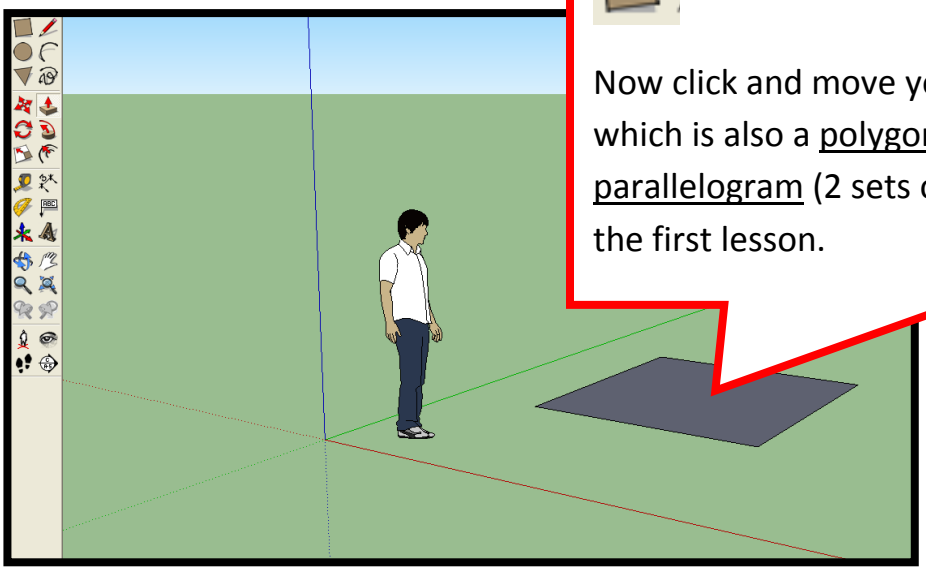
Google Sketch up: Faces, Edges and Vertices of 3D Shapes

2.7A Describe attributes (the number of vertices, faces, edges, sides) of two- and three-dimensional geometric figures such as circles, polygons, spheres, cones, cylinders, prisms, and pyramids, etc.;
3.8A Identify, classify, and describe two- and three-dimensional figures by their attributes.
4.8C Use essential attributes to define two-and three-dimensional geometric figures
5.7A Identify essential attributes including parallel and perpendicular, and congruent parts of two- and three- dimensional geometric figures.

Your Task: Find the number of Faces, Edges and Vertices of a 3D object.

Step 1: Draw a rectangle.

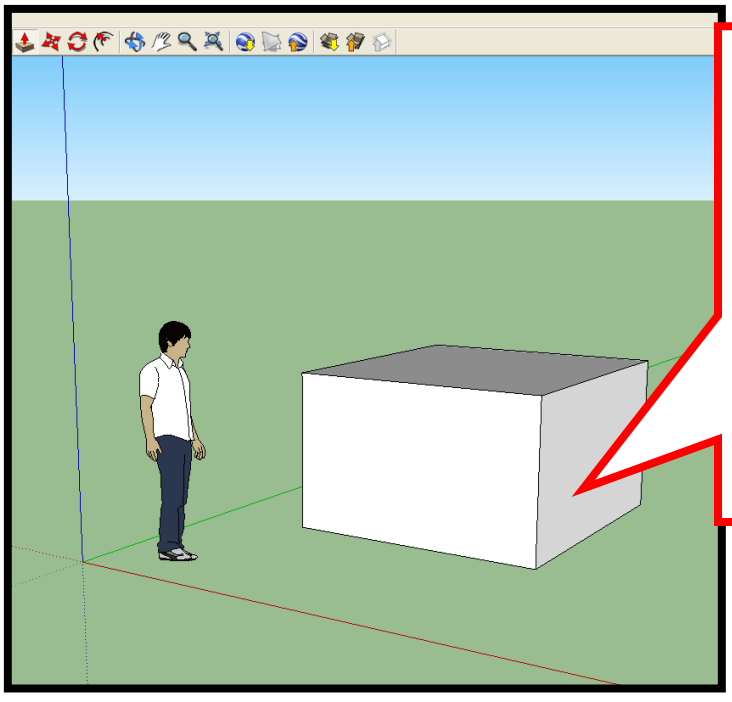


Click on the **brown rectangle tool** in the tool bar

Now click and move your mouse to draw a rectangle which is also a polygon (closed straight sides) and a parallelogram (2 sets of parallel lines) which we proved in the first lesson.

