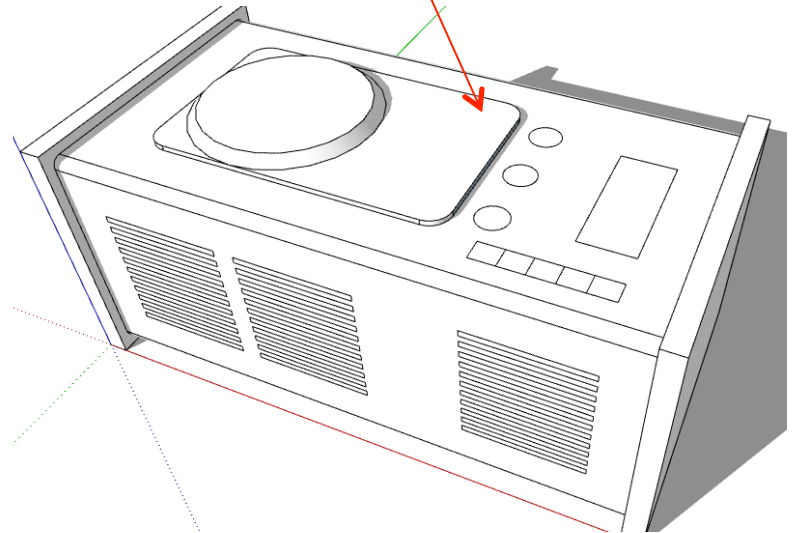
    Type in 6 and press enter.
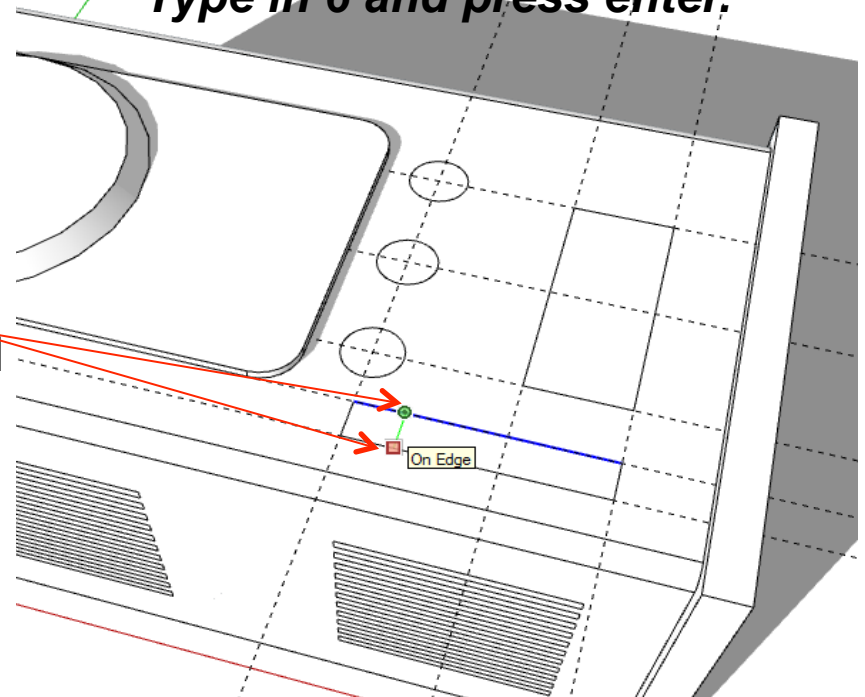
88. Select the *pencil tool* run it along
    the line you have just divided
    into 6 segments. When you
    come to the first segment *it will*
    say endpoint. Ignore the
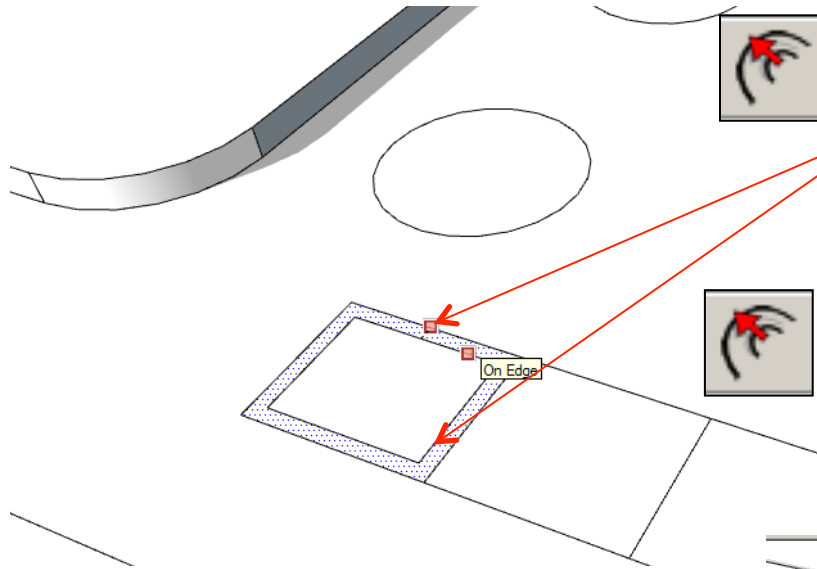   *midway point. Draw a line*
    down to the opposite edge.

