CAD Tutorial 10: SLR Camera

Level of Difficulty

★ ★ ★ ★ ★

Time
Approximately 60–90 minutes

Starter Activity

- Design a digital camera using CAD

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

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

Skills to be used in this project...

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

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

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

Learning Styles
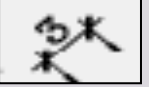
Visual : *Presentation*

Auditory: *Video*

Kinaesthetic: *Demonstration*

Sketchup Help Guide:

Computer Aided Engineering: 15. Drawing and Modification Commands

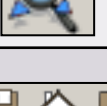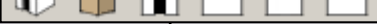| Drawing and Modification Tools	image	Description	Advantages
Modifying Tool 1. **Pencil tool**		used to draw lines in X, Y and Z direction. Can draw simple or complex shapes very quickly.	*Advantages:* *Allows user to draw or modify shapes very quickly and can be used to construct 3D objects faster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

Sketchup Help Guide:

Computer Aided Engineering: 15. Drawing and Modification Commands

Drawing and Modification Tools	image	Description	Advantages
Modifying Tool 11. **Square tool**		used to draw squares and rectangles.	*Advantages:* *Allows user to draw guides of shapes and draw complex 3D shapes very quickly.*
Modifying Tool 12. **Offset tool**		. *You can use the **contour** tool to draw parallel lines or lines within lines.*	*Advantages:* *Allows user to draw duplicate lines and position them within shapes quickly to draw complex 3D shapes very quickly.*
Modifying Tool 14. **Rotate Tool**		used to move rotate parts of a shape or entire shapes on x, y and Z co-ordinates.	*Advantages:* *Allows user to draw or modify shapes very quickly and can be used to construct unusual 3D shapes quickly*
Modifying Tool 15 **Scale Tool**		allows the user to select an object or part of an object and increase its sixe from the base point.	*Advantages:* *Allows user to quickly resize objects to draw complex 3D shapes very quickly.*
Modifying Tool 16 **Paint Bucket Tool**		allows the user to select a colour or materials to produce photo-realistic drawing of their object. Shadows etc. can be added.	*Advantages:* *Allows user to quickly draw objects life like using materials, textures etc...*
Modifying Tool 17 **Pan Tool**		*You can use the **Pan** tool to grab and move your object around the screen.* *Alternatively, you can pan by pressing the **Shift** key **and** holding down the mouse's middle wheel.*	*Advantages:* *Allows user to move and position their object quickly*
Modifying Tool 18 **Text Tool**		*You can use the **text** tool to add text to your object.*	*Advantages:* *Allows user to add 3D text by clicking on the extrude button or 2D text*
Modifying Tool 19 **Zoom Extents Tool**		*You can use this tool to automatically zoom into your entire project.*	*Advantages:* *Allows user to quickly navigate to the entire drawing if they get lost.*
Modifying Tool 20 **View Tool**		*You can use the **view** tool to quickly look at front side and top views as well as 3D views*	*Advantages:* *Allows user to complete working drawings quickly as well as enabling them to show a top view for exporting onto the laser cutter.*
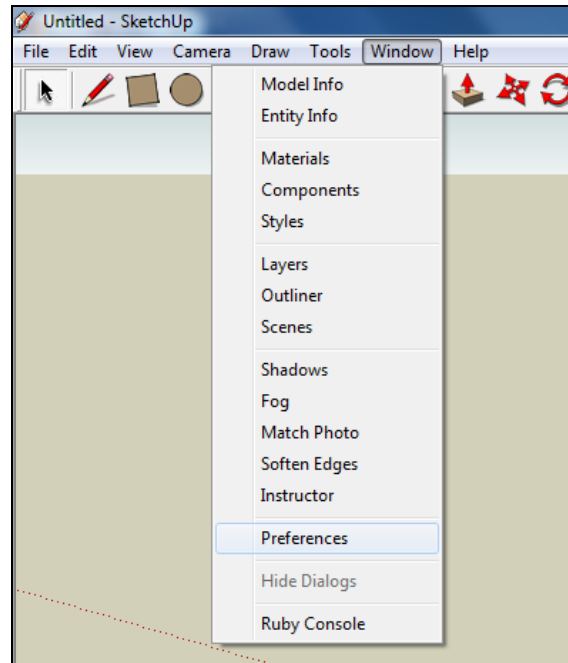
1. Open Library /Designoutthebox.com/ CAD Skills/ Lesson 10 / SLR Camera

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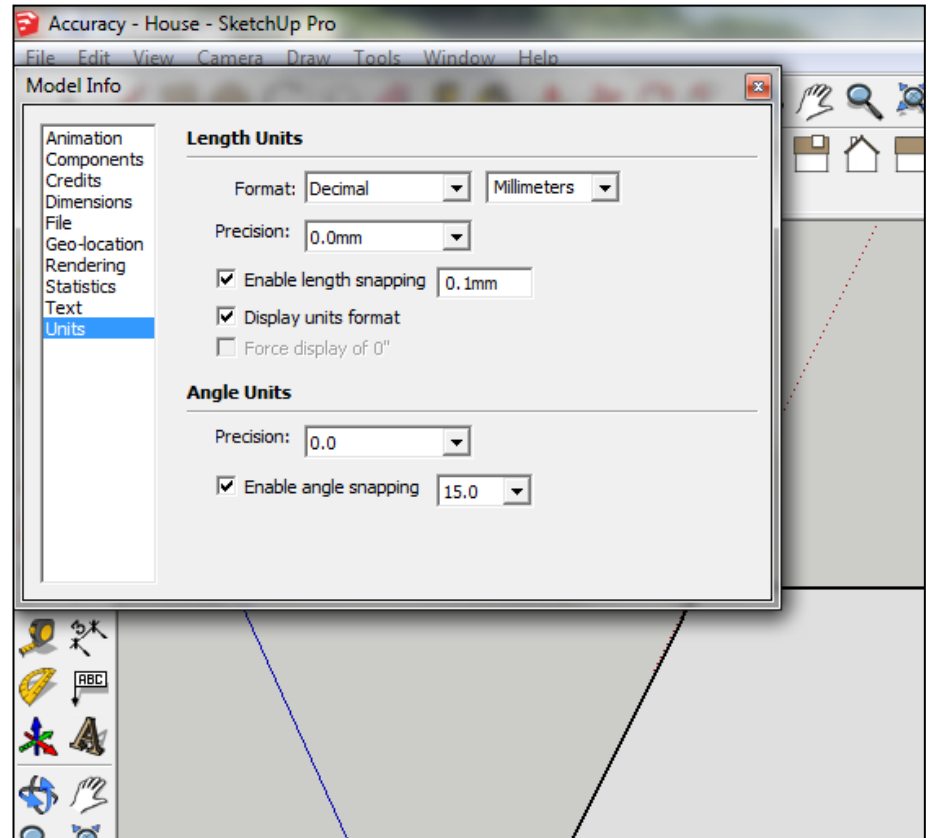
2. Select **Units** and choose **Decimal Millimetres**. We are using this template because we are doing a product design.

*Note: It is often necessary to start a new file to use the new template. Go to **File** then **New**.*
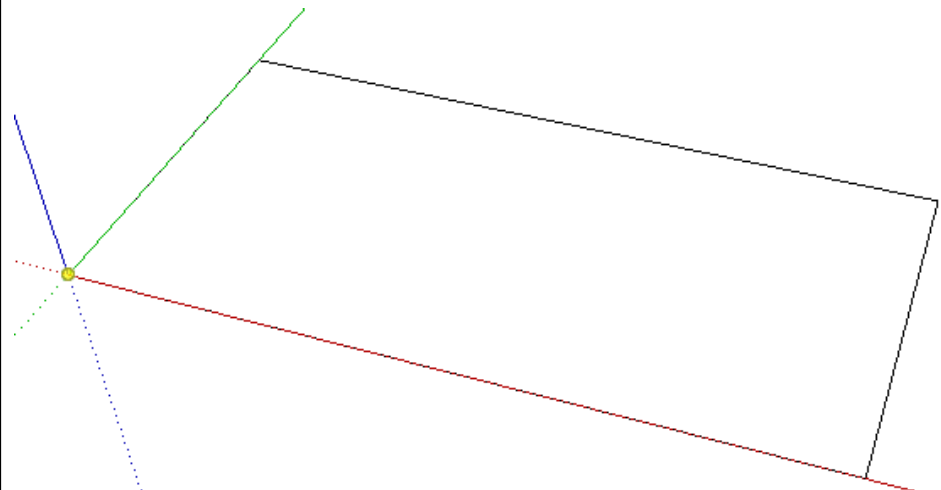
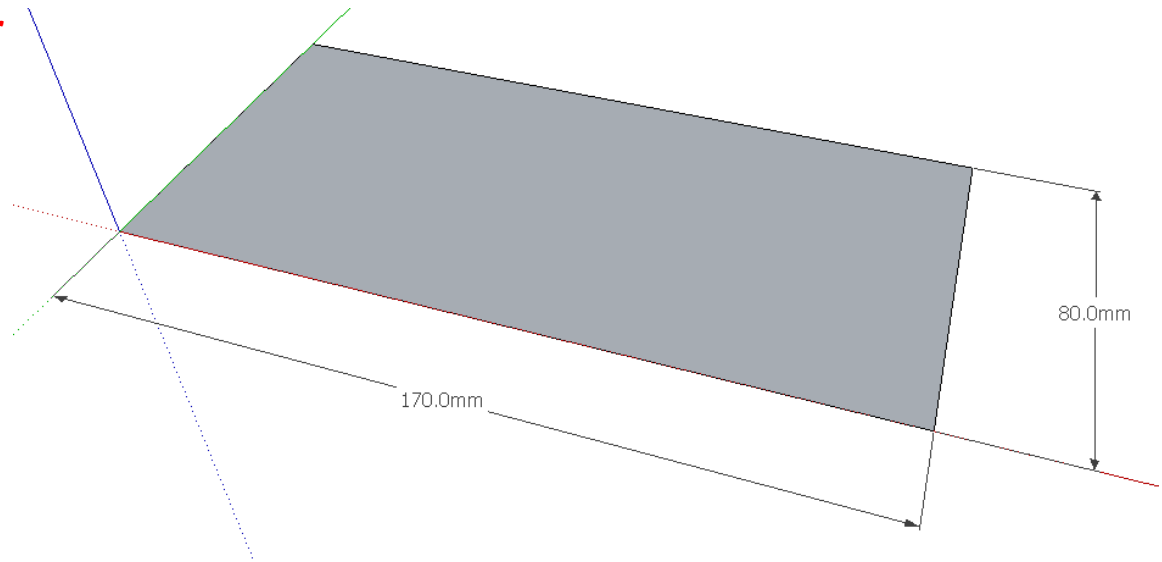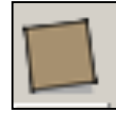3. Now select the **View** then **toolbars** and ensure **Getting Started** and **Large Tool Set** are ticked
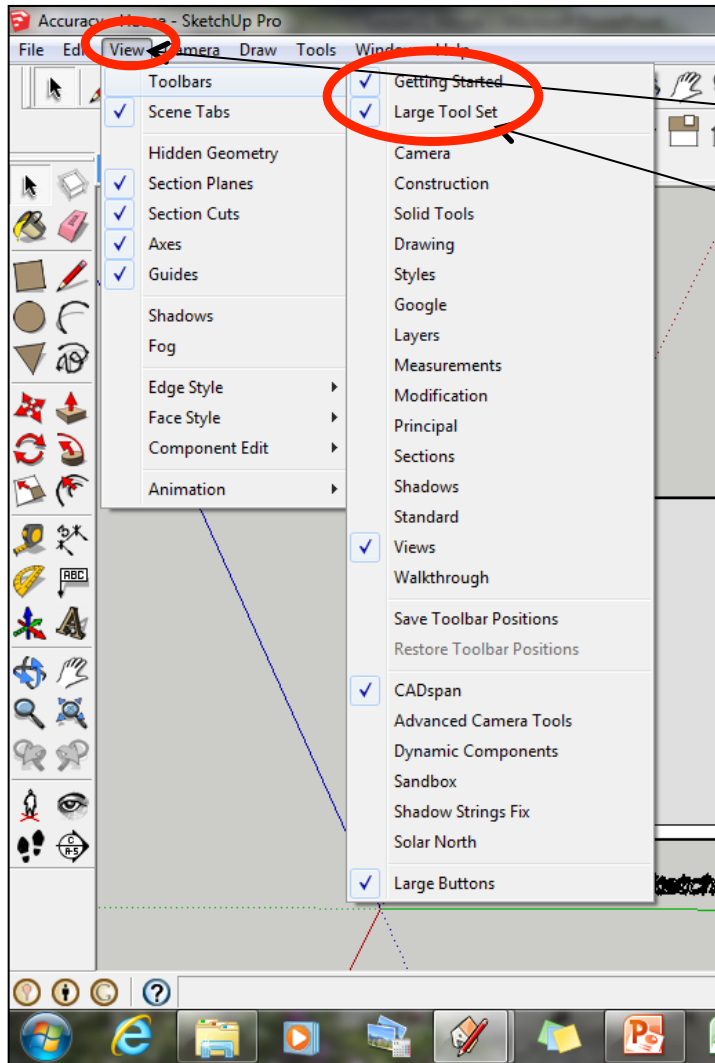
3a Select **View**

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)***

1. ***Click*** on the rectangle tool . Start drawing a square and type **170, 80.** Press ***Enter***

170.0mm

80.0mm

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

Endpoint
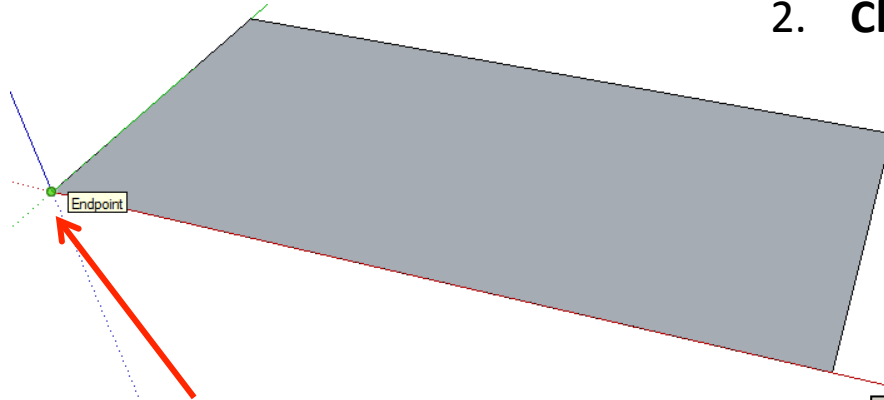
3. Using the *rectangle tool click* on the corner of the rectangle you have just drawn**.**

25.0mm

43.0mm
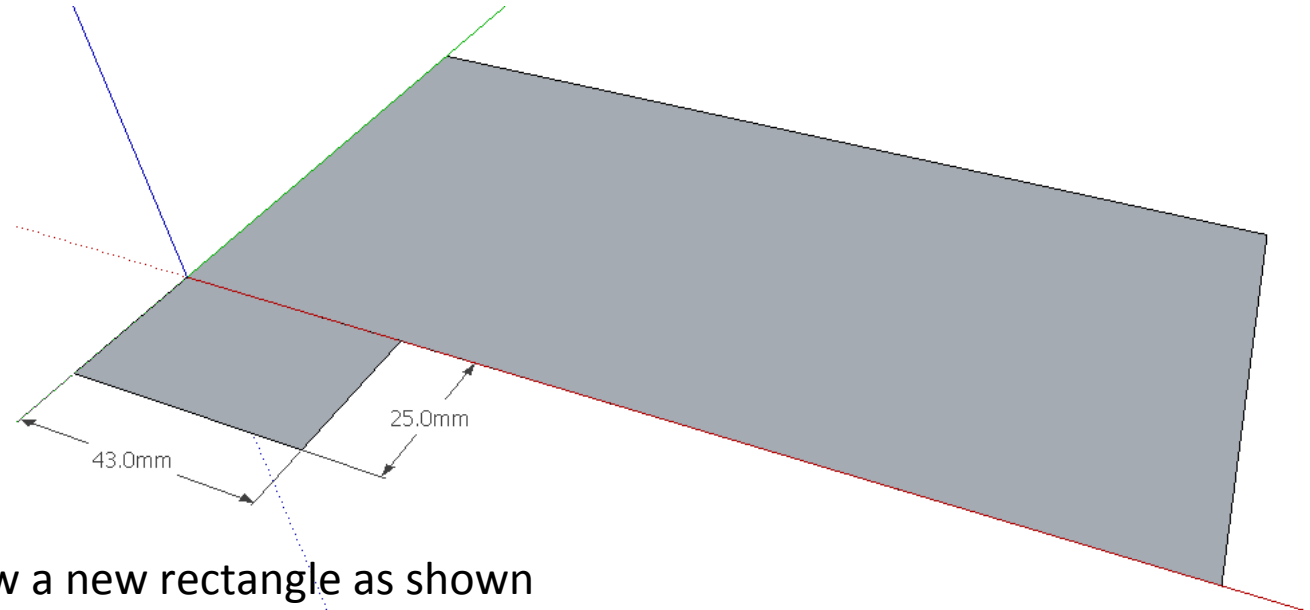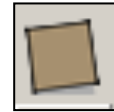
4. Draw a new rectangle as shown and type **43, 25** and press **enter**
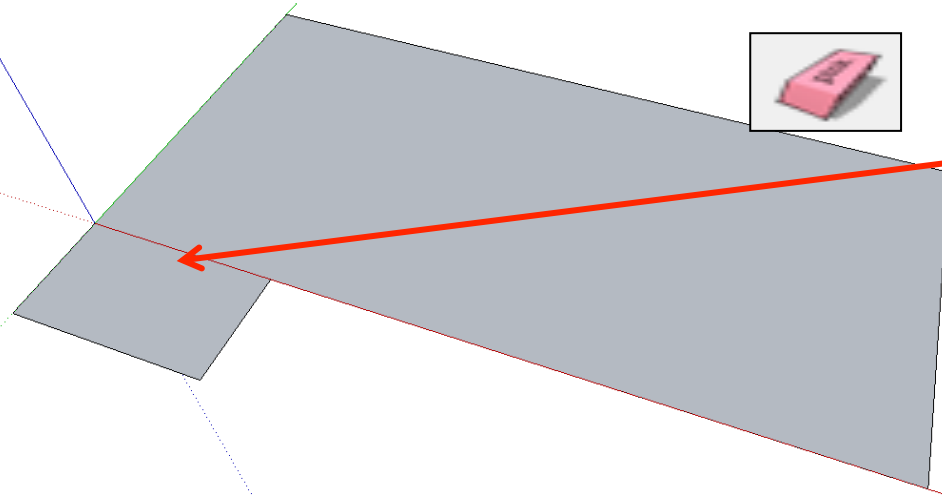
5. Use the *rubber tool* to erase the line separating the two rectangles to leave one shape
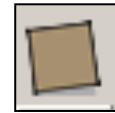
6. Using the *rectangle tool click* on the corner of the rectangle shown and type in *20,20* and press *enter.*

