



INTERIOR DESIGN

VISUAL PRESENTATION



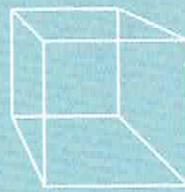
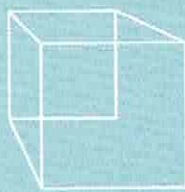
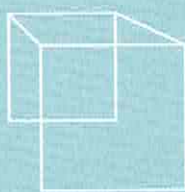
A Guide to Graphics, Models & Presentation Methods



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MAUREEN MITTON

WILEY



6

SketchUp and Digital Modeling

Currently interior designers and architects use a range of software to create three-dimensional models and related perspective views of space. AutoCAD, Revit, Rhino, 3ds Max, Cinema 4D, ArchiCAD, 3ds Max, and SketchUp create three-dimensional models. These models can be viewed digitally as well as printed, and some can be exported for virtual reality and 3D printing. Two-dimensional printed perspective views can be used as underlays for hand sketching, or rendered digitally within the originating program and/or can be imported into a secondary rendering program for use in design presentations and as a design tool.

Computer-generated three-dimensional images are accurate and provide great flexibility because changes can be made quickly and consistently. Many of the most elegant and complex three-dimensional modeling programs are time-consuming to master, with most design students learning how to use one or more of the programs while in school.

The focus of this chapter is the use of SketchUp modeling software for interior environments because this software is easy to use for quickly developing three-dimensional models and drawings. In addition, models generated in SketchUp can be imported into Revit and other modeling programs as well as virtual reality applications and with 3D printers.

Tips for Getting Started in SketchUp:

- SketchUp is available for both Mac and Windows platforms.
- Use of a three-button, scroll-wheel mouse is imperative.
- SketchUp is a graphic intensive program and requires a fast CPU and large amounts of RAM, a video card and video card driver that is 100% OpenGL compliant.
- ~~SketchUp Make is a free Internet download that works very similarly to SketchUp Pro. When downloading SketchUp, users will be given a free trial version of Pro, and may revert to Make when the trial period ends. The Make version allows for very similar modeling and rendering, however its limitations include not allowing: importing and exporting of CAD/Revit files, production of construction drawings, geo location, and other limitations.~~
- SketchUp has very accessible keyboard shortcuts. For example; to use the line tool, one can simply press the letter I on the keyboard. This does not require a capital letter is pressed nor does it require that the additional keys such as control or command keys are held down simultaneously. Throughout the chapter such keyboard shortcuts are noted.
- Use of the Escape key is helpful when one wants to end or suspend an action.

Getting Started in SketchUp

The SketchUp workspace and interface are compatible with the Mac and Windows operating systems. While many of the figures in this chapter illustrate working with the Mac OS version, variations between the two platforms are noted, with some additional Windows illustrations included.

Upon opening SketchUp, the welcome dialog box appears, as shown in Figure 6-1, this is the starting point for creating a model and appears every time you start SketchUp (unless you deselect the “always show on startup” check box). Here, one can select a template; the Simple Template is typically the default and the Architectural Design template works well for interior design modeling.

As illustrated in Figure 6-2, SketchUp opens with a default Menu bar, a Getting Started toolbar above the drawing window, and a Status Bar below the Drawing Window. The toolbar can be customized as shown in Figures 6-3, 6-4, and 6-5.



FIGURE 6-1

The "Welcome to SketchUp" dialog box appears on opening. Note the red arrow pointing to the location of the template tab.

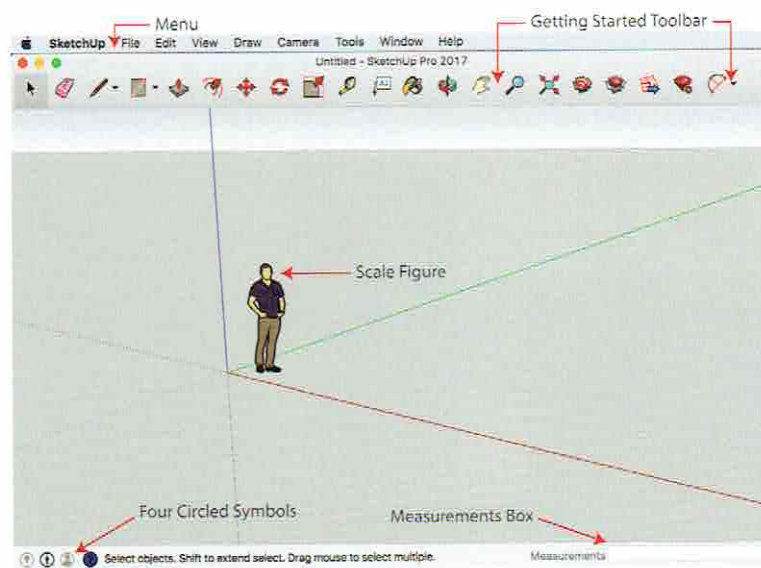


FIGURE 6-2

The architectural template and menu bar, toolbar, status bar, and drawing space.

Menu bar: Many SketchUp tools, commands, and settings are available within the menu bar. The menus are: SketchUp (Mac only), File, Edit, View, Camera, Draw, Tools, Window, and Help.

Getting Started toolbar: Contains the basic tools for modeling and appears by default.

Status bar: contains four circled icons (bottom left). Clicking the question mark icon displays the instructor window, which displays information about selected tools. The measurement box at right displays dimensions during drawing, and desired dimensions can be typed into the measurement box while drawing. Tip: If the measuring box disappears, try maximizing or moving the window up.

The Drawing window: The area where the model is drawn. The three-dimensional space is identified by the drawing axes that extend from the origin; the axes aid in providing direction and as drawing guide.

Scale figure: Can be removed by selecting (using selection arrow on toolbar) and right-click (context click) and selecting erase.

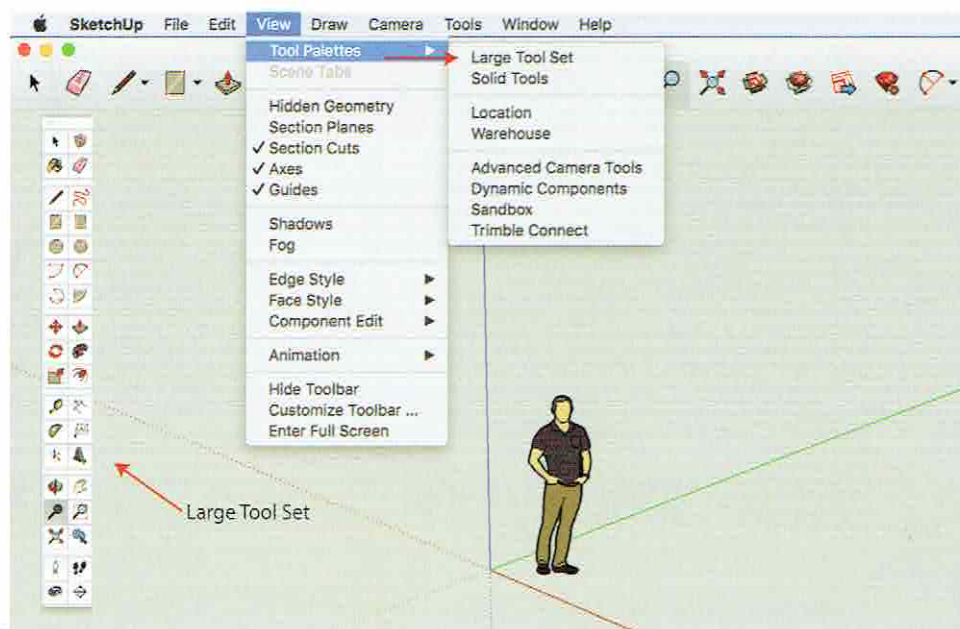


FIGURE 6-3

To increase toolbar options (and change the location/orientation of the toolbar): On a Mac, go to View > Tool Palettes > Large Tool Set. The Large Tool Set toolbar floats and can be moved as desired.

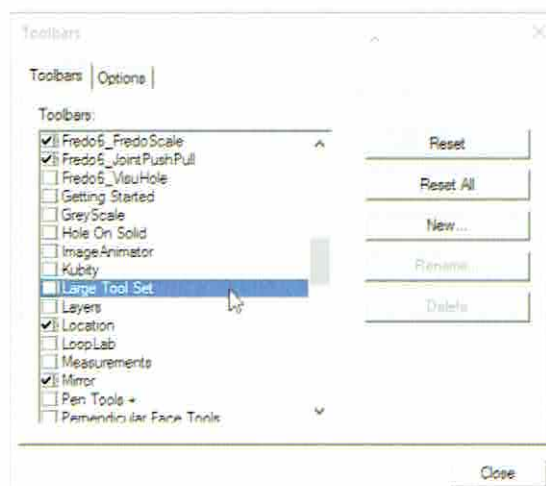


FIGURE 6-4

To add the Large Tool Set using Windows, go to View > Tool Palettes, and click the Large Tool Set box. The Large Tool Set toolbar floats and can be moved as desired.



FIGURE 6-5

To customize the toolbar (add more options), go to: View > Show Toolbar. This will give you a range of options, including those shown here, which can be dragged up to the toolbar area. Those circled are recommended (there are more options available; this image has been cropped for publication).

SketchUp Drawing Basics

Drawing First Steps

Figures 6-6 through 6-11 illustrate the basics of drawing in SketchUp with tools and techniques used to draw directly (without importing CAD or other files). Note that SketchUp employs some helpful keyboard shortcuts; these are noted in the information provided about using the various tools.

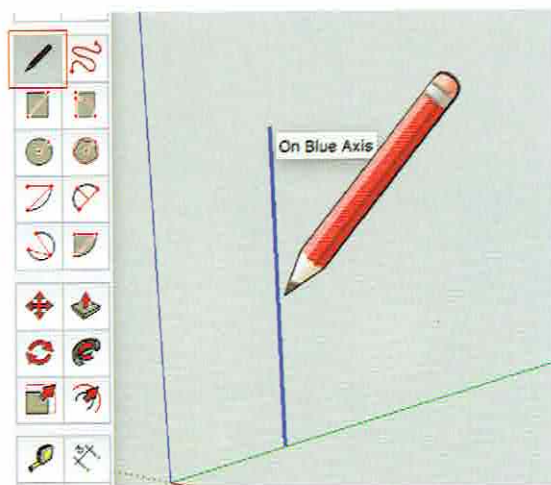


FIGURE 6-6

Using the axis and the Line tool. SketchUp uses a red, green, and blue axis as drawing reference points. In this case, the Line tool (icon framed in red) is being used to draw, parallel to the blue axis (upward); note the related screen prompt. The Line tool can also be accessed by pressing the L key.

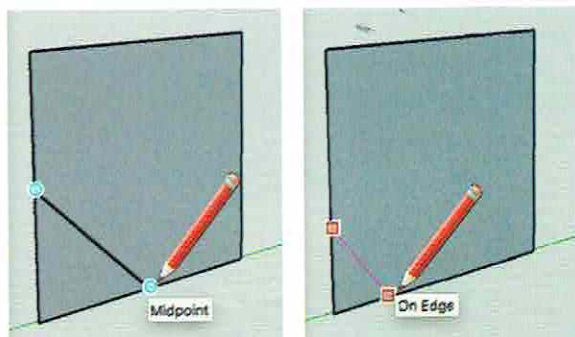


FIGURE 6-7

Using the inference engine. SketchUp's inference engine aids in modeling. For example, as shown, when the Line tool cursor hovers over the midpoint of another entity, the inference displays a light blue dot and prompt. As a line is drawn to an edge, that prompt appears (more about edges is found in Figure 6-14). Each inference has its own color and screen prompt.