Rectan

On Edge
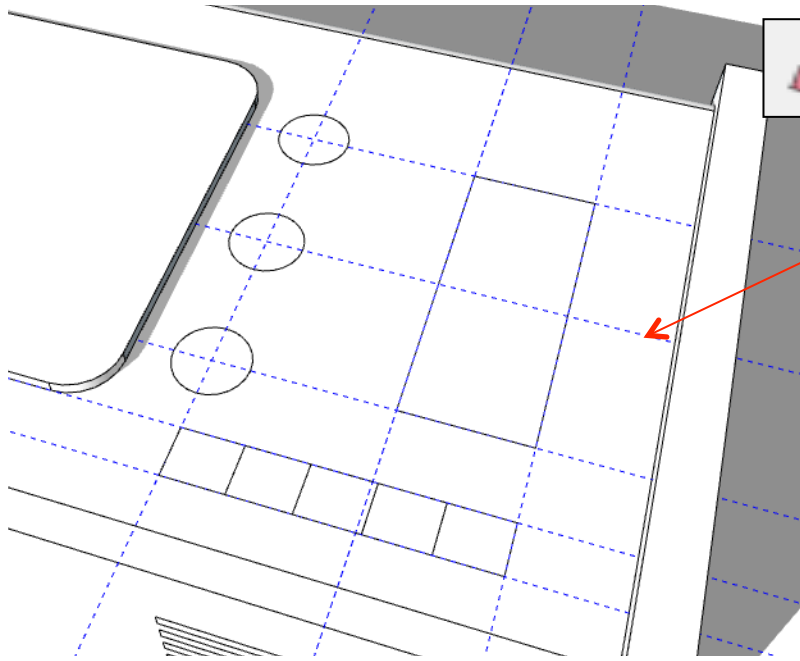
Turn Table

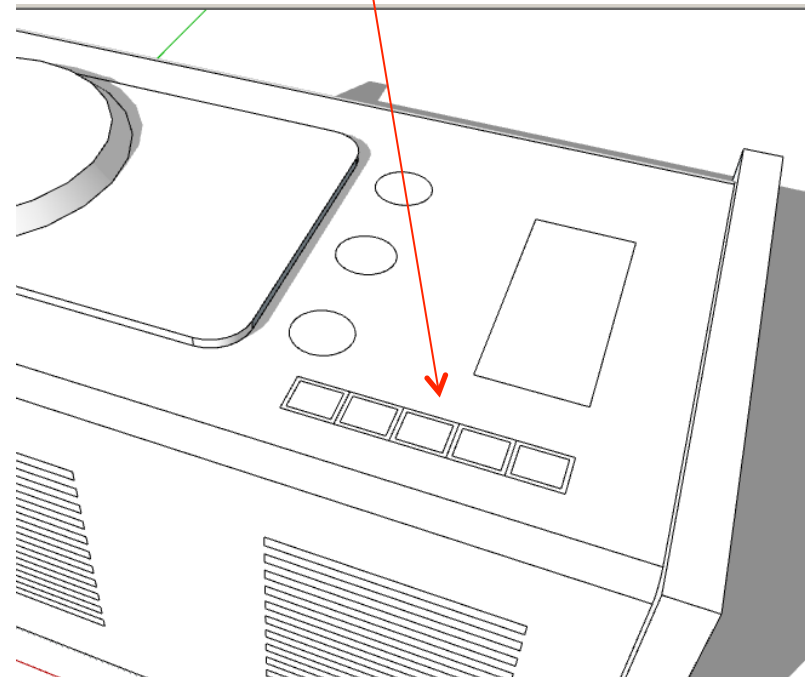89. Use the ***eraser tool*** to erase the guidelines so you are left with the shapes shown below
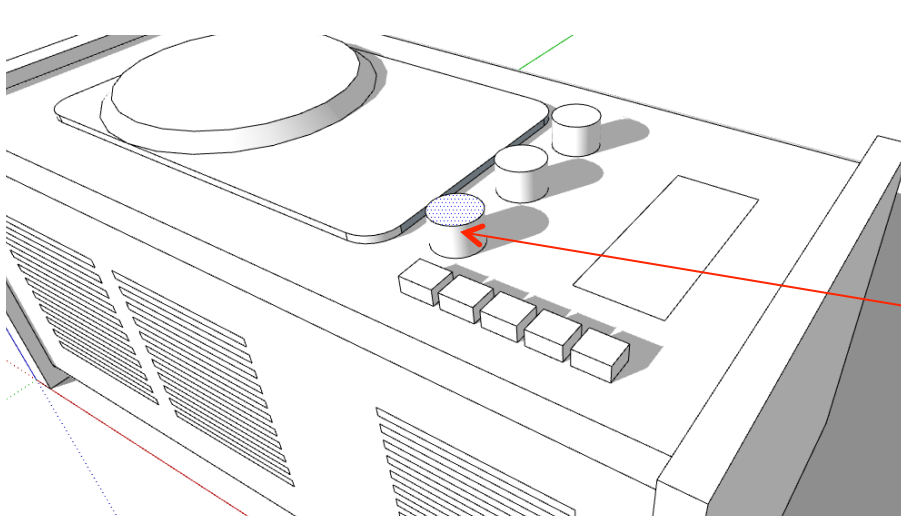
Turn Table

90. Using the ***contour tool*** click on the ***top edge*** of the rectangle shown. The inside of the square should go dotted.