20.0mm

20.0mm
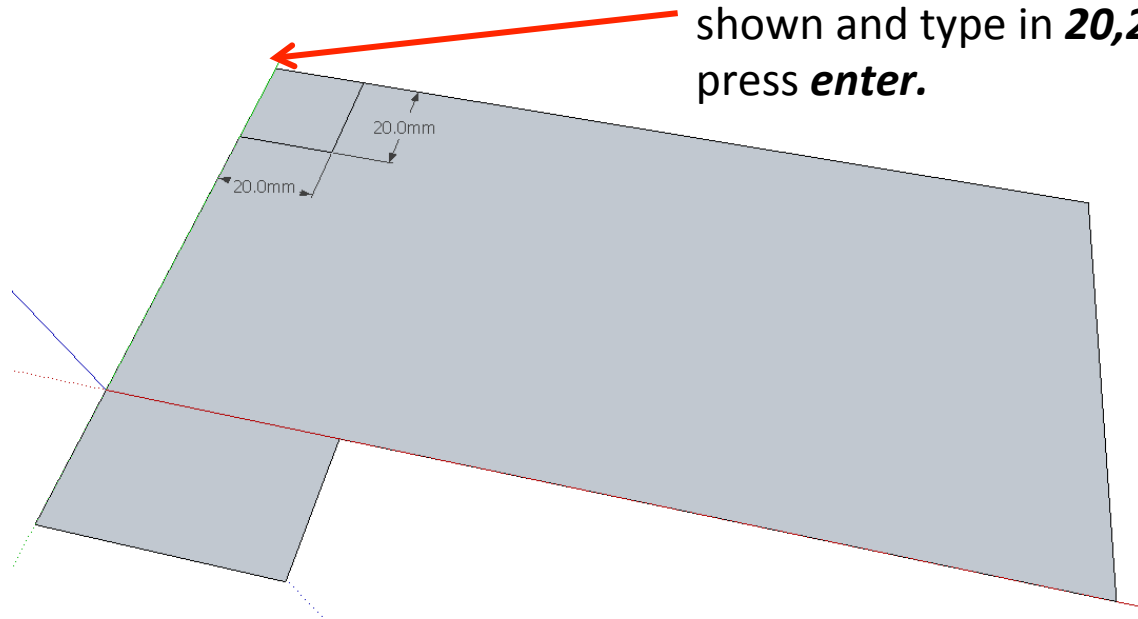
7. **Repeat** this on the other **two corners drawing** squares measuring *20,20*.
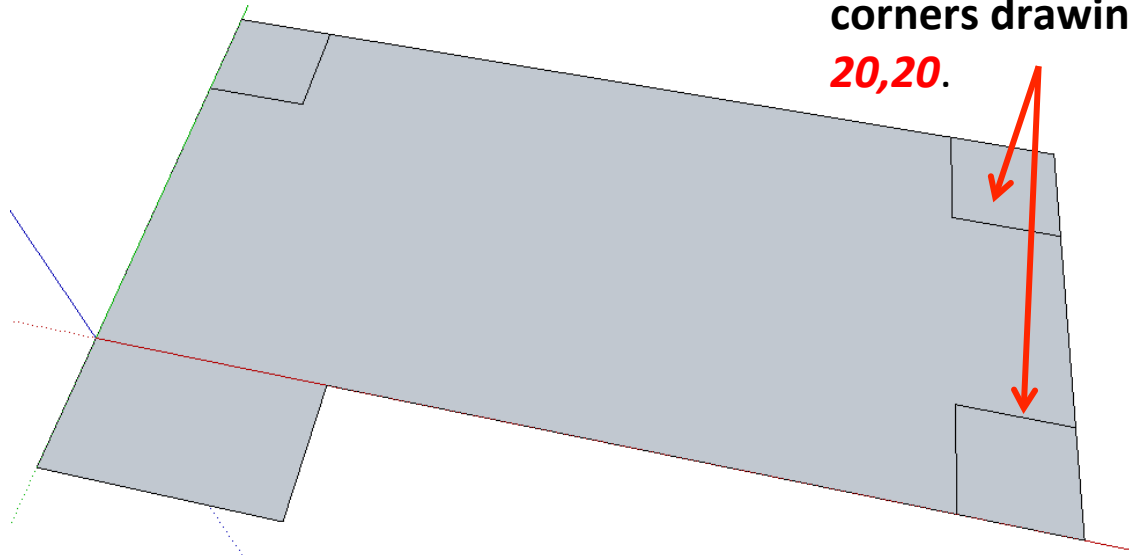
8. ***Click*** on the ***circle tool***. Position the centre on the corner of the square shown above
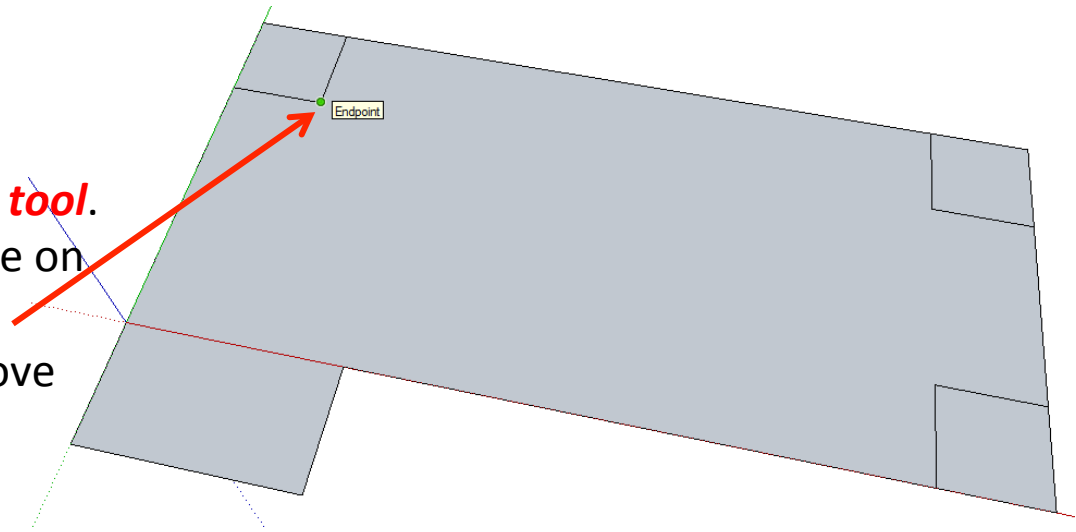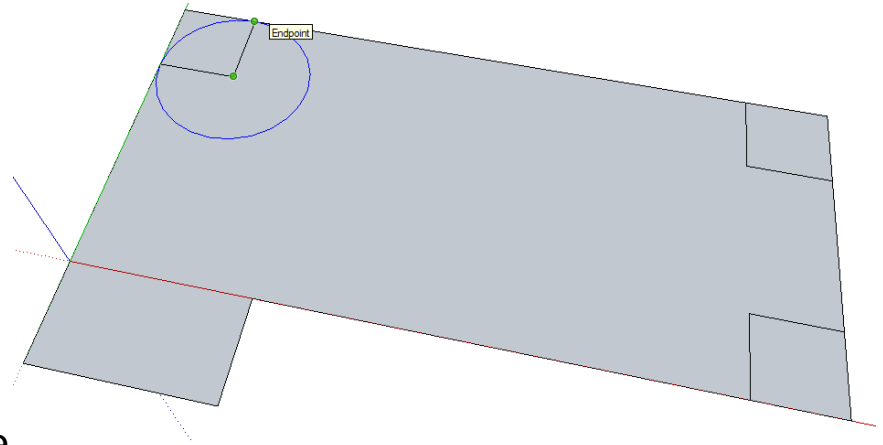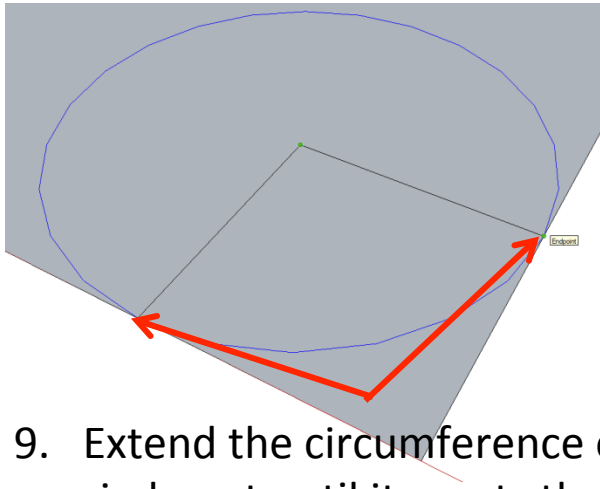
Endpoint

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

10. **Repeat** this on the other **two corners** with the centre point starting on the squares shown.
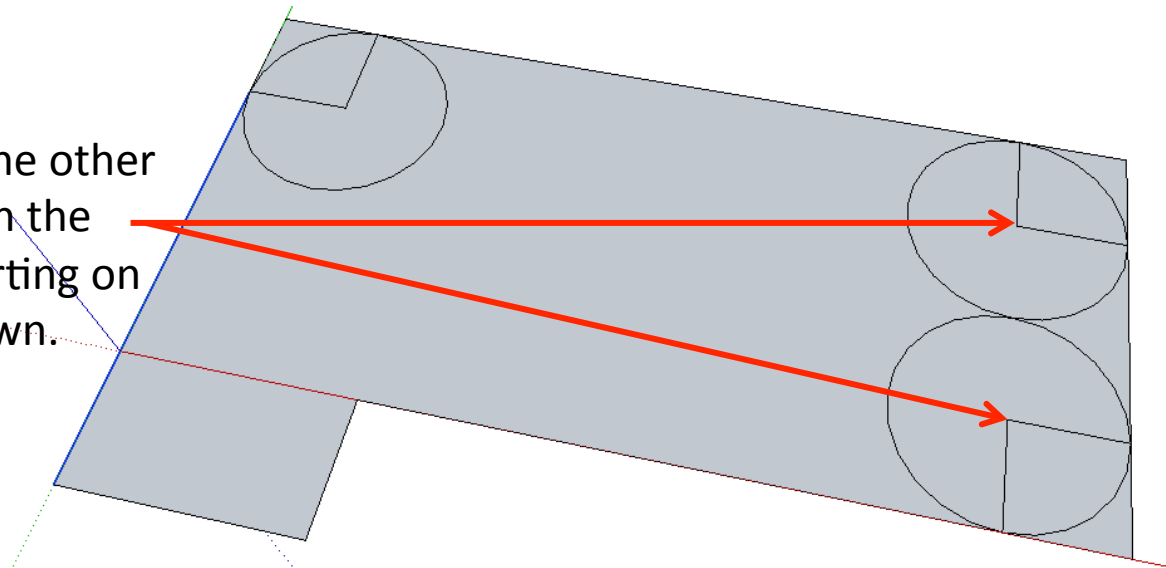
11. **Click** on the **circle tool**. Position the centre on the corner of the midpoint of the line shown above
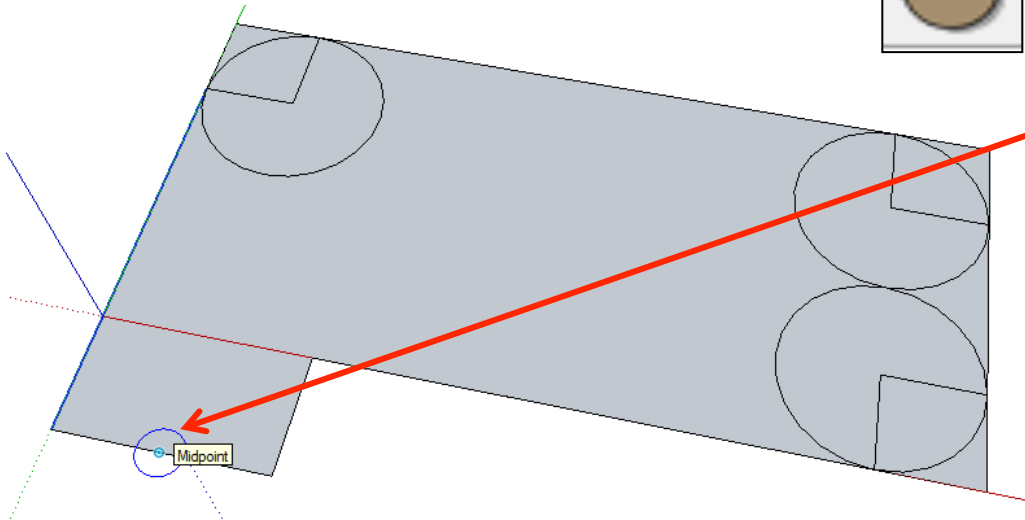
12. **Extend** the **circle** out until the edge **(circumference)** touches one of the two **endpoints** shown
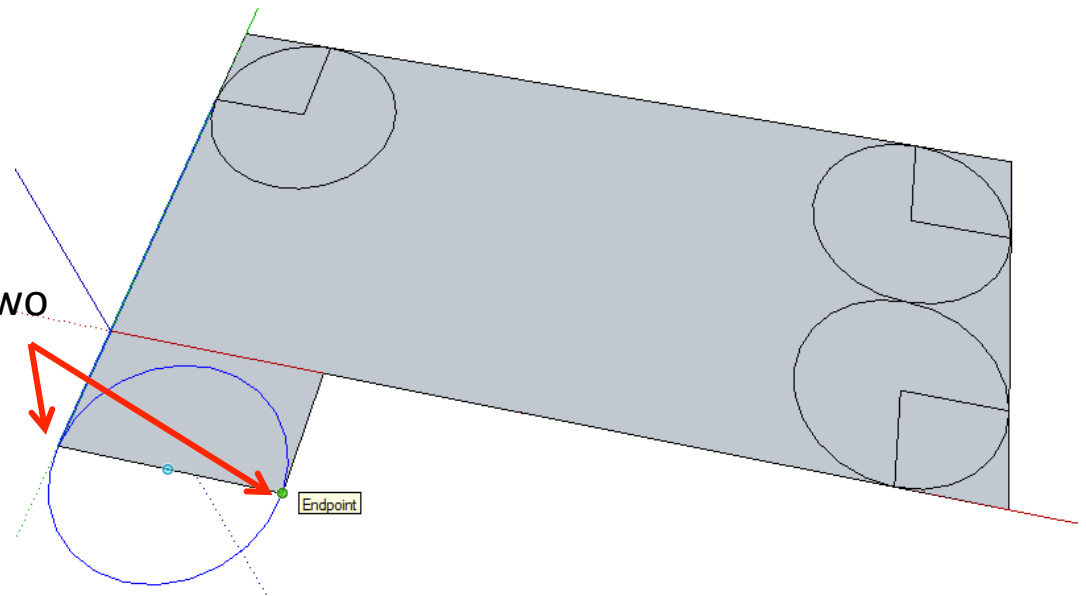
Midpoint

