

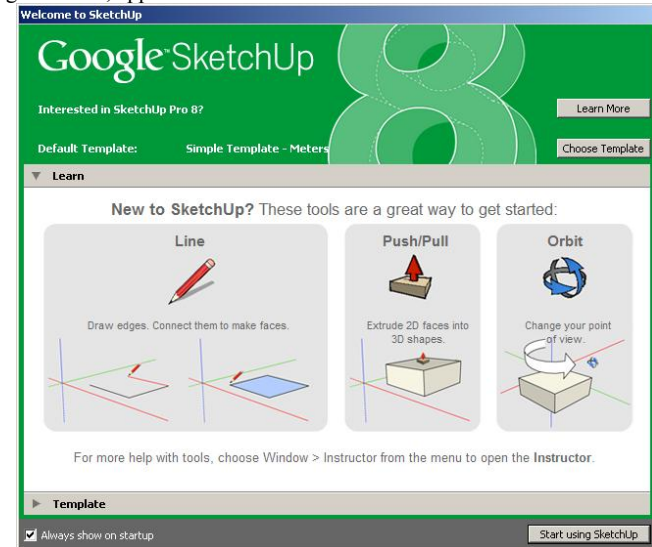
SketchUp Workshop

I.E.S. Llano de la Viña (Villatorres)

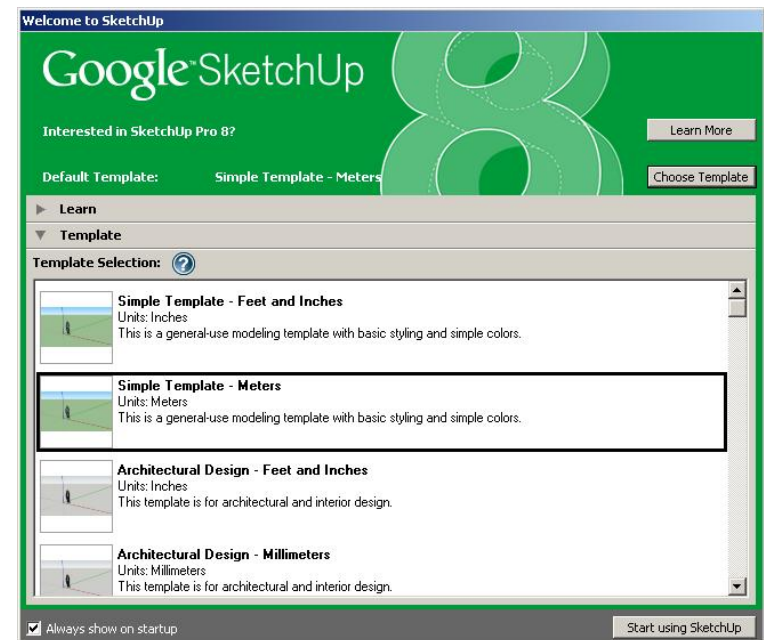
November 2015

Beginning with SketchUp:

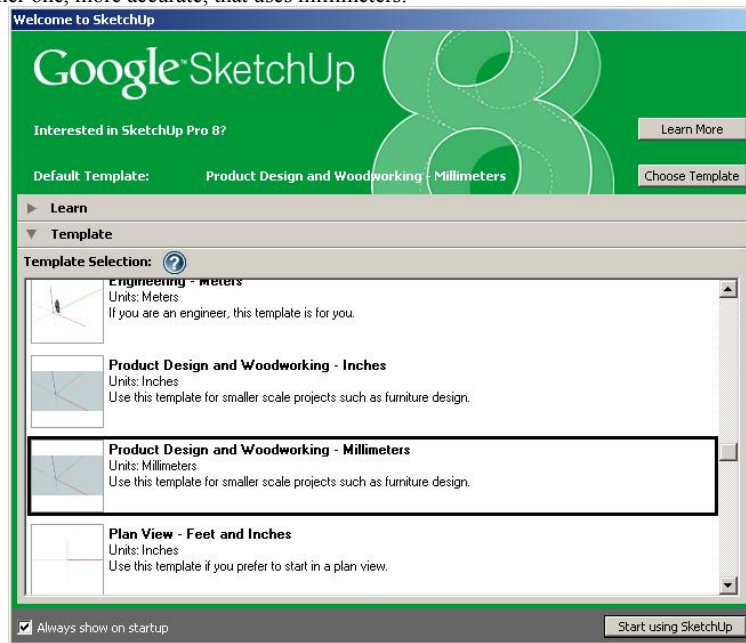
When the program starts, appears a window like this:



At this moment, we can choose the kind of Template pressing the button "**Choose Template**". For example, in the next template the units are in meters: We can skip the window pressing "Start using SketchUp"



Or another one, more accurate, that uses millimeters:

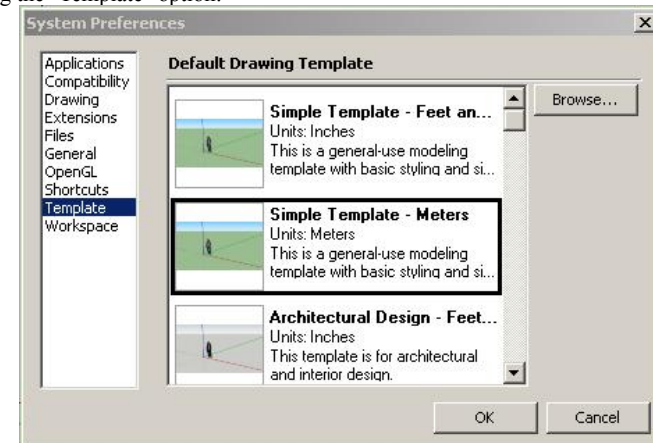


We choose a template and press "Start using SketchUp"

If we skip this window, there's no problem. We can choose the template again through the menu option Window → Preferences



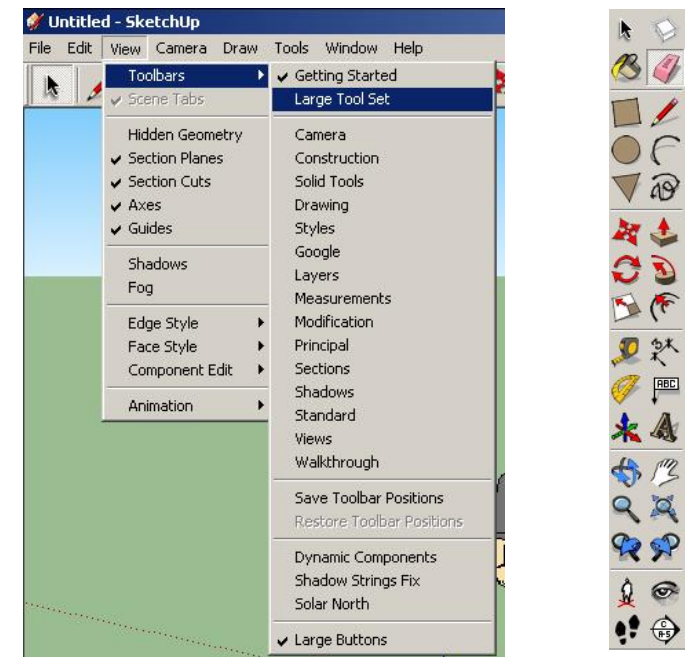
And selecting the "Template" option:



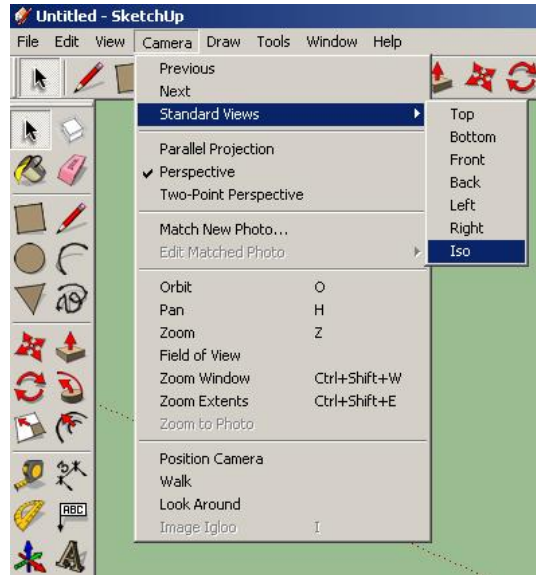
If you use this method, you need to **restart sketchUp** to apply the change in the Template.

Display appearance

Using the menu option **View → Toolbars**, we can expand the number of tools that are displayed on the screen. Choose "Large tool set" to get the largest number of tools.



It is also important to **choose the proper display of the axes**. We can decide between the different options in the menu "Camera". Try different perspectives.

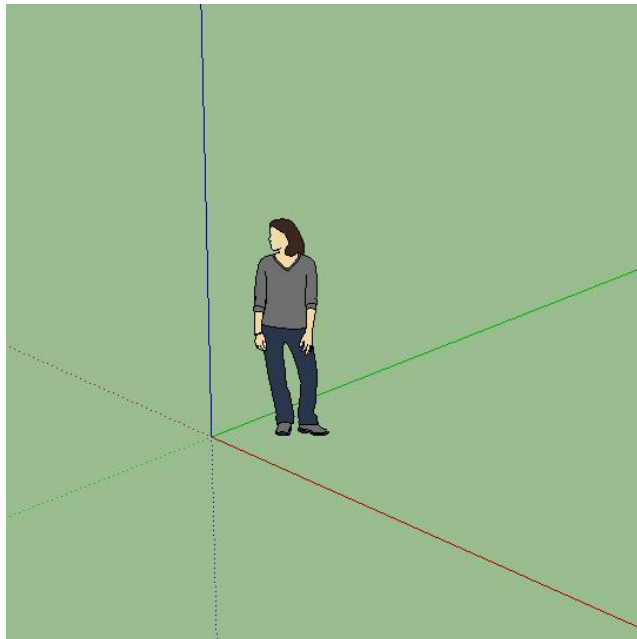


The Axes have different color to represent a different dimension:

- Blue Axis: Height
- Red Axis: Width
- Green Axis: Depth

When we want to draw a line parallel to any axis, the path you are doing will become the same color as the parallel axis.

The human figure helps us to get an idea of the size of the drawing.



Working in 3D

The easiest way to create models in SketchUp consists of:

- Creating 2D faces or shapes and transforming into a 3D geometry using the Push/Pull Tool.

Viewing a Model in 3D Space

There are several tools in SketchUp for viewing your model in 3D space. The most commonly used camera tools are:

The Orbit Tool



Use the Orbit Tool to rotate the camera about the model. To orbit your model:

1. Click on the Orbit Tool in the toolbar. The cursor changes to two interconnected perpendicular ovals.
2. Click anywhere in the drawing area.
3. Move your cursor in any direction to rotate around the center of the drawing area.

The Pan Tool



Use the Pan Tool to move the camera (your view) vertically and horizontally. To pan using the Pan Tool:

1. Click on the Pan Tool. The cursor changes to a hand.
2. Click anywhere in the drawing area.
3. Move the cursor in any direction to pan.

The Zoom Tool



Use the Zoom Tool to move the camera (your view) in or out.

1. Click on the Zoom Tool in the toolbar. The cursor changes to a magnifying glass.
2. Click and hold anywhere in the drawing area.
3. Drag the **cursor up to zoom in** and **down to zoom out**.

Using the mouse to Zoom: You can also Roll the scroll wheel forward/back to zoom in/out your model.

(**Zoom in** = closer to the model. **Zoom out** = farther from the model)

The Zoom Extents Tool




Use the Zoom Extents Tool to zoom your view to a distance where the whole model is visible and centered in the drawing area.

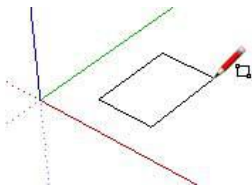
Creating Geometry with the Push/Pull Tool



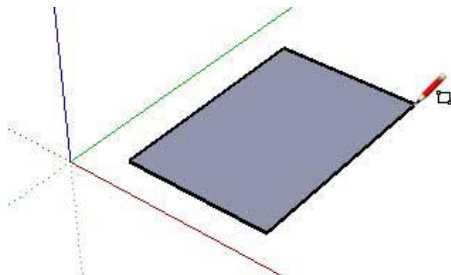
Use the Push/Pull Tool to push and pull faces to add volume to or subtract volume from your models. You can use push/pull to create volume out of any face type, including circular, rectangular, and abstract faces.

Preparing to Use the Push/Pull Tool

1. Click on the Rectangle Tool.  The cursor changes to a pencil with a rectangle.
2. Click anywhere in the drawing area to set the first corner point of the rectangle.
3. Move the cursor diagonally. A rectangle will expand out from the first corner point.



4. Click again to set the second corner of the rectangle. A rectangular face is created bordered by four edges.

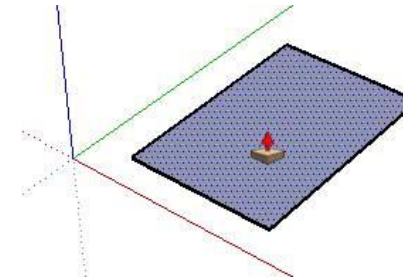


Using the Push/Pull Tool

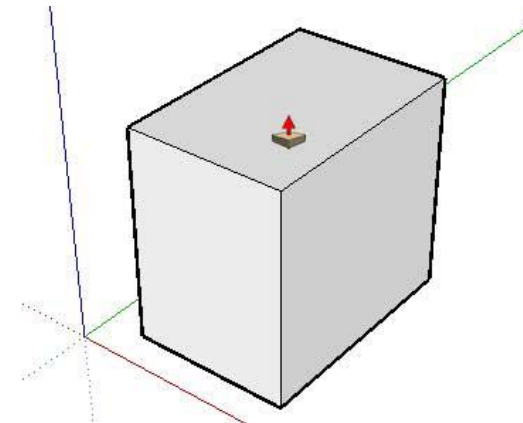


To push or pull a face:

1. Click on the Push/Pull Tool. The cursor will change to a 3D rectangle with an up arrow.
2. Click on the rectangular face created in the previous exercise.