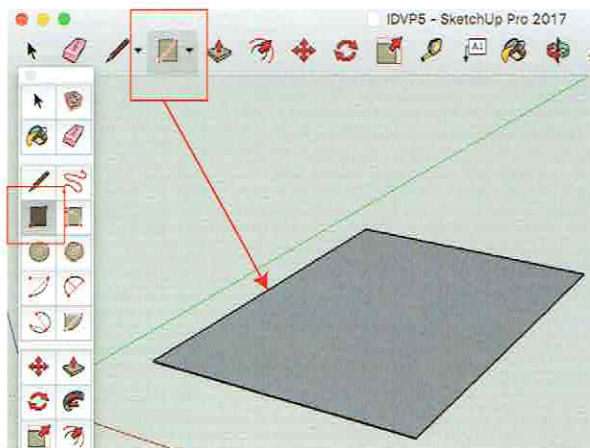


FIGURE 6-8

The Rectangle tool. Selection of the Rectangle tool (or pressing the R key) allows for the drawing of rectangular or square faces, by selecting the tool and then selecting the size of the face by clicking at two opposite corners of the desired shape. A closed series of edges (lines) form a "face." In order to further manipulate forms, a face must be created. The rectangle, square, circle/ellipse, and polygon tools all create faces. The Line tool is also used to draw closed shapes.

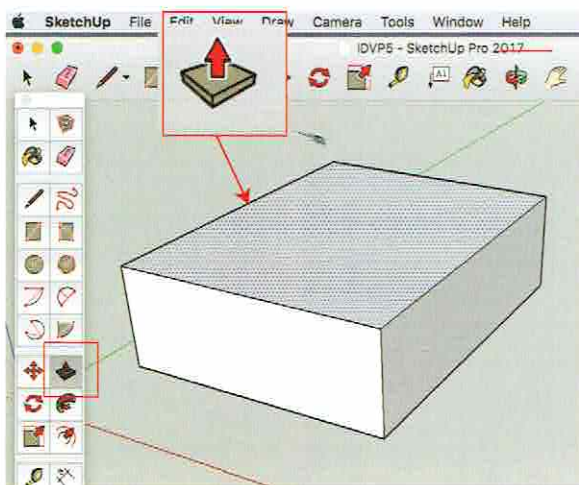


FIGURE 6-9

The Push/Pull tool. Selection of the Push/Pull tool (or pressing the P key) "pulls" or "pushes" a face, adding (or subtracting) volume. As the tool hovers over a face, that face shows that it is ready to be pulled up with the display of many dots inside the face.

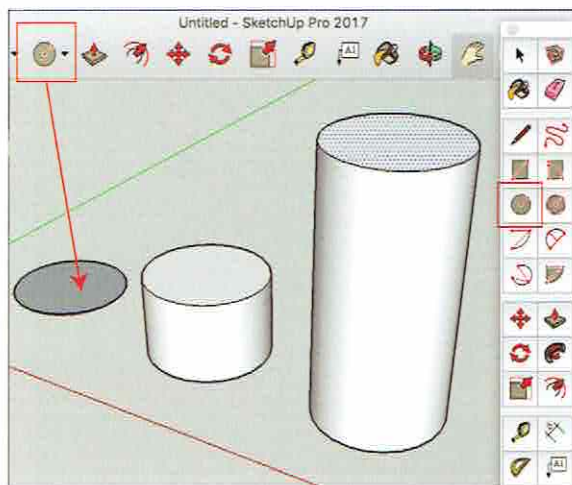


FIGURE 6-10

The Push/Pull tool is used to create volume in any face type. For example, the Circle tool (selected or accessed by pressing the C key) can be used to create a circle that is then pulled or extruded using the Push/Pull tool.

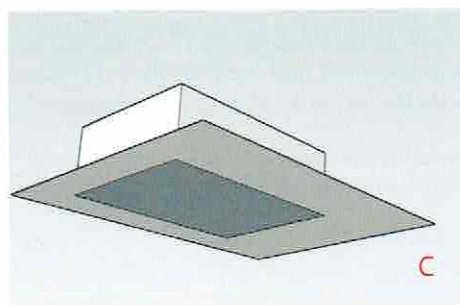
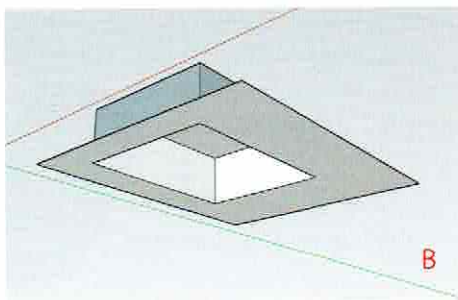
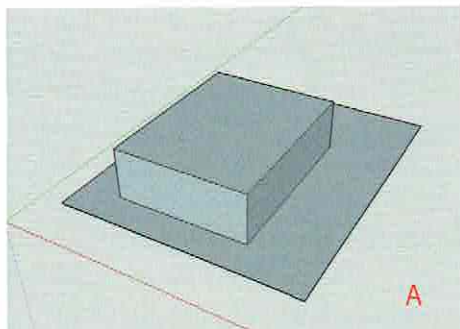


FIGURE 6-11

A warning about the Push/Pull tool: When pulling a face that is adjacent to another face, as shown in A, SketchUp will pull the adjacent face with it (as shown from the bottom in B). In order to keep the adjacent face intact (as shown in C), one must select the Push/Pull tool and press the Option key (Mac) or Control (Windows); this will display a + sign next to the tool.

Navigation Basics

Basic navigation is illustrated in Figures 6-12 and 6-13. Orbit, Pan, and Zoom can all be accessed via tools on the toolbar and by using mouse/keyboard shortcuts shown in Figure 6-12. The Views toolbar generates orthographic (top, right, back, and left) views (for use as plans, elevations, and sections) and can speed up navigation as well.

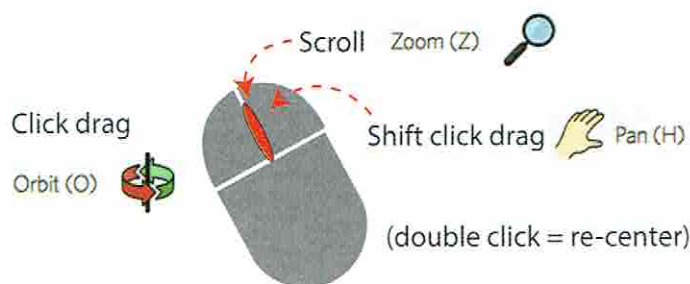
Selection

The Selection tool (arrow) is used to select entities and geometry; and to create selection windows. Consider this phrase when working in SketchUp: “select first, then do.” This means that the item must be selected before making any modification.

With the Selection tool active, entities are selected by clicking on them; alternatively, clicking and dragging also creates selection windows. With the tool active: one click selects only surfaces, two clicks select both surfaces and bounding edges, and triple clicking selects all connected geometry.

FIGURE 6-12

Some navigation tools.



This illustration indicates how to use the scroll wheel mouse to access navigation tools.

Zoom: Accessed by tool selection or by holding and rolling the scroll wheel. Control of the exact zoom area is done by placing the cursor over the desired area. **Zoom Tips:** Zoom slows down when closer to an object (and speeds up when accessed from far away). The **Zoom Previous** tool allows a step back, and **Zoom Extents** zooms and centers to the furthest extents of the model.

Orbit allows one to revolve around the model: It is accessed by tool selection or by pressing and dragging the scroll wheel.

Pan allows for sliding the scene back and forth; can be accessed by tool selection bar or by holding the keyboard Shift key down while orbiting. Pan is also accessed by pressing the scroll down, then pressing the left mouse button to reveal a context box.

Double-clicking the center scroll wheel centers the model.

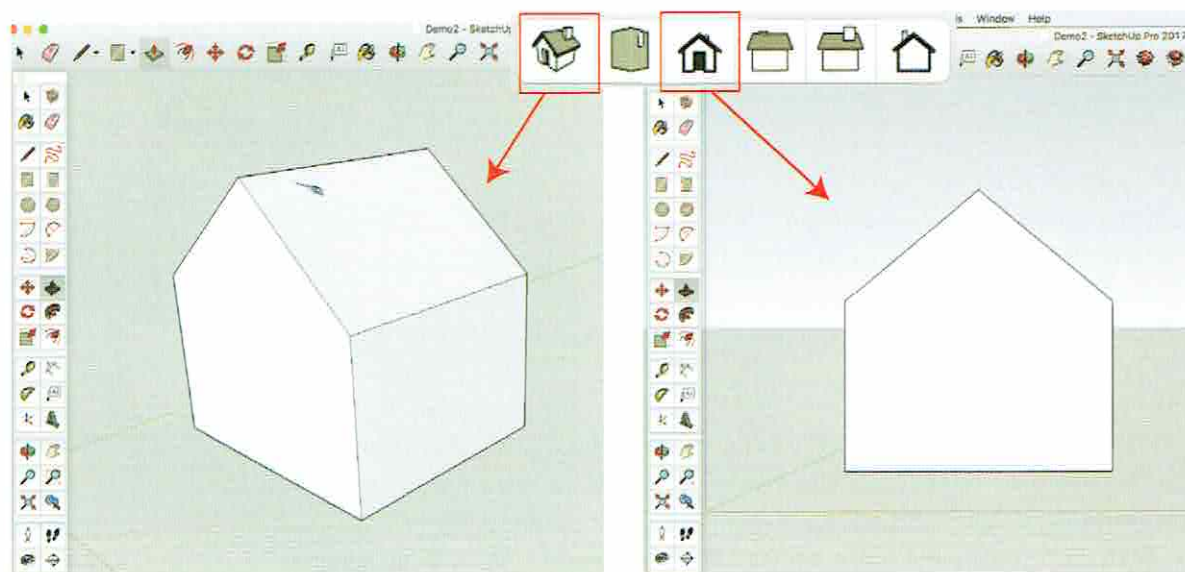


FIGURE 6-13

The **Views** toolbar: Selecting icons generates orthographic (top, right, back, and left) views and is a great aid in navigation and preparing drawings. The toolbar is added as described in Figure 6-4.

Multiple objects can be selected by dragging the selection window around several entities—what is selected is controlled by the direction of the mouse. Dragging to the left allows for selection of anything the window touches and is called a “crossing window.” Dragging toward the right creates the selection window and requires that the window includes all entities desired for selection (Figure 6-14).

Once an element or object is selected, it can be deleted using the Delete key. Selected lines and faces may also be deleted using the Eraser tool. (For more about deleting lines, see Figure 6-15b.)

Within the selection window, there are some helpful keyboard shortcuts. Holding the Shift key while operating the selection window allows individual elements within the window to be selected. Holding the Control key (PC) or Option key (Mac) *adds* entities; in contrast, holding the Control key (PC) or Option key (Mac) and the Shift key *subtracts* entities.

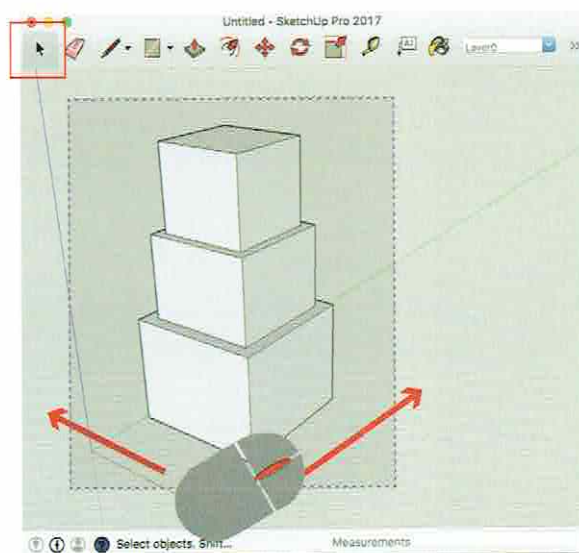


FIGURE 6-14
Selection tool.