***Tip**: Press the space bar to exit any tool.

Step 2: Turn it into a 3D object- A Rectangular Prism.



Click on the Push>Pull tool 

Click on the surface and pull it up so you can see it in 3 dimensions now like shown to the left so that you have a rectangular prism.

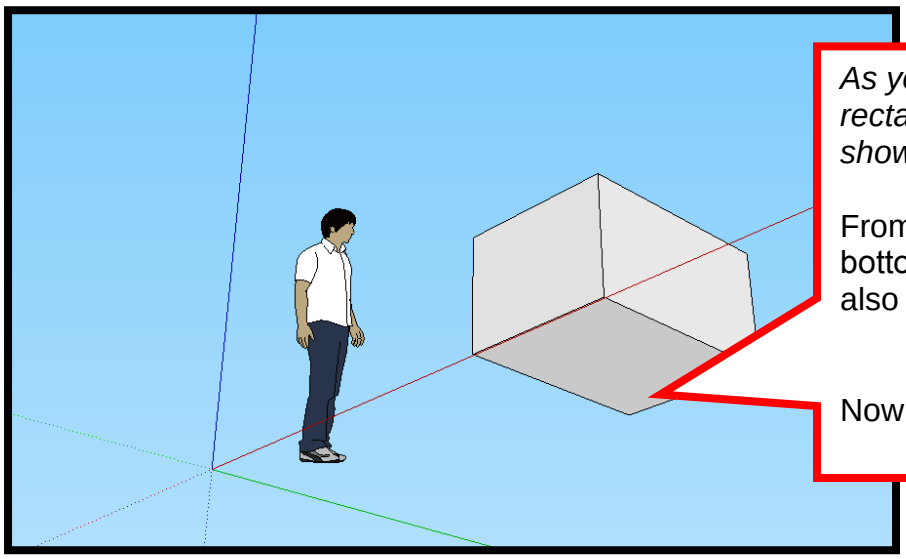
Note: Use the orbit tool to rotate view so you can see a flat surface to pull up.

The sides are now officially called edges.

Sharon Thornton- Instructional Technology

Step 3: Orbit to see all the faces to see how many there are

Now click on the **orbit tool** (or hold down the middle scroll wheel and move your mouse around to rotate.)
Now click on the screen and drag your mouse up and down, to the left and to the right



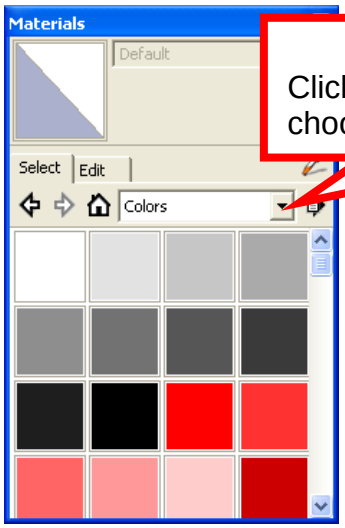
As you turn, you will be able to see this rectangular prism from different views as shown to the left.

From different sides, the back, top and bottom…. Both the horizon line and Nick can also help to remind you of your position.

Now you are able to count the number of faces.