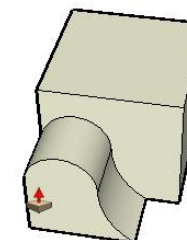
3. Move the cursor to create (or decrease) volume and create a prism.



Press the **Esc** key at any point during the operation to start over.

4. Click when the volume has reached the desired size.

You can use the Push/Pull Tool to create volume from any shape:

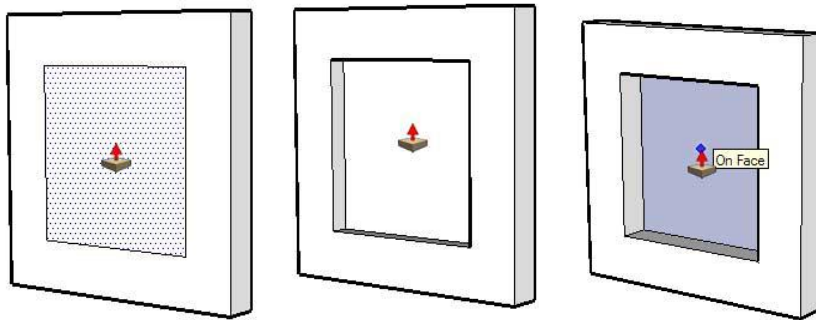


Creating Voids (Holes) with Push/Pull

You can create a void, or empty space.

1. Draw a 2D shape on 3D geometry.
2. Use the **Push/Pull Tool** to push the 2D face until it **meets the back face** of the 3D geometry. We have to **release the mouse** at this point to create the void.

The following three images demonstrate how to push/pull a 2D face that is drawn on 3D geometry to create a void (hole).



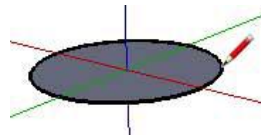
Drawing Shapes with the Circle, Arc, and Rectangle Tools

Drawing Circles

Use the Circle Tool to draw circle entities.



1. Select the **Circle Tool**. The cursor changes to a pencil with a circle.
2. Click to place the **center** point of the circle.
3. Move the cursor out from the center point to define the **radius** of your circle. As you move the cursor, the radius value is displayed dynamically in the Measurements Toolbar and can be specified by typing in a length value followed by pressing the **Enter**.



Press the **Esc** key at any point during the operation to start over.

Drawing Arcs

Use the Arc Tool to draw Arc entities.



Arc entities consist of three parts: the **starting point**, the **ending point** and the **bulge distance**. The distance between the starting point and the ending point is also known as the chord length. To draw an arc:

1. Select the **Arc Tool**. The cursor changes to a pencil with an arc.
2. Click to place the **starting point** of your arc.
3. **Move** the cursor to the ending point of your chord.
4. Click to place the **ending point** of your arc. A straight line is created.
5. **Move** your cursor perpendicular to the straight line to adjust the **bulge distance**. A straight line will extend perpendicular from the straight line.

When the distance is equal to a **Half Circle**, a label appears.



Note: Press the "Esc" key at any point during the operation to start over.

6. Click to **set the bulge distance (arc amplitude)**.

Drawing Rectangles



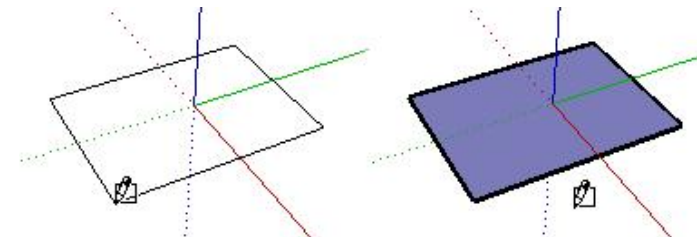
Use the Rectangle Tool to draw rectangular Face entities, specified by clicking at **two opposite corners** of the desired shape.

Rectangles can be placed on existing faces or separate from existing geometry (aligned to an axes plane). To draw a rectangle:

7. Select the **Rectangle Tool**. The cursor changes to a pencil with a rectangle.
8. Click to set the **first corner point** of the rectangle.
9. Move the cursor diagonally.

Note: Press the **Esc** key at any point during the operation to start over.


10. Click again to set the **second corner point** of the rectangle.



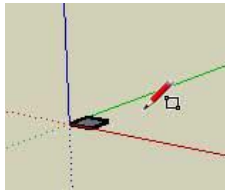
Creating your first model

(A) Creating a chair in SketchUp: The subtractive approach

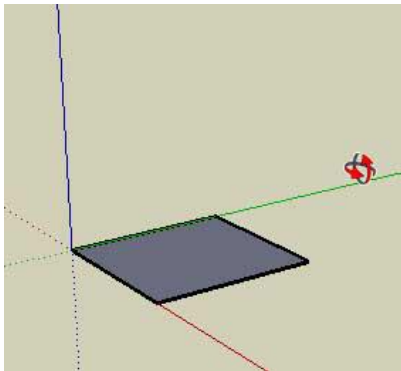
You will create a chair by subtracting volume from a 3D form in this exercise. We use the Push/Pull tool **to remove the pieces** of the form that will not be in the final model:


1. Select the **Rectangle** tool. 
2. Click to set the first corner point of the rectangle.
3. Move the cursor diagonally.
4. Type **18, 18** (or **0,5; 0,5** if the dimensions are in meter) and press the **Enter** (Microsoft Windows) key. Your dimensions appear in the Measurements toolbar and the rectangle will snap to 18 by 18 inches. (**0,5 by 0,5 meters**)

Dimensions 18", 18"

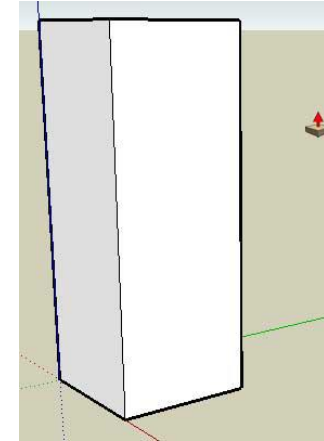



5. Zoom, orbit, and pan to such that your rectangle is large enough to push/pull with the Push/Pull tool.



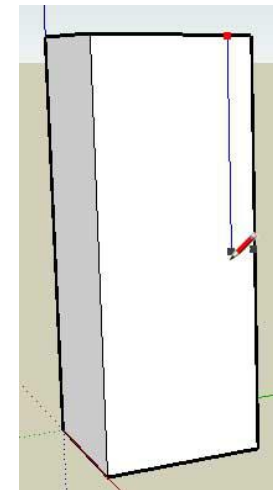
6. Select the **Push/Pull** tool. 
7. Click on the rectangular face.
8. Move the cursor to create (or decrease) volume.
9. Type **4'** (or **1,2** if the dimensions are in meter) and press the **Enter** (Microsoft Windows) or **Return** (Mac OS X) key. Your dimensions appear in the Measurements toolbar and the rectangle will expand up and snap to 4 feet (**1,2 meters**).

