ITEC185
Introduction to Digital Media

SKETCHUP MAKE 2016 - II

Introducing Drawing Basics and Concepts

- Drawing a model in 3D is different from drawing an image in 2D.
- This introduction to drawing basics and concepts explains a few ways you can create edges and faces (the basic entities of any SketchUp model).
- You also discover how the SketchUp inference engine helps you place those lines and faces on your desired axis.

Drawing a line

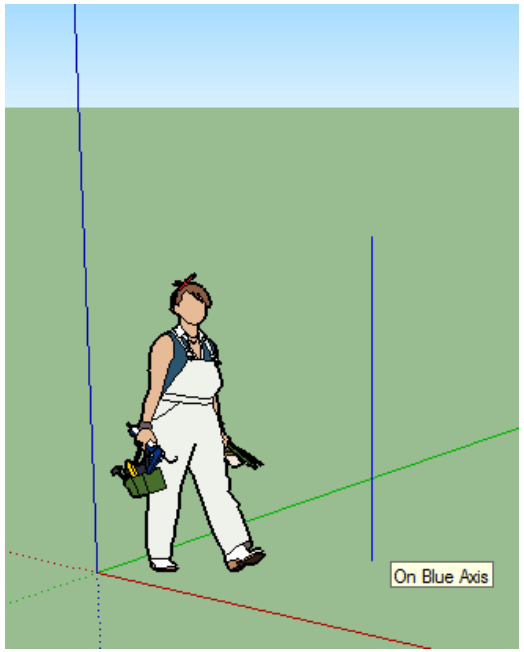
- Use the Line tool to draw edges (also called line entities).
- Edges form the structural foundation of all models.
- Select the Line tool () on the toolbar (or press the **L** key).
- The cursor changes to a pencil.
- Click to set the starting point of your line.
- If you click the wrong place, press the **Esc** key to start over.

Drawing a line

- As you move your cursor around the drawing area, notice the following:
  - A line follows your cursor.
  - The line length is displayed dynamically in the Measurements box. (The Measurements box uses the units specified in your template.)
  - The line that's following your cursor turns red, green, or blue whenever the line is parallel with the red, green, or blue axis, respectively.
  - If you hover for a moment, a ScreenTip appears (that's the SketchUp inference engine).

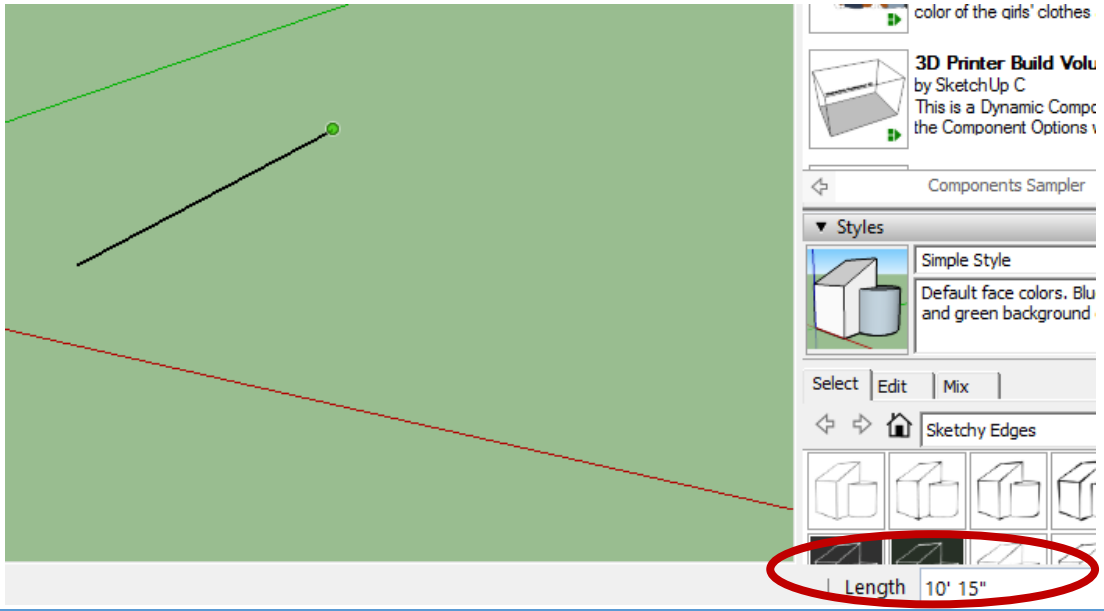
Drawing a line

- Click to set the line's end point.
- This end point can also be the starting point of another line.
- Press **Esc** or select a different tool when you're done drawing lines.
- After you set the end point, you can press **Ctrl+Z** (Microsoft Windows) or **Command+Z** (Mac OS X) to undo your line and start over.



Drawing a line

- To make your line a precise length, type a value and press **Enter** (Microsoft Windows).
- You can repeat this process as many times as you like until you draw a new line or select another tool.
- If you don't specify a unit, SketchUp uses the unit specified in your template.
- However, you can type any imperial or metric unit for your line.
- So, you can type **3mm** or **5'2"** for example. Your value appears in the Measurements box as you type.

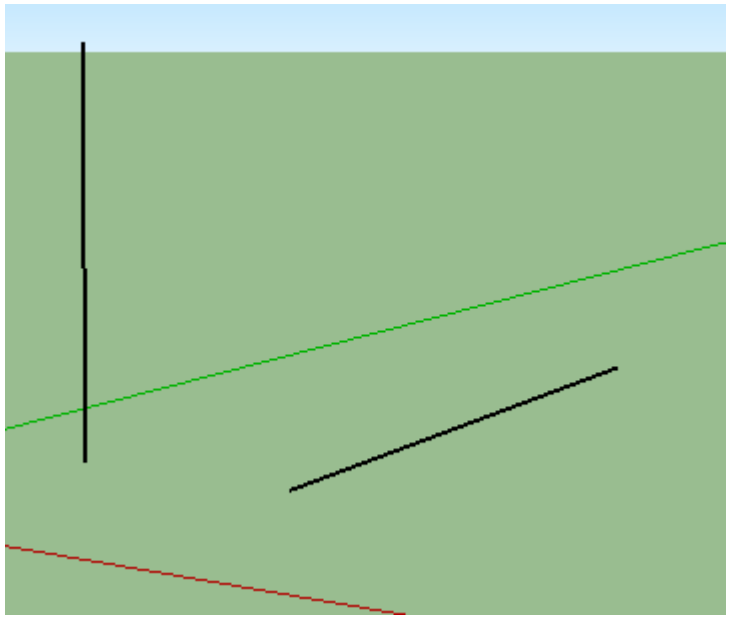


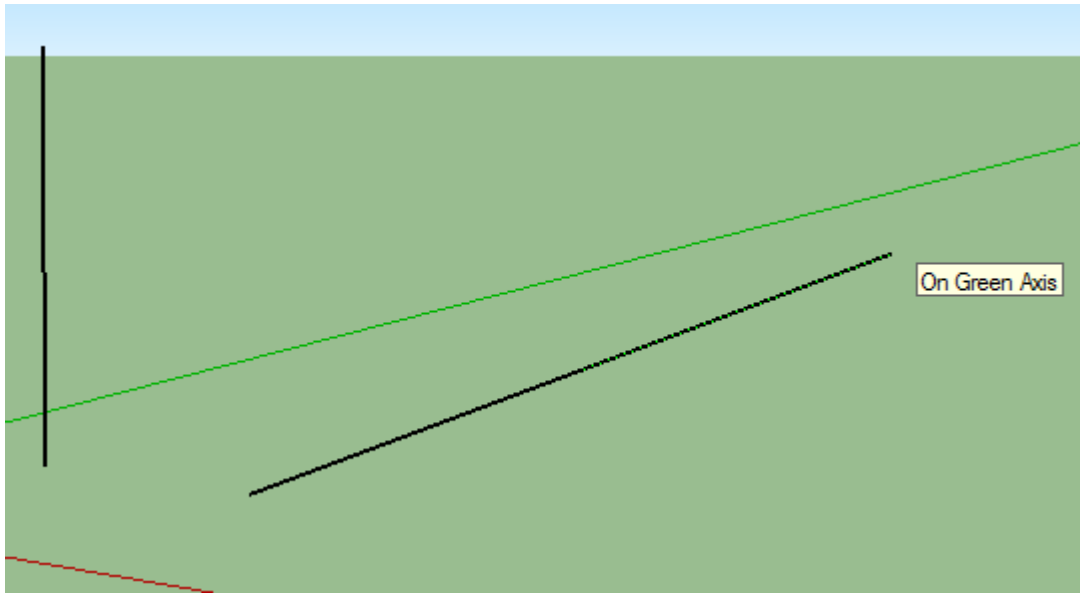
Drawing a line

- The Measurements box also accepts 3D coordinates for lines:
  - An absolute coordinate, such as [3’, 5’, 7’], places the end of the line relative to the current axes. Square brackets indicate an absolute coordinate.
  - A relative coordinate, such as <1.5m, 4m, 2.75m>, places the end of the line relative to the starting point of your line. Angle brackets indicate a relative coordinate.