Endpoint

13. Use the **_rubber tool_** to erase the edges of the shape
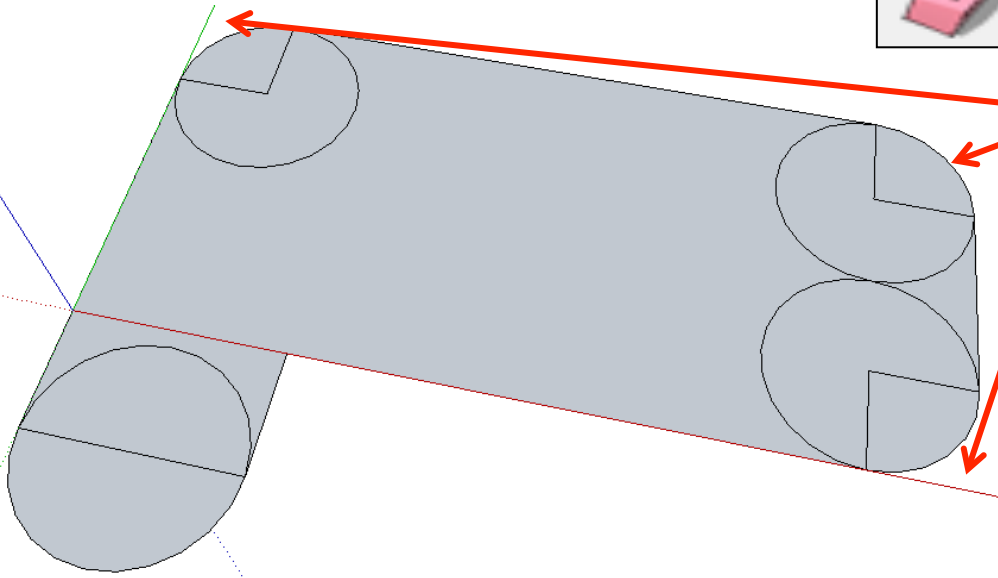
14. Use the **_rubber tool_** to erase the inside lines so you are left with the base of the camera
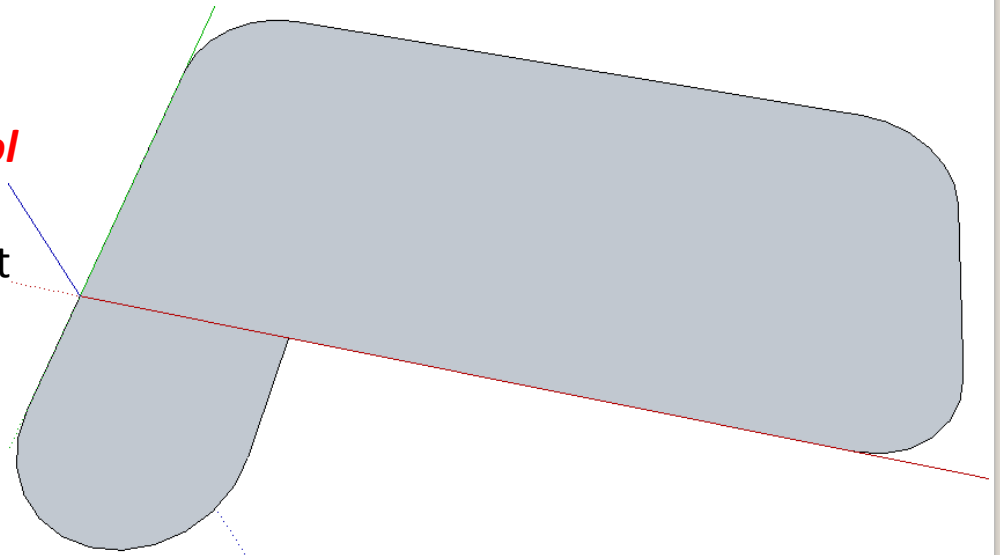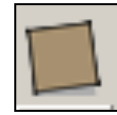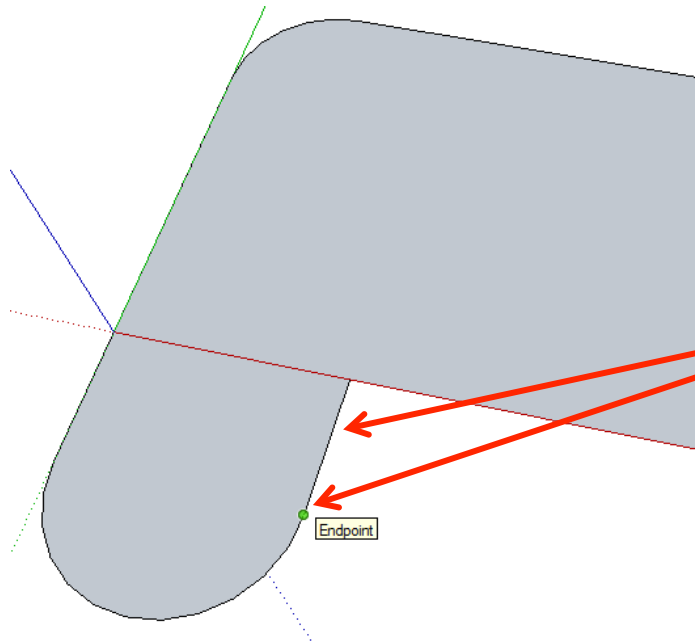
15. Using the ***rectangle tool move it*** along the handle line shown until it says ***endpoint.*** Start to draw the rectangle

16. Using the ***rectangle tool move it*** along the front line shown until it says ***endpoint.*** Click to complete the rectangle
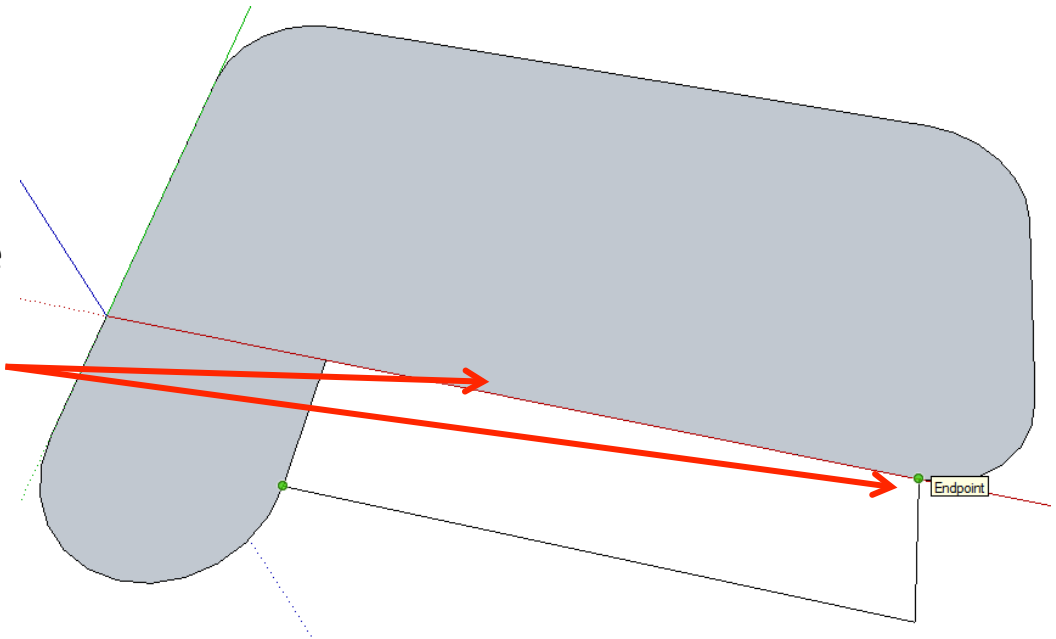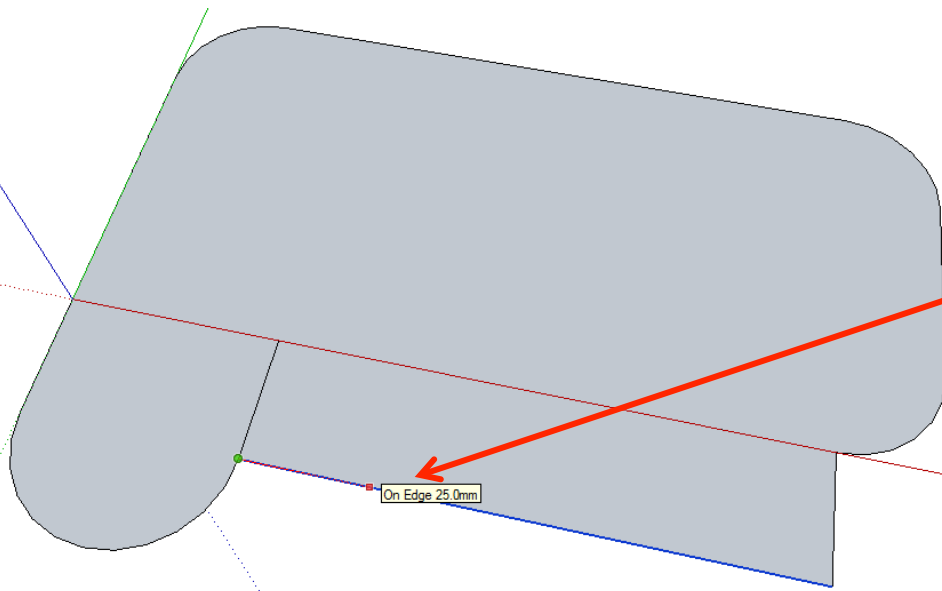
Endpoint

Endpoint

17. Using the *pencil tool* *start on the endpoint shown.* Move the pencil along the line and *type in 25* and *press enter*

On Edge 25.0mm

18. *Click* on the *circle tool*. Position the centre on the corner of the endpoint of the pencil line you have just drawn shown opposite.
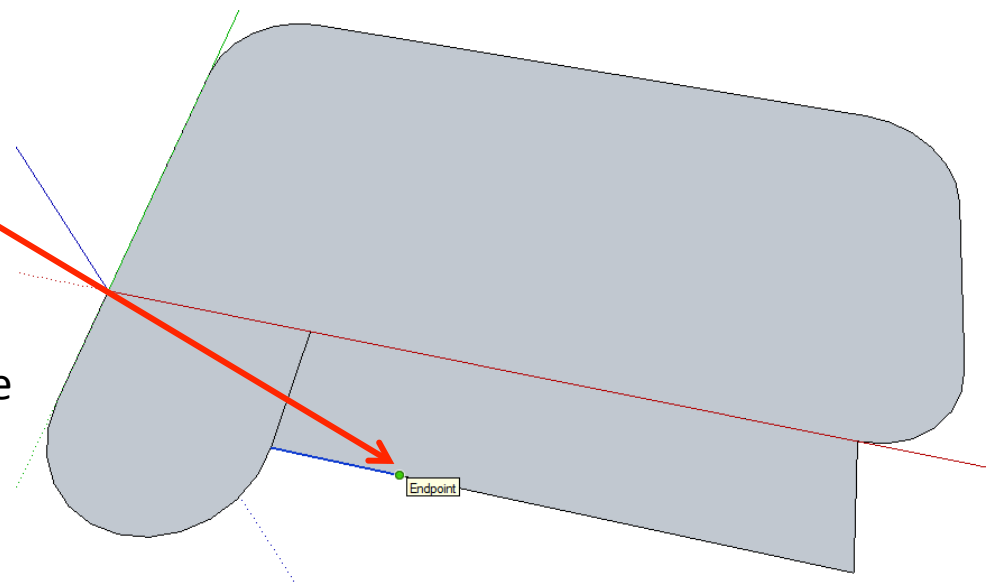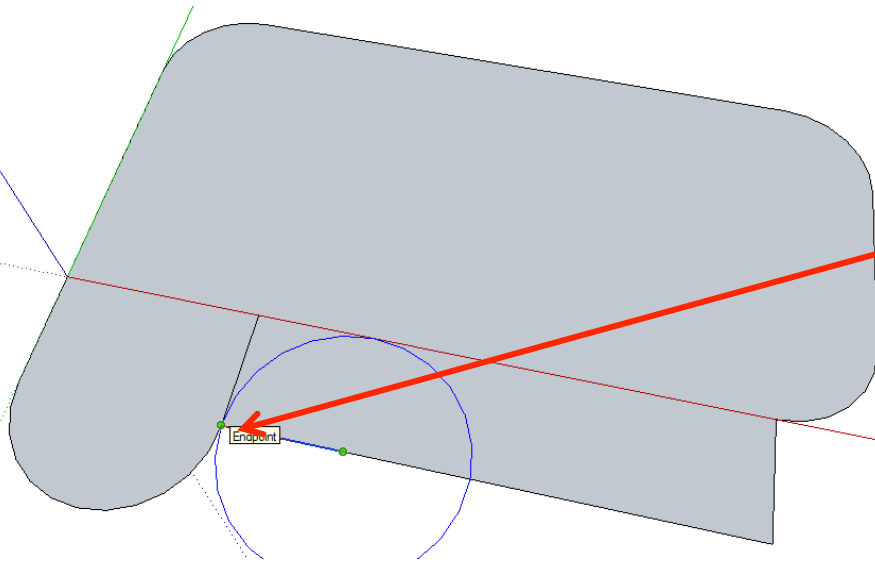
Endpoint

19. ***Using*** the ***circle tool***. Pull the circle circumference outwards. Make sure the circumference touches the endpoint shown.

20. Use the ***rubber tool*** to erase the bottom half of the circle

21. Use the Select ***tool*** and click on the right hand arc of the circle. It should now be ***highlighted in blue***.
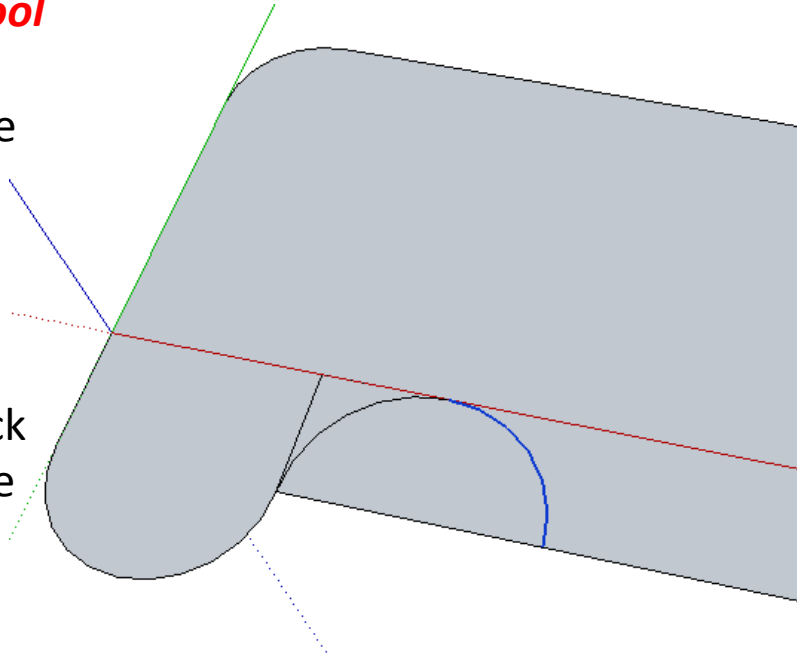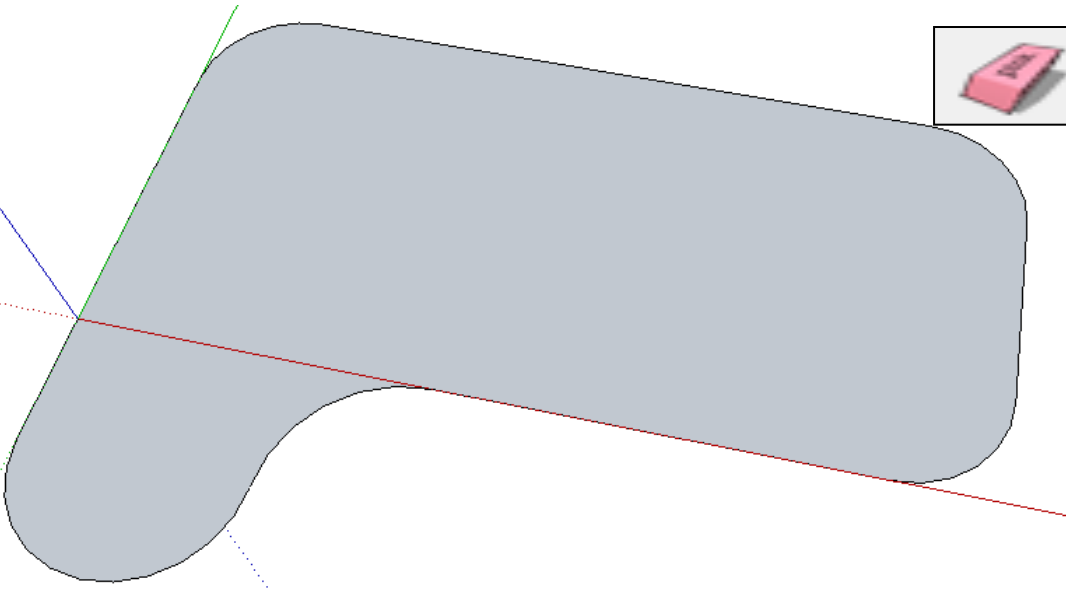
22. Use the *rubber tool* to erase the lines shown to be left with the shape shown.

**23.** Use the *push pull tool* to raise the camea up. Type *'80'* and press *enter*.

80mm
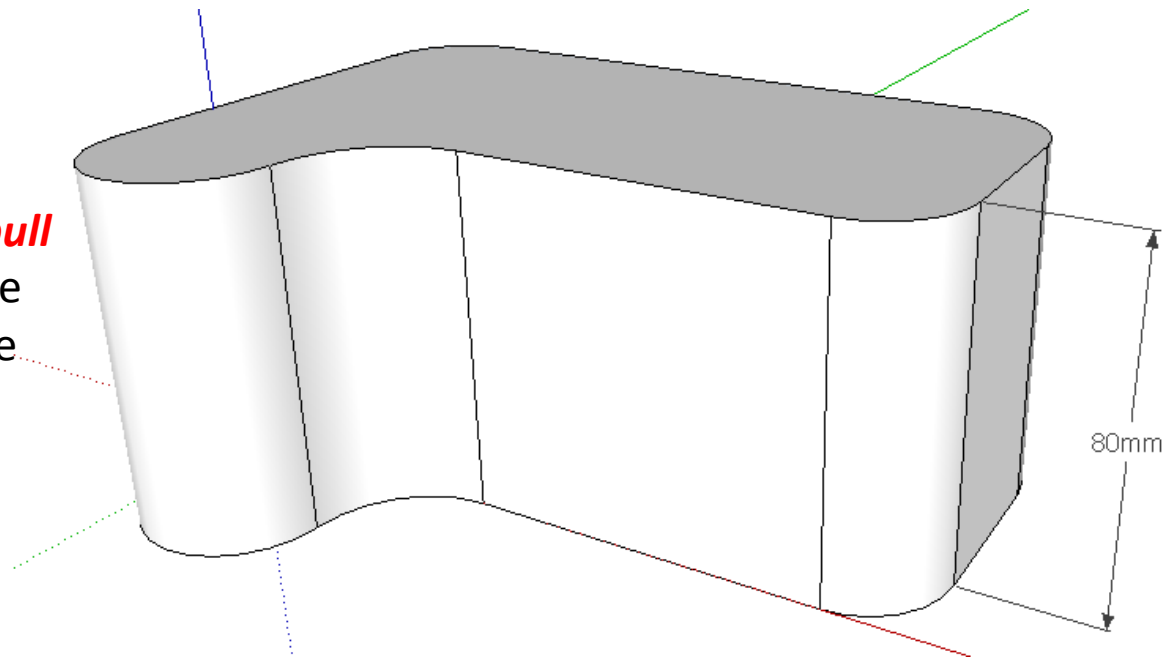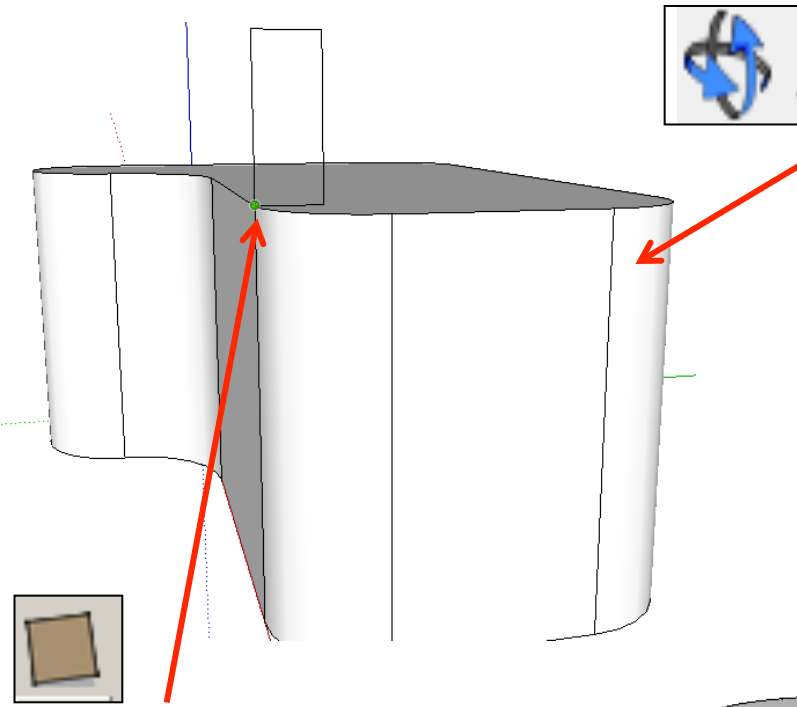
24. Use the *orbit tool* to position the camera as shown.
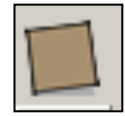
25. Using the *rectangle tool move it* along the edge as shown until it says *on edge.* Start to draw the rectangle so its vertically upwards as shown. Type *7,7* and press *enter*.

