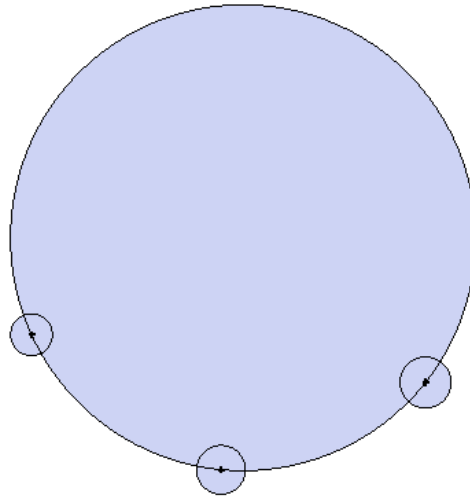


Creating a Circle from Three Points, in Google SketchUp

Everyone (right?) knows that you can create a circle that passes through any three points, as long as those points do not all lie on the same line. This project will show you how to start with three points in SketchUp, and come up with that circle.

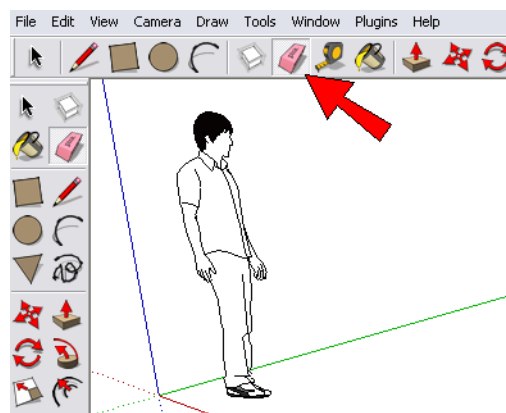


For this project, it helps to have some basic knowledge of Google SketchUp (though detailed instructions are provided). In particular, it's important to know how to zoom and pan the view. If you need more information on how to get started, and a description of some basic tools, please read 3DVinci's Getting Started Guide (PDF).

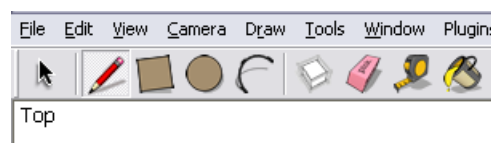
PC users: go to http://www.3dvinci.net/SketchUp_Intro_PC.pdf.

Mac users: go to http://www.3dvinci.net/SketchUp_Intro_MAC.pdf.

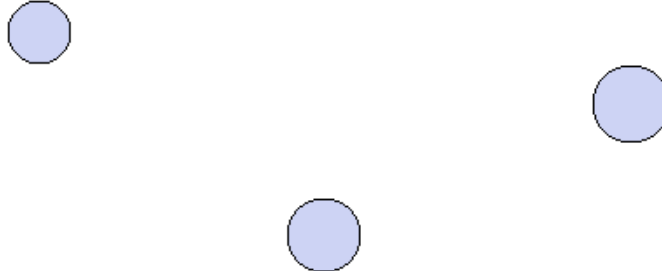
1. Open Google SketchUp. If your file contains a person standing on the ground near the origin, click the **Eraser** tool and erase him or her.



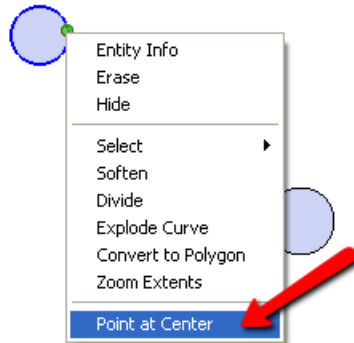
2. From the main menu, choose **Camera / Standard Views / Top**. Now you're looking down on the "ground," and the word **Top** appears in the top left corner of the SketchUp window.



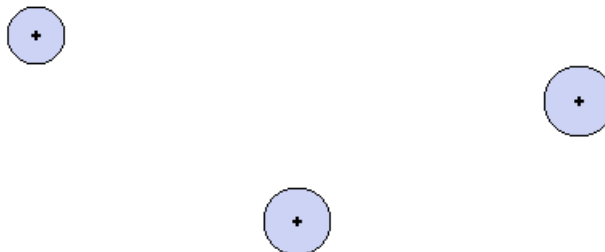
3. Activate the **Circle** tool, and draw three small circles anywhere. (To create a circle, first click the center, then a point on the circumference.) The centers of these circles will be the three points through which the larger circle will pass.