Drawing a line

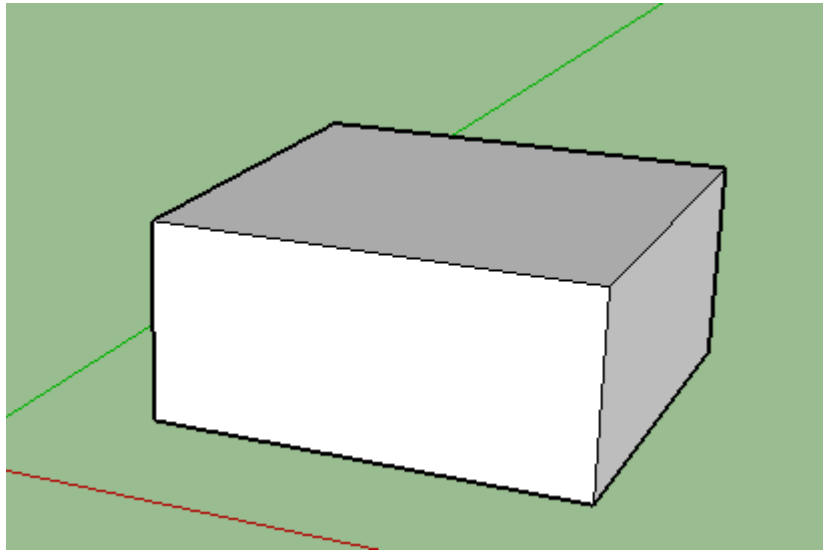
- You can edit the length of a line as long as it doesn't bound a face.
- Select the Move tool ( ).
- Hover the Move tool cursor over one of the line's end points.
- Click and drag the end point to change the line's length.





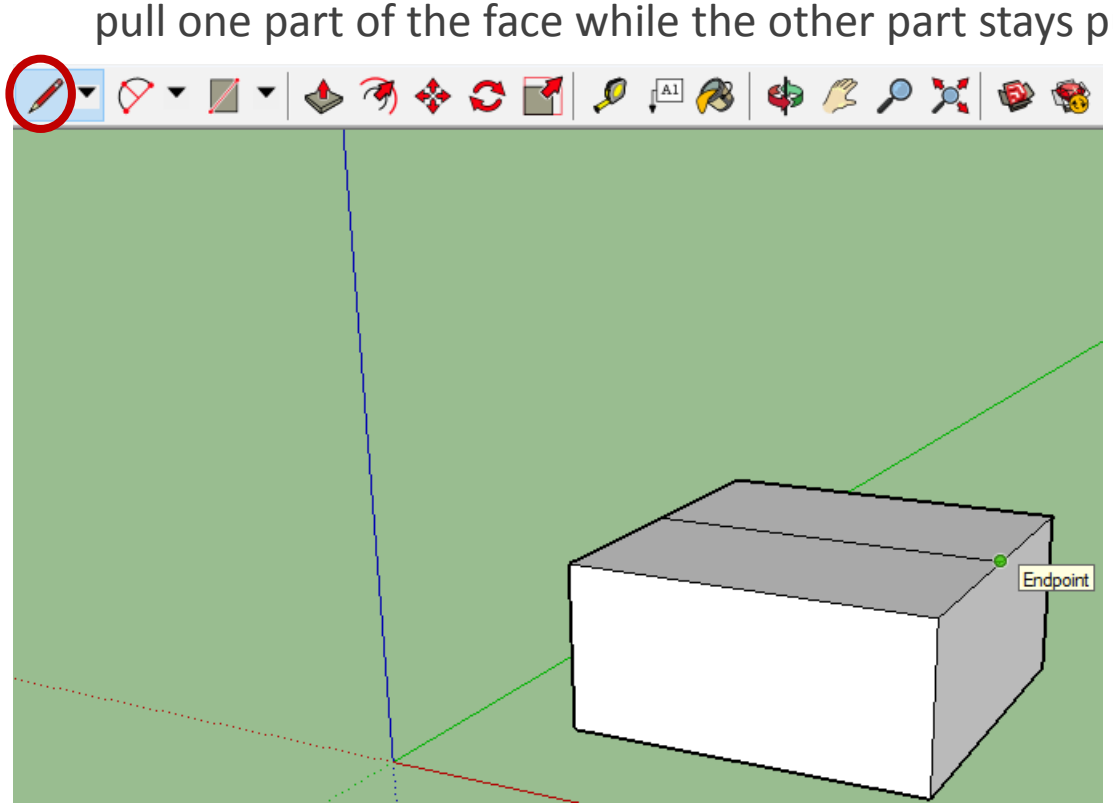
Creating a face

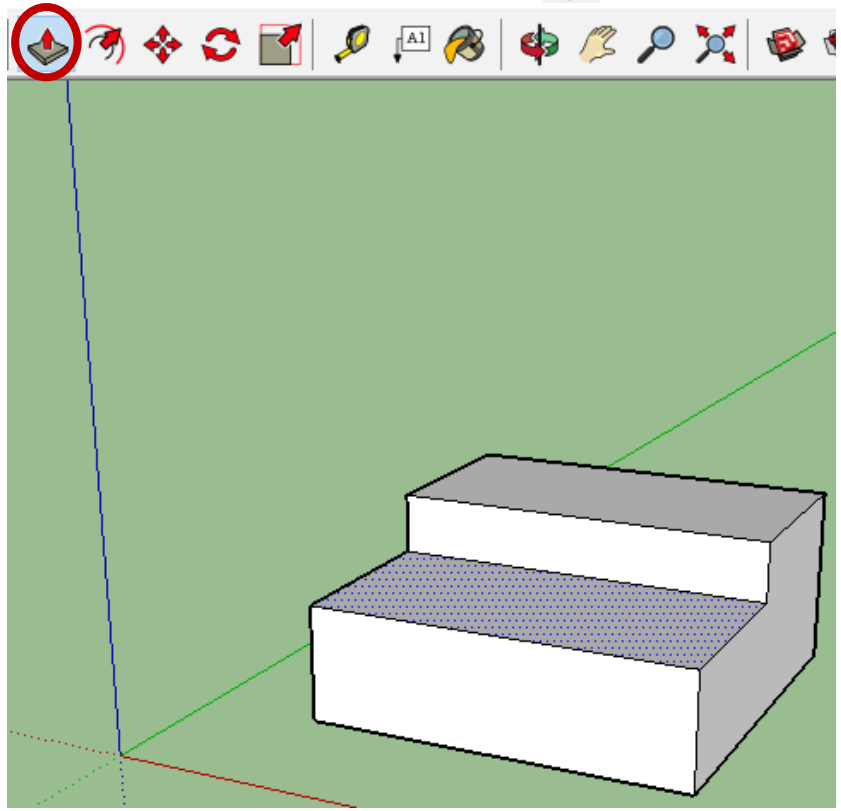
- When you join several lines into a shape, they form a face.
- By default, SketchUp adds shading to some faces, and the faces are opaque, so you know your model has an actual wall, floor, or whatever your face is supposed to represent in your 3D model.
- The shape tools — Rectangle, Circle, and Polygon — also create faces.