91. Pull the ***contour tool*** into the ***centre*** of the rectangle shown. Type in *1* and ***press enter***

On Edge

Rectang

Turn Table

92. Use the *eraser tool* to erase the outside edge contours shown on the rectangles.

93. Using the *push pull tool* raise the rectangle shapes shown. Let go of the mouse and type in *10 and press enter.*

Turn Table

94. Using the *push pull tool* raise the circle shapes shown. Let go of the mouse and type in *15 and press enter.*

95. Using the *push pull tool* to lower the rectangular shape shown. Let go of the mouse and type in *2 and press enter.*
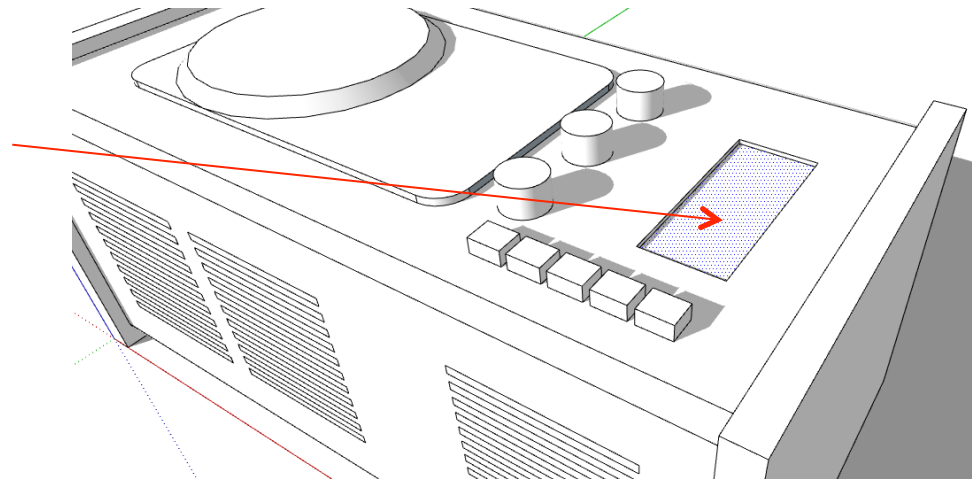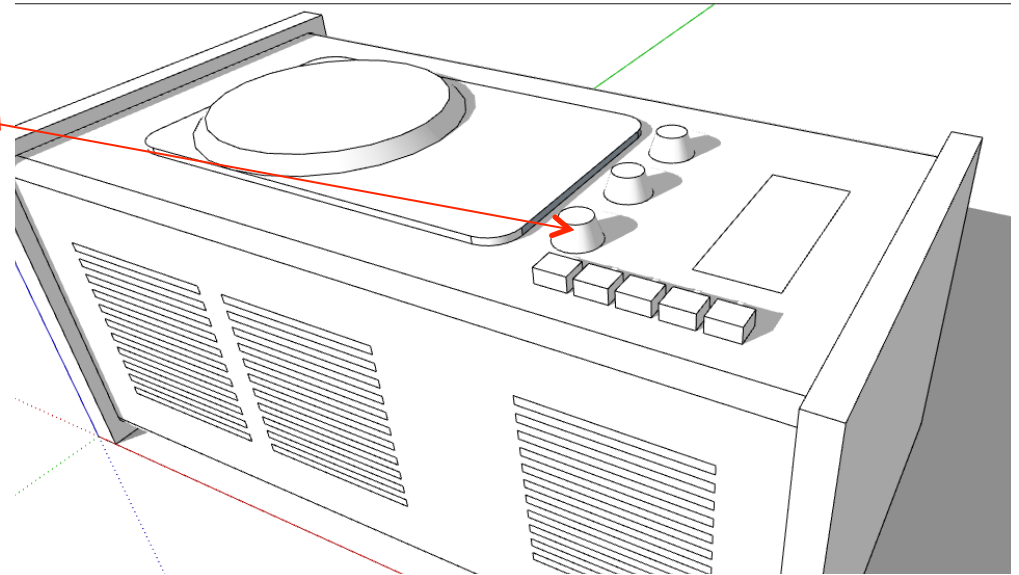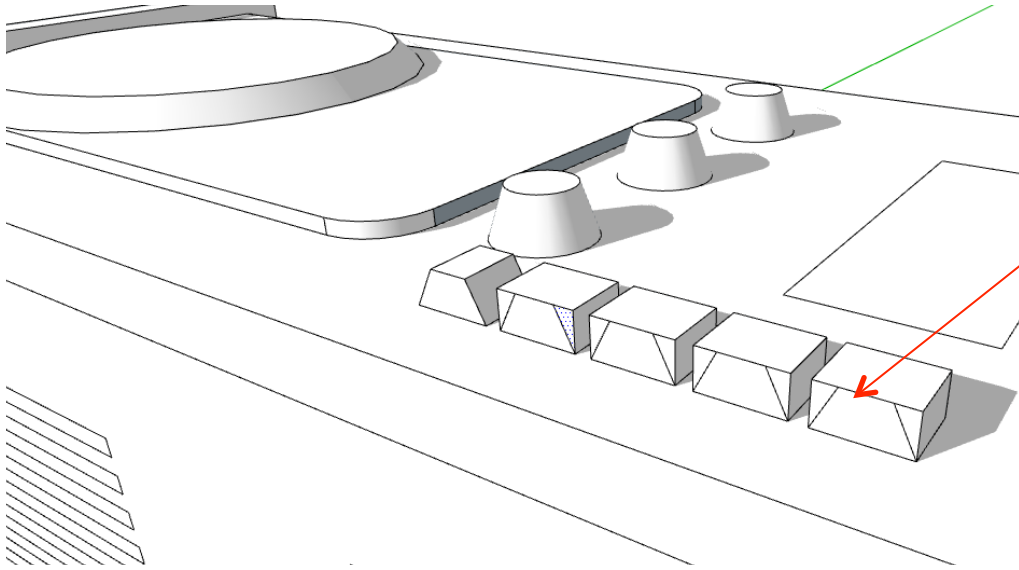
Turn Table
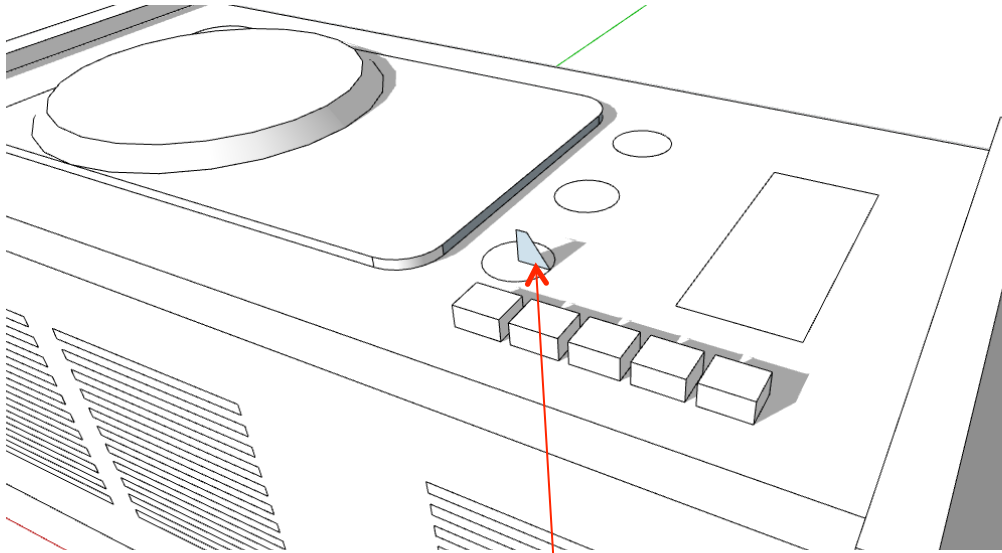
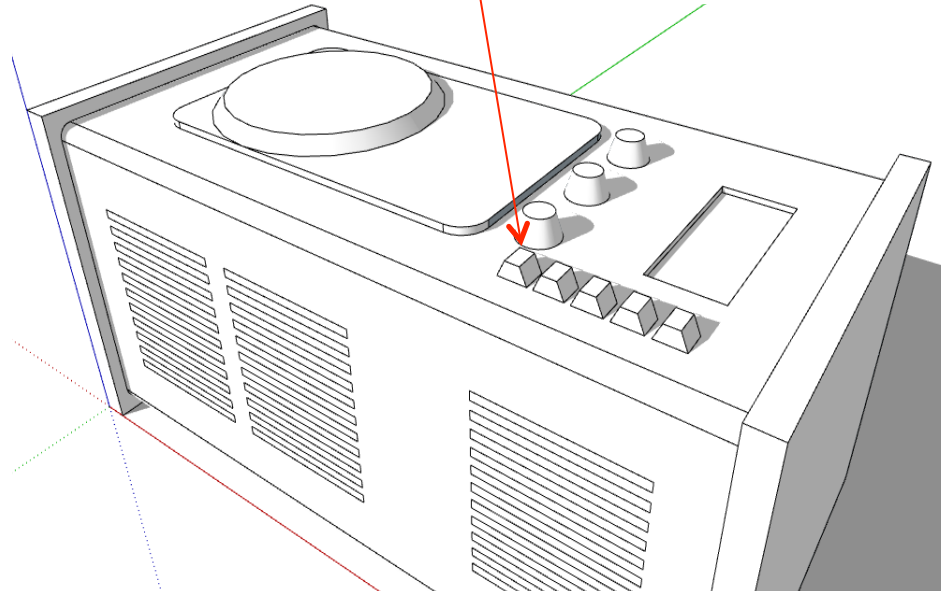96. Using a combination of the *pencil tool*, rectangle tool and *follow me tool* to add detail to your drawing………