Distance 4'

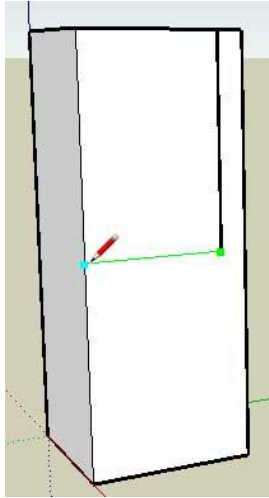


10. Select the **Line** tool. 

11. Draw a line from a top, horizontal, edge, (vertically) about half-way down your model.



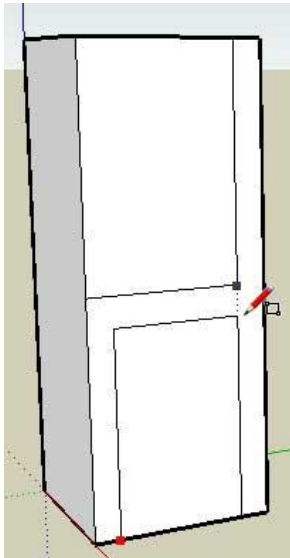
12. Draw a line from the ending point of the last line horizontally until you meet a vertical edge.



13. Select the **Rectangle** tool.



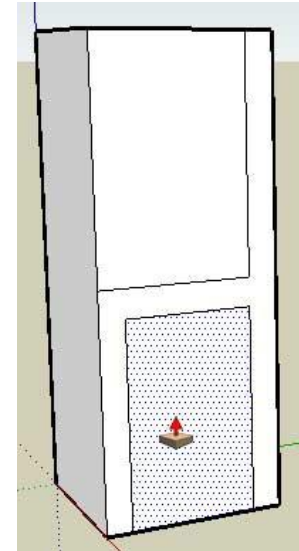
14. Draw a rectangle to represent the space between the legs of the chair. The profile of a chair is now drawn on one side of your model.



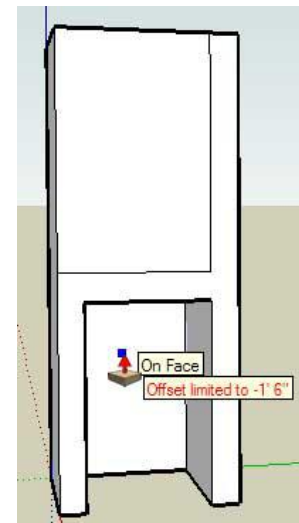
15. Select the **Push/Pull** tool.



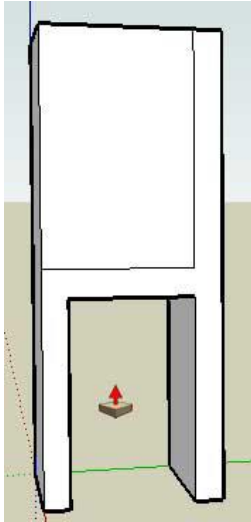
16. Click on the rectangular face you just drew between the legs.



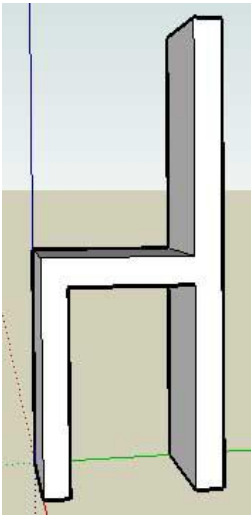
17. Push the rectangular face until it meets the back of the model. The tool tip should say 'on face' when the cursor has met the back face of the model.



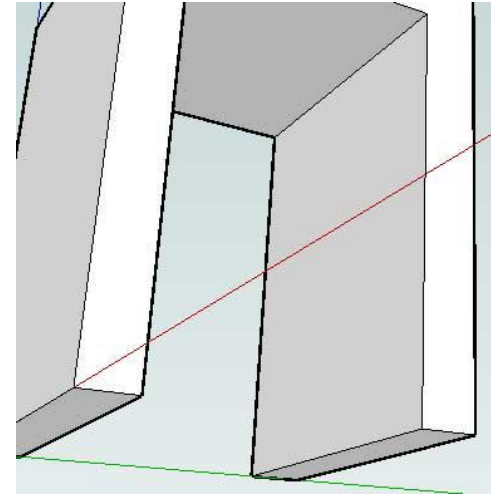
18. Click to remove the area below the seat of your chair. The area below the seat of your chair should disappear.



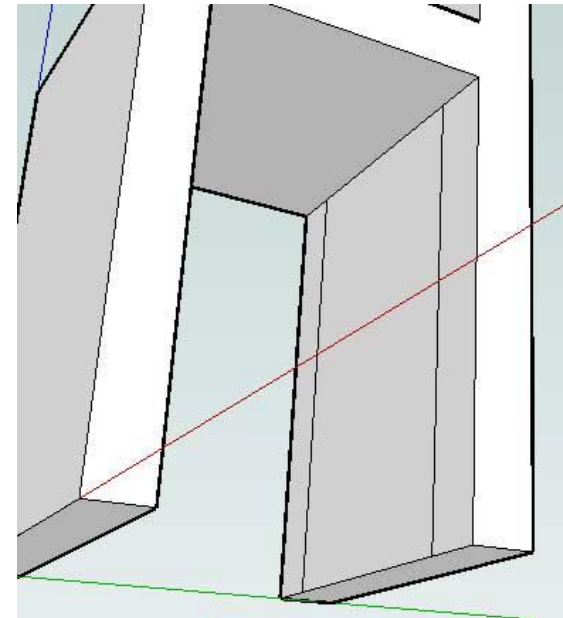
19. Remove the area above the seat and against the back by repeating the process you just used to remove the area below the seat. Your model should now closely resemble a 3D chair (without individual legs).



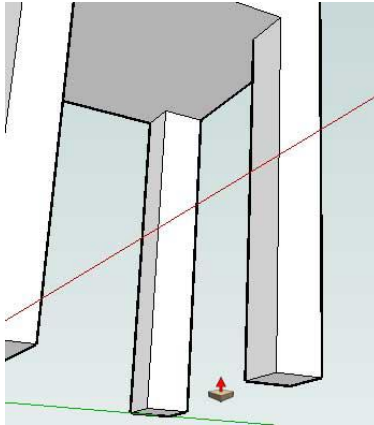
20. Zoom, orbit, and pan under the chair so that you are facing the back legs.