Dividing faces

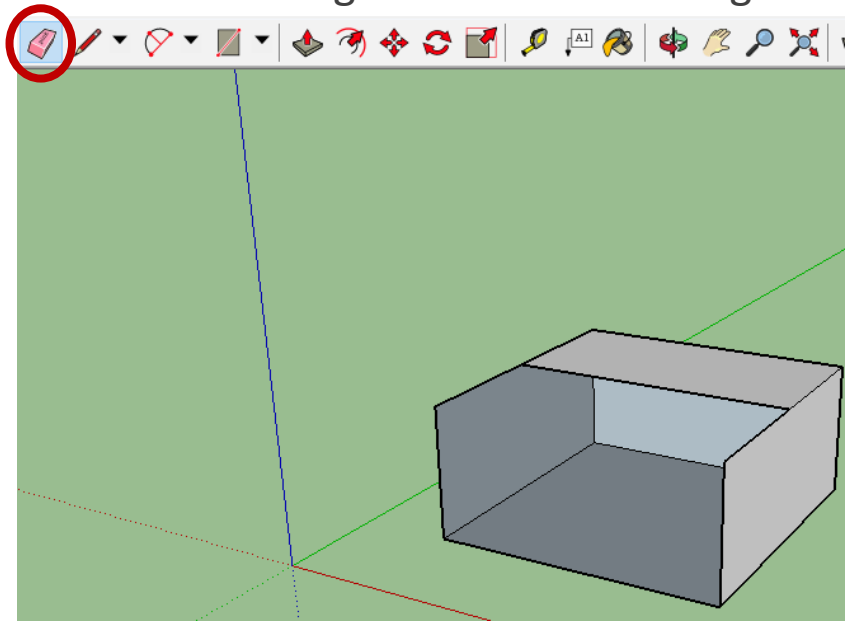
- When you draw a line (or a curve) on an existing face, you split the face.
- This concept is important because, after you split a face, you can use the Push/Pull tool ( ) to push or pull one part of the face while the other part stays put.

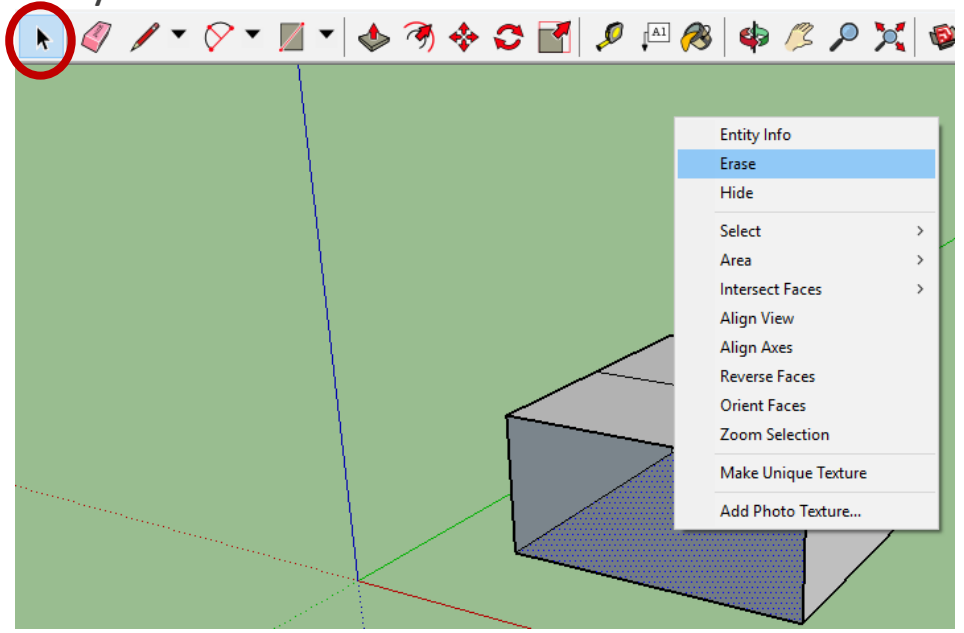




Opening 3D shapes by erasing edges and faces

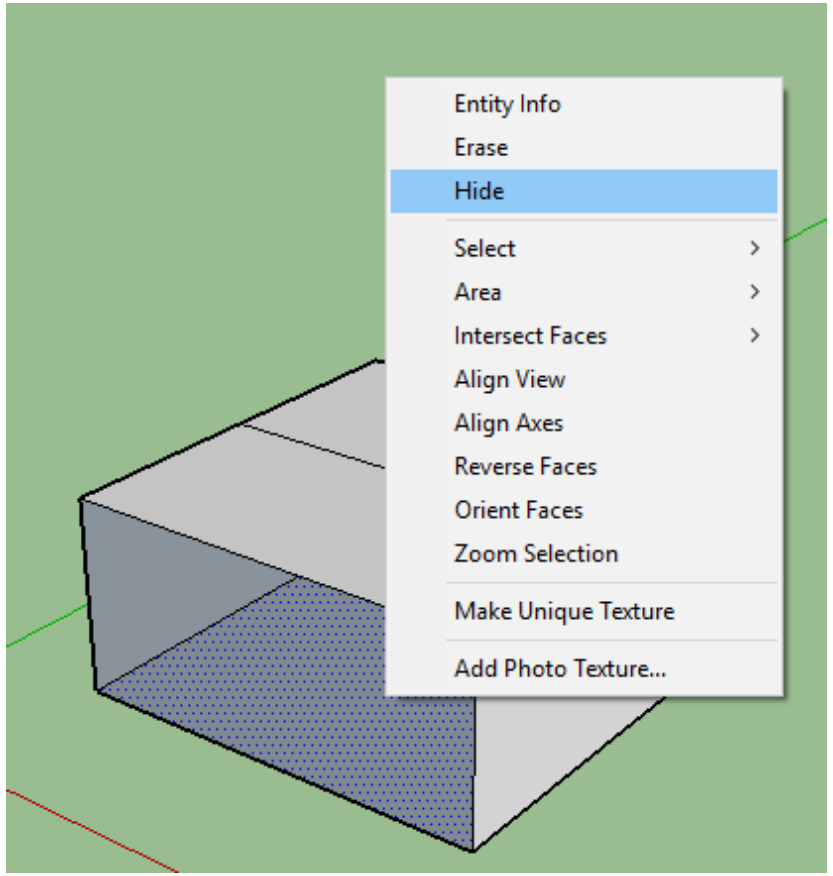
- You can erase an edge or face to create an opening in a shape.
- To see how erasing an edge affects your model, first select the Eraser tool ( ) in the toolbar or press the **E** key, and then click an edge:
  - Clicking an edge erases the edge and any face that touched that edge.
  - Context-clicking a face and choosing Erase deletes only the face.