From Point
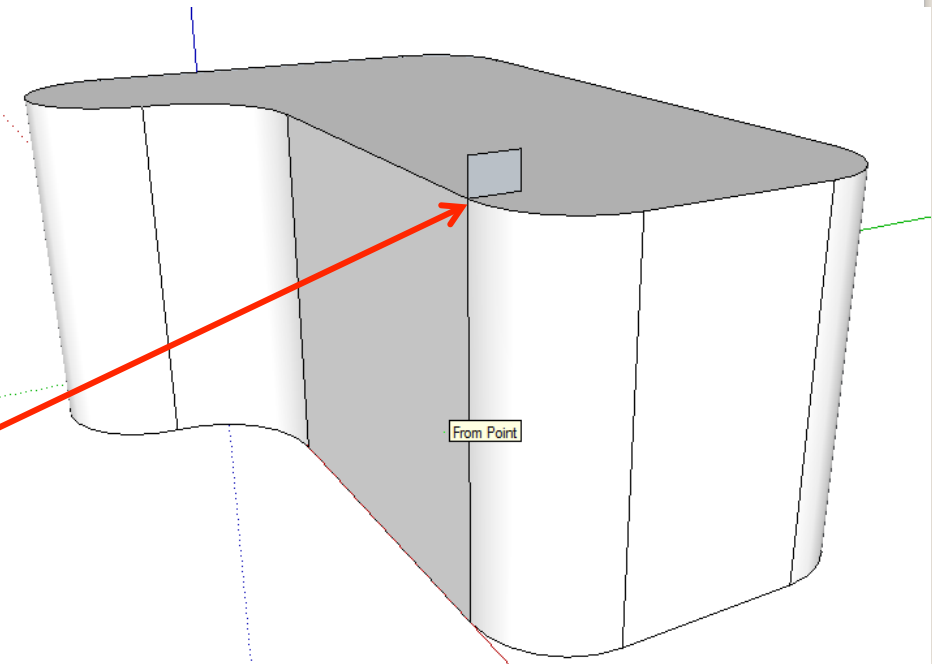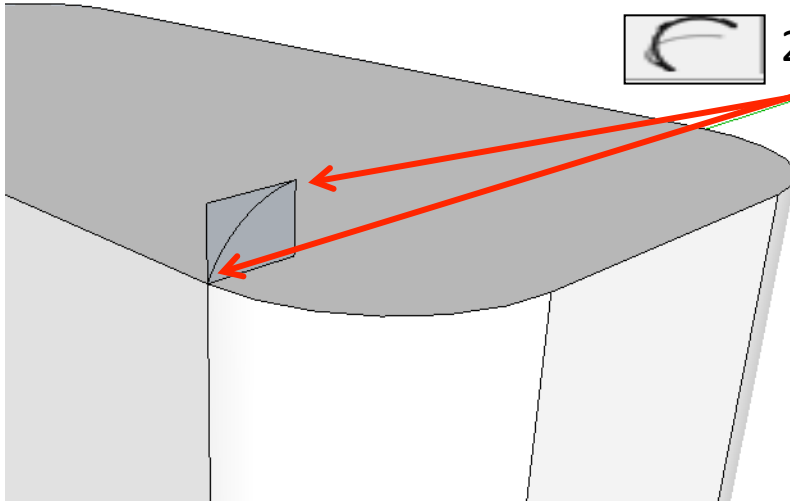
26. Use the ***arch tool*** to draw an arc from the two points shown.

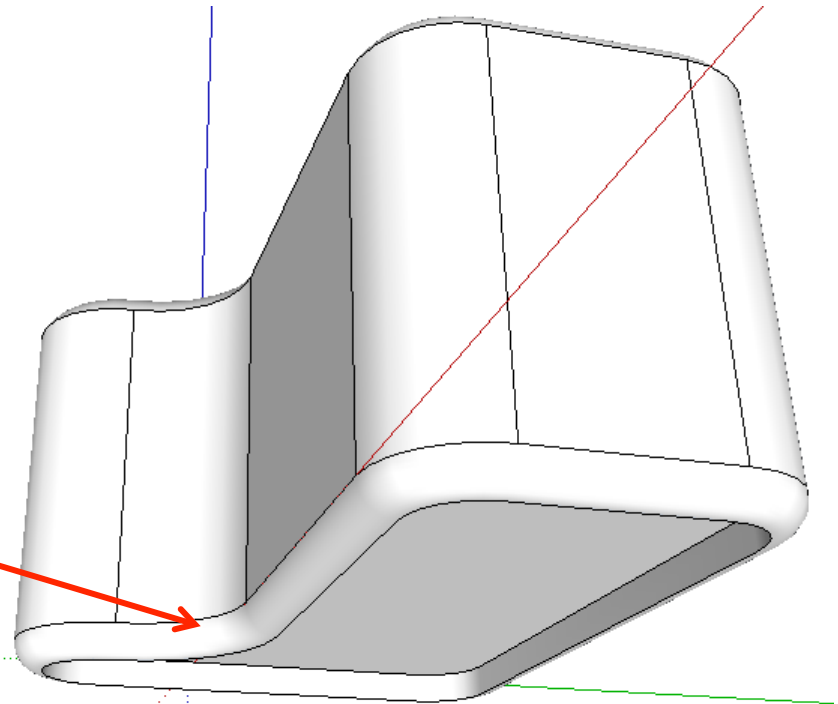27. Use the ***rubber tool*** to erase the lines shown to be left with the shape shown.
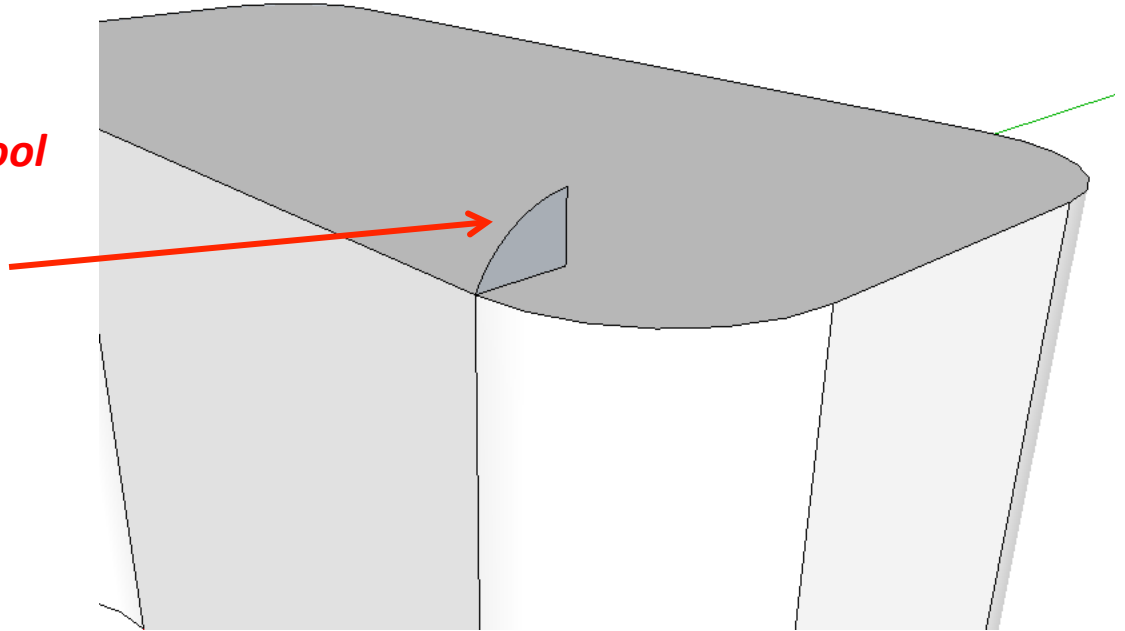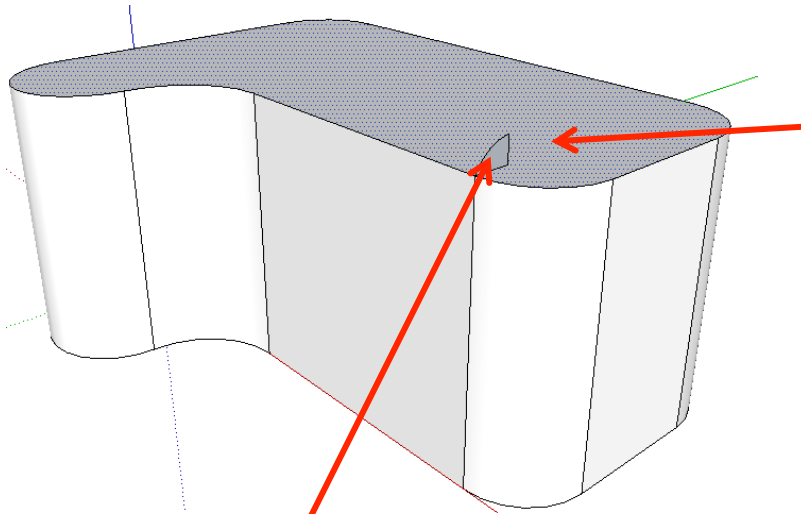
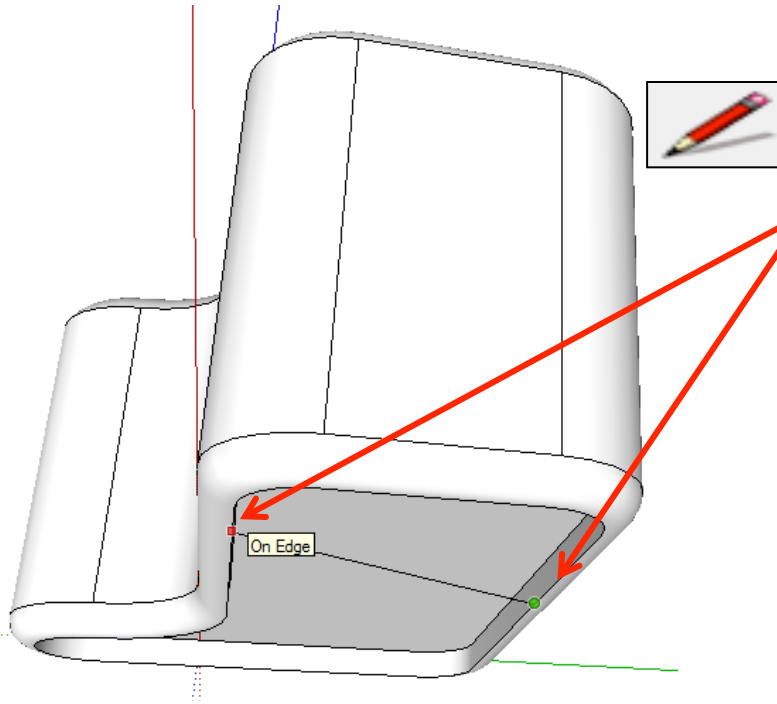28. Use the Select *tool* and click on the top of the camera. It should now be *highlighted in blue dots*.

29. Select the *follow me tool* and click on the *shape* on the top. You should have drawn the shape shown opposite.........
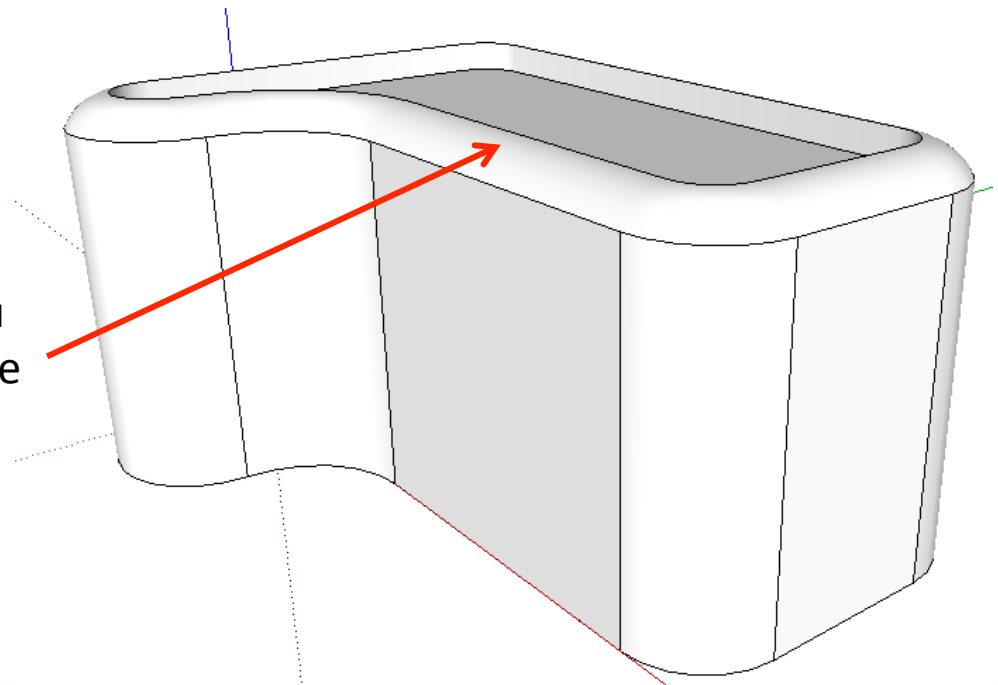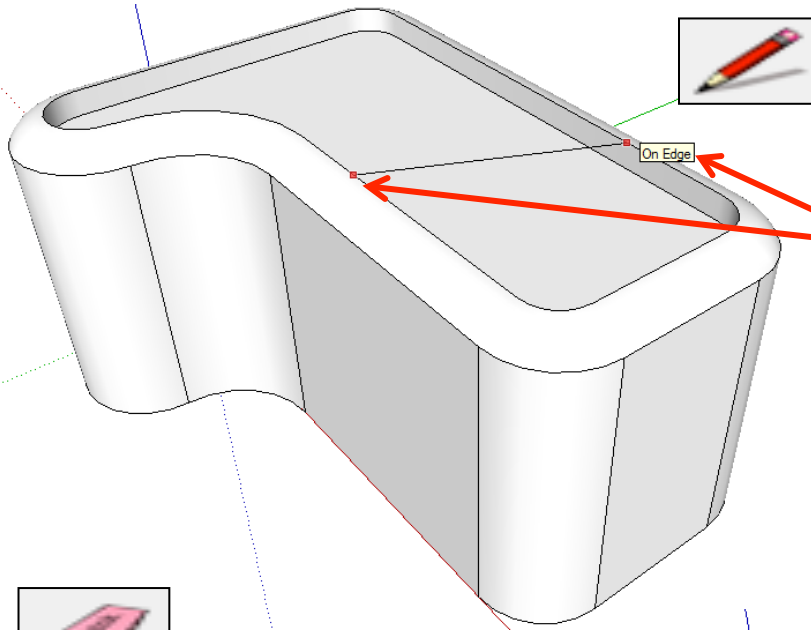
30. Select the **pencil tool** and click on the **top of the shape shown.** It will say **on edge**. Draw a line shown to the opposite side. It will say **on edge** and fill the top piece.

On Edge

31. Use the **rubber tool** to erase the line shown in blue to be left with the camera body shape.
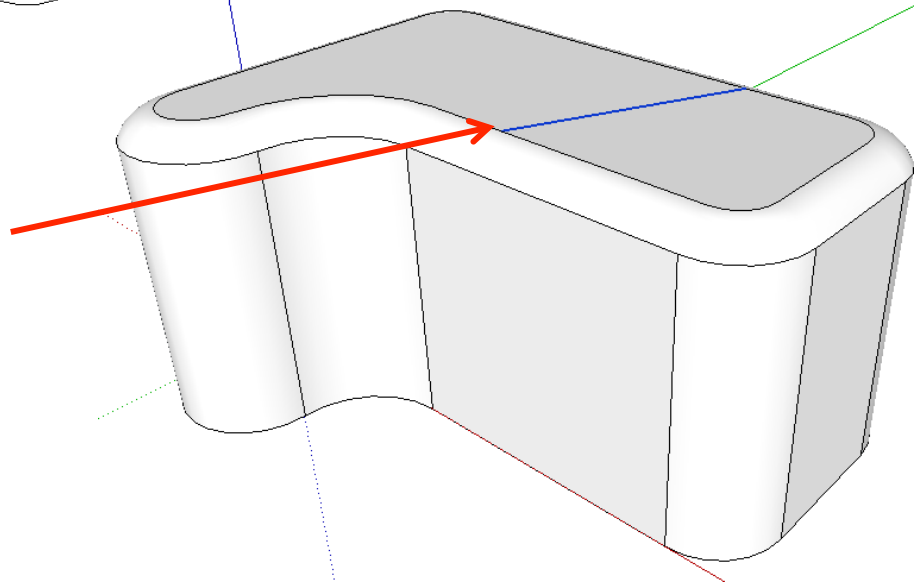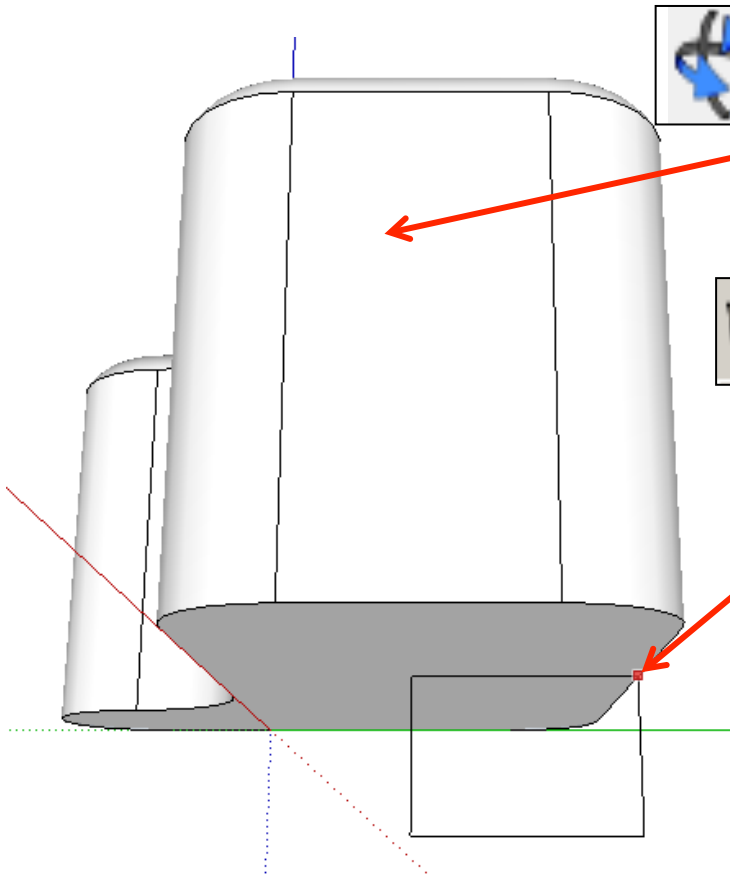
32. Use the *orbit tool* to position the camera as shown.
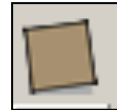
33. Using the *rectangle tool move it* along the edge as shown until it says *on edge.* Start to draw the rectangle so its vertically downwards as shown. Type *7,7* and press *enter*.