21. Use the Rectangle tool to draw a rectangle that represents the space between the two back legs.

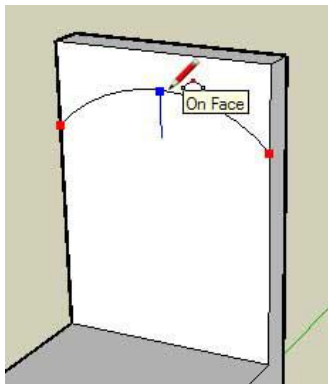


22. Use the Push/Pull tool to remove the area between the back legs.

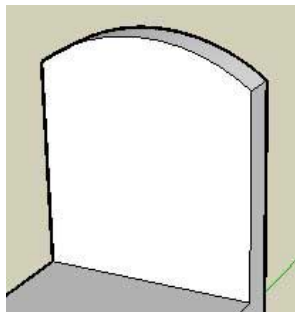
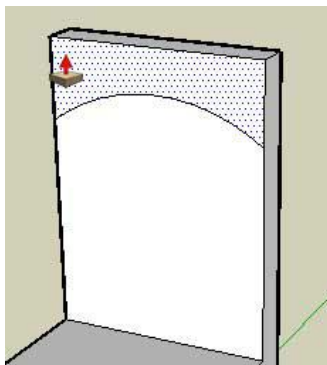


23. Repeat the three previous steps with the front legs.

24. Draw an arc across the top of the back starting just below the left side of the back of the chair. A separate face will be created at each corner of the top of the chair.



25. Use the Push/Pull tool to remove the two areas at the top of the chair and create a rounded chair back.

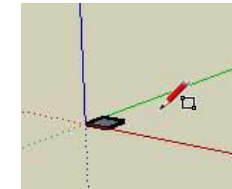


(B) Creating a chair in SketchUp: The additive approach

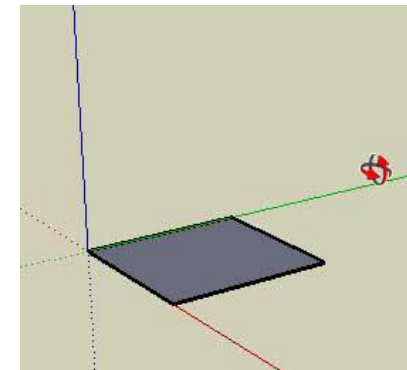
You will create a chair by starting with a chair seat and **adding the legs and back**. To create a chair using an additive approach:

1. Select the **Rectangle** tool.
2. Click to set the first corner point of the rectangle.
3. Move the cursor diagonally.
4. Type **18, 18** (or **0,5; 0,5** if the dimensions are in meter) and press the **Enter** key. Your dimensions appear in the Measurements toolbar and the rectangle will snap to 18 by 18 inches. (**0,5 by 0,5 meters**). You are creating a chair seat.

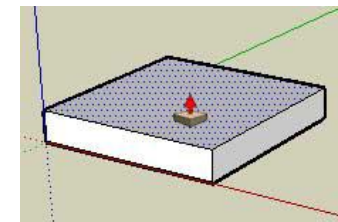
Dimensions: 18", 18"



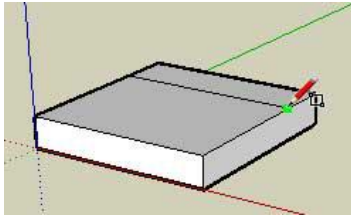
5. Zoom, orbit, and pan to such that your rectangle is large enough to push/pull with the Push/Pull tool.



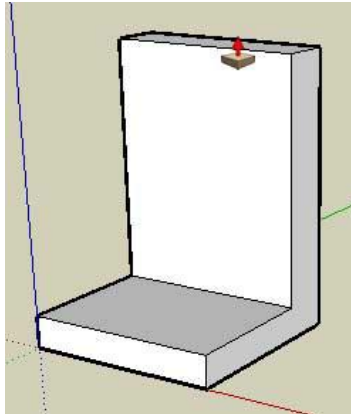
6. Select the Push/Pull tool.
7. Click on the rectangular face.
8. Move the cursor to create the seat thickness.



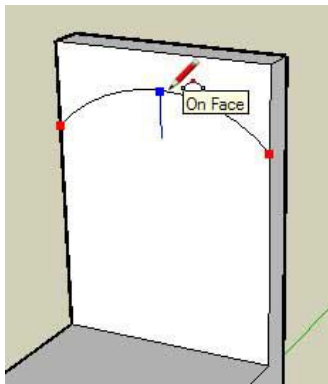
9. Draw a line toward the back of the seat to represent the profile of the seat back.



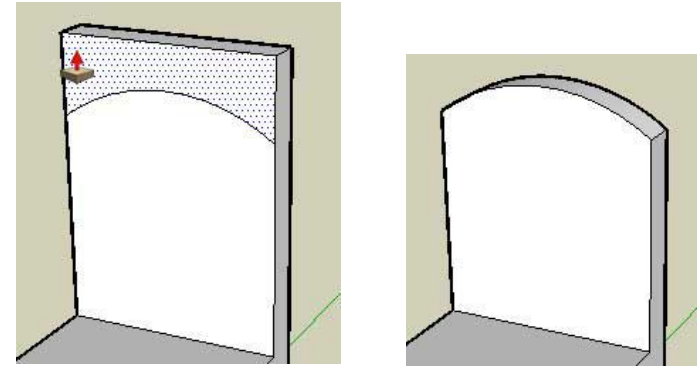
10. Use the Push/Pull tool on this rectangle to create the seat back.



11. Draw an arc across the top of the back starting just below the left side of the back of the chair. Two separate faces will be created at each corner of the top of the chair.



12. Use the Push/Pull tool to remove the two areas at the top of the chair and create a rounded chair back.

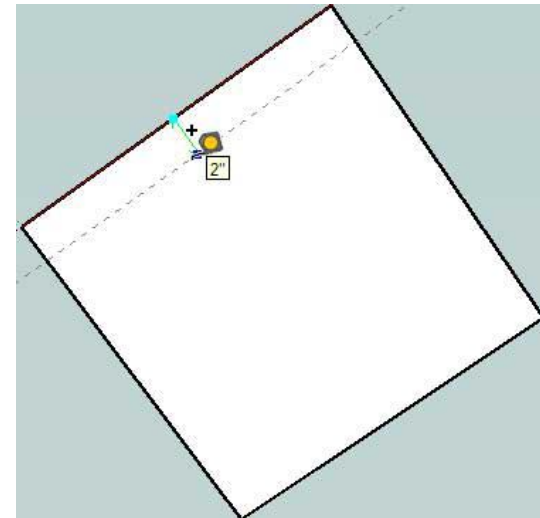


13. Zoom, orbit, and pan to such that you can view the bottom of the chair seat. Refer to Viewing a Model in 3D Space for further information.