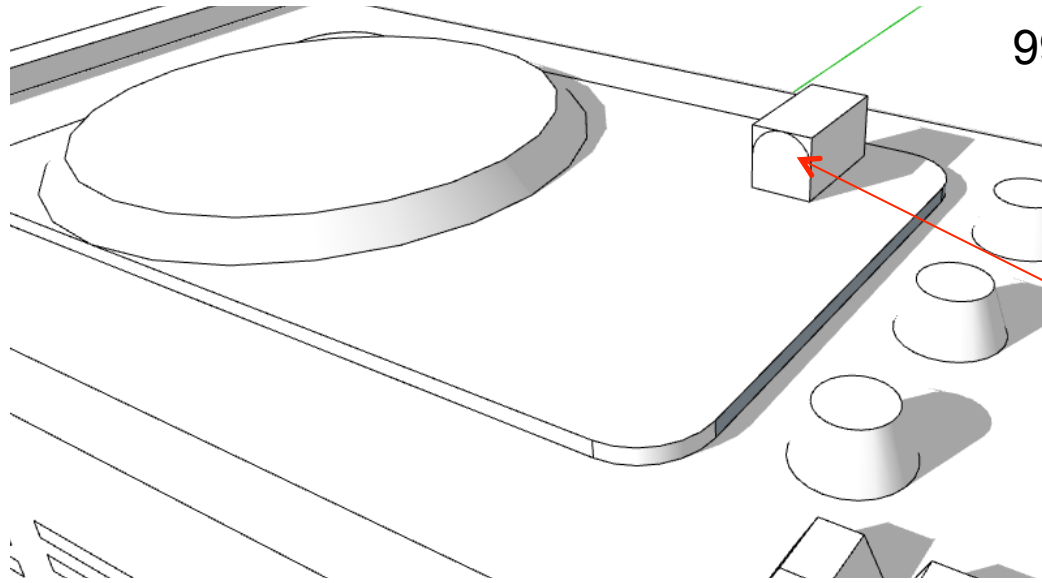97. Use the *follow me tool* to add a more unique shape to your buttons
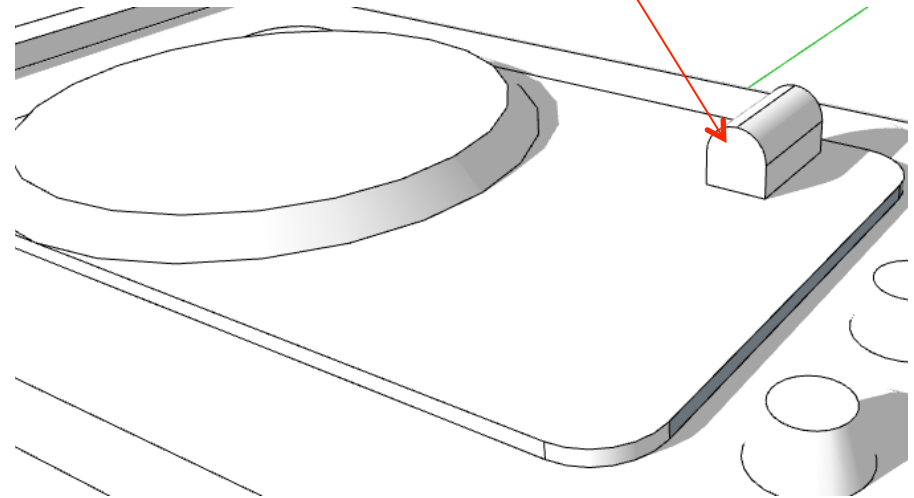
Turn Table