34. Use the *arch tool* to draw an arc from the two points shown.

35. Use the **_rubber tool_** to erase the lines shown to be left with the shape shown.
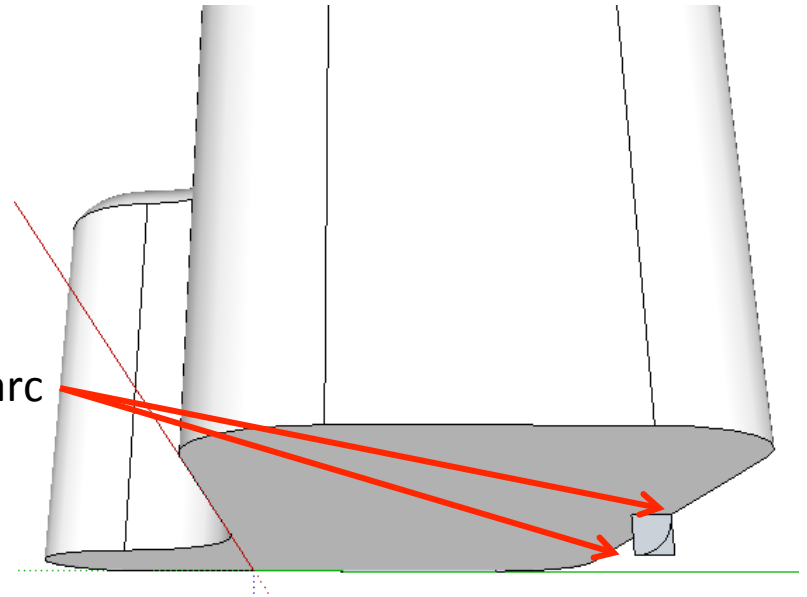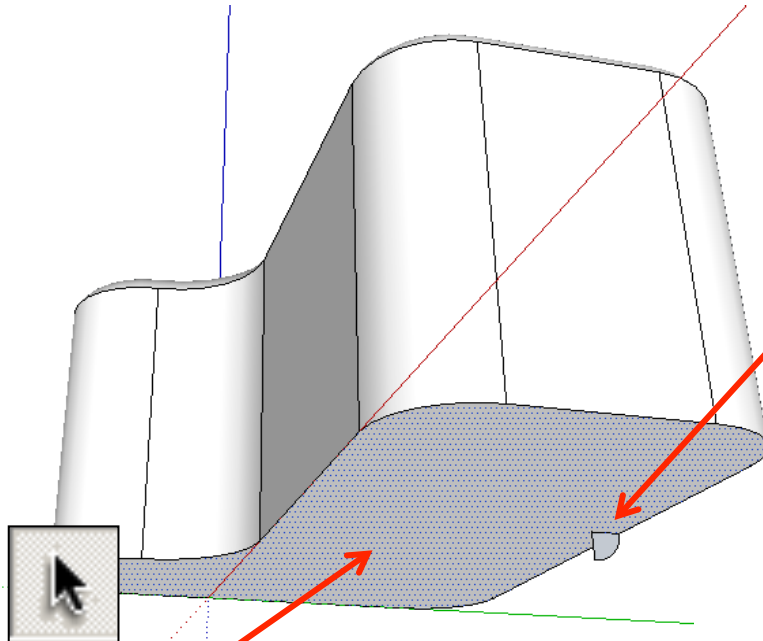
36. Use the Select **_tool_** and click on the bottom of the camera. It should now be **highlighted in blue dots**.

37. Select the **_follow me tool_** and click on the **shape** on the bottom. You should have drawn the shape shown opposite.........

38. Select the *pencil tool* and click on the **top of the shape shown.** It will say **on edge**. Draw a line shown to the opposite side. It will say **on edge** and fill the top piece.

On Edge

39. Use the *rubber tool* to erase the line shown in blue to be left with the camera body shape.
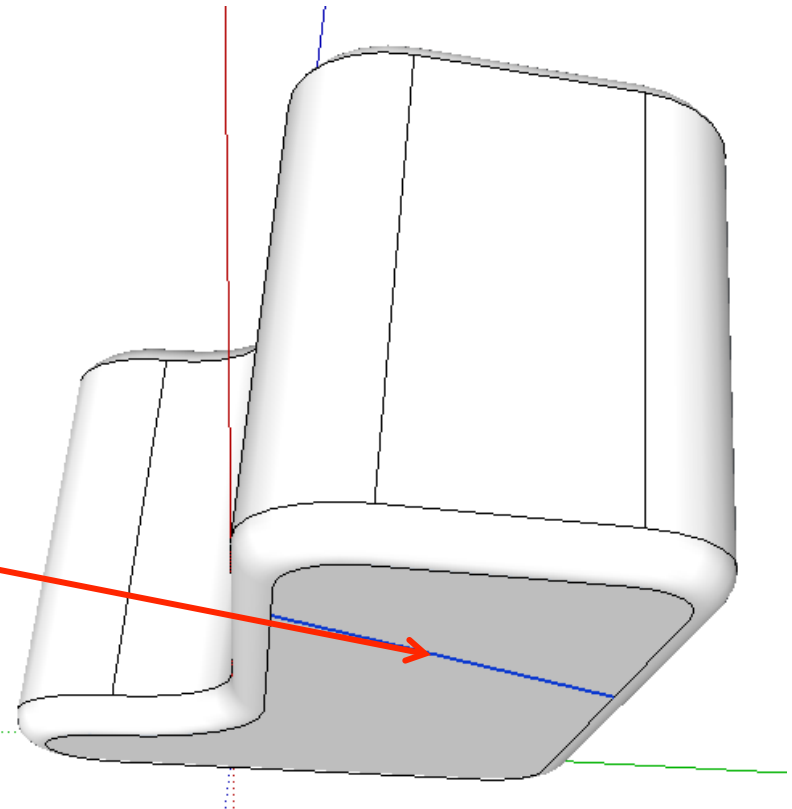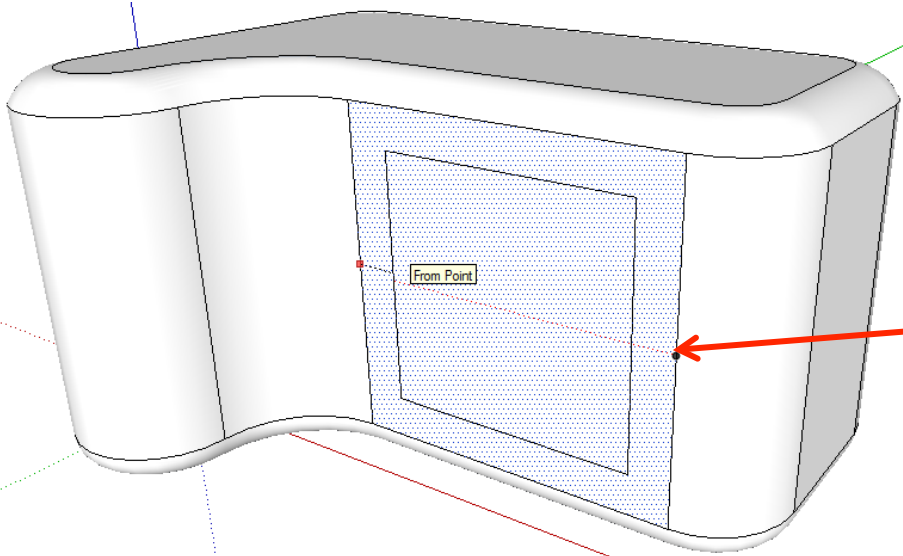
40. Use the *contour tool* to pull in a square from the edge shown. Type in *15* and *press enter*

From Point

41. Use the *push pull tool* to pull the square out. Type *'15'* and press *enter*.
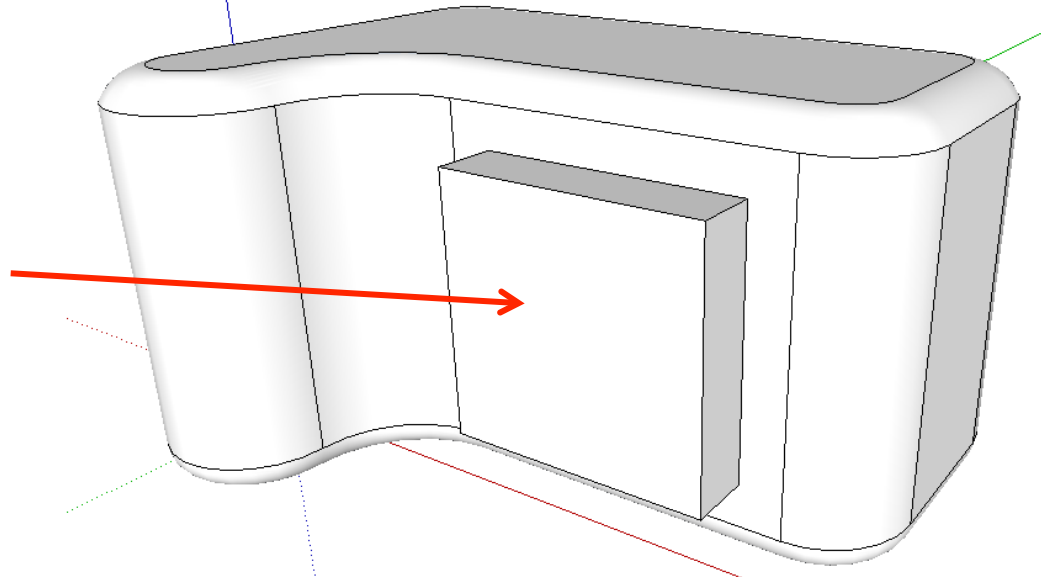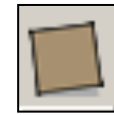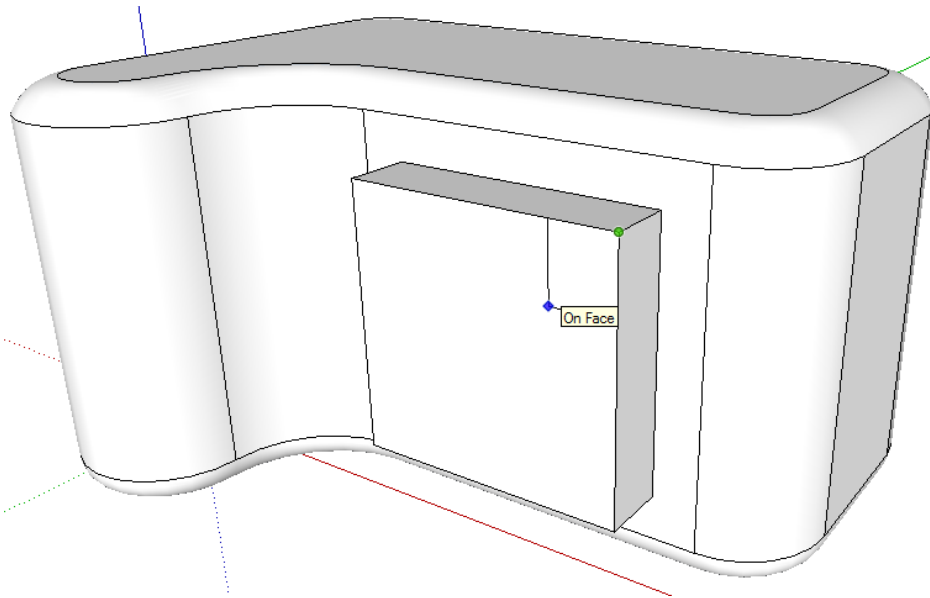
42. Using the *rectangle tool click* on the corner of the rectangle shown. Pull in towards the centre of the square and type in *15,15* and press *enter.*

43. **Repeat** this on the other **three corners drawing** squares measuring *15,15*.

On Face
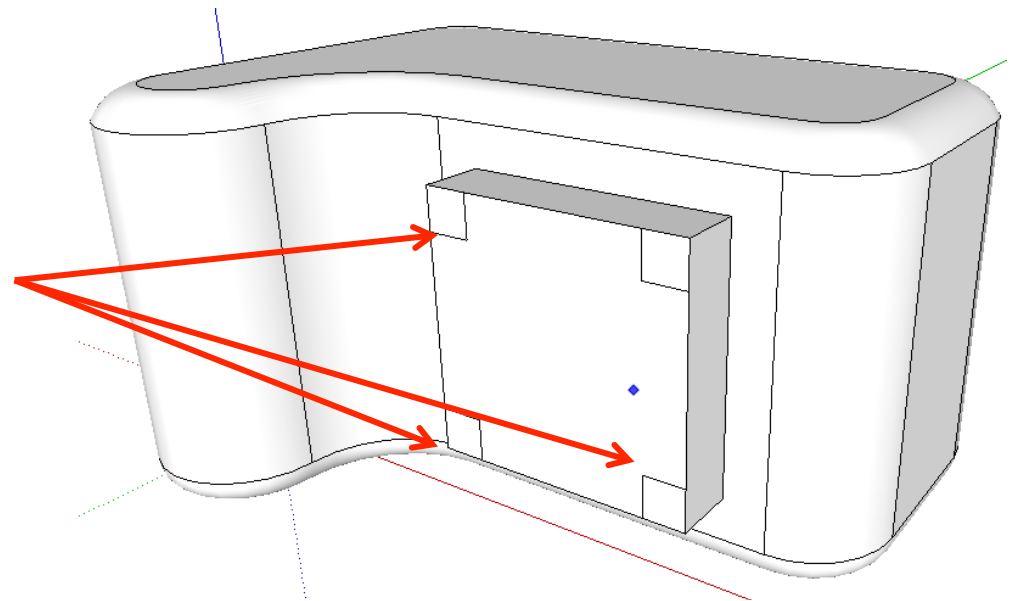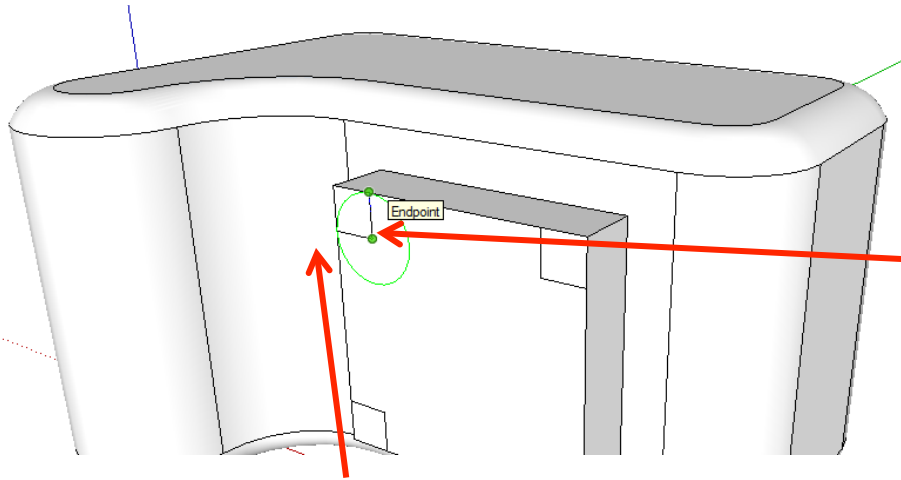
44. **Click** on the *circle tool*. Position the centre on the corner of the square shown opposite