A selection window is created by dragging toward the *right*, as shown, and requires that the window include all entities desired for selection—this is a more selective window. A crossing window is created by dragging to the *left* and selects everything the window touches; more items are selected with a single sweep by dragging to the left.

Keyboard shortcuts: Holding the Shift key with selection window active allows individual elements to be selected. Holding the Control key (PC) or Option key (Mac) adds entities; hold the Control key (PC) or Option key (Mac) and Shift to subtract entities.

More Drawing Basics

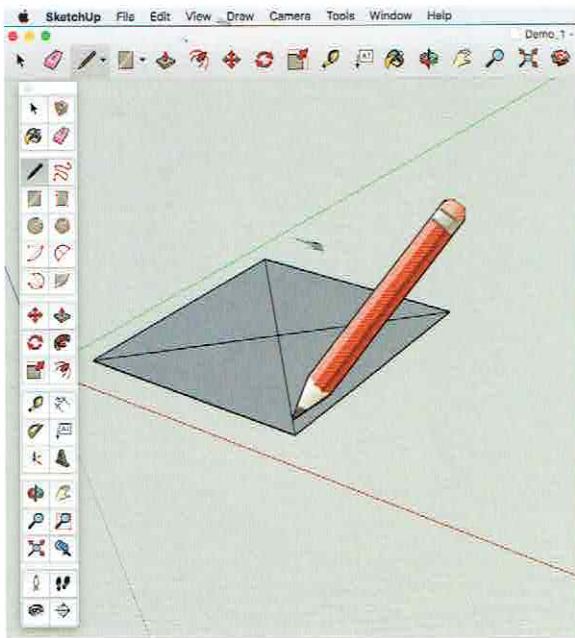
Figures 6-10 through 6-15 cover some additional basic drawing and modeling tools and information. What is provided here is intended as a primer to help in moving forward with this software. The reference section provides resources for gaining more advanced information.

Escape Key and Space Bar

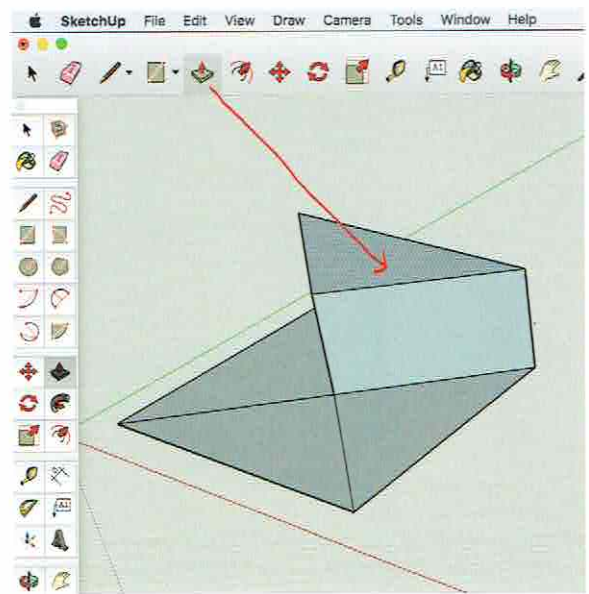
The Escape key interrupts or stops an operation, but it keeps the current tool selected. Tapping the Space Bar interrupts the operation and reverts to the Selection tool (arrow).

Dividing Lines, Splitting Faces

The Line tool and various shape tools can be used to split faces for modification, as shown in Figures 6-15a and 6-15b. SketchUp automatically splits a line segment when a new line is drawn perpendicular to that line, which allows that line to be deleted or modified. Lines can be divided into equal segments, as shown in Figure 6-15c.



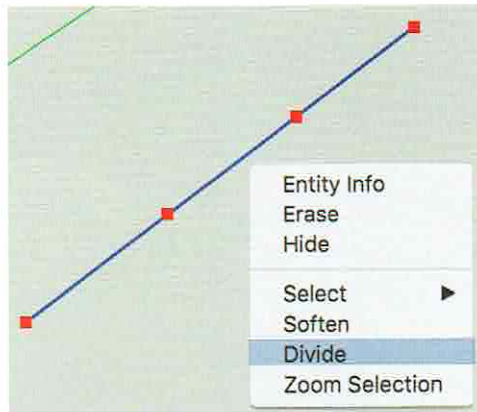
(a)



(b)

FIGURES 6-15A AND 6-15B

The Line tool can be used to draw lines that divide a face to create individual faces for further extrusion or modification. After dividing the original face as shown above, the new smaller faces can be extruded using the Push/Pull tool (6-15b). The Rectangle and other shape tools can also be used to create faces within faces (as can the Offset tool—as discussed in Figure 6-20).



(c)

FIGURE 6-15C

To divide a line or arc into equal segments: Select the line or arc, and right-click to select Divide from the context menu. SketchUp places division points on the items; moving the cursor reduces (aimed at center) or increases (aimed away from center) the number of segments.

Moving, Copying, and the Move Tool

The Move tool (select from toolbar or press the M key) is used to move lines, faces, entities, groups, and components. Here again, the statement, “select first, then do” is helpful to remember, because one must make sure the item is accurately selected prior to selecting the Move tool. The process for moving items is: Select the item (or items) you want to move, then select the Move tool (M key), and then move the selected item into place. Pressing the Escape key will end the function; pressing the spacebar will reopen the selection tool.

When using the Move tool, selecting a corner as the move point will help to align the object with something else in the model. When in use, the Move tool pulls on individual faces or edges; this means the entire object is not selected; therefore, saving an entity as a group prior to moving it can be helpful. Figures 6-16 and 6-17 illustrate use of the Move tool.

Copying items in SketchUp is similar to doing so in other software programs, using Edit > Copy > Paste, or keyboard commands. However, the Move tool can also be used to copy and multiply items. This is done by selecting the desired item and then the Move tool and pressing the Option (Mac) or Ctrl (Windows) key; a plus sign will appear. Next, click the selected entities and move the cursor to Copy. For multiple copies, type the quantity desired into the measurement box, with the number and an for example, “7X” to make seven copies. Groups, Components and “Sticky Geometry”

In SketchUp, items that touch can “stick together.” This can be true of items that are moved together or elements that are drawn touching adjacent geometry (such as a wall or table touching a floor). However, objects that are saved as a Group or Component will not stick to adjacent items. Multiple objects can be saved as Groups or Components.

FIGURE 6-16

This image shows use of the Move tool to move a line drawn on the top of a cube up so that it forms a pitched roof-like form. Notice that the line is selected first (turning it blue) and then moved with the Move tool, following the select first, then do protocol for SketchUp.

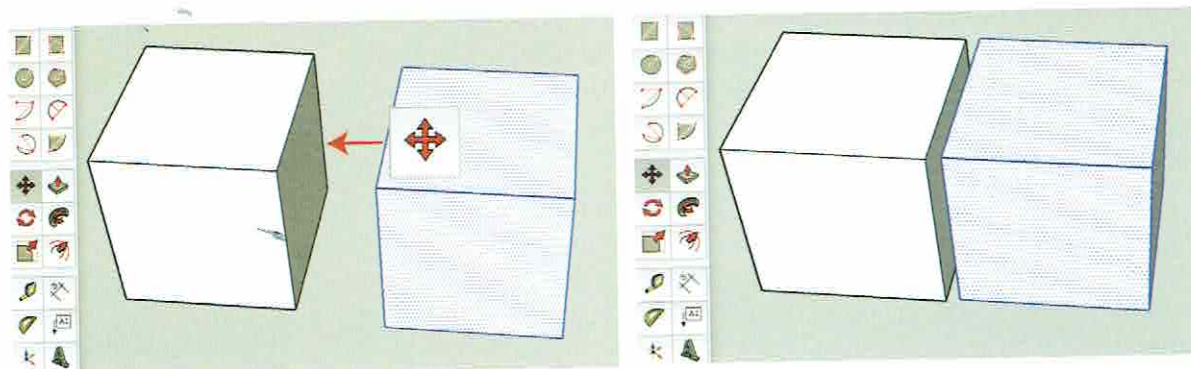
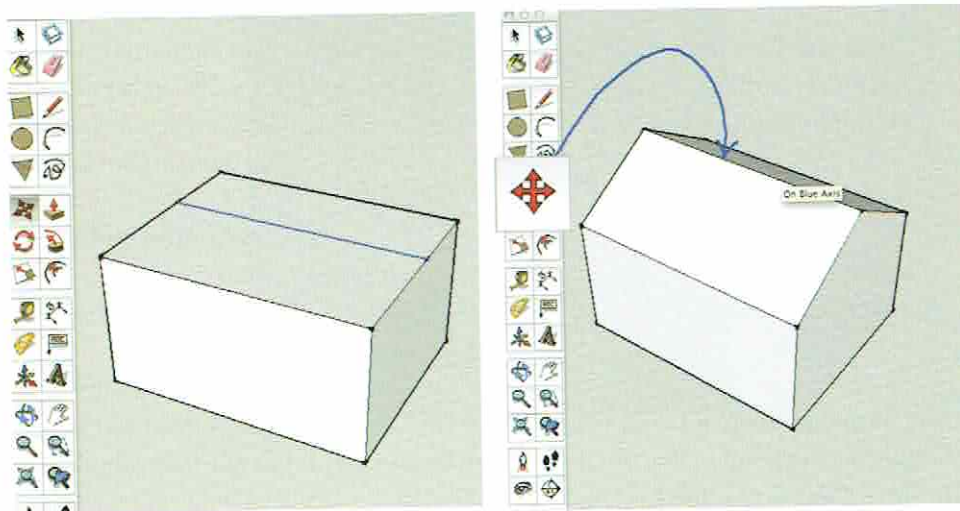


FIGURE 6-17

The Move tool is also used to move faces, entities, objects, groups, and components. In this illustration, the cube to the right is selected (making it blue) and then moved to the left with the Move tool. When using the Move tool, selecting a corner as the move point will help to align the object with something else in the model.

Grouped items are typically for single use, and are isolated so they do not stick and can be edited, moved, rotated, and so on. Components are similar in that they do not stick and can be edited, moved, and so on, but they are created for multiple use and saved for reuse. Components can also be created so that they stick to one plane such as the floor. To save an object as a Group or Component, select the object and right-click to bring up a context box, as shown in Figure 6-18.

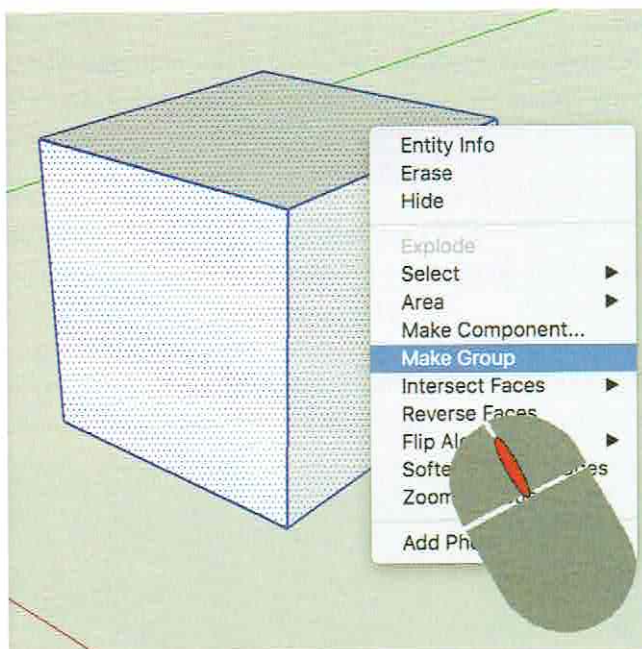


FIGURE 6-18

To save an object as a Group or Component, select the object and right-click and select Make Group or Make Component from the context menu. Saving objects as groups or components is highly recommended as it eases movement and does not allow items to “stick” to one another.