Rectang

98. Using a combination of the pencil tool, push pull and to add detail to your buttons………
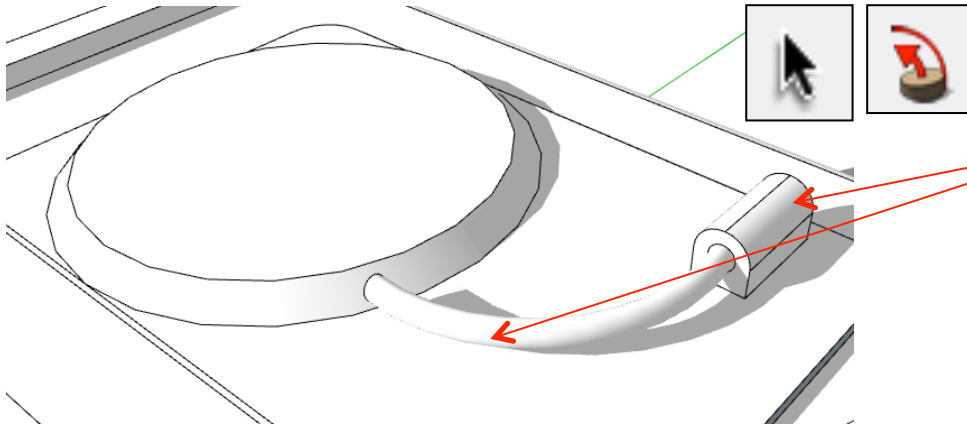
Turn Table