14. Select the **Tape Measure** tool. 

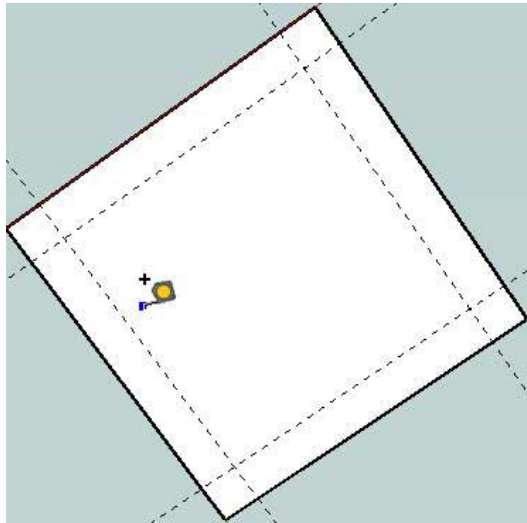
15. Click on one edge of the chair bottom.

16. Move the cursor to away from the edge. A guide line will be drawn perpendicular to the line. Guide lines help you draw geometry to a specific dimension. (2" = 0,05 meters)

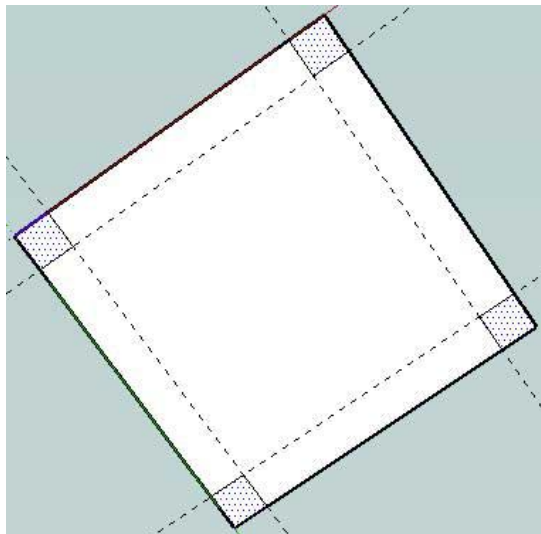


17. Type 2 (or 0,05 if the dimensions are in meter) and press the **Enter** (Microsoft Windows) or **Return** (Mac OS X) key. Your dimensions appear in the Measurements toolbar and a guide will be created 2" (or 0,05 m) away from the edge.

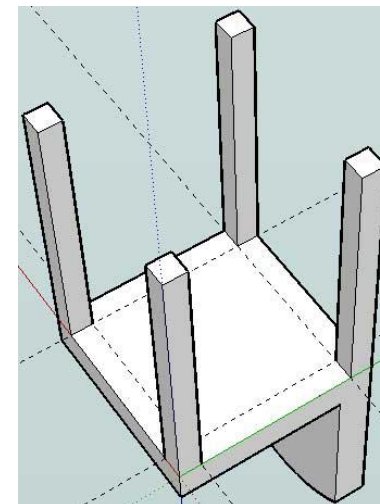
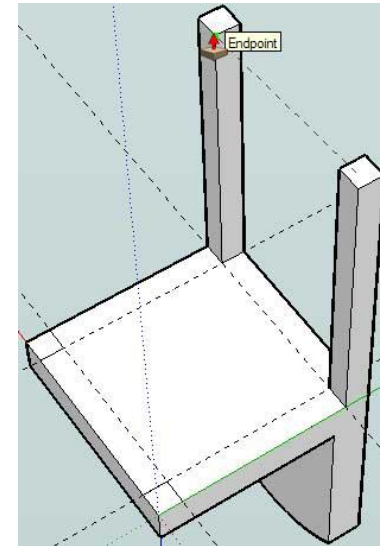
18.Repeat steps 15-17 to create three more guides. Your model should look like the following:



19.Use the Rectangle tool to create the profiles of each chair leg within each corner of the chair bottom. The Rectangle tool will snap to each guide in the corner to make accurate 2" x 2" (0,05x0,05m) legs. The following picture shows the resulting four rectangular faces in each corner of the chair bottom.



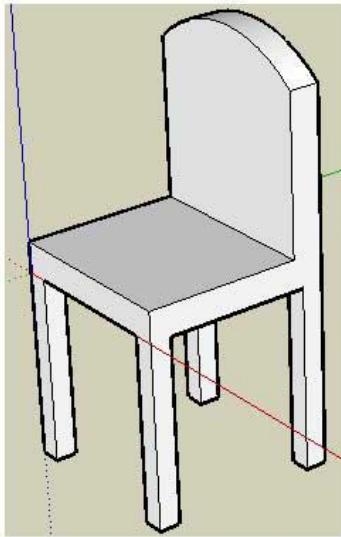
20.Use the Push/Pull tool to create the legs from the four faces created in the previous step. You can use inference to align length of the second through fourth leg to the length of the first leg.



21.Use the Eraser tool to erase all of your guide lines.






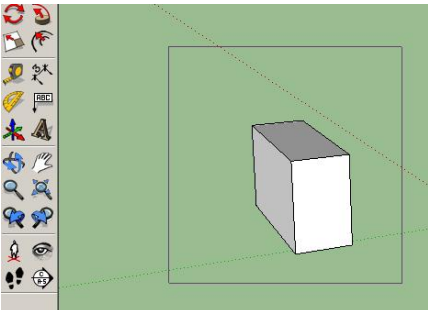
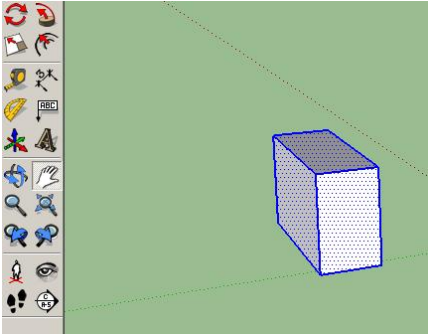









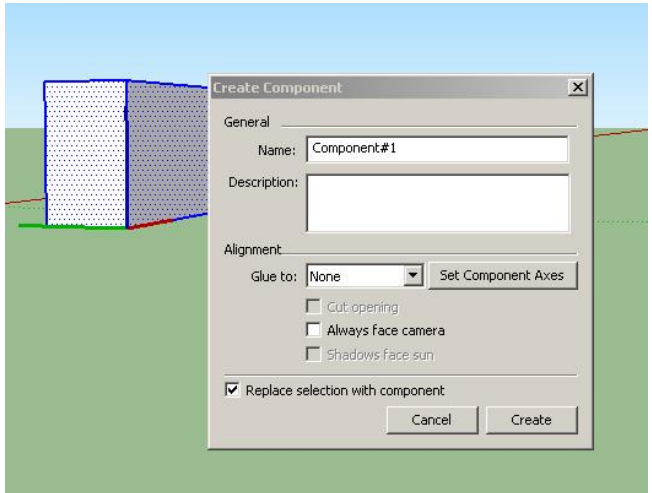


22.Zoom, orbit, and pan to view the chair in its normal, upright, position.