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

46. **Repeat** this on the other **three corners**. To be left with drawing shown
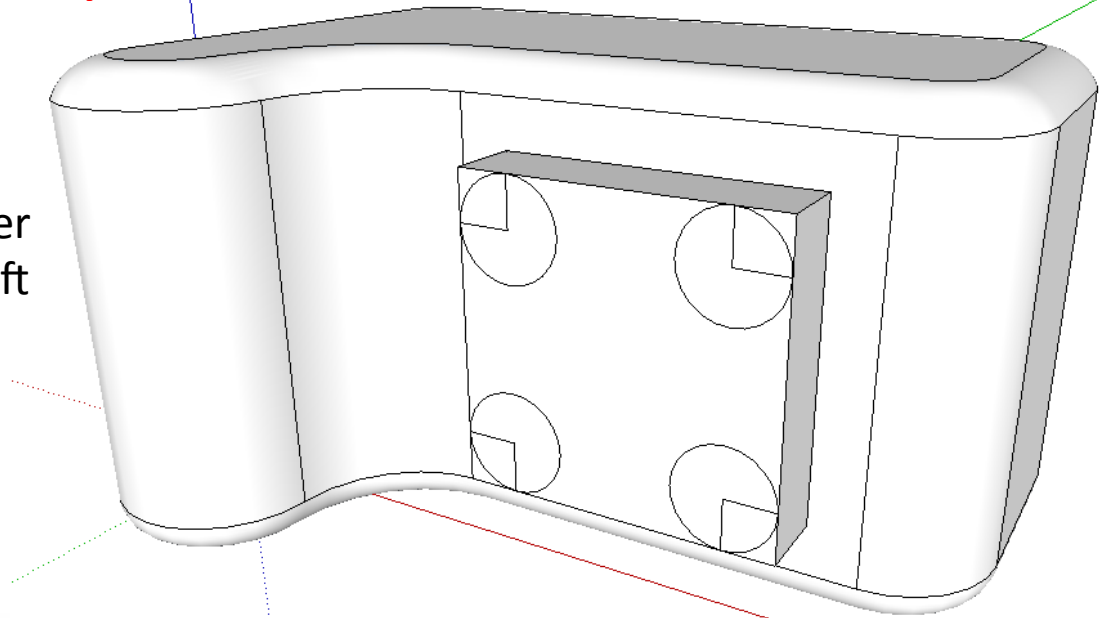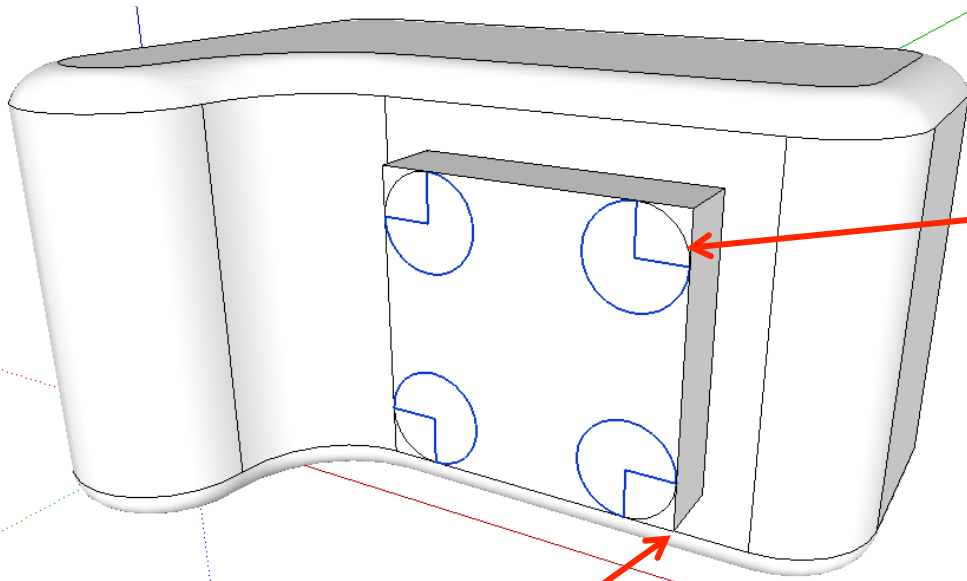
47. Use the *rubber tool* to erase the lines highlighted in blue.

48. Use the *push pull tool* to push the edges of the shape back to be left with the drawing opposite.
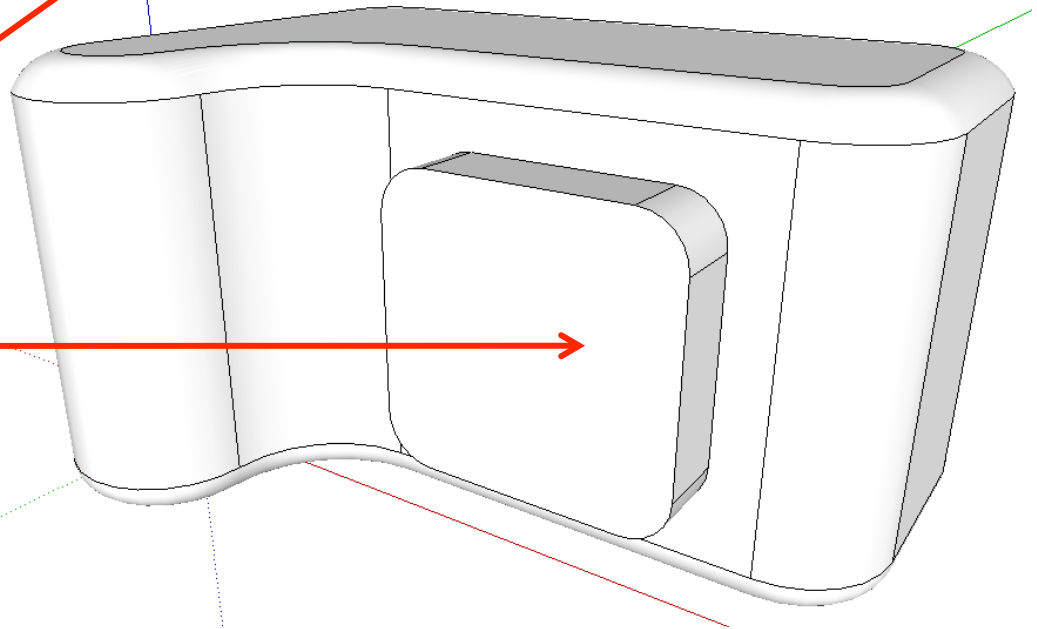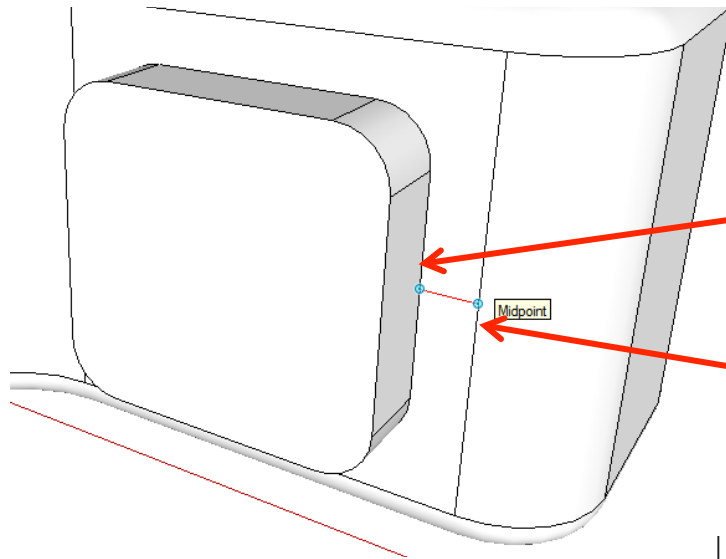
49. Using the **_pencil tool_ _start on the midpoint of the edge shown._** Draw a line out along the _red axis_ until it touches the next line that will also say midpoint

50. Using the **_pencil tool start on the end of the pencil line you have just drawn._** Draw a line out along **_the green axis_** until it touches the next line that will say midpoint
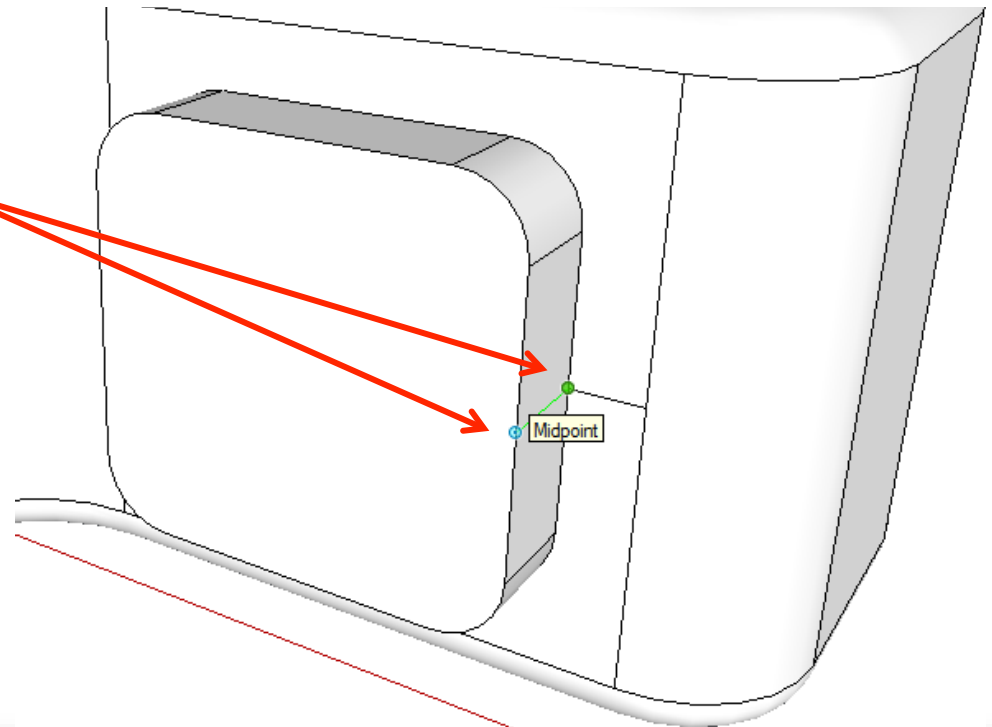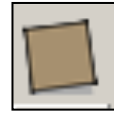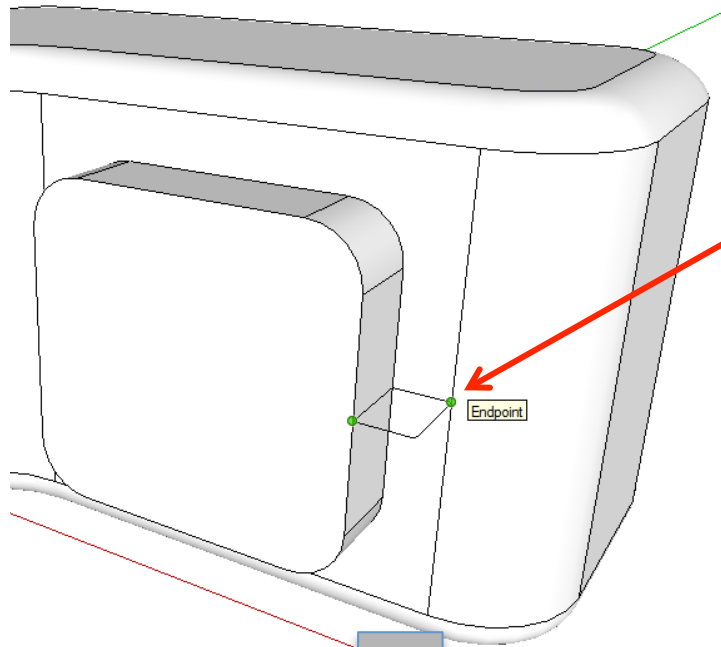
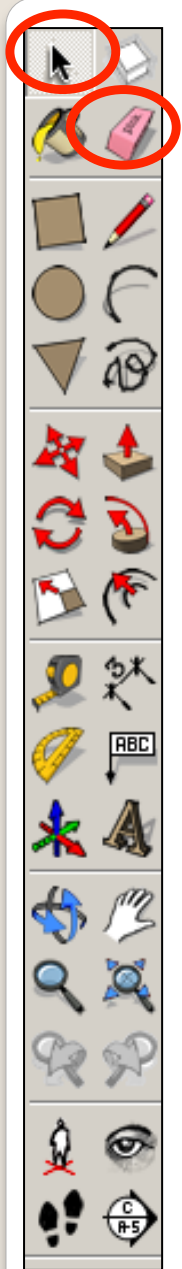51. Using the *rectangle tool* *click* on the endpoints of the two lines you have just drawn.
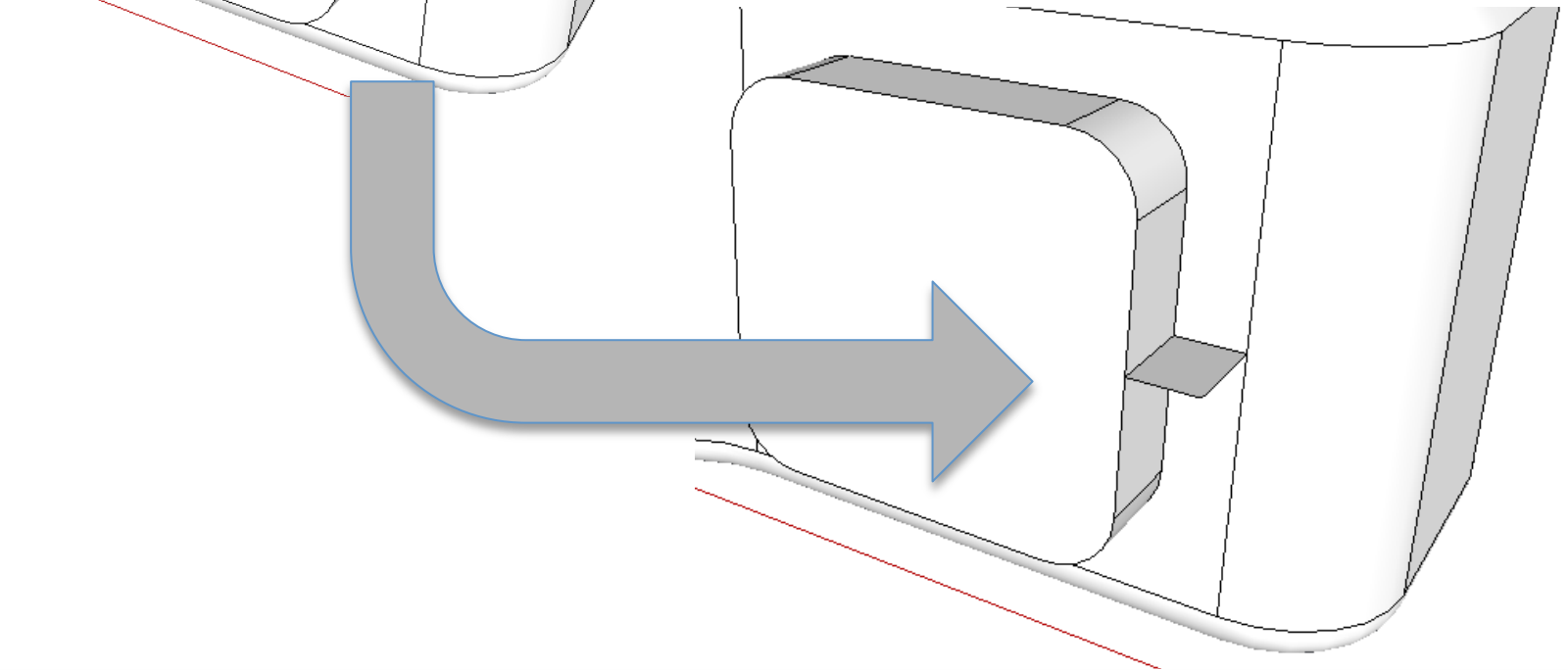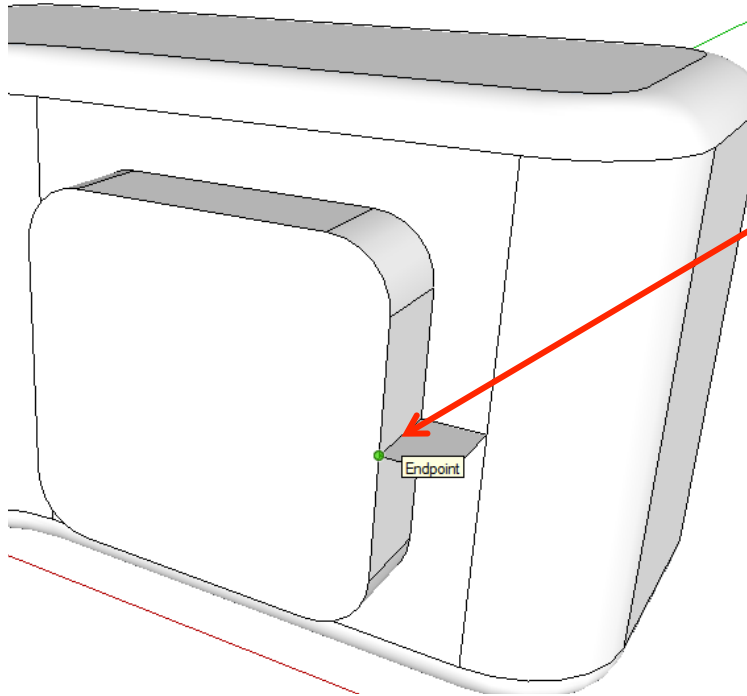
Endpoint