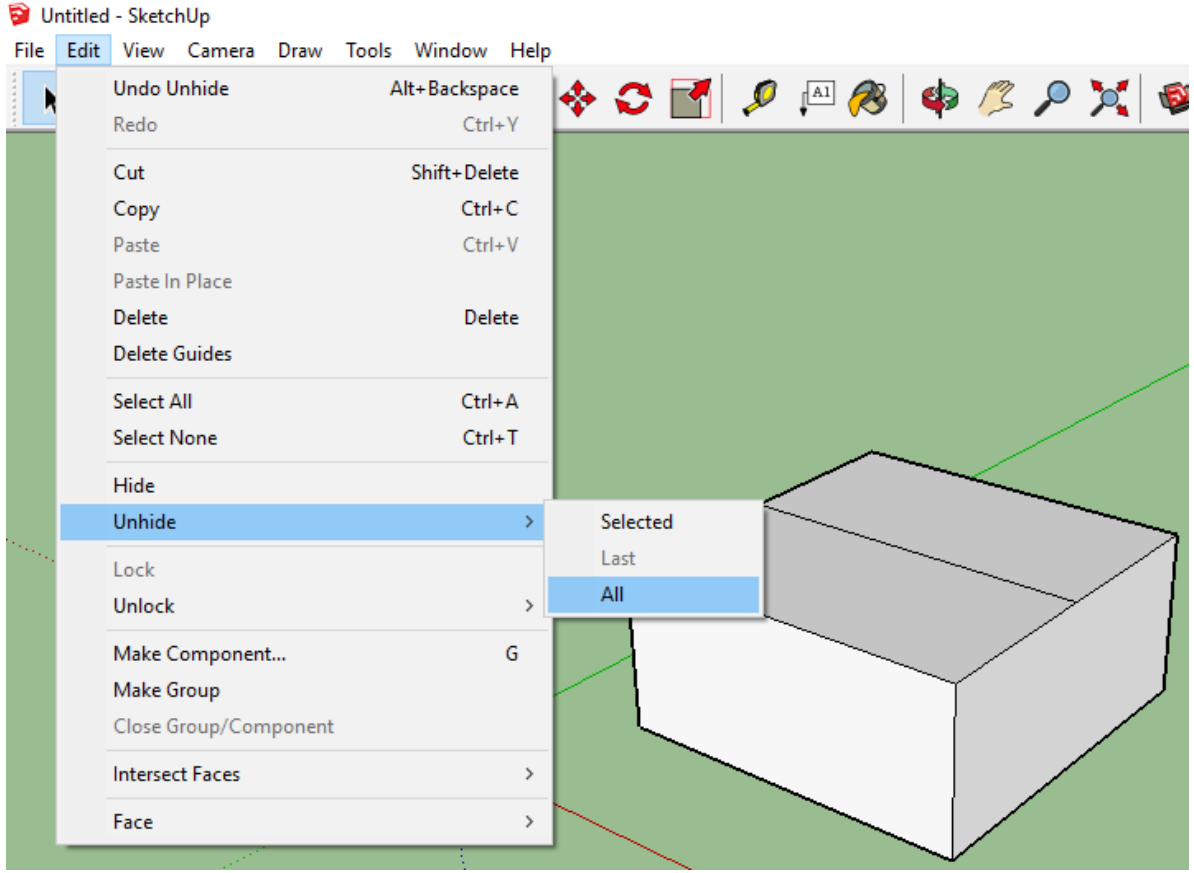




Opening 3D shapes by erasing edges and faces

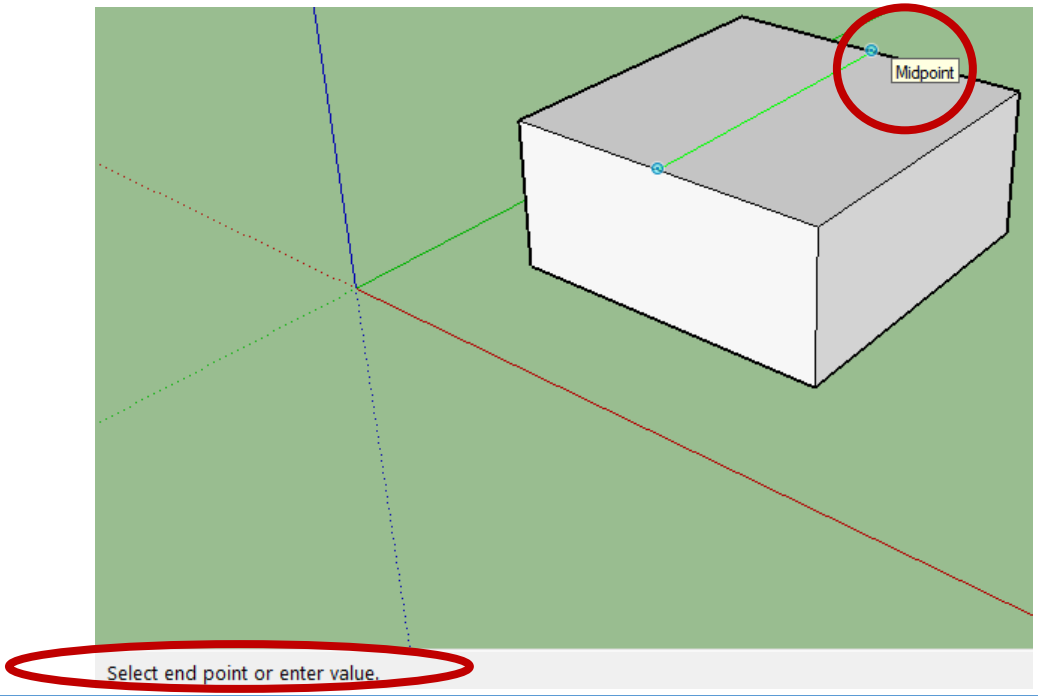
- If you want to hide a line instead of erasing it, context-click the line and select Hide.





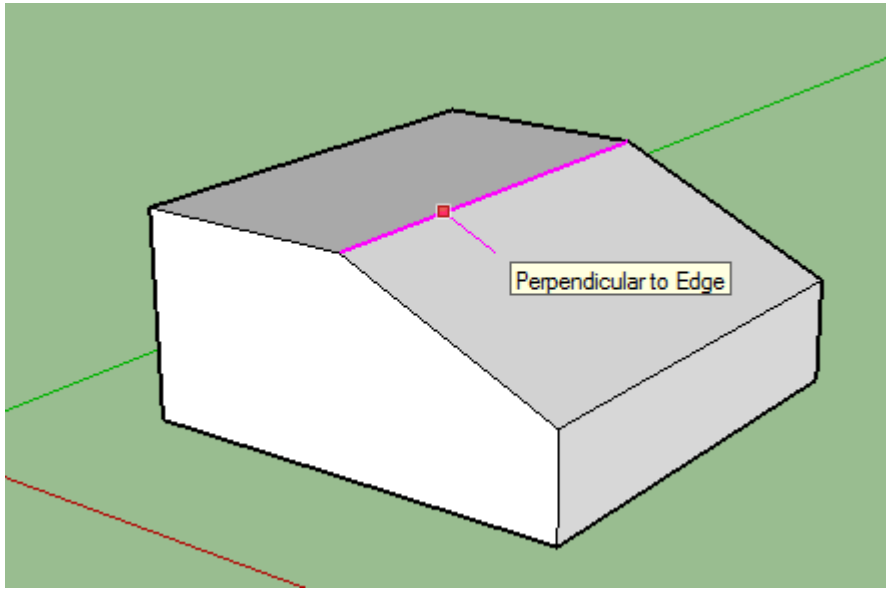
Finding and locking an inference

- SketchUp has an inference engine that helps you work in 3D space.
- For example, when the Line tool cursor is hovering over the midpoint of another line, the inference engine tells you by displaying a light blue dot and ScreenTip that says “Midpoint”.
- Every inference has its own color and ScreenTip. (will be discussed later in this chapter).



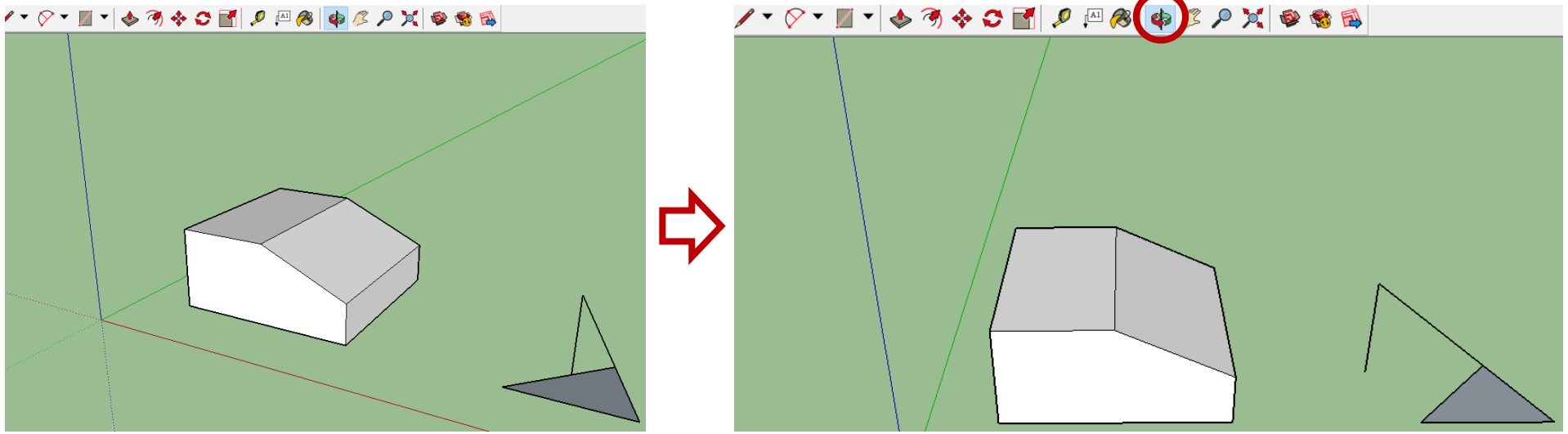
Finding and locking an inference

- The inference engine can also help you find geometric relationships between lines.
- For example, it tells you when a line you're drawing is perpendicular to another line.
- In the following figure, notice that a colored dot also appears at the start point of the line, giving you a few bits of information all at once.



Finding and locking an inference

- Pay close attention to the inference engine and orbit occasionally to check your drawing from different viewpoints.
- In the following figure, the lines might appear to be on the red and green plane until you orbit to a different view.
- To avoid this common pitfall, SketchUp helps by turning your drawing direction or drawing plane red, green, or blue when you're creating edges or planes parallel to those axes (or magenta if you're parallel/perpendicular to an edge or face in your model).

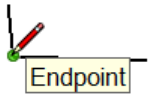
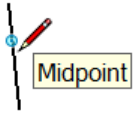
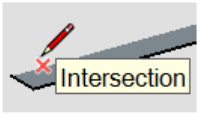
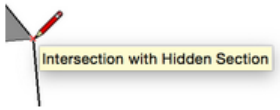


Knowing your inference types

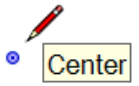
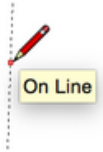
- SketchUp displays several types of inferences: point, linear, and shape.
- SketchUp often combines inferences together to form a complex inference.
- Also, components and dynamic components have their own inference types.