Problem Solving: Flipping Reverse Faces

Because SketchUp objects are hollow rather than solid, each face has a back and front. Occasionally, faces switch or flip front to back and become difficult to work with. When this happens, the face can be switched as illustrated in Figure 6-19.

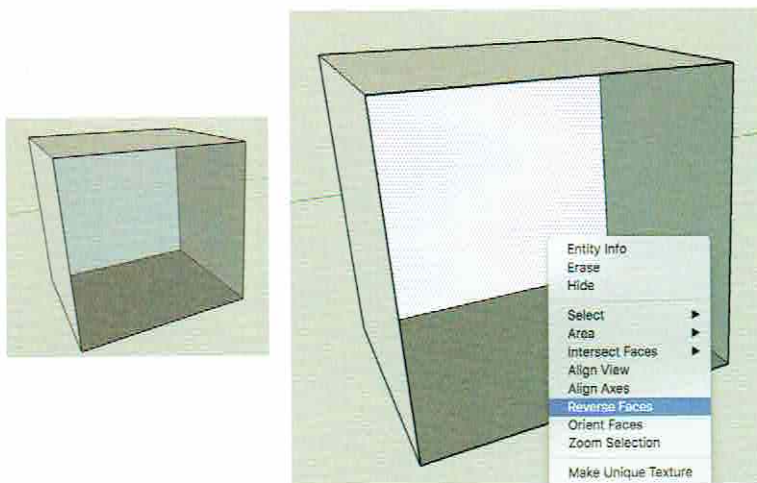


FIGURE 6-19

Reversing faces: Each face has a back and front. Occasionally, faces switch or flip and become difficult to work with. To reverse a flipped face: select that face and right-click and choose Reverse Faces.

The Offset Tool

The Offset tool is used to offset edges of faces at a uniform distance and is quite useful in modeling interior elements such as furnishings and equipment. Figure 6-20 illustrates use of this tool.

More about the Push/Pull Tool

The Push/Pull tool extrudes 3D shapes from faces and thus can also cut shapes out of faces. The Push/Pull tool can be used with all types of faces, including circular, rectangular, and abstract faces.

The Push/Pull tool can be used to push openings such as doors and windows into walls and add architectural details. The pencil tool (and other tools) can be used to draw elements that can be extruded with the Push/Pull tool (as shown in 6-21).

FIGURE 6-20

The Offset tool. In this example, the Offset tool was selected (or one can press the F key) to create the evenly offset lines within the top face of this object (at right). The tool is shown enlarged in this image for emphasis. With portions of faces offset, offset areas become separate faces that can be manipulated, as shown here.

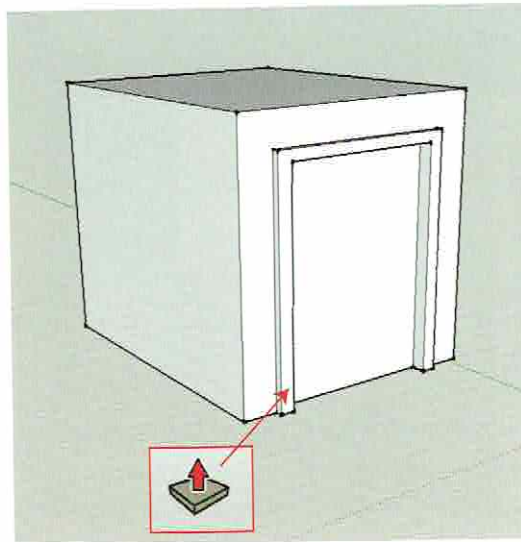
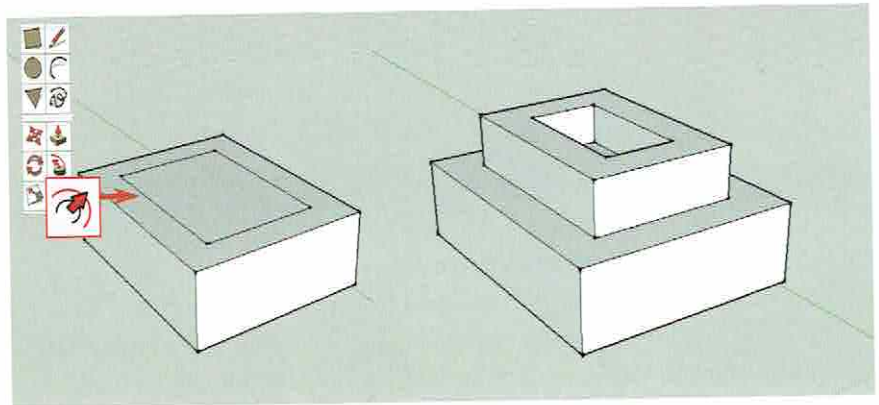


FIGURE 6-21

The Push/Pull tool (selected or accessed by pressing P) extrudes 3D shapes from faces. With the frame for this door drawn by the pencil tool, portions of the frame were extruded using the Push/Pull tool, the tool also easily pushes through walls to create door and window openings. Here the tool icon is enlarged for clarity.

Shadows and Views

Shadows can greatly enhance models. By default, shadows are turned off in SketchUp. Turning on and viewing shadows is illustrated in Figure 6-22. The View pull-down menu also allows for default views to be turned off and on; for example, the axes and guides can be turned on and off from the View menu.

Measuring, Scaling, Dimensioning, and Text Tools

The Tape Measure tool (press the T key) is used to measure dimensions and create helpful drawing measurement guidelines, as illustrated in Figure 6-23. The Protractor tool measures angles and sets angled guide lines. The Text tool creates screen text and leader lines, whereas the 3D Text tool creates 3D text, and dimensions are created with the Dimension tool.

The Scale tool (press the S key), resizes selections based on a percentage of original size, see Figure 6-24. Geometry can also be resized with the Tape Measure tool.

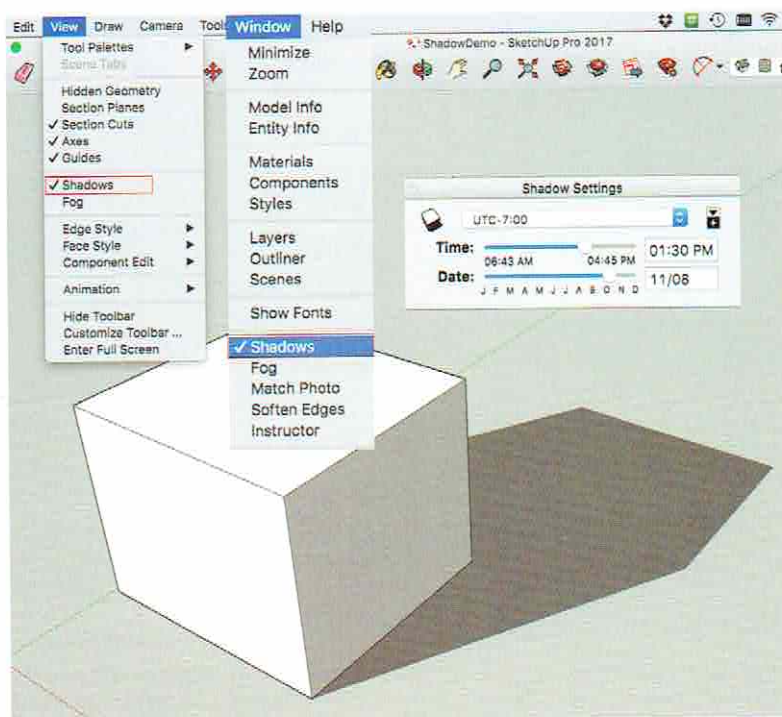


FIGURE 6-22

Shadows and Views. Displaying shadows requires two actions: select Window > Shadows (PC: Open the Shadows panel in the Default Tray), as shown, to open the Shadow Settings dialog box; Also select View > Shadows as shown. To select the time of day, drag the Time slider along the timeline or enter a time in the Time box.

Note: the View menu, allows for turning items such as Shadows and Guides on and off. When turned off, the items are not viewable, including when that saved view is exported.

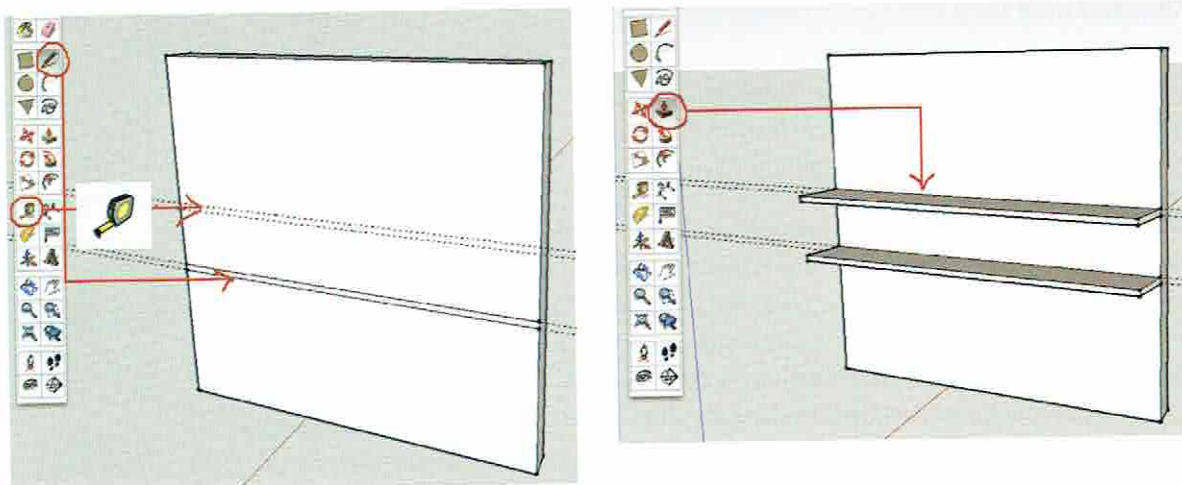
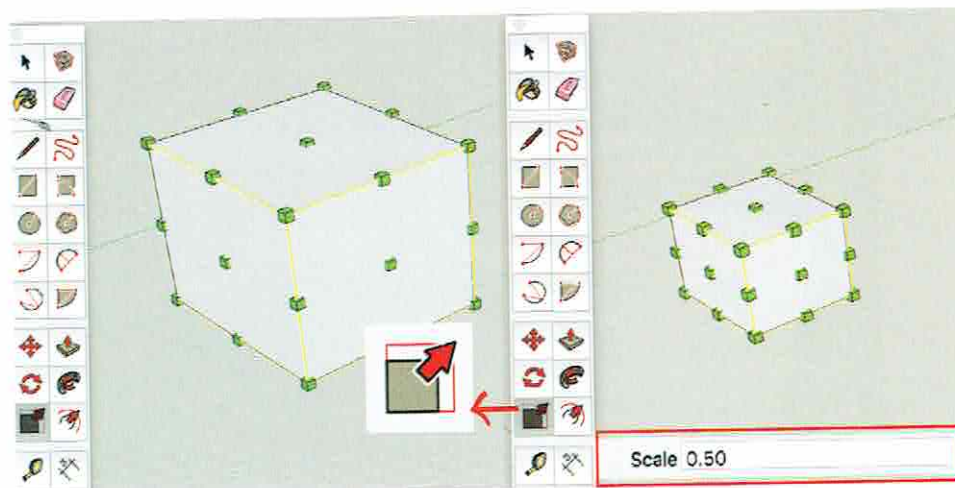


FIGURE 6-23

The Tape Measure tool measures and creates guidelines that can be used as drawing aids. Here, the shelves were drawn using the guidelines created, as shown at left. The Pencil tool was used to draw the shelves locations onto the wall surface and the Push/Pull tool was used to extrude the shelf volume as shown (right).