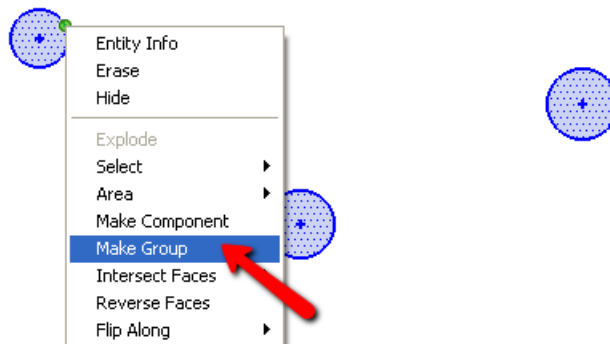
4. On each circle, right-click on its edge (don't right-click on the face) and choose **Point at Center**.



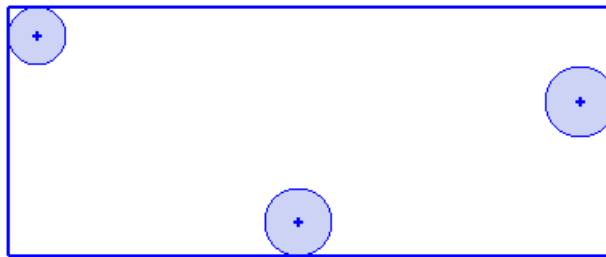
This marks each circle with a small “plus” sign.



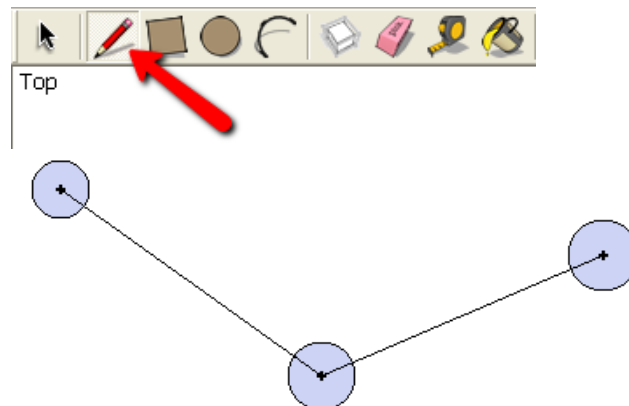
5. These objects need to be “separated” from future objects, so that they won't affect anything that's about to be created. This will be done by making a group from these circles and points. To select everything in the model so far, press Ctrl + A (PC) or Cmd + A (Mac), then right-click on any selected face and choose **Make Group**.



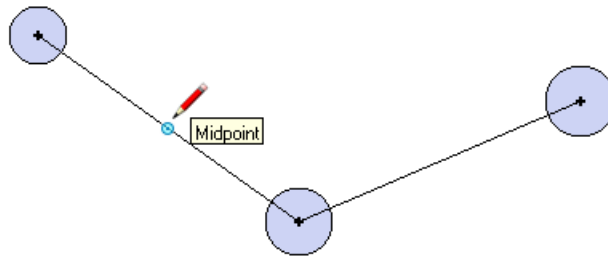
Now everything that's part of the group is enclosed in a blue bounding box.



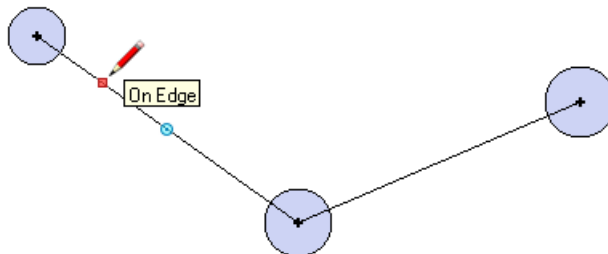
6. This means that the group is selected, so right-click anywhere in blank space to unselect the group.
7. The next step is to draw two lines. Activate the **Line** tool, start the line at one center point, click the next centerpoint, then click the third one. Press Esc to end the line drawing.