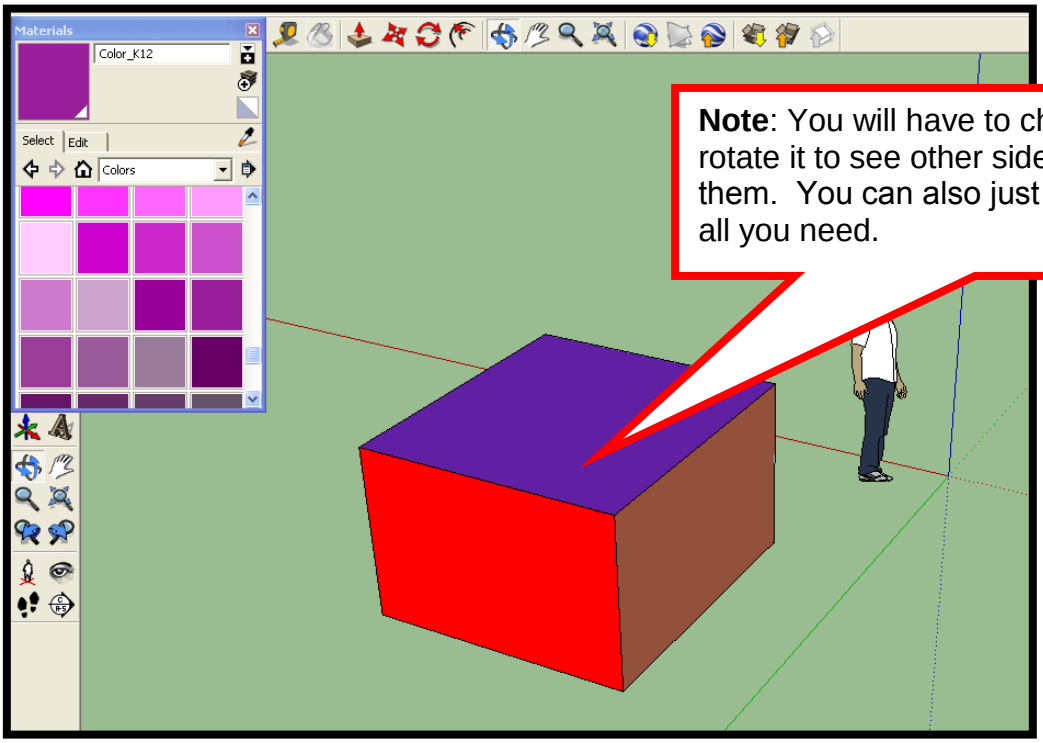
***Tip:** You can click on the paint bucket tool (the materials window) and color in each face with a different color to make them easier to count.

Click on the Paint bucket tool.

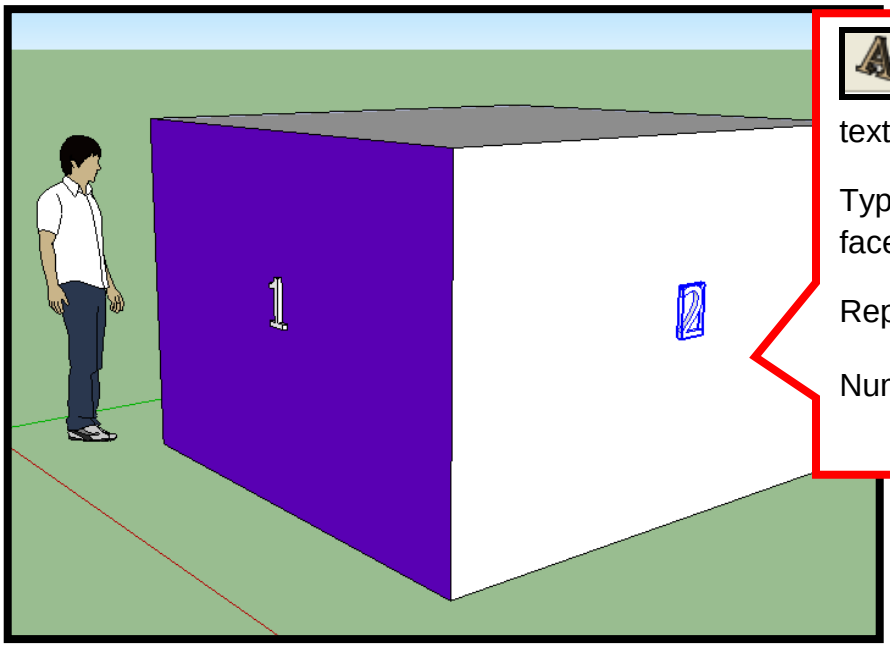


Click on the drop down menu and choose colors.