Knowing your inference types

- A **point inference** is based on the exact point of your cursor in your model.
- The following table lists the point inference types.

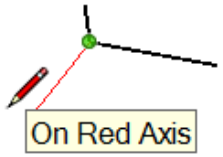
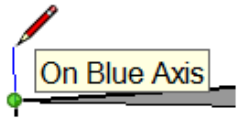
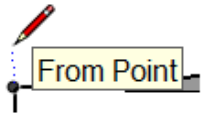
Point Inference Type	What It Looks Like	What It Means
Endpoint		End of a line, arc, or arc segment
Midpoint		Middle point on a line, edge, or arc segment
Arc Midpoint		Middle point on an arc
Intersection		Point where a line intersects another line or face
Intersection with Hidden Section		Point where an edge that is generated by a hidden section plane intersects with the drawing tool

Knowing your inference types

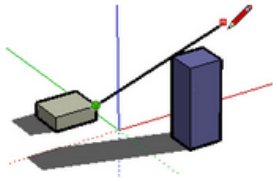
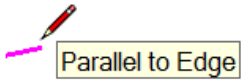
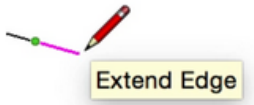
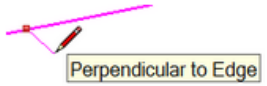
On Face		A point that lies on a face
On Edge		A point that lies on an edge
Center		Center of a circle, arc, or polygon
Guide Point		A guide point
On Line		A point along a guide line

Knowing your inference types

- A **linear inference** snaps along a line or direction in space.
- In addition to a ScreenTip, a linear inference sometimes displays a temporary dotted line while you draw.

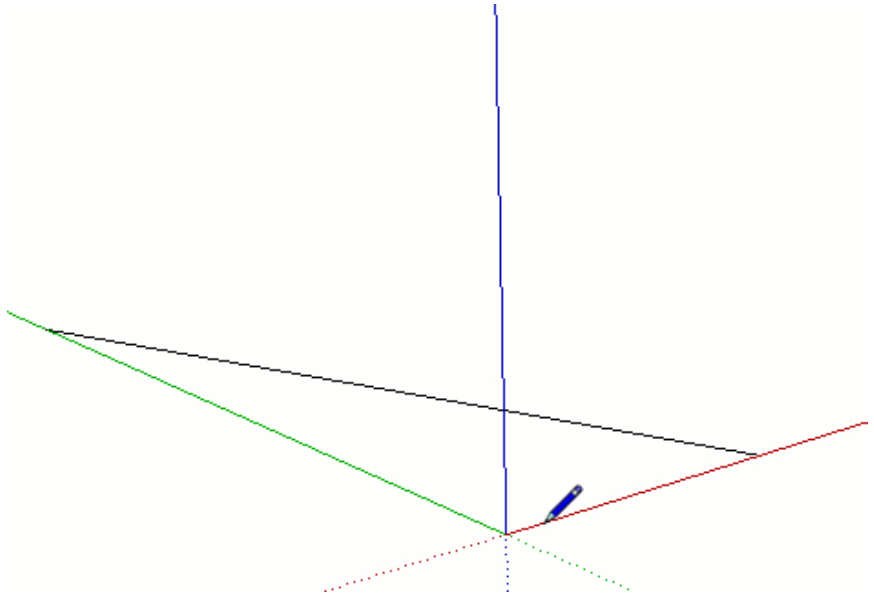
Linear Inference Type	What It Looks Like	What It Means
On Red Axis		Linear alignment to the red drawing axis (Click and drag as you draw to see the inference.)
On Green Axis		Linear alignment to green drawing axis (Click and drag as you draw.)
On Blue Axis		Linear alignment to the blue drawing axis (Click and drag as you draw.)
From Point		Linear alignment from a point; the dotted line's color corresponds to the axis direction

Knowing your inference types

Through Point		Draw from one point, hover over another point then hold Shift to lock the direction from the start of the drawing through the second point.
Parallel		Parallel alignment to an edge
Extend Edge		Continuation of an existing edge
Perpendicular		Perpendicular alignment to an edge
Tangent at Vertex		Arc whose vertex is tangent to a previously drawn arc's vertex

Locking inferences with a keyboard

- By locking inferences, you can confidently draw along the direction you intend to draw.
- Another reason to lock an inference is to maintain one drawing direction while you reference geometry from another part of the model.
- That's a more advanced move, but very helpful.
- The easiest way to lock an inference to the default axes directions is to use the arrow keys:

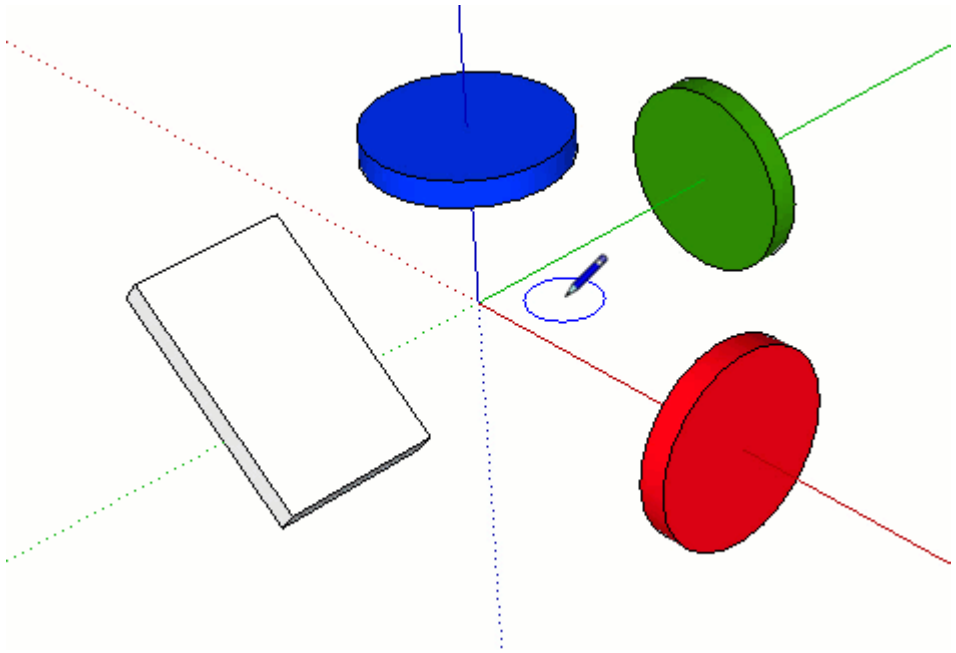


Locking inferences with a keyboard

Key	What it looks like
↑	Locks the drawing direction or drawing plane to the Blue axis
←	Locks the drawing direction or drawing plane to the Green axis
→	Locks the drawing direction or drawing plane to the Red axis. A good way to remember left from right is to say "Right locks Red."
↓	Toggle to lock the parallel/perpendicular drawing direction or drawing plane to an inferenced edge or plane. Basically, anything that turns magenta. The drawing direction will turn magenta in color as well as the edge of face that is being inference.
Shift	Locks the drawing direction or drawing plane to the active drawing direction/plane. So if you're drawing along the Blue axes and hold down Shift, the Blue inference will lock.

Locking inferences with a keyboard

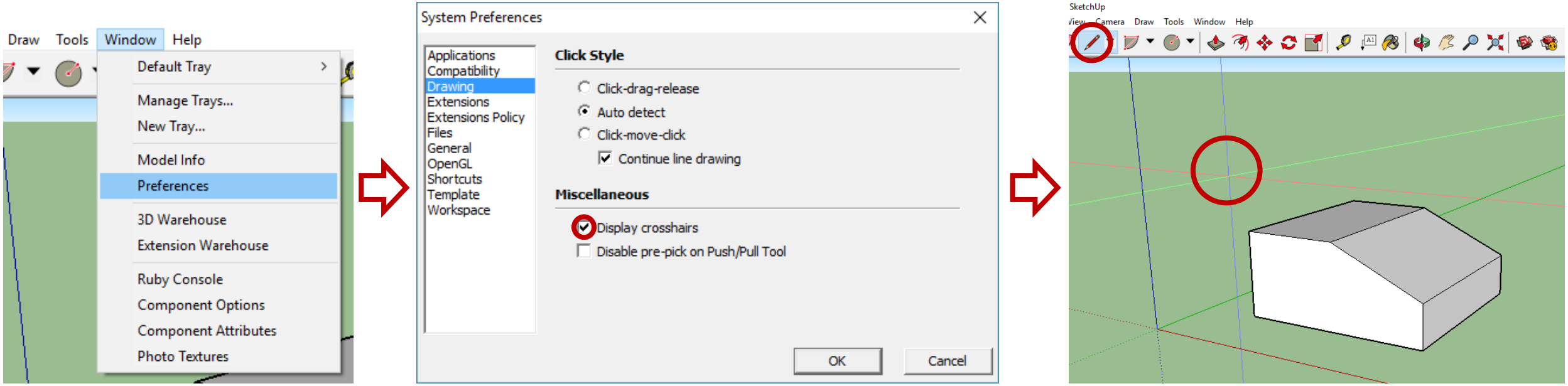
- Some tools, like the circle and rotate tools, can lock to a plane (instead of a drawing direction).
- For these tools you can lock the drawing plane by choosing the colored direction for the tool's axis or "normal".