FIGURE 6-24

Using the Scale tool requires first making a selection and then choosing the Scale tool (press the S key); note that a yellow box with green grips appears around the selection.



For uniform scaling, click a corner scaling grip and move the cursor; this will make the selected grip and the opposite grip red. The cursor is then moved to scale the entity. Also note that the Measurements box displays the scale dynamically (enlarged here for clarity). Press the Esc key at any point to start over. To set the scale from the center instead of the opposite corner, hold down the Ctrl key (PC) or the Option key (Mac) while moving the red corner grip. Click to set the selection's new scale, or type the desired scale dimensions and press Enter (PC) or Return (Mac).

Scenes and Styles

Scenes save different model views and properties and make navigation back to those views easy (rather than having to pan and orbit). When a Scene is created, a tab appears at the top of the drawing area: clicking that tab brings the one back to that Scene. Figures 6-25 and 6-26 contain instructions for creating Scenes. Additional properties can be saved with each Scene: shadows, rendering styles and the like are saved with the Scene.

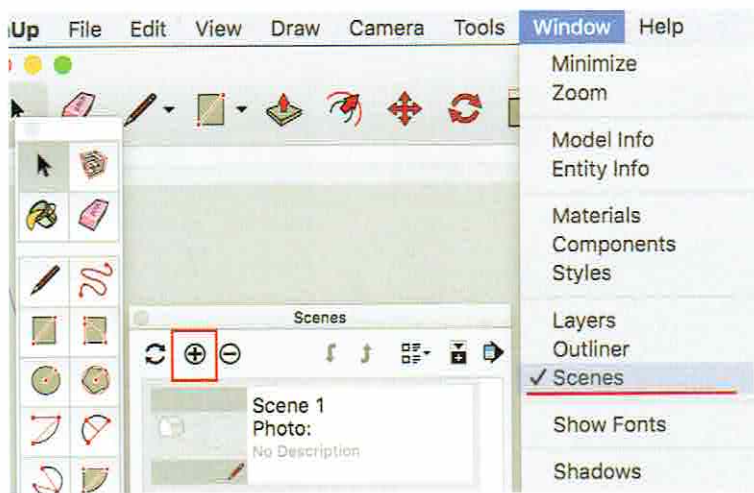


FIGURE 6-25

To add a Scene (Mac), follow these steps: Select Window > Scenes to open the Scenes panel. In the Scenes panel, click the Add Scene icon (+ sign) shown in the middle of illustration. The scene appears in the Scenes panel with the default name of Scene 1. It is extremely helpful to title each scene clearly. Once the model contains a Scene, context-clicking the Scene tab and selecting Add adds a new Scene. Additional properties can be saved with each Scene.

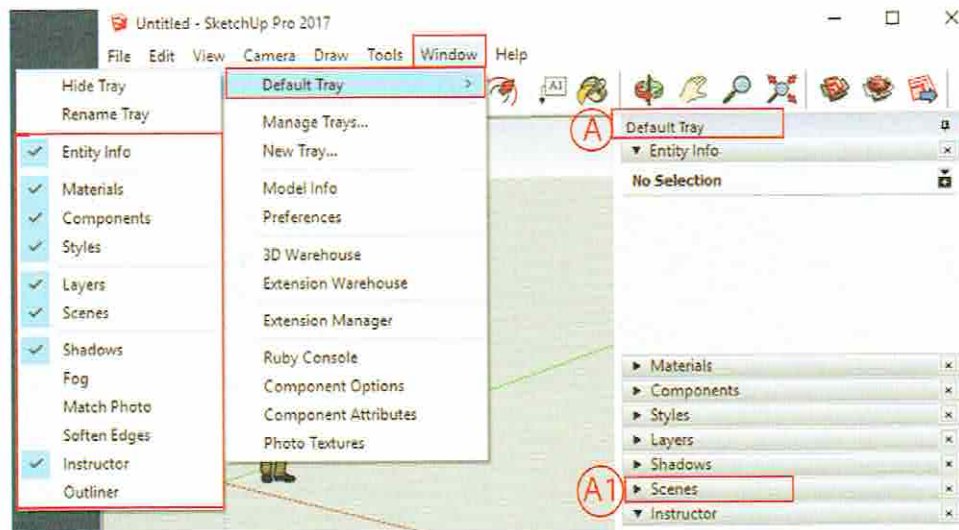


FIGURE 6-26

To add a Scene (Windows), follow these steps: go to Window > Default Tray > Scenes (open the Scenes panel [A1] in the Default Tray [A]).

SketchUp has a number of predefined styles that can be used to change the look of models. Each style combines a collection of settings for the edges, faces, and background. These range from very sketchy-looking line work to colored lines on colored, textured “paper.” Styles are selected from the Window menu as described in Figures 6-26 and 6-27. Note that when a Scene is created the Style in use at the time of Scene creation becomes part of that Scene.

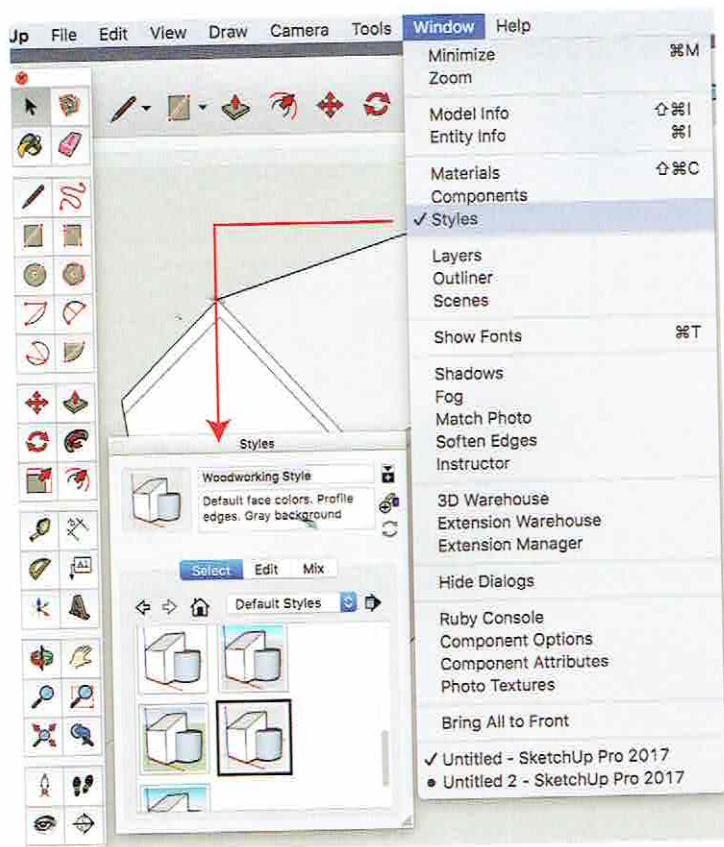


FIGURE 6-27

To Change model styles: Select Window > Styles (PC: Open the Styles panel in the Default Tray as described in 6-26). The Styles browser will appear with the selected style thumbnail, name at the top with a description for style; Click the Select tab (if it's not already selected). From the Styles collections drop-down list, select a collection, such as Default Styles, Color Sets, or Sketchy Edges. Clicking a style thumbnail applies the style to a model and the drawing area, as shown in Figure 6-28.

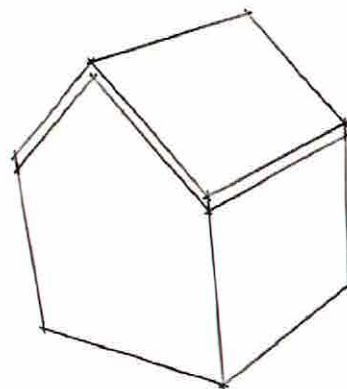
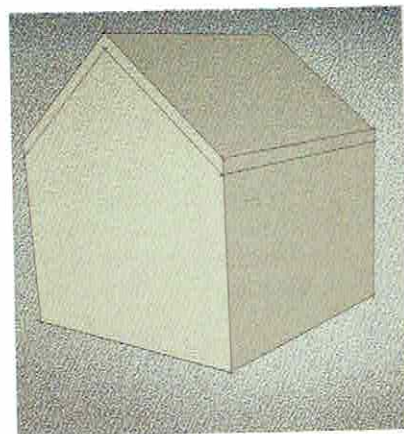


FIGURE 6-28

Examples of two model styles applied to the same model: Top: Assorted styles – POS Vignette style. Bottom: Sketchy Edges, and Airbrush with Endpoints style.

Components

As mentioned previously, components are similar to groups in that they can move together and won't stick to geometry (unless they were designed to stick). Components can be reused, can be created from scratch, and can be inserted into models from other models and the online 3D Warehouse.

Premade components can be inserted from the components panel into a model by Selecting Window > Components; by default, the Components panel opens to the Components Sampler collection. However, the sampler's selection is limited compared to the selection available in the 3D Warehouse. See Figures 6-29 through 6-31 for illustrations of inserting a component using the 3D Warehouse. It is worth noting that a vast range of items from furniture to architectural elements, people, plants, and animals can be found in the 3D Warehouse.

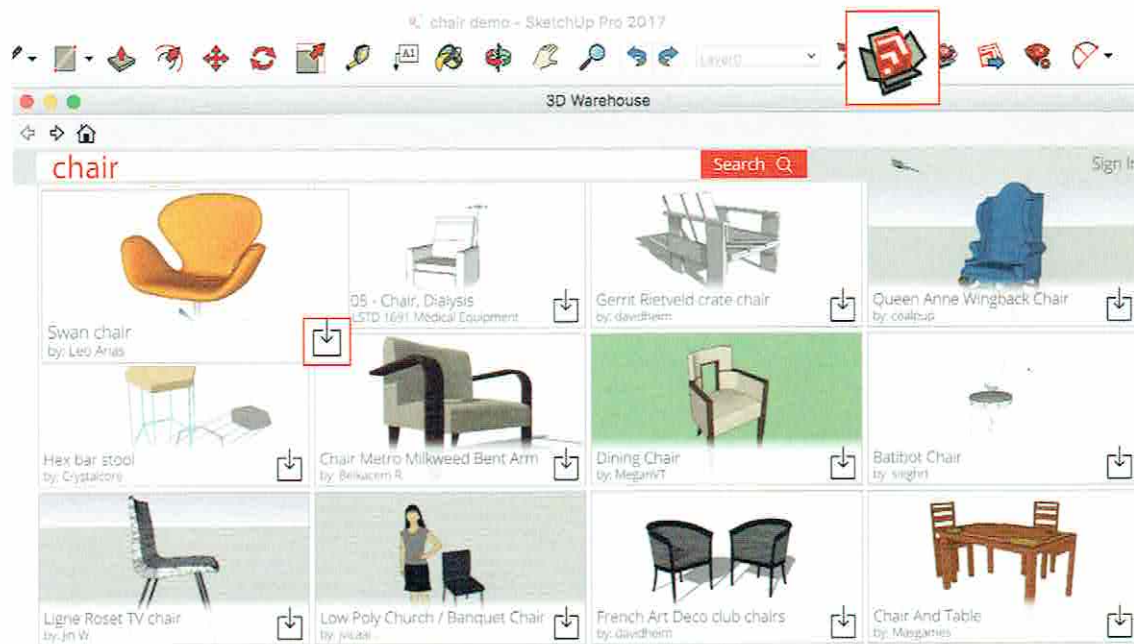


FIGURE 6-29

Using Components from the 3D Warehouse. The 3D Warehouse is accessed by selecting the 3D Warehouse icon on the toolbar (enlarged here) and typing in the search box as shown (press Enter after typing). Icons of models are displayed in the preview area. Clicking directly on the icon brings up a details page (see Figure 6-30), and clicking directly on the download icon (in red frame here) will download the model, which brings up a Load into Model? prompt; pressing "yes" will insert the component into the model. The model can then be moved using the Move tool, or rotated using the Rotate tool. The 3D Warehouse is also accessible via a Web browser—outside of the SketchUp software.