- Now click on each face and change it to a different color.



Note: You will have to choose the **<u>orbit tool</u>** to rotate it to see other sides so you can color them. You can also just color one side if that's all you need.



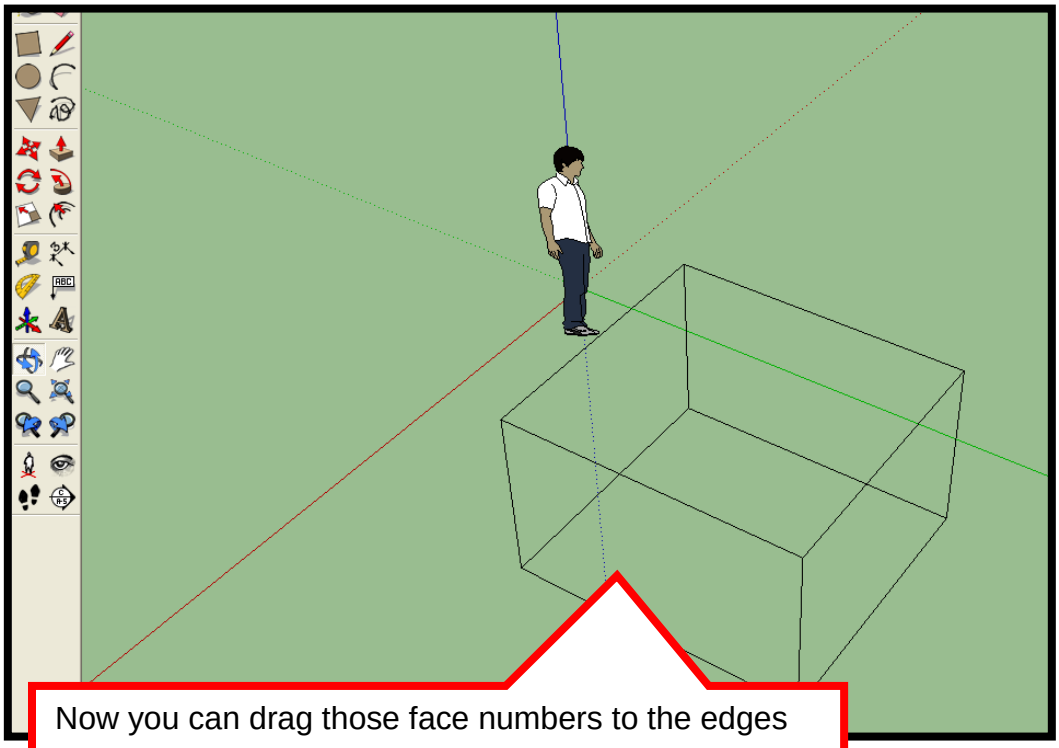
Click on the 3D text tool or ABC text tool.

Type 1 and click place. Drag on a face.

Repeat for all faces.

Number of Faces _____

Step 4: Count the number of edges and vertices (corners)



To do this, we are going to erase all of the faces first.

Click on a face, then press the delete key. Do this until all of your faces are gone.

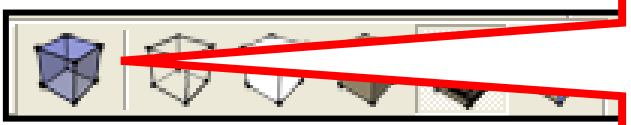
Number of Edges _____

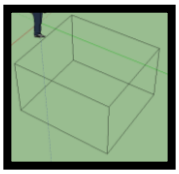
Number of Vertices (corners) _____

Now you can drag those face numbers to the edges and add more numbers if needed.