99. Add the LP playing arm by following using the *rectangle tool*, the *arc tool* and the **push pull tool.**

Rectang

Turn Table

100. Use the *circle tool* to add the shape shown.

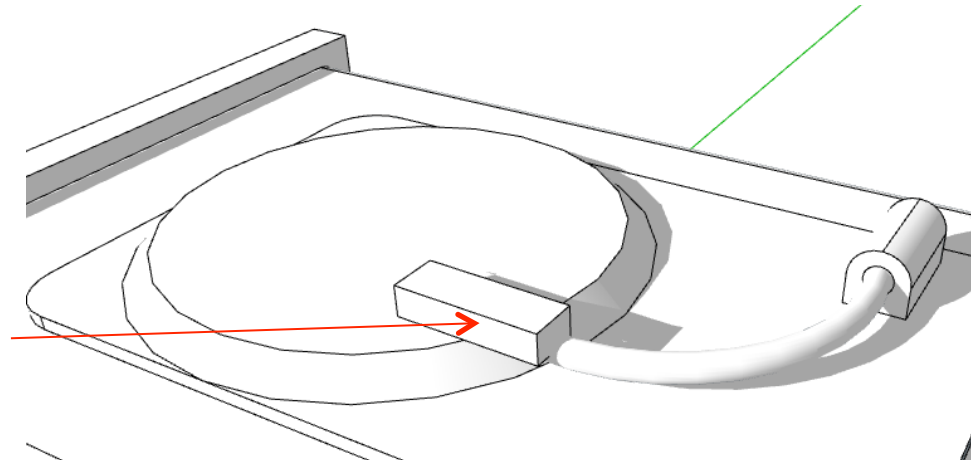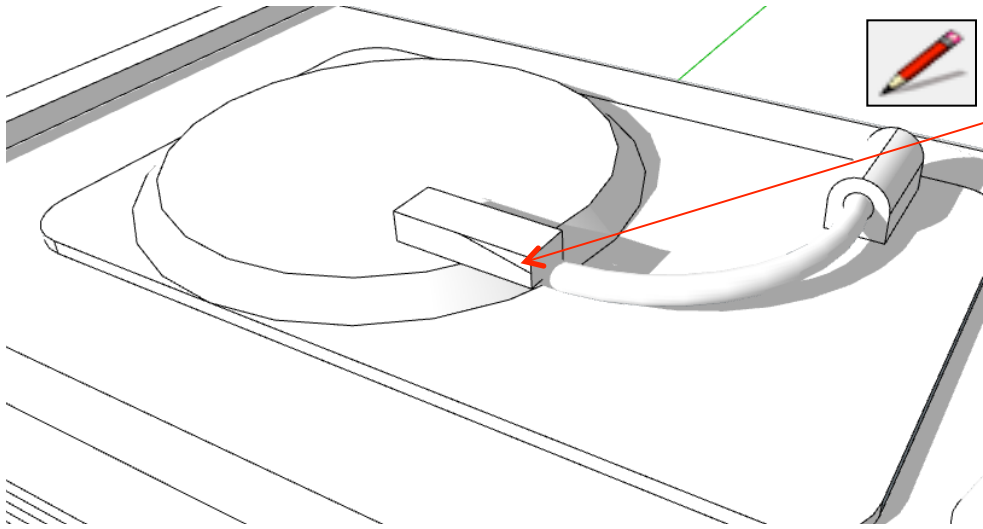101. Use the *arc tool* to add the line shown.

Tangent at Vertex

Turn Table

102 Using the select tool click on the *line* and then using the **follow me tool** click on the *circle* to produce the curved arm shown

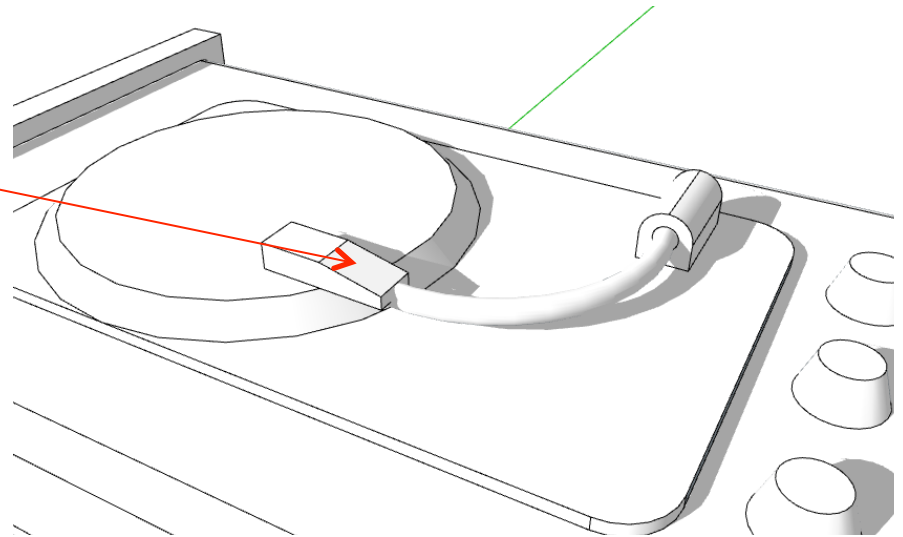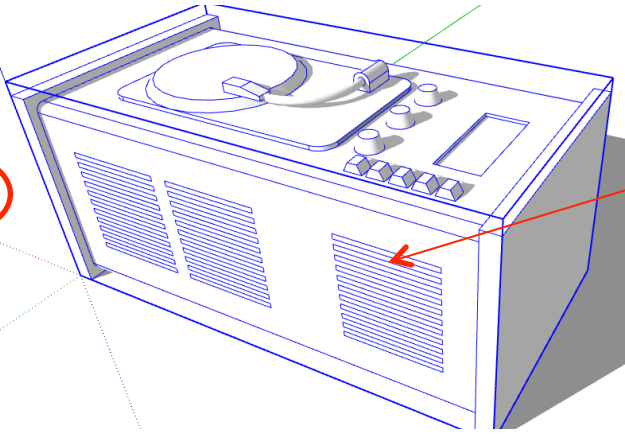103. Use the **rectangle tool** and the push pull to add. The LP needle

Turn Table

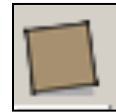104. Use the *pencil tool* to add the line shown.