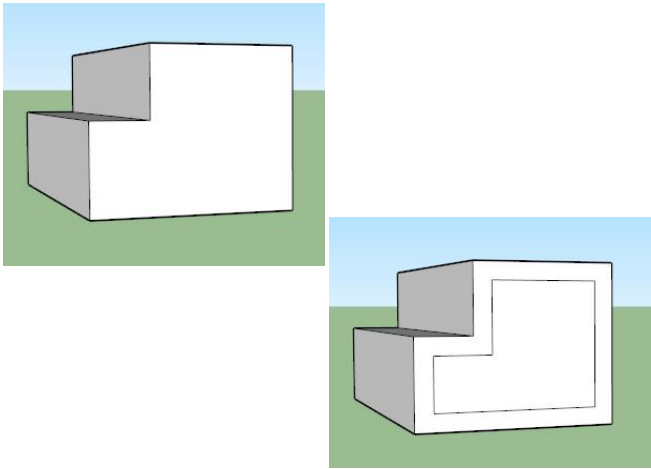

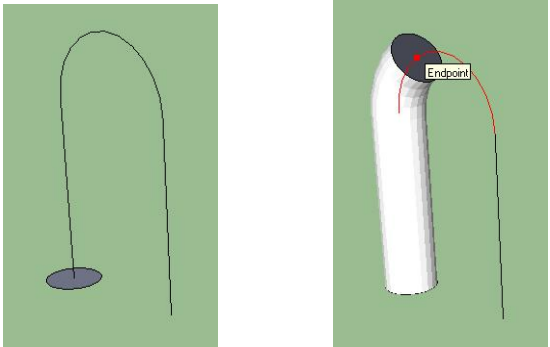



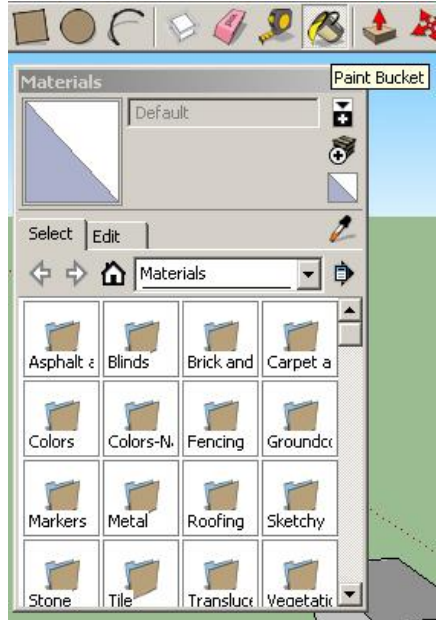







Glossary of main Tools and Commands


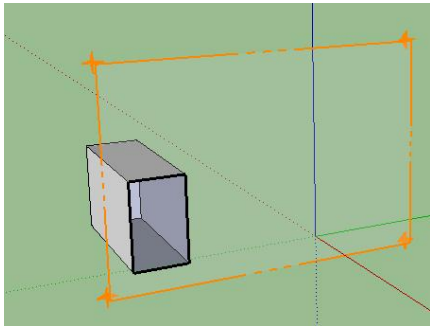
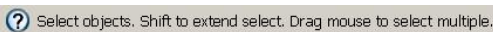

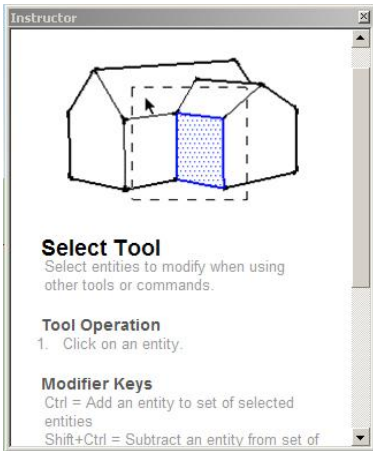



Icon	Tool	Description
	Line	Draw edges or lines from point to point. For drawing straight lines between two points . Click on every point to create a line. When we want to draw a line parallel to any axis, the path you are doing will become the same color as the parallel axis. The program alerts you to important points of an object (End point, Middle point, Intersection...)
	Rectangle	Draw rectangular faces from corner to corner. Click and drag the mouse to perform the rectangle or square. When the drawing is a square, a diagonal dotted line appears. If you want to specify an exact dimension, you can type the concrete value on the "Measurement box". This box changes his name according to the appropriate kind of measure: Length, Dimensions, Radius, Sides...
	Circle	Draw circles from center point to radius. This tool draws a circle by clicking in the center and dragging to encompass the desired radius. You can type the exact Radius in the Measurements Box.
	Polygon	Draw polygons from center point to radius. This tool draws a polygon in a similar way to the previous tool. On the "Measurement box" you can choose the sides of the polygon before clicking on the center of the polygon.
	Arc	Draw arcs from point to point with bulge. You have to click on the first extreme after on the last , and finally adjust the bulge (arc amplitude) . When you reach the distance for Half Circle , a message is shown.
	Freehand	Draw freehand lines by clicking and dragging.
	Push / Pull	Push and pool face entities to sculp 3D models. This is the tool used for create a 3D figure from a 2D surface . You can pull from a surface (that appears dotted when the cursor is on it) or push to create a hole (void) . In the dimension box you can type the exact dimension for the height or depth.

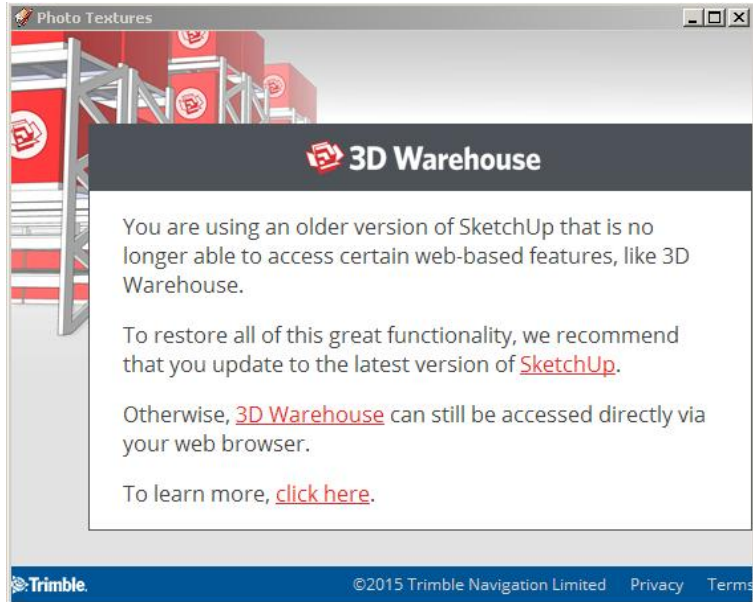





Icon	Tool	Description
	Eraser	Erase entities in the model. This tool deletes lines, surfaces, geometric bodies or components as on paper. Pay attention to the different options in the advices of the status bar.
	Move	Move, stretch, copy and array selected entities. If you select this tool, you can move an object by clicking on it and dragging the mouse. It's easier if you block one of the dimensions. To do this, hold the cursor key corresponding to the size you want to block, while dragging the mouse.
	Rotate	Rotate, stretch, copy and array selected entities about an axis. Similarly to the previous tool, you can rotate an object. You can rotate in any plane of projection. A protractor appears to help you choose the angle of rotation.
	Axes	Move or reorient the drawing axes
	Select	<p>Select entities to modify with other tools or commands. You can select different entities: lines, surfaces, objects, figures... by clicking on them with the mouse cursor or drawing a rectangle around the figure that we want to select:</p>  <p>The selected object is highlighted with blue lines:</p> 
	Orbit	Rotate the camera about the model. With this tool you can rotate the display until the desired viewing angle.