***Tip:** You can click on each edge as you count and it will turn blue as you count.

There is another- simpler way you can count the edges and vertices without removing all the faces.



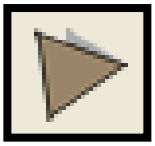


- Triple rectangular prism to select it.
- Click on the X-Ray tool in the tool bar.
- (Don't see this tool- **View>Toolbars>Face Style**
- **You can now see inside of your 3ED shape.**

- Now draw a cylinder, triangular prism and a cube.

For the cylinder: Click on the circle shape in the toolbar and draw your circle. You will have to rotate to see the bottom to pull it up.

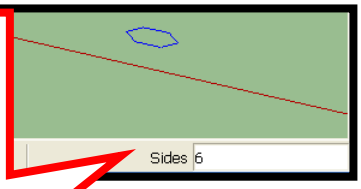
- **For the triangular prism: Your surface needs to have 3 sides.**



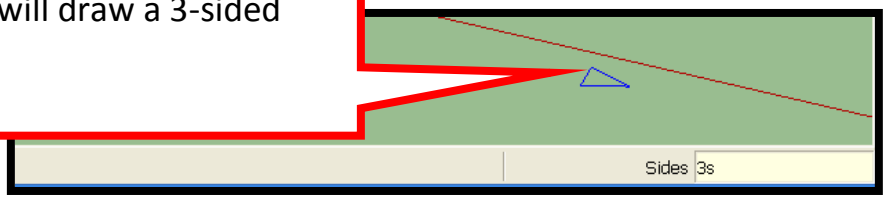
Choose the polygon tool (*since the default is six sides, you will have to type in the number of sides that you want which is 3.)*

In the bottom right hand corner it now says sides- 6. You can even see the shadow of a hexagon in blue. Take your hand off of the mouse and wait. Notice how it says Sides- 6.

Type **3S** and press the **enter key**.



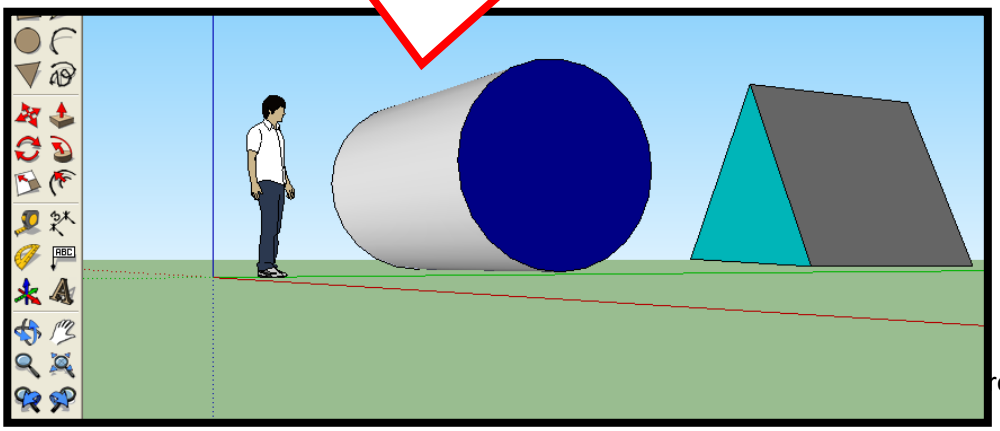
Now you can see that it will draw a 3-sided shape- a triangle.



-Use the push/pull tool to create 3D objects.

-Use the paint bucket and orbit tool to fill in the faces.