52. Use the **arch tool** to draw an arc starting at the point shown. It will say **endpoint.**

Endpoint

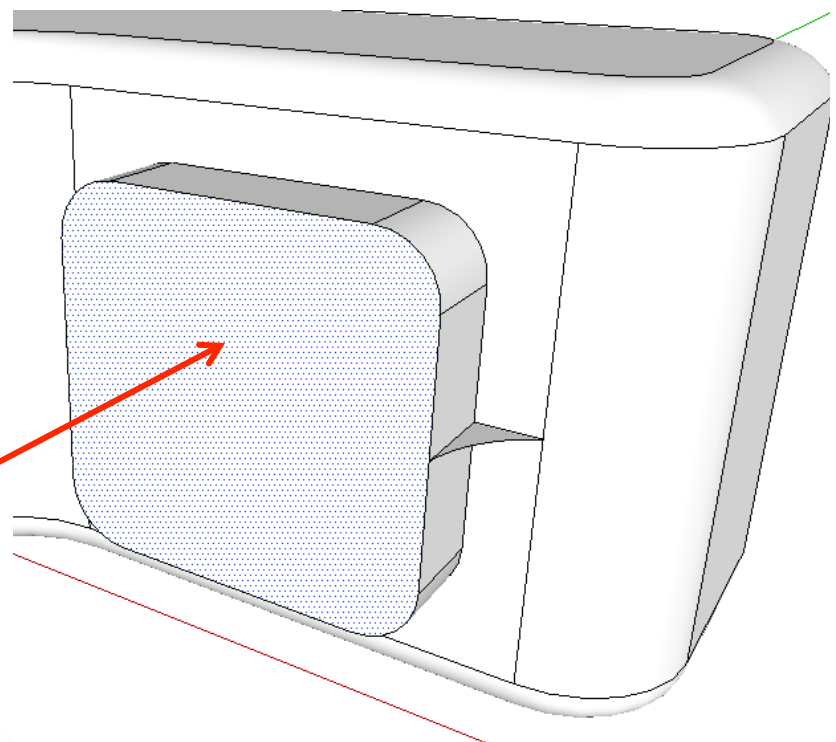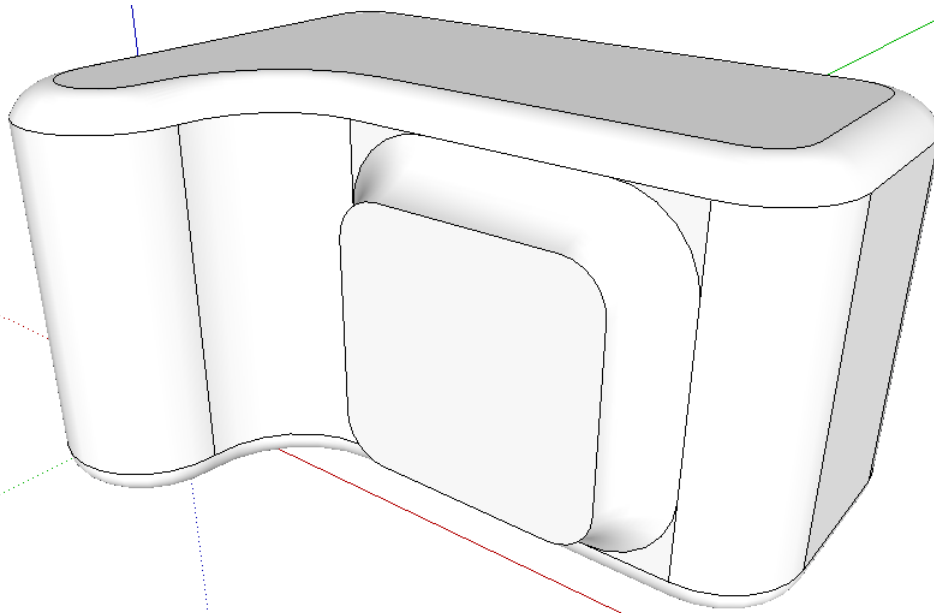53. Use the **arch tool** to complete the arc ending at the point shown. It will say **endpoint.**
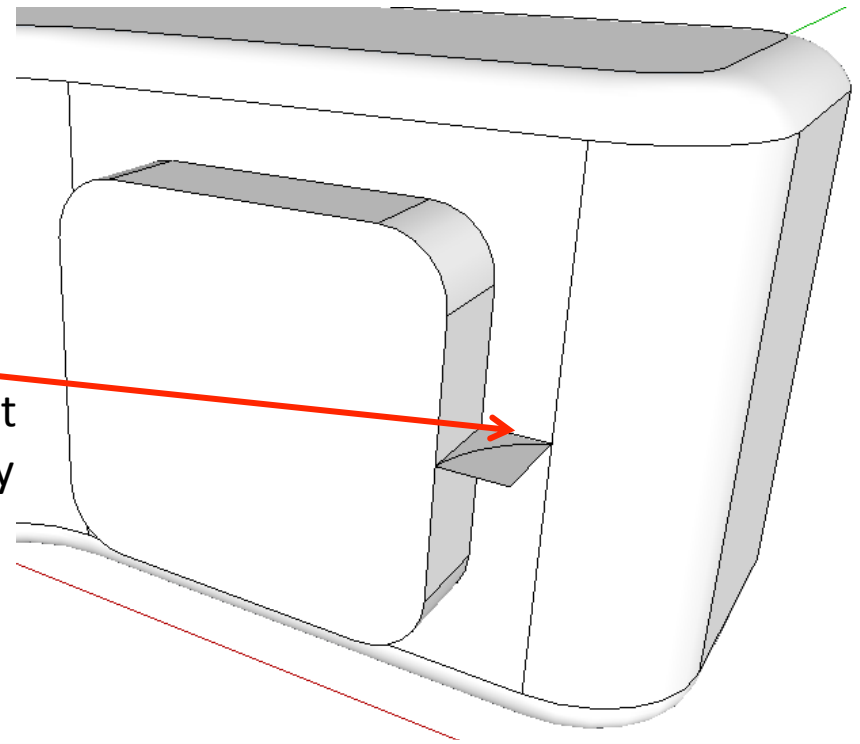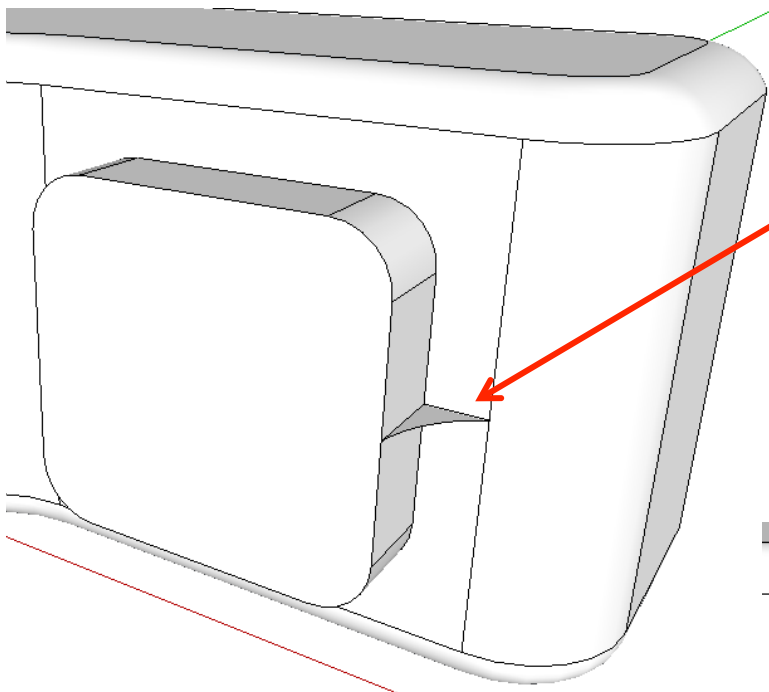
54. Use the **rubber tool** to erase the lines shown to be left with the shape shown.

55. Use the Select **tool** and click on the bottom of the camera. It should now be **highlighted in blue dots**.

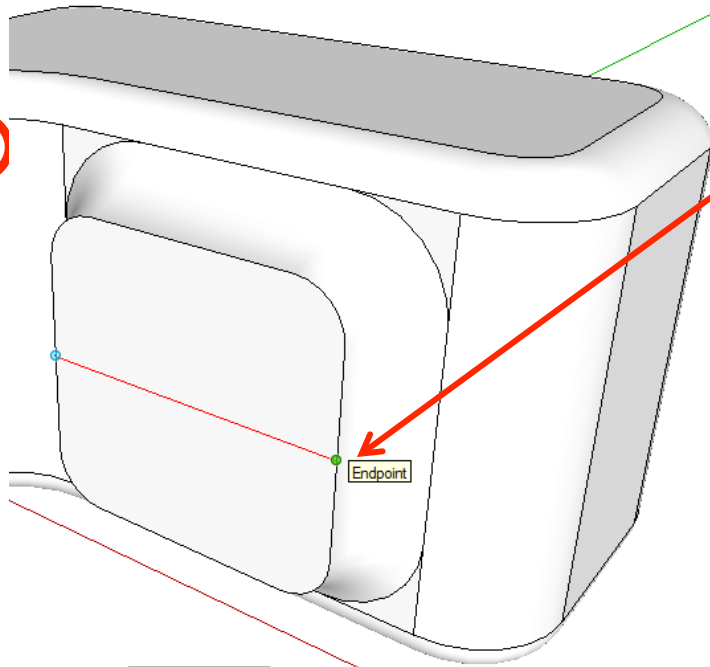56. Select the *follow me tool* and click on the *shape* on the side. You should have drawn the shape shown opposite.........

57. Select the *pencil tool* and click on the *edge of the shape shown.* Move it along the edge until it says *midpoint*.
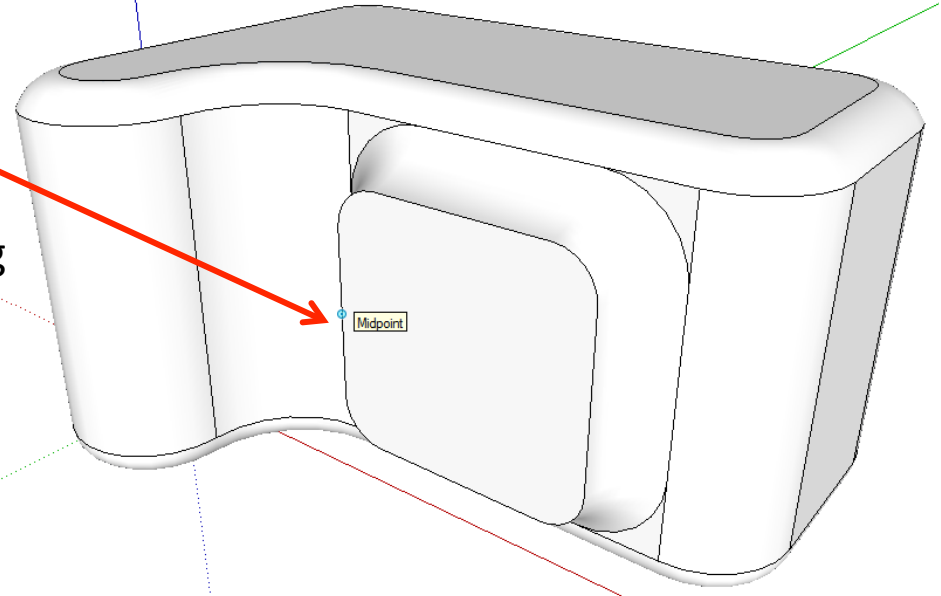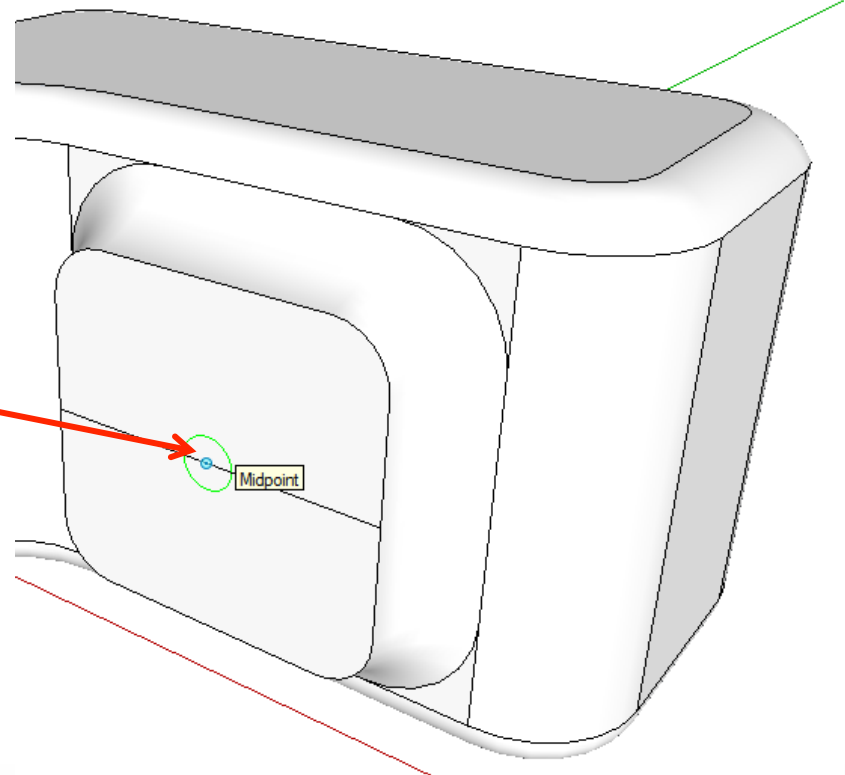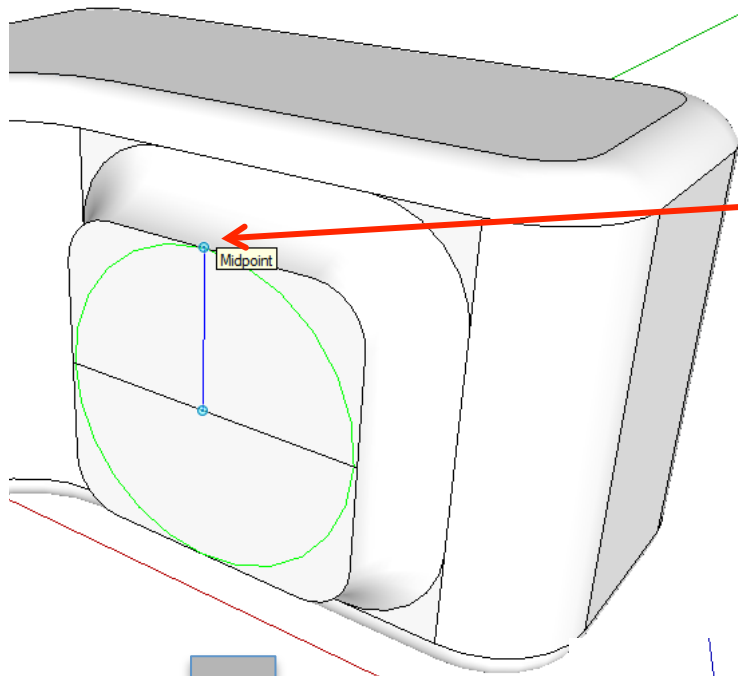
Midpoint

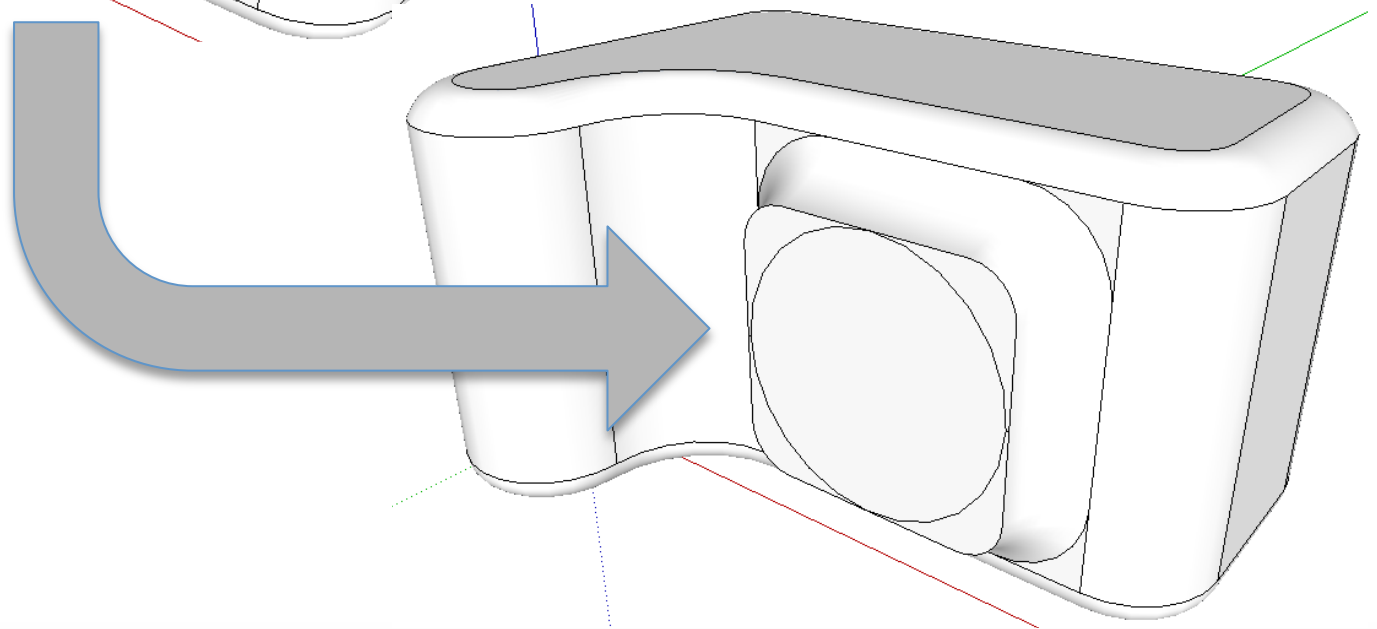58. Draw a line shown to the opposite side. It will say *endpoint.*

Endpoint
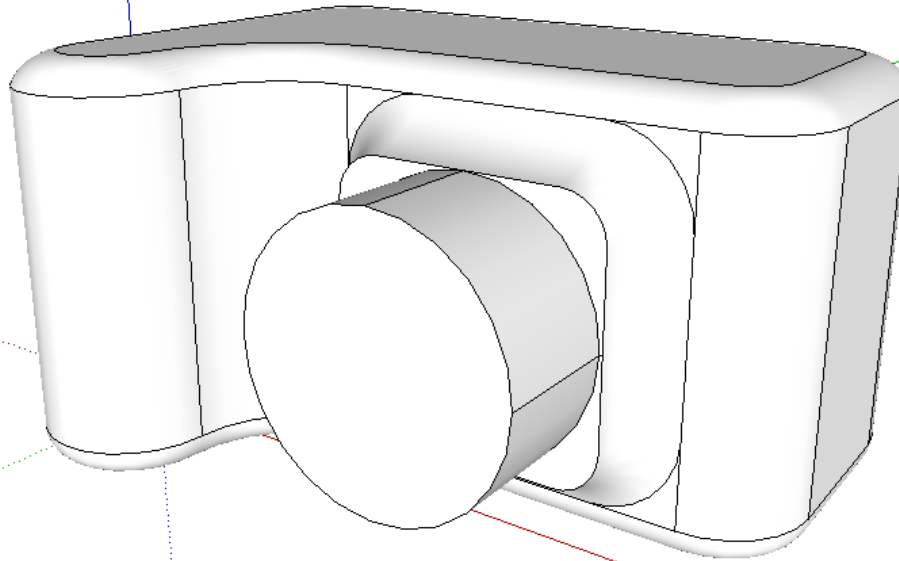
59. **Click** on the **circle tool**. Position the centre on the midpoint of the last line you have just drawn.