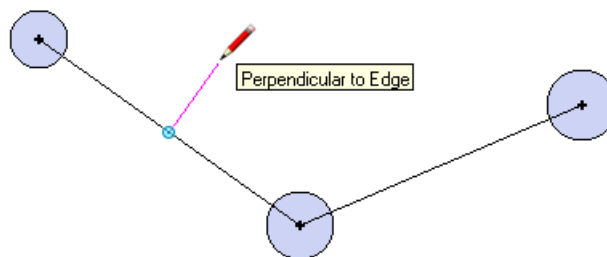
8. Now both of these lines need a perpendicular bisector. Leave the **Line** tool active, and start a new line by clicking one of the midpoints.



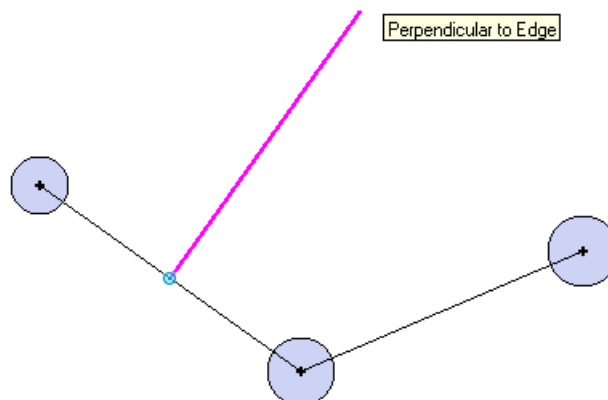
9. Then before clicking the next point, hover your cursor for a second or two over the line itself - you'll see the "On Edge" popup.



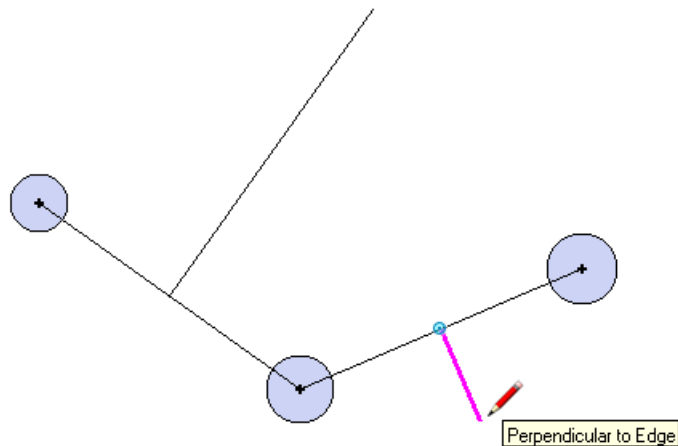
10. Then move the cursor away until the preview line turns magenta and you see the "Perpendicular to Edge" popup.



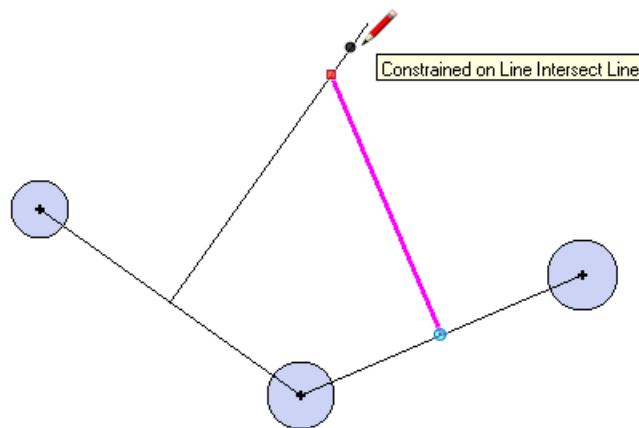
11. Before clicking anywhere, press and hold the Shift key. This turns the magenta preview line bold, which means the perpendicular direction is locked in. Keeping Shift pressed, click anywhere to finish the line, making it longer than you know it needs to be.



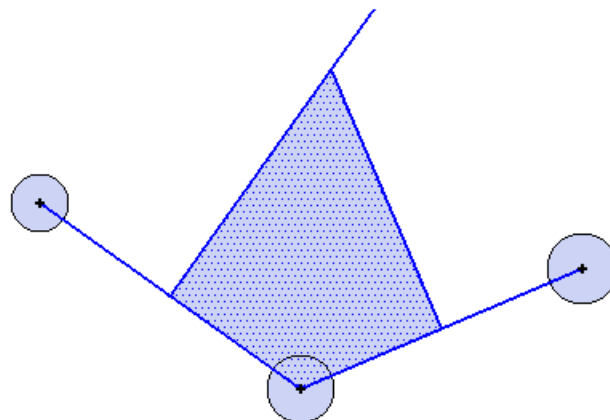
12. Now use the same method to create a perpendicular line starting from the midpoint of the other line. You can set the preview line in either direction - if it's away from other objects you'll be able to avoid picking up unwanted popups.