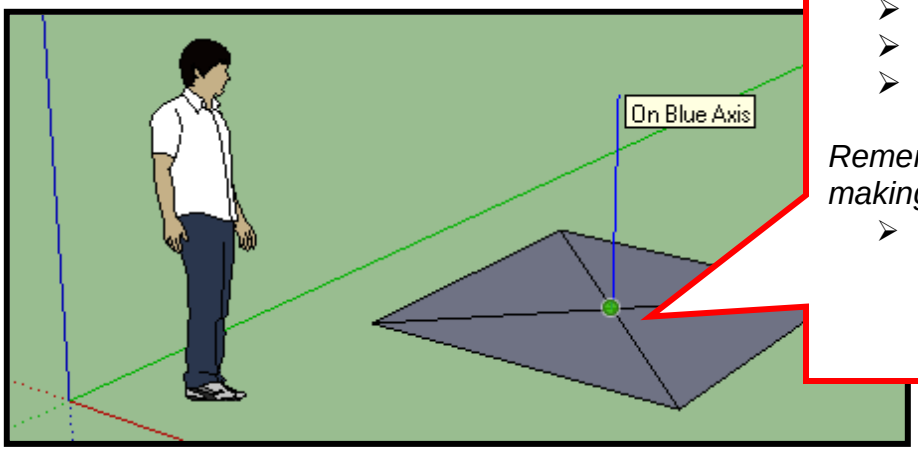
-Delete the faces to count the number of edges and vertices.



Cube
____Faces
____Edges
____Vertices

Triangular Prism
____Faces
____Edges
____Vertices

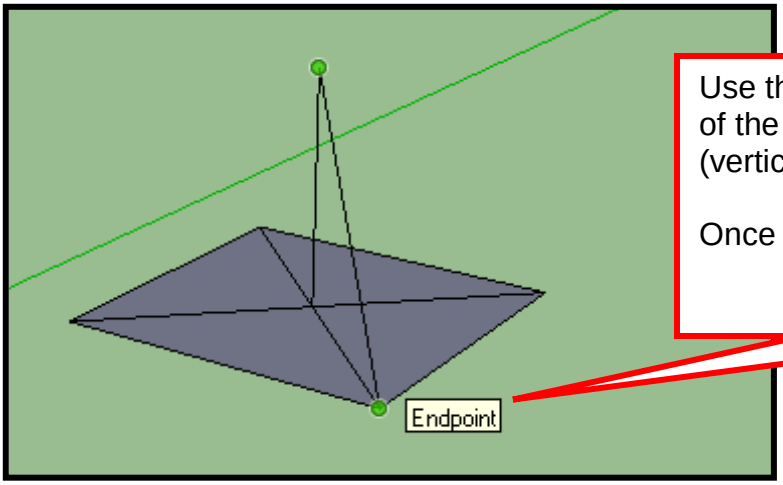
- **Draw other 3D shapes**



- **<u>Square or rectangular pyramid</u>**
- Draw a square or rectangle.
- Use the line to to draw 2 diagonal lines as shown (endpoint to endpoint.)

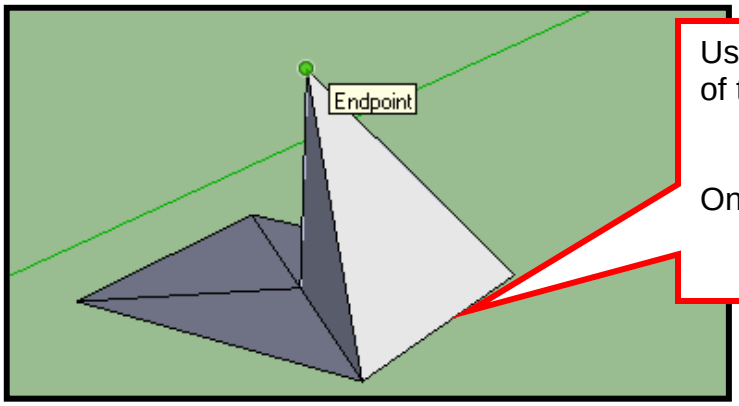
Remember to press the space bar in between making lines so they are not connected.

- Use the pencil tool again to draw one vertical line up the middle-
  drag so it snaps along the blue axis line to make sure the line is going up.