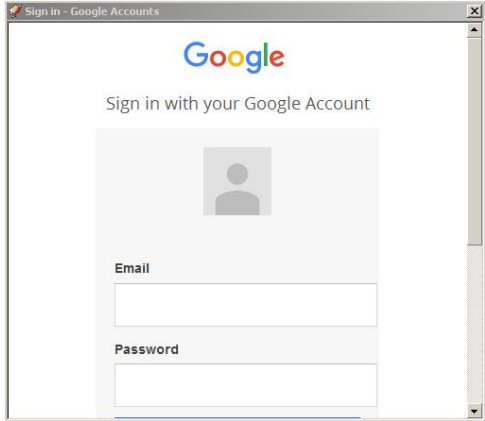

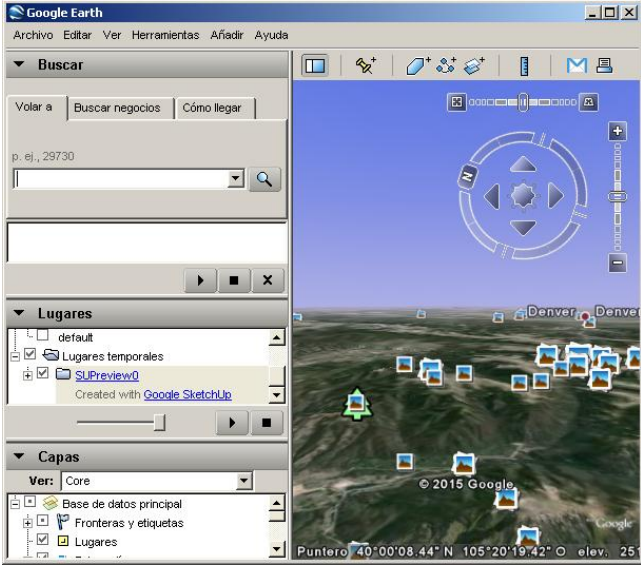
Icon	Tool	Description
	Pan	Move the camera (your view) vertically or horizontally. This is for moving the screen as a scroll effect, by clicking and dragging the mouse.
	Tape Measure Tool	Measure distances, create guide lines. With this tool you can take measurements between two points of the design. You can also draw guide lines parallel to another (taken as reference line) to the distance you choose. The guide lines are shown as dotted lines.
	Protractor	Measure angles and create angular guides.
	Dimension	Draw dimension lines between any two points.
	Scale	Resize and stretch portions of geometry relative to other entities in model. You can resize the selected entities, according a certain reference direction.
	Make component	<p>Make a component from the selected entities. When a component is selected, you can create a model using the selection. The tool is highlighted only when there is something selected. When you use the tool appears a window where you can choose several options like a name, a description, the alignment conditions...</p> 
	Text	Draw text labels. This tool is used to add plain text to the drawing. The text may be referred to any object with an arrow or without any reference (on the "air").
	3D Text	Draw 3 Dimensional text using any font. You can also add 3D text, that can be placed in any of the surfaces created.

Icon	Tool	Description
	Offset	<p>Create copies of the lines at a uniform distance from originals. You can use this tool for drawing parallel (outer or inner) lines around a surface.</p> <p>Example:</p> 
	Follow Me	<p>Duplicate a face along a path.</p> <p>This tool extends a pattern through a path. It creates a 3D figure from a 2D surface (a profile or pattern). Follow the next instructions:</p> <ol style="list-style-type: none"> 1. Identify edge of geometry to modify. (This edge is the path). 2. Draw a face perpendicular to the path. (This is the pattern). 3. Select the line (or lines, with "Ctrl") or surface along which the pattern will extend. 4. Click on "Follow Me" tool. 5. Click on the face to extend (the pattern). <p>Example:</p> 

Icon	Tool	Description
	Paint bucket	<p>Apply color and material to entities in the model. You can fill in color any surface using the colors or patterns of the "Materials" window.</p> 
	Zoom	Move the camera (your view), in or out.
	Zoom extents	Zoom the camera view (in or out) to show the entire model.
	Previous	Undo to the previous camera view (if possible).
	Next	Redo to the next camera view (if possible).
	Position Camera	Position camera (your view) at a specific eye height to check line of sight or walk through model
	Look around	Pivot camera (your view) from a stationary point.
	Walk	Walk through (tour) a model.

Icon	Tool	Description
	Section Plane	Create section cuts effects enabling you to view geometry within a model. Example: 
Notification Bar		Shows notifications about the tool in progress. 
Notification Bar Icons		
	Show / Hide Instructor	To show or hide the instructor window. 
	Geolocation	Add a geolocation to the model and gather site information nearby.
	Credits	To recognise or attribute the authority of a material.
	Signed-in / Not Signed-in	If you have got a google account, you can sign in (and finally sign out) and use it for additional utilities.

Icon	Tool	Description
3D Warehouse and Google Earth Tools Some of the next tools are not available via SketchUp 8, but it's possible to access through the web browser.		
		
SketchUp shows this message when this fact occurs.		
Icon	Tool	Description
	Add Location	Add a geolocation to the model and gather site information nearby.
	Toggle Terrain	Use the Toggle Terrain button to toggle the Google Earth snapshot image between a 2D and 3D image.
	Add New Building	You can import designed buildings from the 3D Warehouse into SketchUp. SketchUp 6 announces that it's not possible access to the database. It also redirects you to a web direction where you can read instructions about how to do this.
	Photo Textures	To Apply photo-textures to the sides of your building. SketchUp shows the previous notice about the access to the 3D Warehouse.
	Get Models	Get a model from 3D Warehouse.

Icon	Tool	Description
	Share Component	Share the selected component to 3D Warehouse. Only when a component is selected. Then the tool is highlighted in blue.
	Share Model	Share this model to 3D Warehouse. You must Login on a google account. 
	Preview Model in Google Earth	Starts Google Earth window and Preview Model on a geolocation. 

Useful Commands		
Keys	Action	Description
Ctrl + Z	Undo	Undo the last command (if possible).
Ctrl + Y	Redo	Redo the last command (if possible).
Ctrl + S	Save	Save the File
Ctrl + N	New	Begin a new model
Supr	Delete	Delete the selected entity.