Note: Another way to insert Components is to Select Window > Components (PC: Open the Window panel in the Default Tray similarly to as described in 6-19b). By default, the Components panel opens to the Components Sampler collection. However, using the 3D Warehouse offers more options.

FIGURE 6-30

Components can be downloaded via the details page by clicking on download (see red arrow).

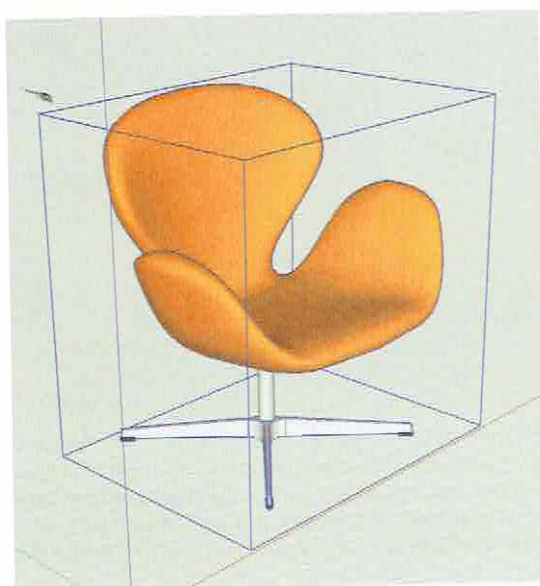


FIGURE 6-31

In this illustration, the chair downloaded from the 3D Warehouse is placed in the model by clicking in the drawing area. If necessary, the object placed into the drawing can be moved (using the Move tool, as well as rotated using the Rotate tool. See Figures 6-32 and 6-33 for information on the Rotate tool.

Rotate, Flip Geometry

As its name implies, the Rotate tool is used to rotate geometric shapes. When the Rotate tool is selected (or press Q), the Rotate icon floats over a surface as the cursor hovers over it. Use of the tool requires three mouse clicks, as described in Figure 6-32. As with several SketchUp tools and commands, the Rotate tool requires the object to be selected first and then the tool can be used on the object (see Figure 6-33).

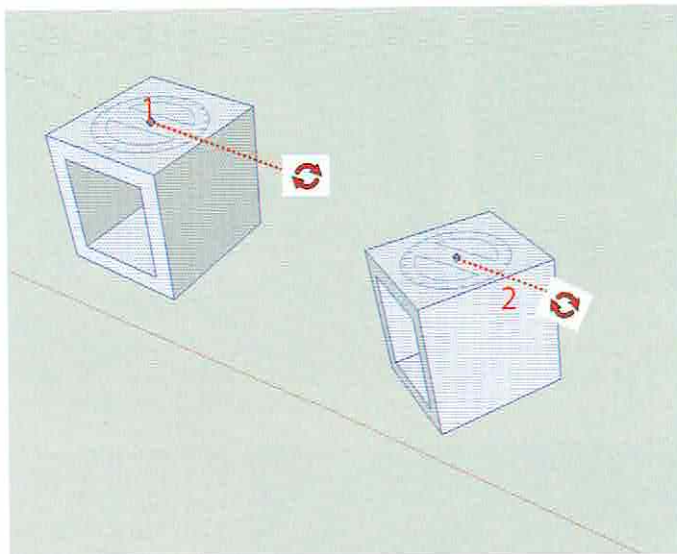


FIGURE 6-32

Using the Rotate tool requires three clicks of the mouse. (1) First, select object and click once to set the rotation center and orientation. (2) Move mouse away to set a rotation arm, and click again to rotate using that arm. (3) Click a third time to complete the action.

Tips: Lock the rotate orientation by holding the Shift key; this is done by hovering over surface and holding down Shift—the Rotate tool will no longer change orientation to each surface but will remain locked in one orientation.

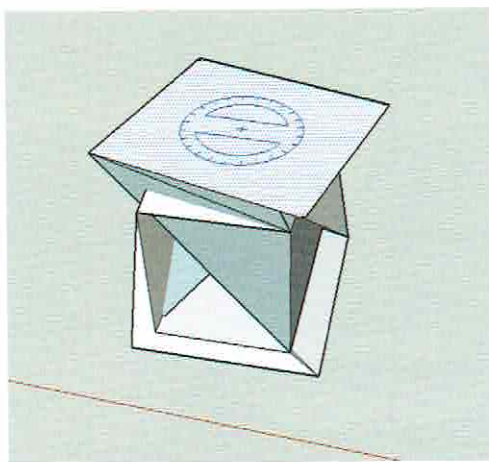


FIGURE 6-33

The Rotate tool requires selecting the object first and then using the tool. In this example, the entire object was not selected—only the top face. When the tool was activated it twisted the top face rather than rotating the object.

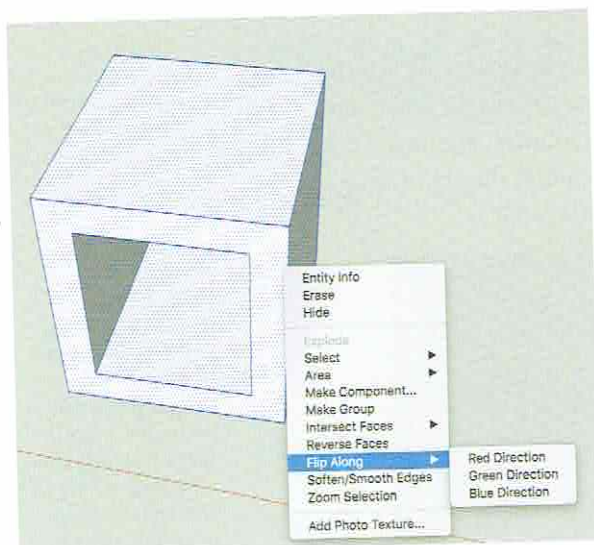
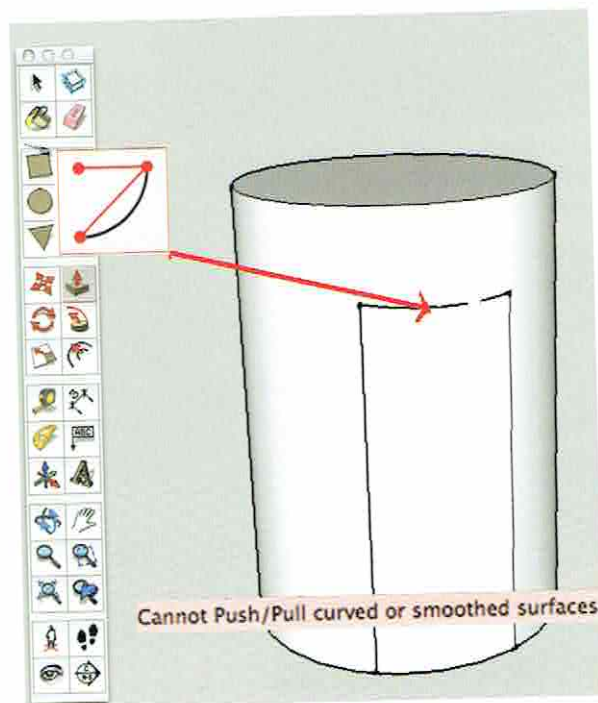


FIGURE 6-34

Entities can be “flipped” upside down and along axis by selecting the item and right clicking and selecting flip along axis direction.

FIGURE 6-35

Working with curves



While vertical lines can be drawn directly on the surface of a cylinder or curved forms, the Line tool cannot be used to create lines that follow the curved portions of the form. The Arc tools will draw on curved surfaces; however, curved surfaces, known as *surface entities*, cannot be extruded with the Push/Pull tool—and trying to do so will generate the warning “Cannot push/pull curved or smoothed surfaces.”

Occasionally, there is a need to flip entities upside down; this is done as shown in Figure 6-34.

Working with Curves in SketchUp

Working with curved elements is a bit of a challenge because the curved faces created with the Push/Pull tool produce a curved entity called a surface entity. Surface entities can only be worked with as a whole unless the number of faces that form them are identified through View > Hidden Geometry. See Figures 6-35 and 6-36 for illustrations covering working with curves. Additional methods of drawing curves and arcs are covered in Figures 6-37 and 6-38.

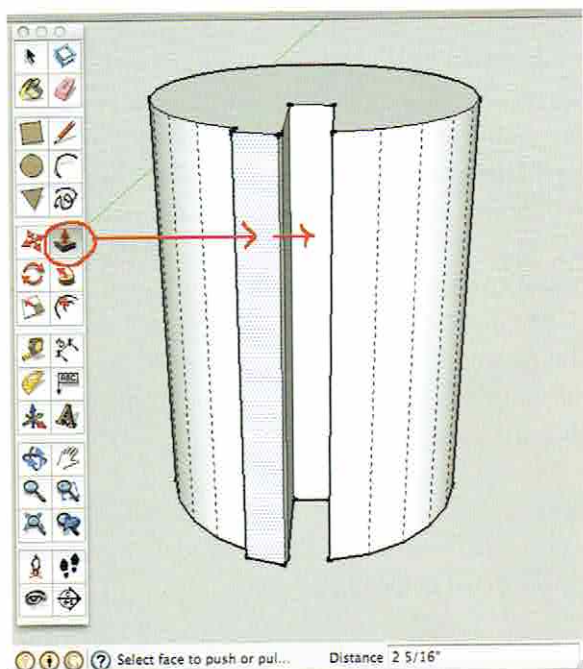


FIGURE 6-36

In order to extrude and work with curved surfaces (surface entities), one can go to View > Hidden Geometry, which allows individual faces within the entities to be seen and manipulated.

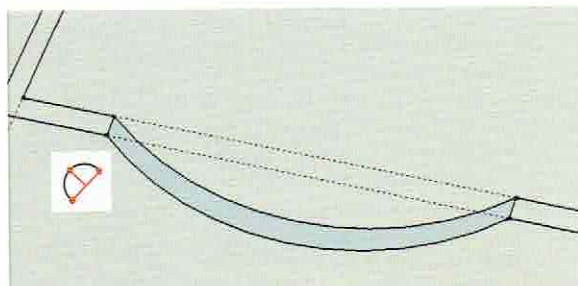


FIGURE 6-37

Curved wall forms can be drawn directly using the Arc tools and Line, Offset and Push/Pull tools.

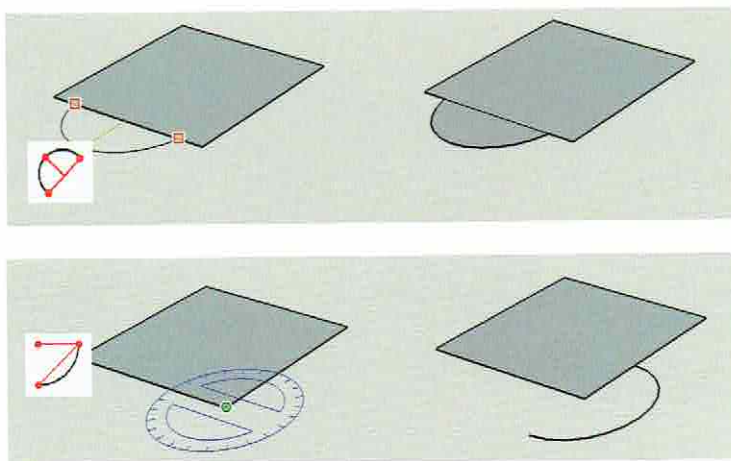


FIGURE 6-38

There are several Arc tools, each with slightly different functions.