Midpoint

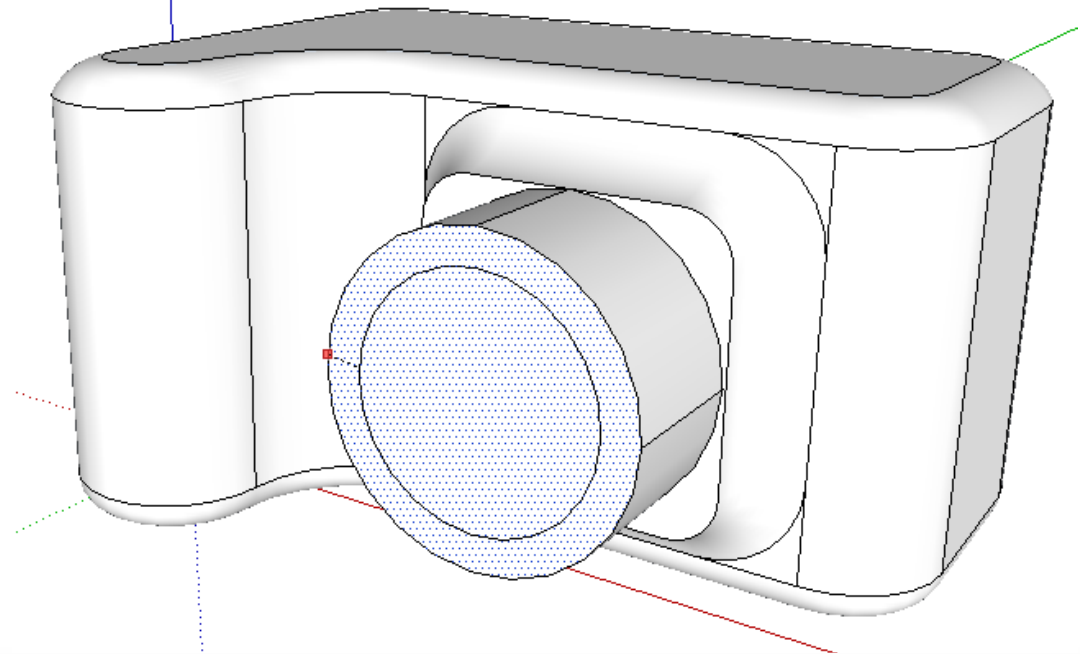60. **Pull** the *circle tool* outwards until it touches the midpoint shown opposite.
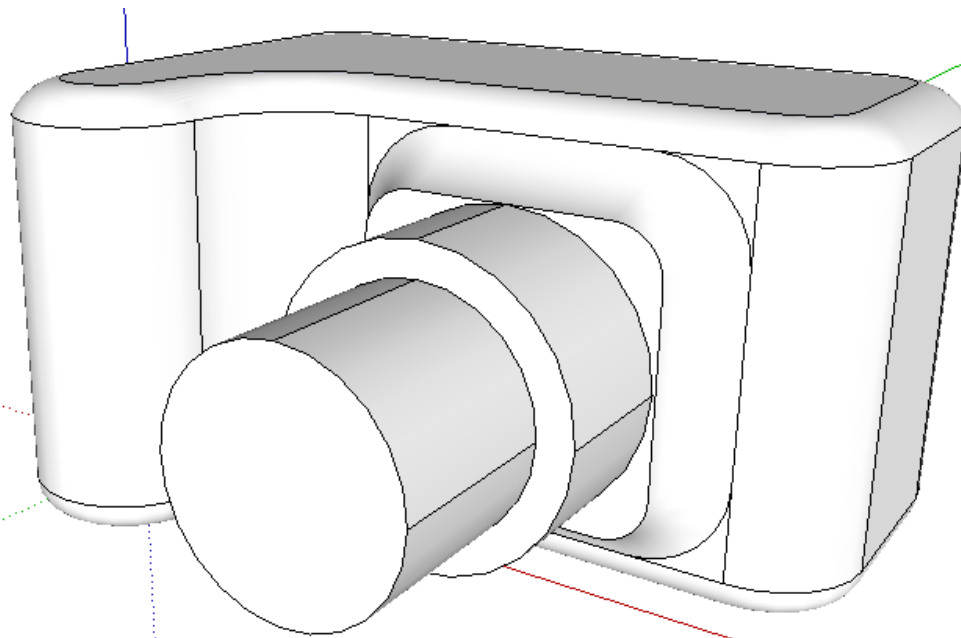
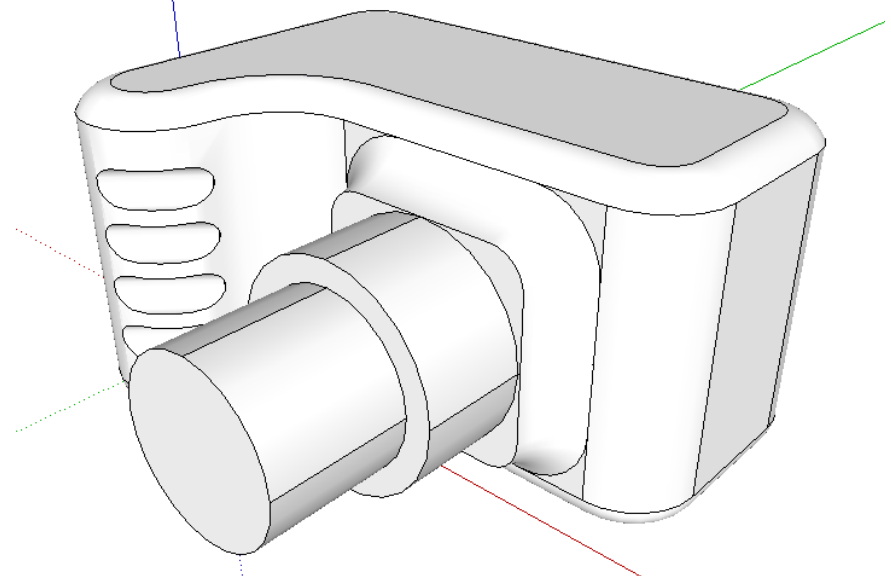61. Use the *push pull tool* to pull the camera lens out. The length is up to you.

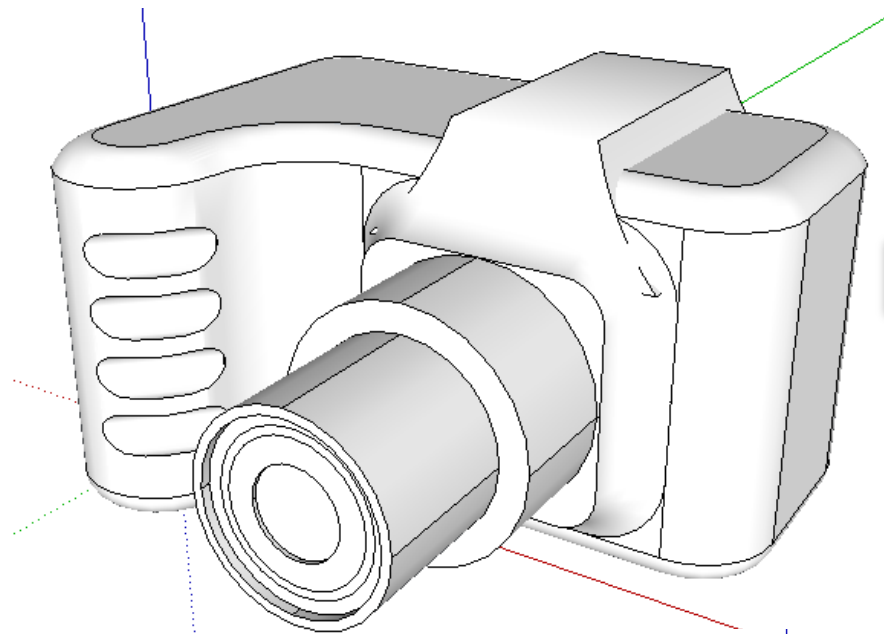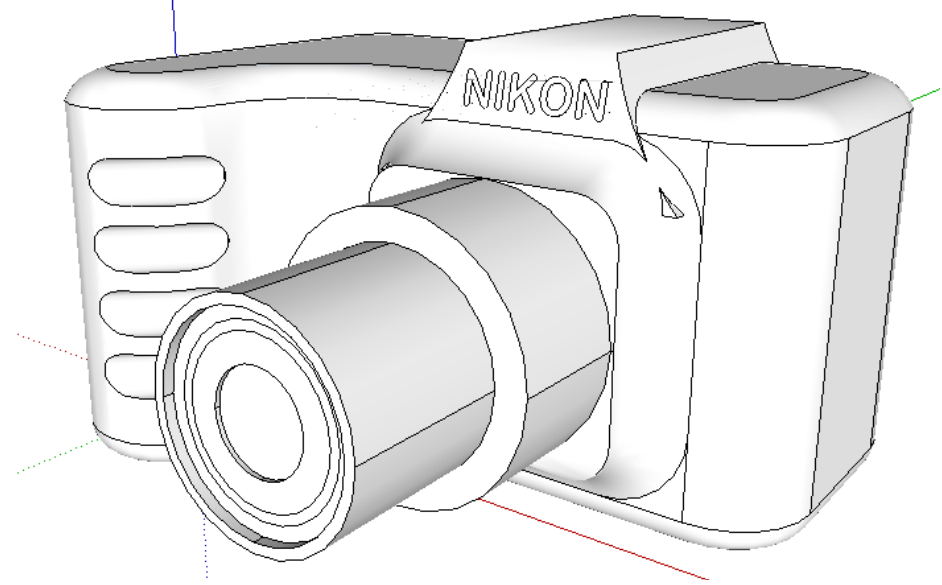62. Use the *contour tool* to draw a contour shown. Again size is up to you.

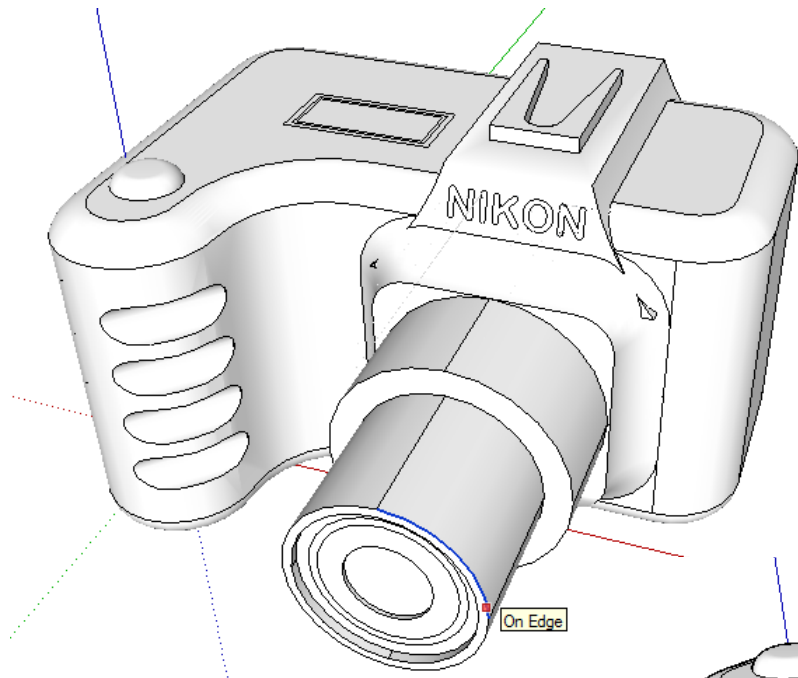63. Use the *push pull tool* to pull the camera lens out. The length is up to you.
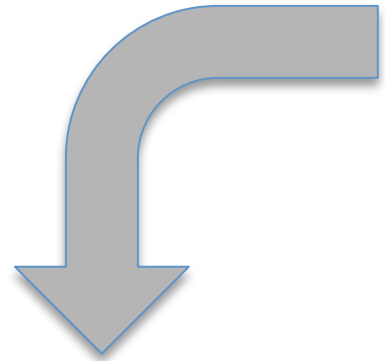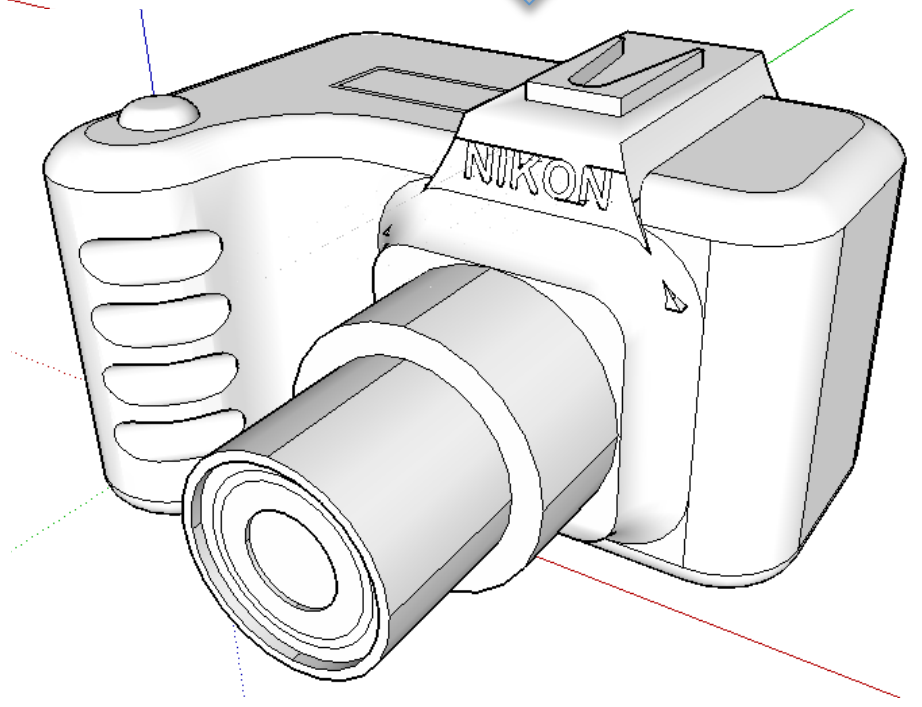
64. Use your own skills to add more details

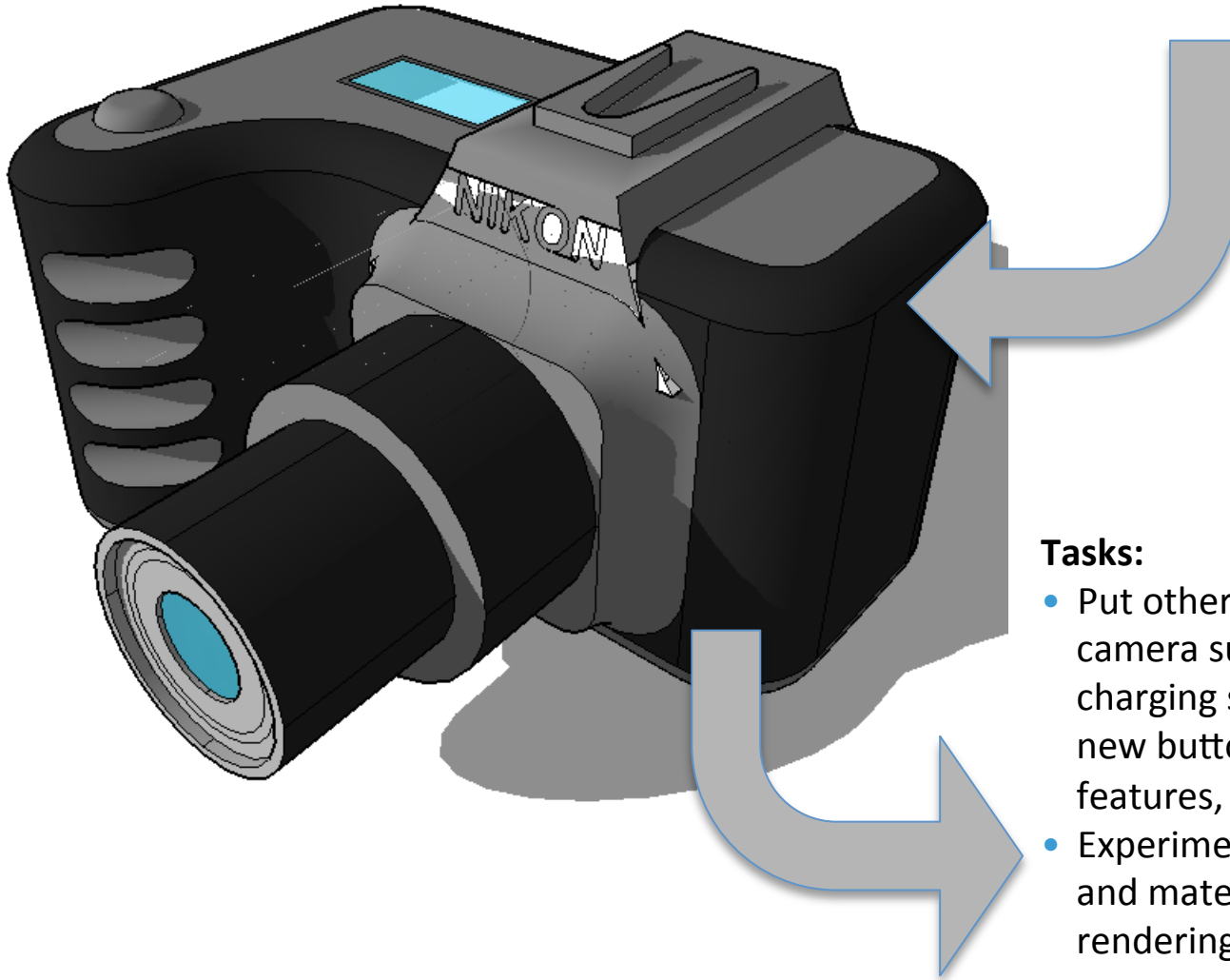**65.** Use your own skills to add more details

66. Use your own skills to add more details

67. Click *View – toolbars* and un-tick axis. Place a tick next to shadows

Tasks:
- Put other details on the camera such as a charging socket, flash, new buttons and features, etc.
- Experiment with colours and materials for rendering.

Extension

- Design your own SLR camera and its relevant detail………..