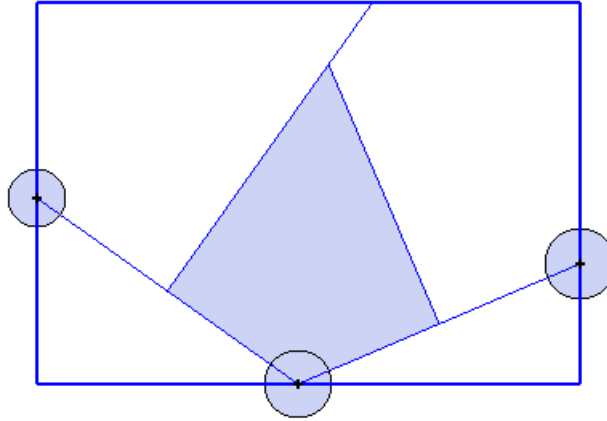
13. Press and hold Shift again to lock in the perpendicular direction, and move your cursor to the other perpendicular line you just created before. When you see the "Constrained on Line Intersect Line" popup, click to complete the line. The point where these two perpendicular lines intersect is the center of the circle we're looking for.



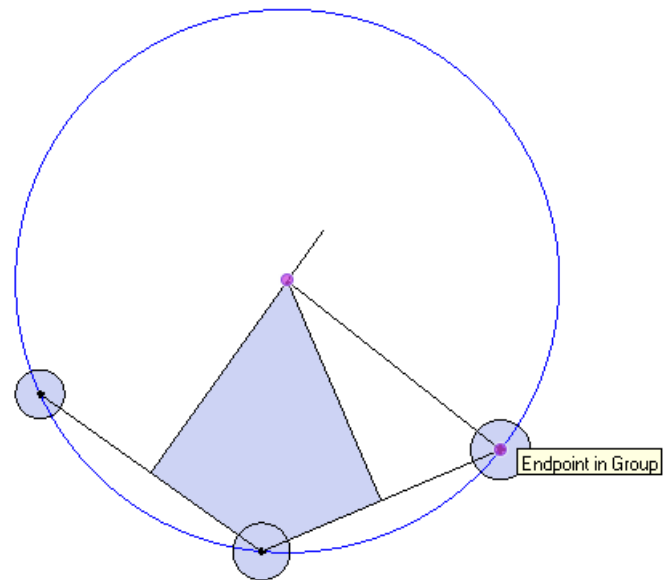
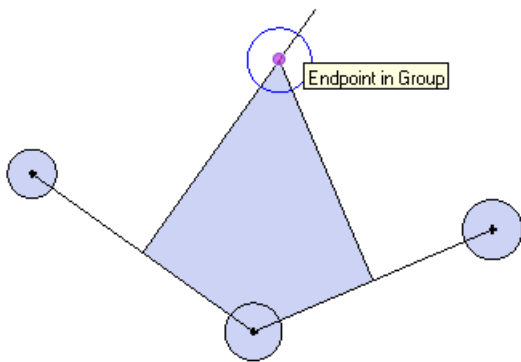
14. In order that the lines we just created can be easily erased later, let's make them into another group. To select everything so far that's not part of the original group of circles, activate the **Select** tool (press the Spacebar). Then *triple-click* on one of the lines or the face you just created. This selects everything except for those original three circles.



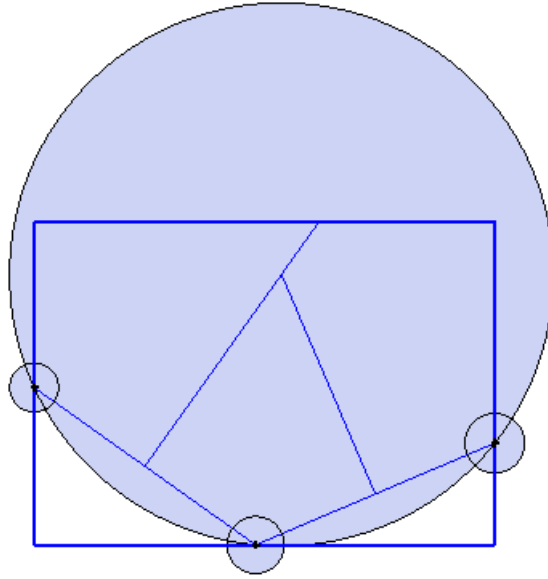
15. Right-click on any selected line or face and choose **Make Group**.