Shown here at the top is the 2 Point Arc tool. This is used by clicking to set two points and then dragging to create an arc. The Arc tool (bottom) sets a center point, when selected a protractor appears as a drawing aid; this tool creates an open arc.

Not shown: The Pie tool, which is similar to the Arc tool but creates a closed shape that becomes a face, and 3 Point Arc tool, which draws an open arc based on a pivot point.

Layers

Layers in SketchUp help to organize models but have a very different function from layers in imaging or CAD software programs. While in other applications layers control the actual geometry, SketchUp's layers control only visibility—not the geometry itself! In SketchUp, toggling layers off hides the geometry associated with that layer and can make modeling items easier. However, entities within the geometry remain attached, even though they may not be visible.

Using layers in SketchUp takes some getting used to, especially for users familiar with other imaging, modeling, and CAD applications, but it is highly worthwhile as a visual aid. The use of layers is helpful for working on a model, for example, modeling parts of a ceiling that may be difficult to see or get to, with all of the geometry visible. The Layer function can also be used to toggle between design options for client presentations.

Working with layers is a bit complex at first, but becomes easy with practice. The following list covers important concepts related to working with layers, and Figures 6-39 and 6-40 illustrate some of the concepts covered in the list.

Working with Layers

- Create groups and components to separate and prepare geometry or layers.
- Never assign geometry to a layer unless it is in a group; group first, then assign a layer!
- Keep “Layer 0,” the active layer for drawing everything!
- Layers are created in the the Layers dialog box; to do this, select: Windows > Layers (a Layers toolbar can also be added to the toolbar).
- In the dialog box, layers are arranged alphabetically, by visibility, or by color.
- The Layers dialog box offers a fly-out arrow used for selection of View by Color and Purge (use Purge to delete empty layers).
- The creation of layers requires both the Layers dialog box and the Entity Info box. Layers are created in the dialog box but assigned to objects in the Entity Info box. The Entity Info box can also be brought up by right-clicking a Group.

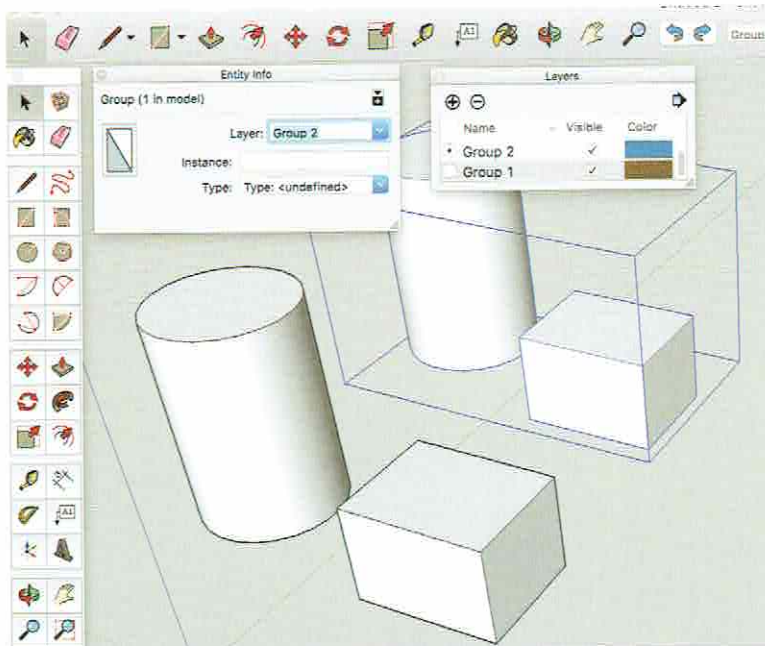


FIGURE 6-39

Creating layers. Layers are created in the Layers dialog box (Window > Layers); box shown at right of screen. Layers are assigned to objects in the Entity Info box shown at left of screen (Windows > Entity Info Box—or right-click with the Group selected).

Note that the cylinder and box form at foreground and background are organized into two separate Groups. Geometry must be grouped in this manner prior to assigning a Layer!

In this example, two layers are created in the Layer dialog box and titled "Group 1" and "Group 2." With the layers created and named (in the Layers dialog box), the Entity Info box is used to assign the Groups Entities to that layer using the pull-down menu next to the word Layer.

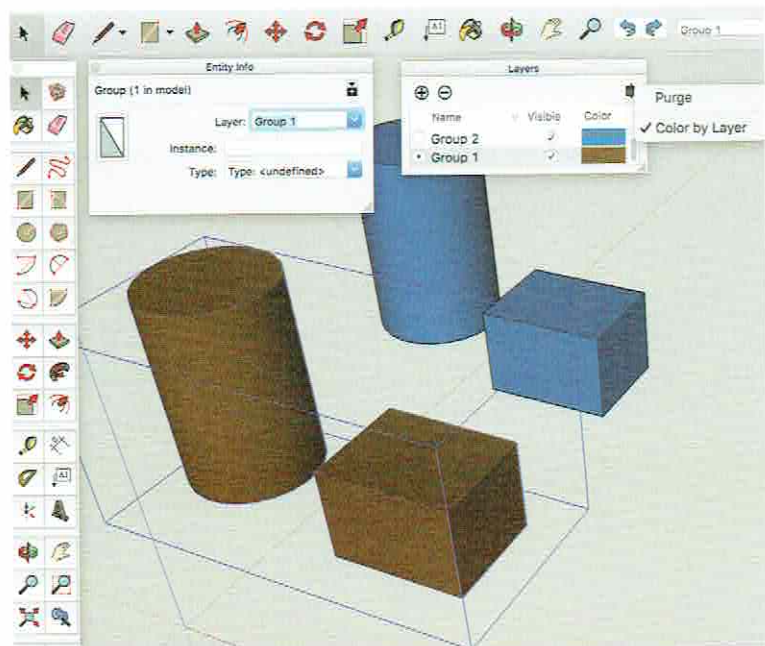


FIGURE 6-40

More about the Layers dialog box. The Layers dialog box (right) has a fly-out menu with the option of "View Layer by Color," with this selected the two similar groups that are saved as two layers are identified with distinct colors. The Purge function displayed on the fly-out menu, deletes empty layers. Also note that the Layer dialog box has a radio button that can be selected, as well as a Visible check box, which is used to hide the objects in that Layer. If the Group 1 Layer shown here had Visible toggled off, the object would disappear.

Creating Plan and Section Views

The Section Plane tool creates cutaway views of models and can be used to create plans, elevations and section views, as described and illustrated in Figures 6-41 through 6-43.

FIGURE 6-41

Creating plans, in SketchUp. Shown is a top view of a part of a residence. The view shown is not a plan; it is a top-view-one-point-perspective.

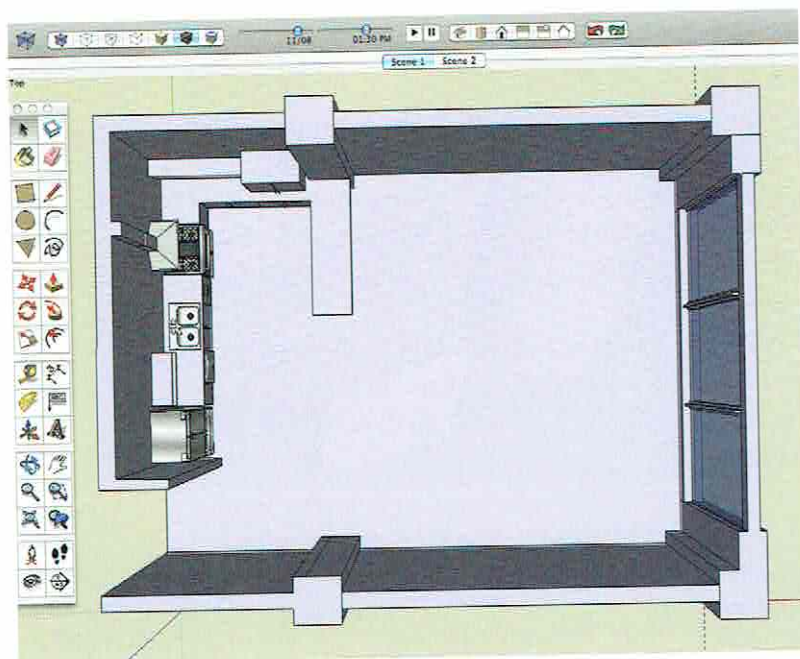
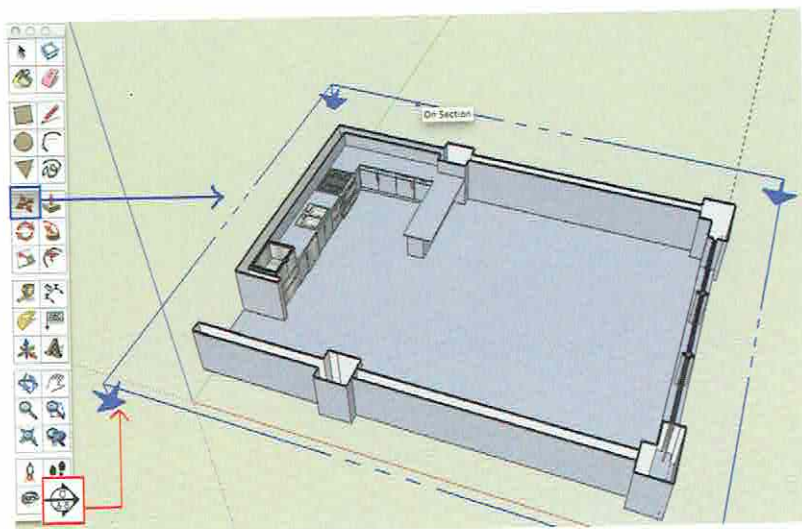


FIGURE 6-42

Creating plans, in SketchUp. To create a plan or sectional view of the model, first select the Section Plane tool in the red frame at bottom left here (the Section Plane tool is found the Large Tool Set palette).

Selection of this tool will bring up the Section Plane element. To create a plan view (horizontal section), click on the section plane in the horizontal position. (Holding the Shift key locks the plane's orientation.) To create a section, click the plane into a vertical position. To move the section plane to the desired location, use the Move tool or Rotate tools.



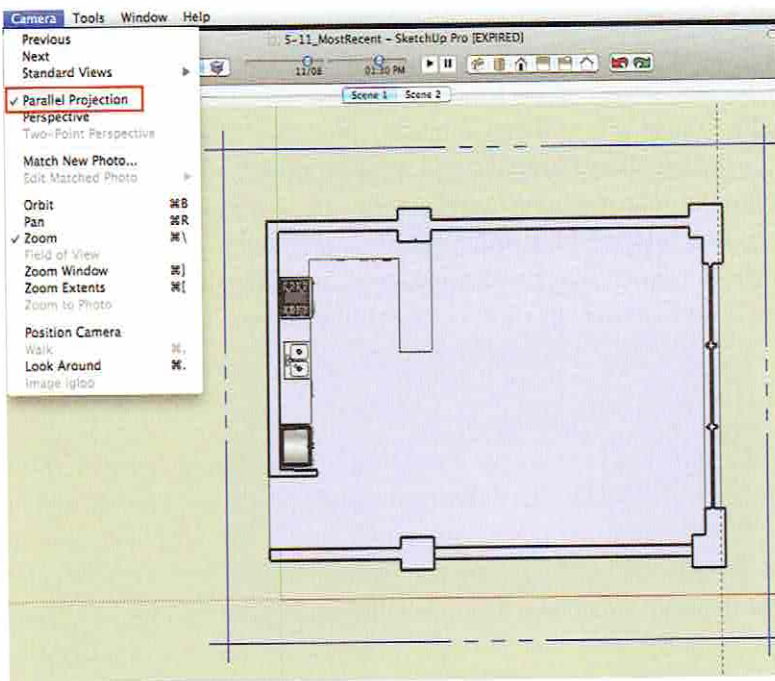


FIGURE 6-43
Creating plans, sections, and elevations in SketchUp.