Ensuring edges are aligned to axes

- To ensure your edges align to axes, you may find it helpful to change the cursor to the axes colors.
- Or, if you need to check the alignment of existing geometry, change your edges to the axes colors.
- To change your cursor to axes colors, follow these steps:
  - Select **Window > Preferences** (Microsoft Windows) or **SketchUp > Preferences** (Mac OS X). The System Preferences dialog box appears.
  - Select the **Drawing** item on the left.
  - In the Miscellaneous area of the Drawing panel, select the **Display cross hairs** checkbox.
  - Click **OK** to close the System Preferences dialog box.
  - The cursor displays cross hairs that are the color of the axes.

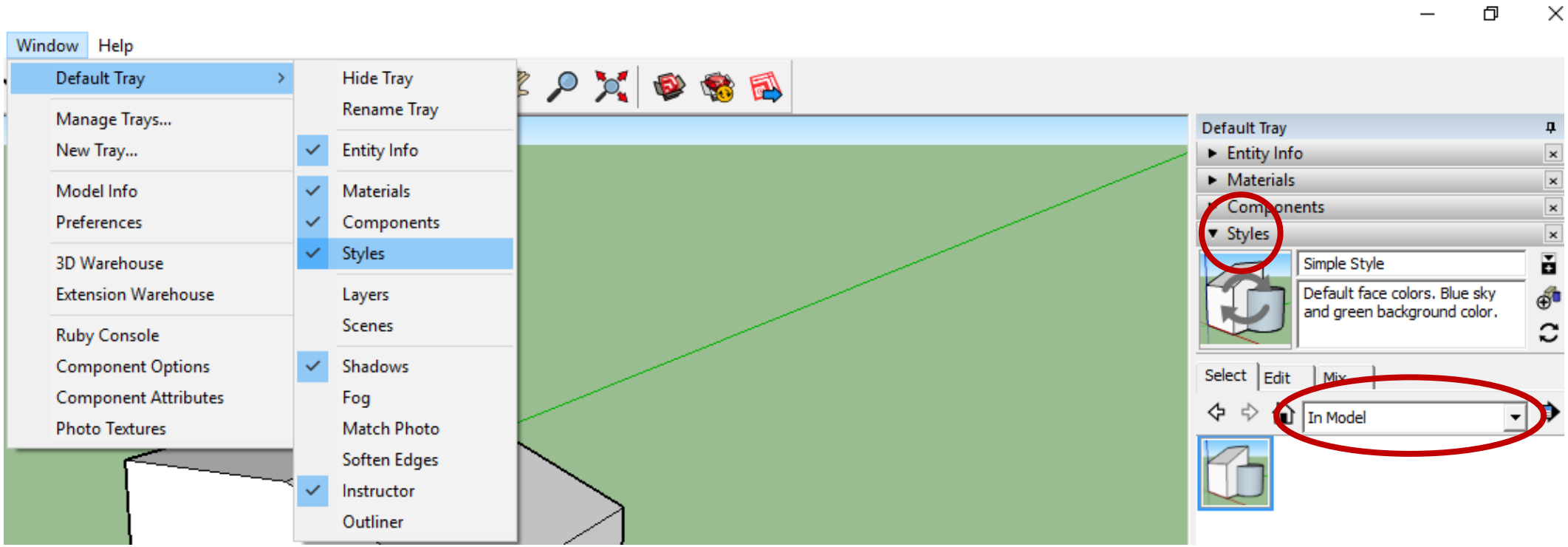
Ensuring edges are aligned to axes



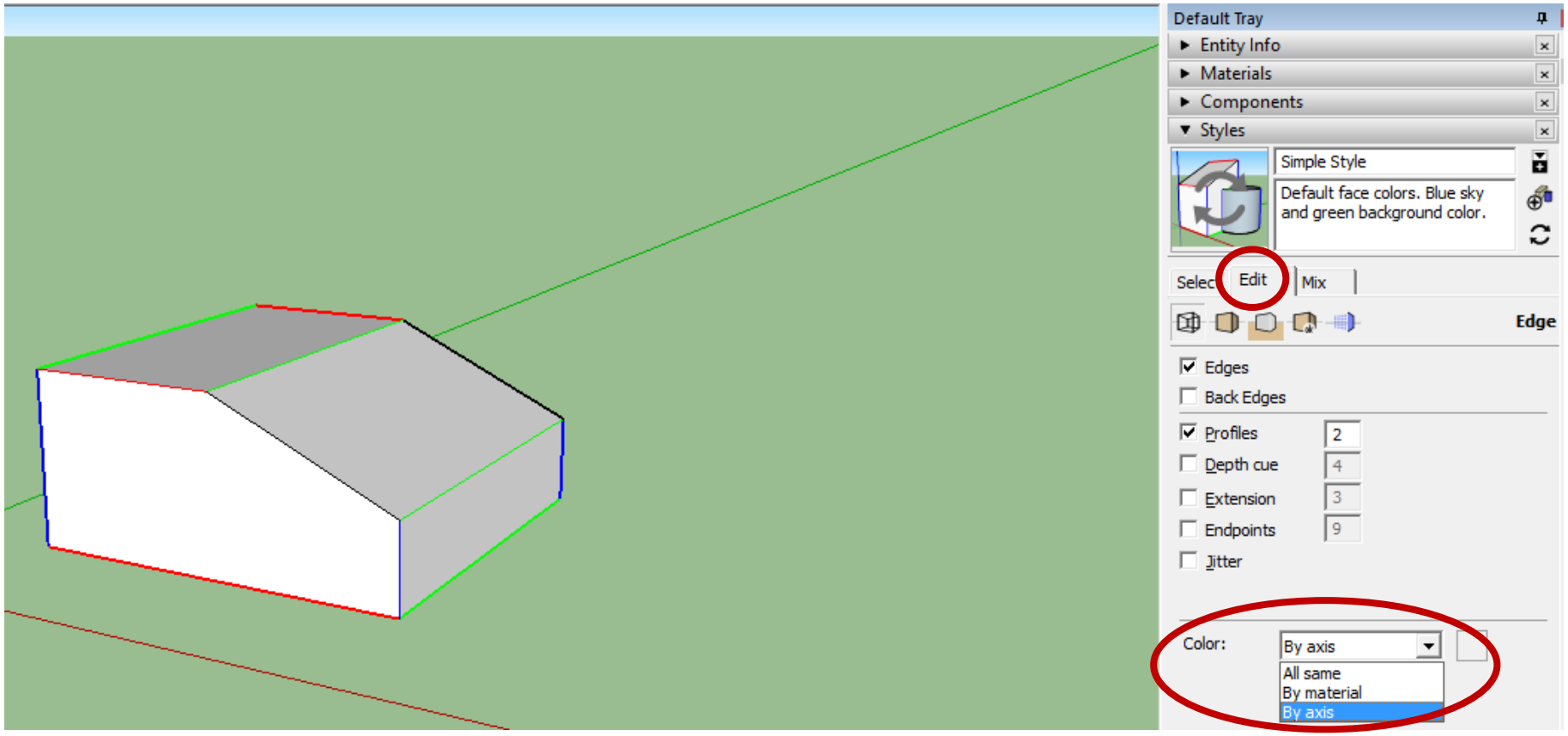
Ensuring edges are aligned to axes

- To make the edges in your model reflect the axis color to which it is aligned, follow these steps:
  - Select **Window >Default Tray > Styles**.
  - In the Styles dialog box, select **In Model** from the drop-down list of styles libraries.
  - Click the **Edit** tab.
  - Click the **Edge Settings** icon.
  - From the Color drop-down list, select **By axis**.
  - The colors of the edges in your model change to reflect their alignment to the axes (unless an edge isn't aligned to an axis, and then the edge color does not change).