105. Use the *push pull tool* to create the shape shown.

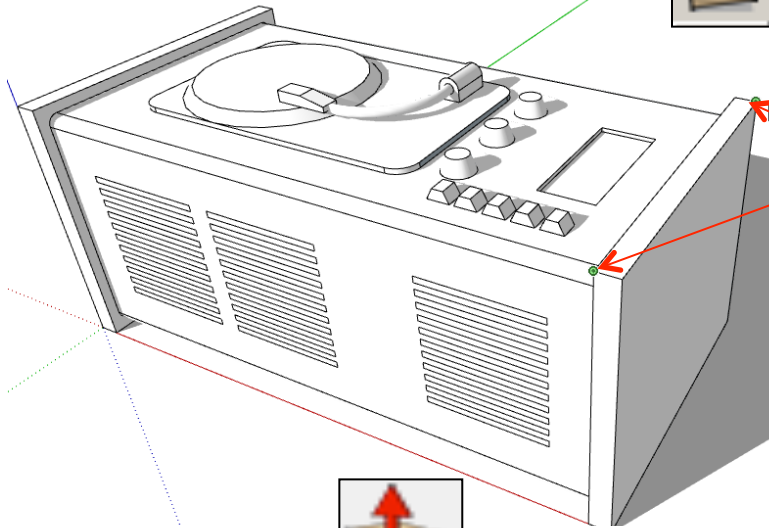**Turn Table**

106. Use the *select tool* to highlight the record player*. Right click* on the mouse and *make group.*

107. Using the *rectangle tool* click on the *bottom left hand corner shown*. Pull the rectangle down to the *top right hand corner* shown.
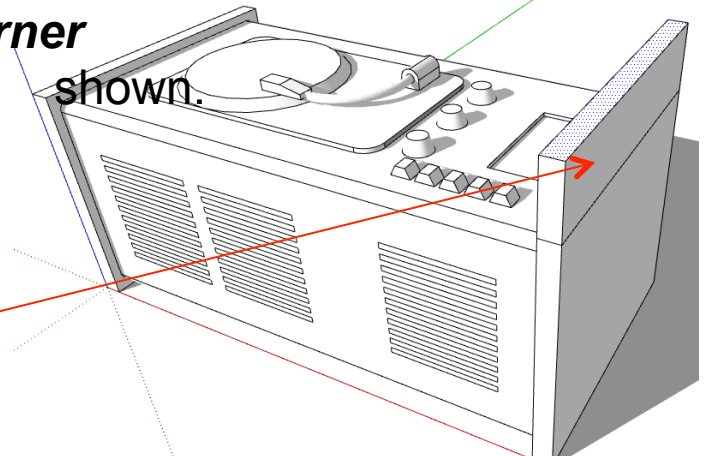
108. Use the *push pull tool* to create the shape shown. Type in *70 and*