With the section plane in the desired location, one more step is required: Go to Camera > Parallel Projection (which clicks the view out of Perspective). Also note that right-clicking on the section plan brings up a context menu that provides options to reverse the direction of the cut, and the Create View from a Slice option, which copies a group of edges from the where the section plane intersects the model (this can create a series of edges that read like a line drawing).

To create a vertical section or elevation (not shown), click on the section plane in the vertical position. Once again, the view must change from perspective to Camera > Parallel Projection for a true section/elevation.

The section plane can be deleted with the Eraser tool; doing this removes the sectional cut through view.

Exporting Files

Orthographic drawings, such as plans and elevations, can be exported for inclusion in presentations and for rendering in other programs. Exporting of files in SketchUp is only available in the full SketchUp Pro version.

Exporting from SketchUp Pro for use in another program is done by going to File > Export. The choices under Export include: 3D Model, 2D Graphic, Sectional Slice, and Animation. Selection of the 3D Model option exports the entire model in a range of file options (some of these options work well for virtual reality applications). Selection of the 2D View option exports the drawing into a range of two-dimensional file format options from .jpg to .dwg.

SketchUp Pro offers a feature called LayOut that allows for SketchUp models and drawings to be assembled in sheets and boards, booklets, and slide shows. Layout is only available with SketchUp Pro licenses and is not available in SketchUp Make.

Typically, SketchUp is used first to model a project, with scenes created to show varied views, including plans, elevations, and sections, as well as three-dimensional views, if desired. With the desired scene active, that view can be inserted into Layout (go to: File>Send to LayOut). It is possible to orbit and pan within a model inside of LayOut. Additionally, there is a dynamic link maintained from SketchUp to LayOut so that, when updates are made in SketchUp, those changes can be shown in the LayOut document.

Importing Files

SketchUp Pro allows users to import files in the .dwg or .dwx file formats; this is not available in SketchUp Make. The following list provides the steps involved in importing CAD files. Prior to the import, it is important to prepare the CAD files by reducing the files' size to 15 MB or less. This can be done by simplifying the CAD files to just walls, and perhaps doors and windows). Compatibility between a CAD file and SketchUp is maximized by saving AutoCAD files down in to Release 13 or Release 14 format.

Steps for Importing CAD Files

1. In SketchUp Pro, open the .skp file into which you want to import your dwg or .dxf file.
2. Select File > Import; an import dialog box appears.
3. From the Format drop-down list, select AutoCAD Files (*.dwg, *.dxf).
4. Select the file you want to import.
5. Click the Options button; the DWG Import Options dialog box appears, as shown in the following figure.
6. Importing geometry at the correct scale requires selecting type of measurement units used in your CAD file from the Units drop-down list.

Some clean-up tasks can be done after importing files:

- Delete unnecessary layers, go to: Windows > Layers and choose Purge.
- Delete unnecessary data, go to: Windows>Model>Statistics by clicking the Purge Unused button.
- Delete unnecessary AutoCAD entities by selecting and erasing.

Working from Imported CAD Files

Imported CAD files come into SketchUp Pro as a two-dimensional image, which can serve as a guide for drawing the three-dimensional model. This means that three-dimensional elements, such as walls, are redrawn using the Line and Shape tools and extruded with the Push/Pull tool. Imported CAD files come into SketchUp as a single entity or group and must be exploded in order to work with individual lines/elements. PDF files of orthographic drawings are used in the same manner. Figures 6-44 through 6-47 illustrate this process of working from imported two-dimensional files.

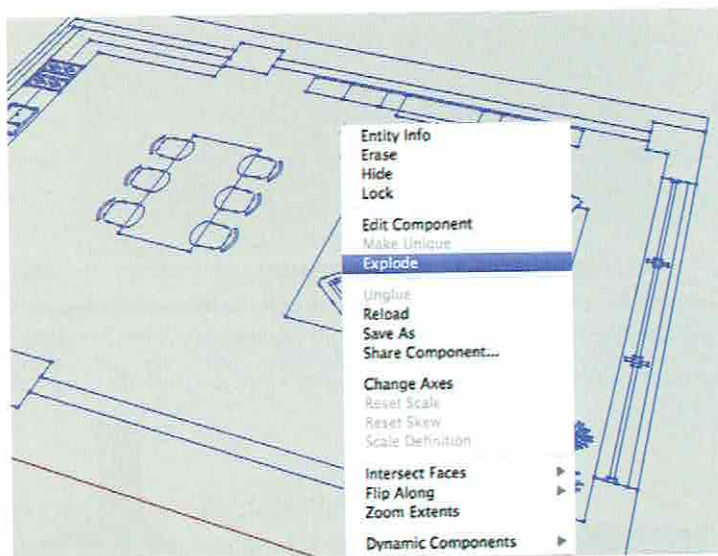


FIGURE 6-44

Imported CAD files come into SketchUp as a single entity or group. In order to remove items or work with individual lines/elements, right-click and select.

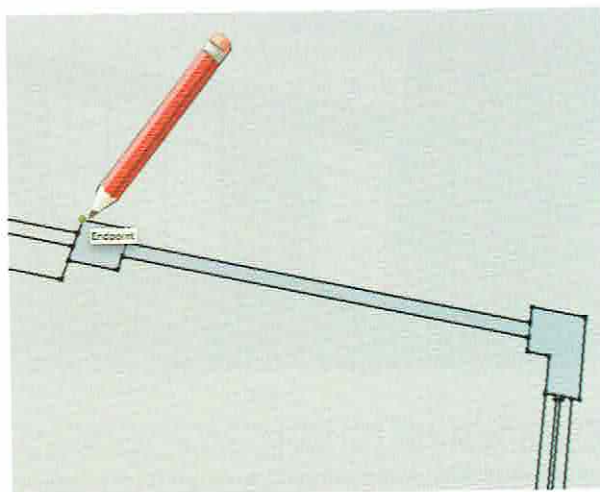
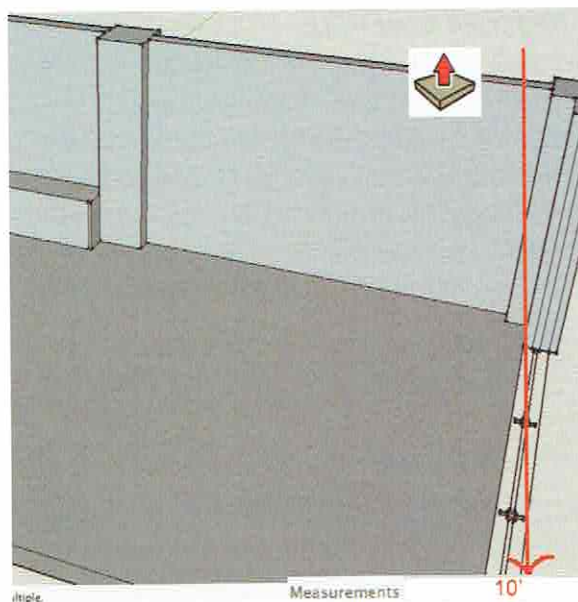


FIGURE 6-45

With the file imported, the Line tool is used to trace over all of the necessary lines to create architectural three-dimensional forms. In some cases, as the room form dictates, the Rectangle tool can be used in combination with the Line tool to retrace the plan more quickly.

FIGURE 6-46
Creating walls.



With the lines traced to create individual surfaces for walls and objects, the Push/Pull tool can pull selected surfaces to appropriate heights. The height can be typed into the measurement box or pulled by visual assessment and verification. Note that architectural elements, such as windows and doors, can be inserted into the model as components.

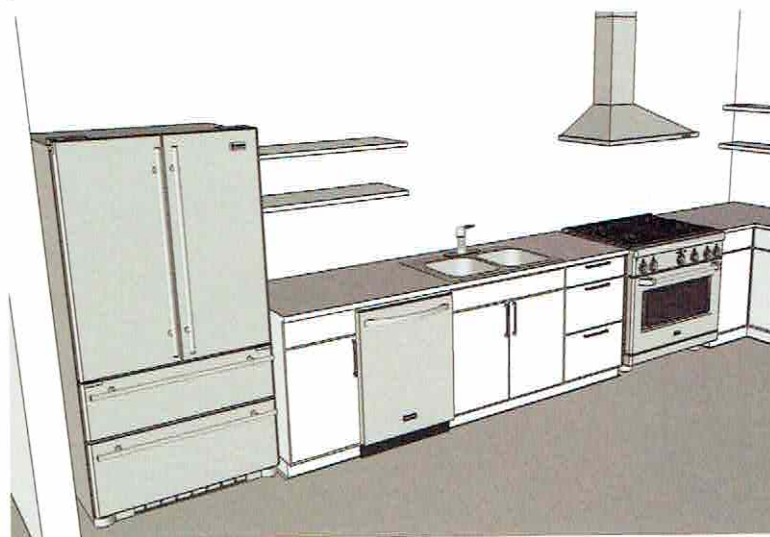


FIGURE 6-47
This view of the completed kitchen shows appliance components that were imported from the 3D Warehouse (as covered in Figures 6-29 through 6-31). In this example, the cabinets were modeled as custom elements, but one can easily use imported cabinet components. Note that items such as cabinet handles were drawn and saved as a group, then copied and pasted rather than being redrawn in each location.

Working with Revit and Other File Types

Importing Revit files requires saving the .rvt files as .dwg or .dxf files while they are in Revit, to prepare for export. Note that, when working with Revit, one must be in the Revit 3D orthographic view when exporting the Revit model as a .dwg/.dxf file. Because of the complexity of Revit models, exporting Revit models is somewhat complicated; please see the references section of this chapter for additional resources.

20-20 files must be saved as .dxf file within 20-20 prior to export. Once a file is saved as a .dwg or .dxf file, it can be imported into SketchUp exactly as described previously in this chapter.

3D digital content creation tools such as Maya, 3ds Max, and Rhino use COLLADA files with the .dae extension, and these can also be imported into SketchUp Pro. COLLADA is an open standard XML-based schema that enables data transfer among 3D digital content creation tools, such as Maya, 3ds Max, SketchUp, and Rhino. COLLADA files are XML files identified with the .dae file extension, which stands for Digital Asset Exchange. SketchUp allows import and export of COLLADA files. For further information, see the reference section of this chapter.

VRML (Virtual Reality Modeling Language) is a file format for representing three-dimensional (3D) interactive vector graphics. SketchUp Pro users can export models to a VMRL file format. For further information see the reference section of this chapter.

Rendering and Materials Selection in SketchUp

Both SketchUp Pro and Make allow for “painting” materials on faces. Materials are essentially paints that have a color and optional texture, and therefore the Materials function is used to render the model. For purposes of clarity, information about use of materials and rendering in SketchUp is covered in the next chapter.

REFERENCES

Contains both works cited and recommended reading. Annotations where appropriate.

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