Ensuring edges are aligned to axes



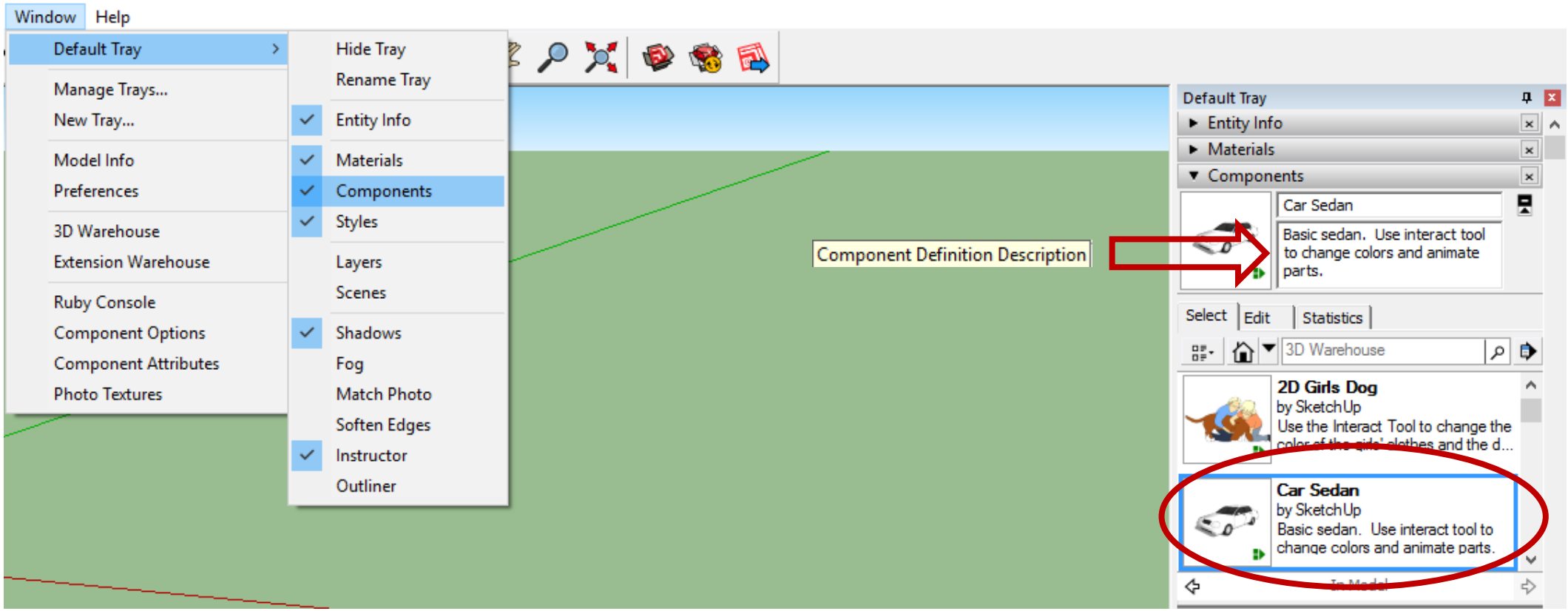
Ensuring edges are aligned to axes



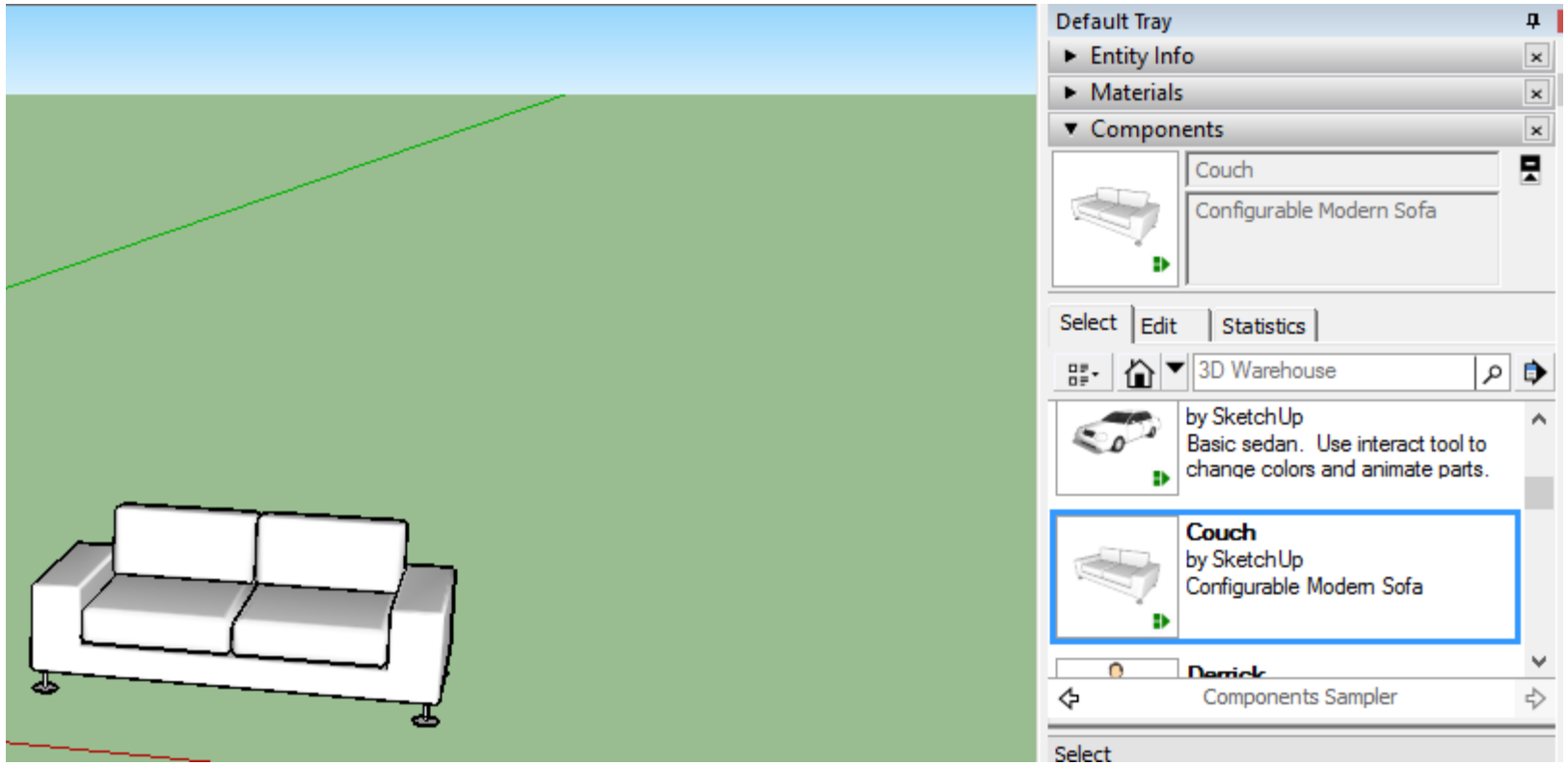
Adding Premade Components and Dynamic Components

- SketchUp components enable you to reuse objects.
- For example, pretty much every building has at least one door and window.
- Instead of modeling these common objects, you can insert a component that someone else has already made.
- Before you start inserting components, you need to know that every component has a definition and an instance:
  - A component definition provides a blueprint for how all components of a specific type appear and behave in the drawing area.
  - When you insert a component into a model, you create a component instance, which is based on its definition.