Lid

109. Repeat sets
107-108
    on the opposite side

Rectang

110. Using the *rectangle tool* click on
    the ***top left hand corner shown***. Pull the rectangle down
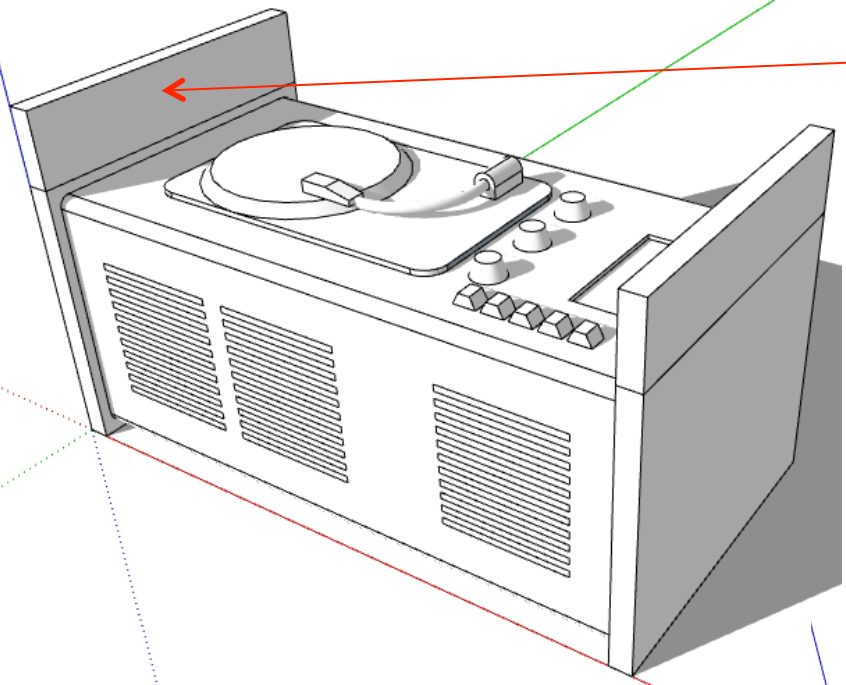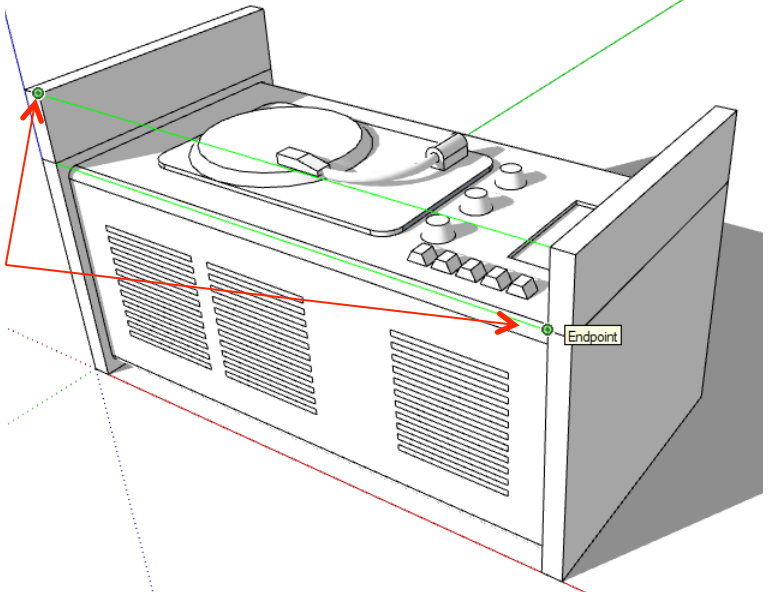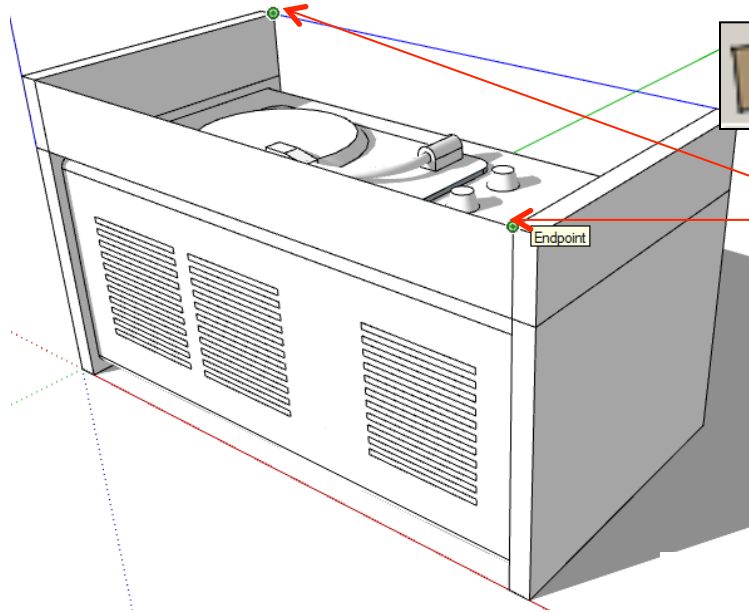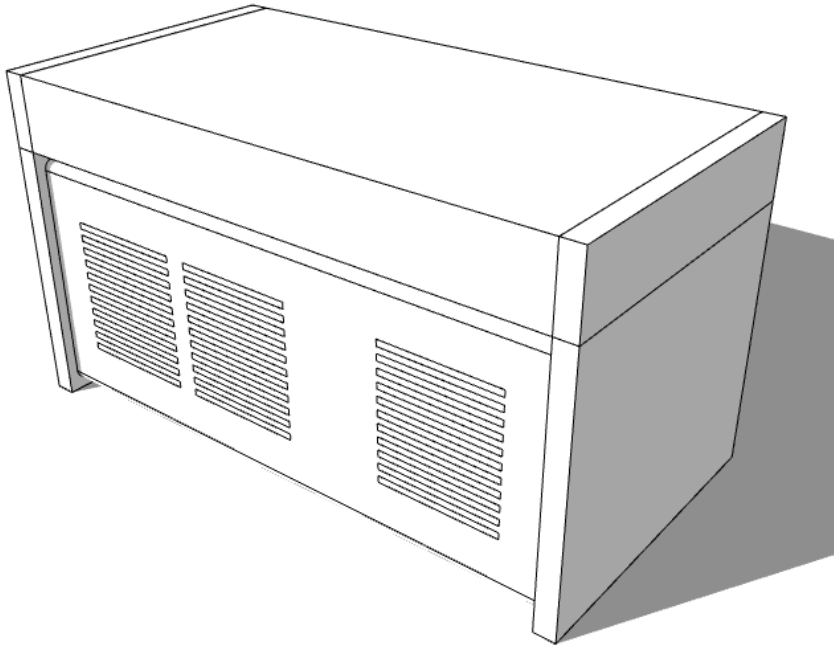   to the ***bottom right hand corner***
    shown.

Endpoint

Lid

111. Using the *rectangle tool* click on
the *top left hand corner shown*. Pull the rectangle down
to the *bottom right hand corner* shown.

Endpoint

Rectang

112. Repeat at the back to complete the lid………

Lid

113. Use the **colour bucket** to

render your design………

114. Try and design the lid open

or *rotate* it….

Lid

Extension

- Use the skills you have learnt to develop the Braun SK60 full radio, LP and docking station for release in 2025. it must be in the style of Dieter Rams