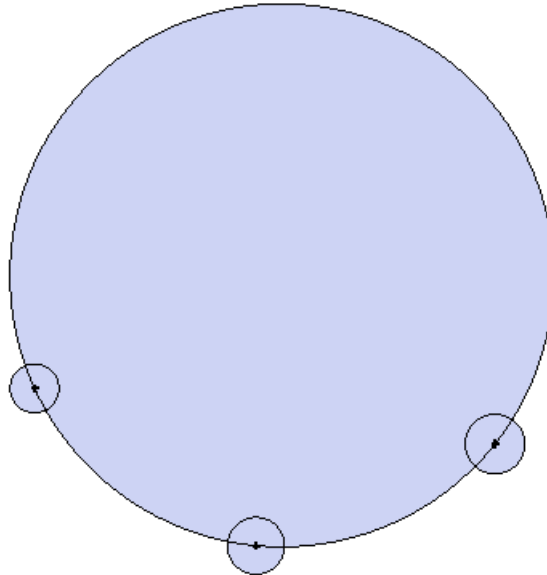
16. Now we're ready to create the three-point circle. Activate **Circle** again, click the point you know is the center, then click the centerpoint of any of the three original circles. The circle should pass through all three points. That's all there is to it!



17. To clean up the display, activate **Select** and click any line you used to construct the large circle - this selects the entire group the line belongs to.

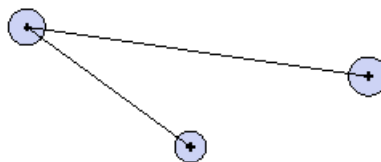


18. Press the Delete key to erase this group. Now we just have the three original circle and the large one passing through.

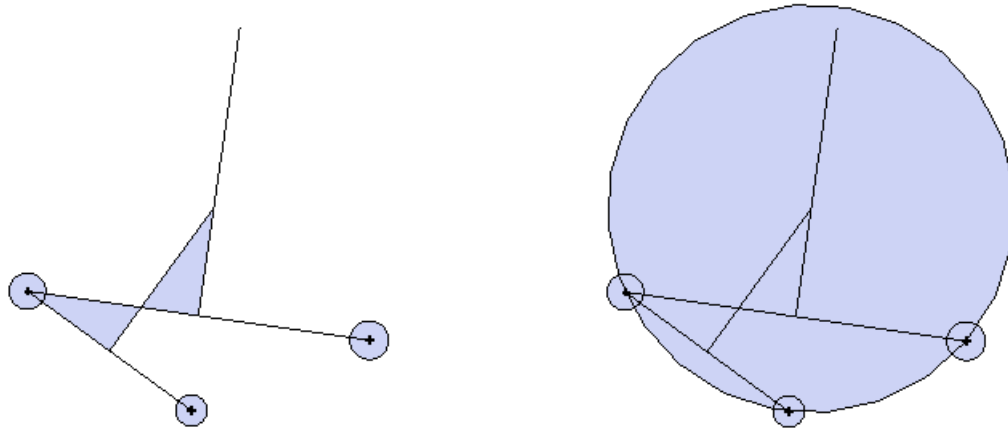


Try This

When you draw the two lines between the centerpoints, it doesn't matter which lines you draw. For example, if you draw these two lines:



You'll get the same result.



Want More?

For more geometry projects using Google SketchUp, check out our GeomeTricks books. All books are available in print and as printable e-books. See <http://www.3dvinci.net/ccp0-catshow/GM.html>.

You can also sign up for our [SketchUp Project of the Month](http://www.3dvinci.net/ccp0-prodshow/POM.html) subscription. Each month you will receive three fun projects (one in math, two in 3D design) that can be used in K-12 classes. Details at <http://www.3dvinci.net/ccp0-prodshow/POM.html>.

January has a project that shows how to make an animation into a series of “infinite” hexagons.