Adding Premade Components and Dynamic Components



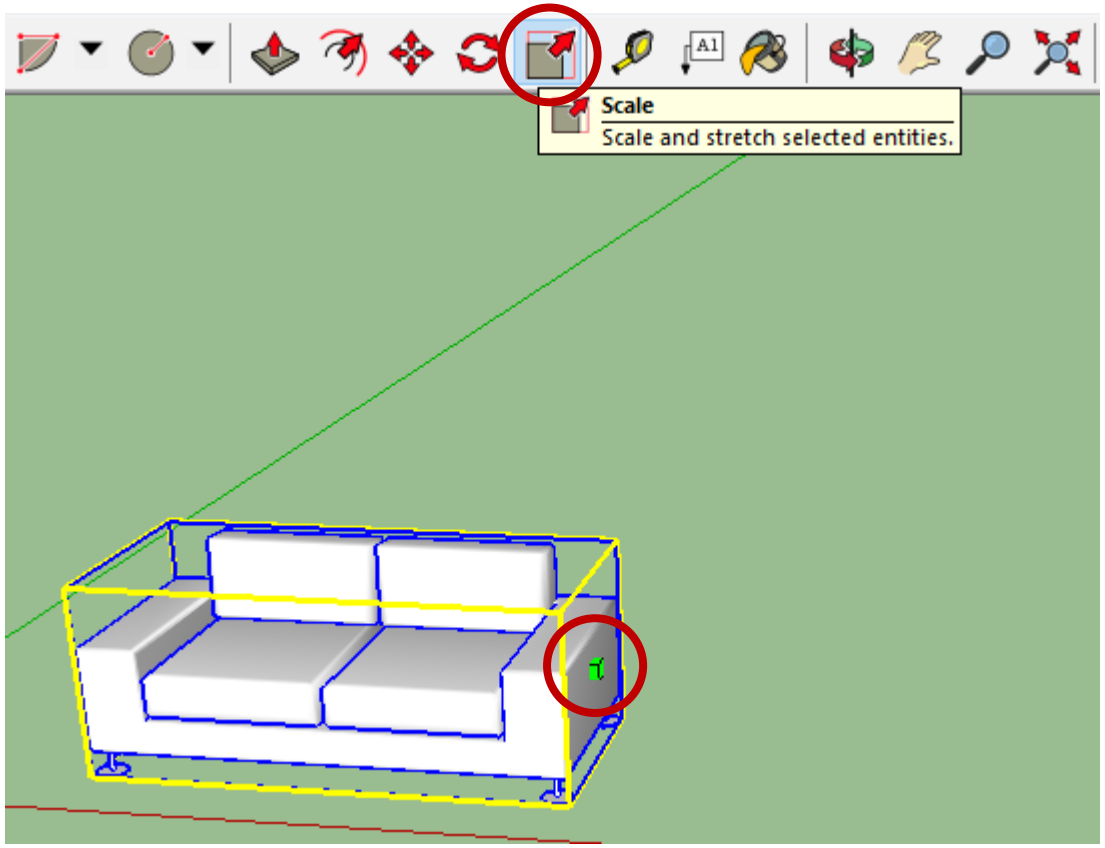
Adding Premade Components and Dynamic Components

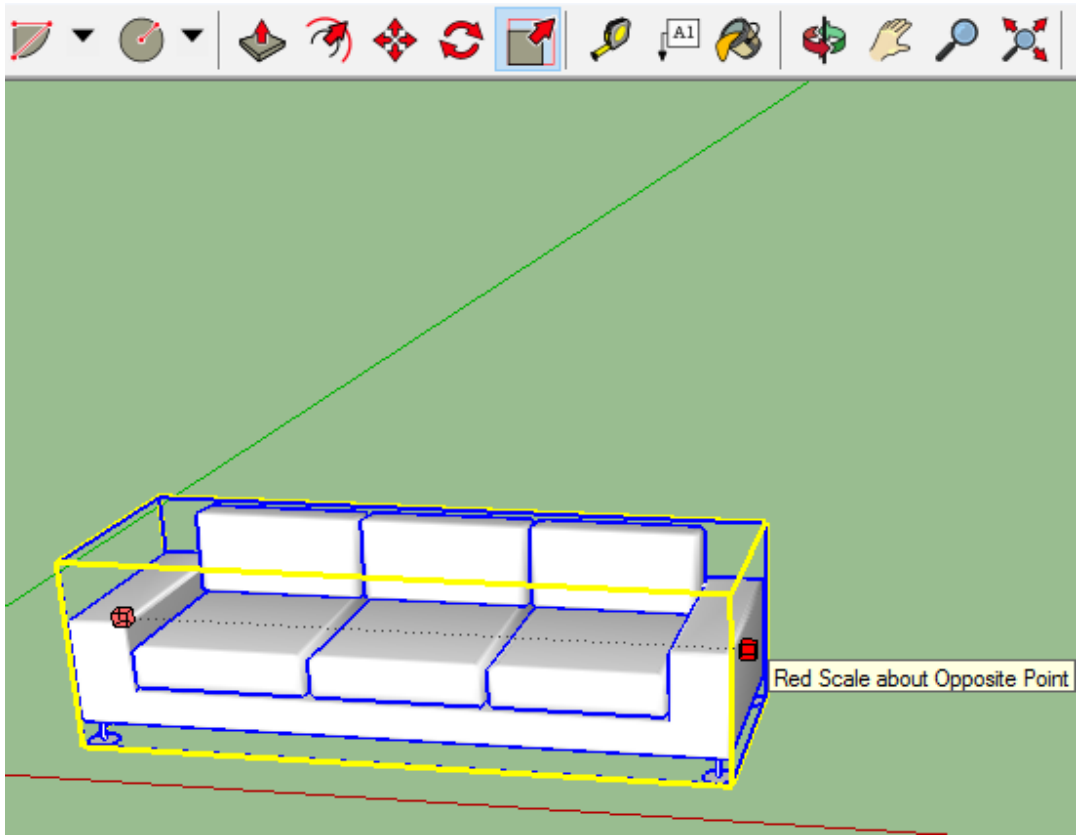


Adding Premade Components and Dynamic Components

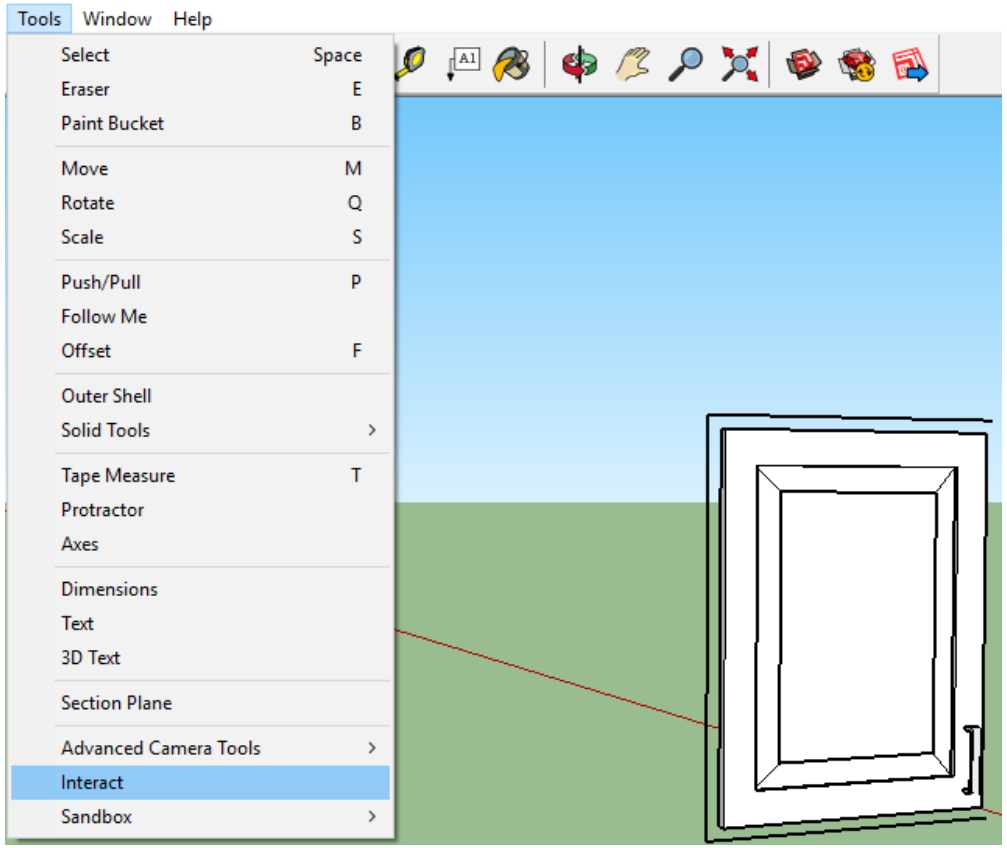
- Dynamic components have even more capabilities than regular components. If a component is dynamic, it has at least one of the following elements:
  - **Constrained values:** For example, a dynamic cabinet door component might have a frame that's constrained to 3 inches. Whether the panel inside the frame is 12 x 24 inches or 24 x 48 inches or some other dimension, the frame remains 3 inches wide all the way around the door.
  - **Repetitive elements:** A dynamic component can have subcomponents that repeat as you scale the component. For example, a repetitive dynamic component might add steps to a staircase, cushions to couch, pickets to a fence, studs to construction framing, and so on.
  - **Configurable values:** A dynamic component can have a predefined set of values that you can configure, such as a couch's length or the picket spacing in a fence component.
  - **Animated features:** An animated dynamic component moves when you click it with the Interact tool (). With animated dynamic components, your model can have doors and windows that open.

Adding Premade Components and Dynamic Components





Adding Premade Components and Dynamic Components



Adding Premade Components and Dynamic Components