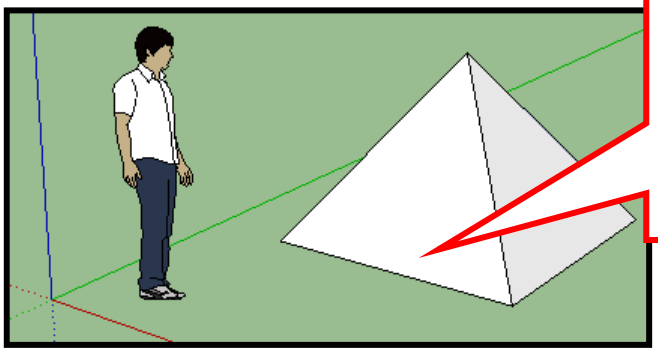
Use the pencil to draw a line from the top endpoint of the vertical line to one of the bottom corner (vertices) endpoints as shown.

Once you click the surface face will be filled in.



Use the pencil to draw a line from the top endpoint of the vertical line to the next corner (vertices.)

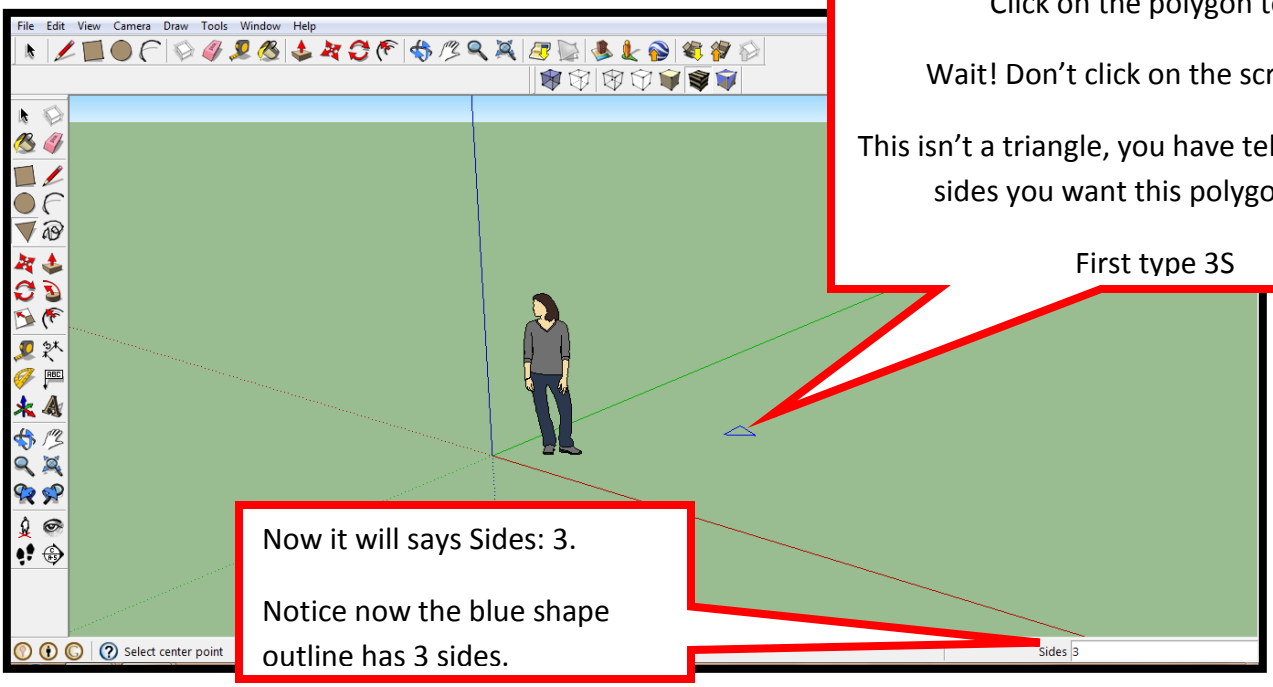
Once you click the surface face will be filled in.



Continue this pattern for the last 2 corners (vertices.)

You will now have a pyramid as shown.

Create a Triangular Pyramid



Click on the polygon tool.

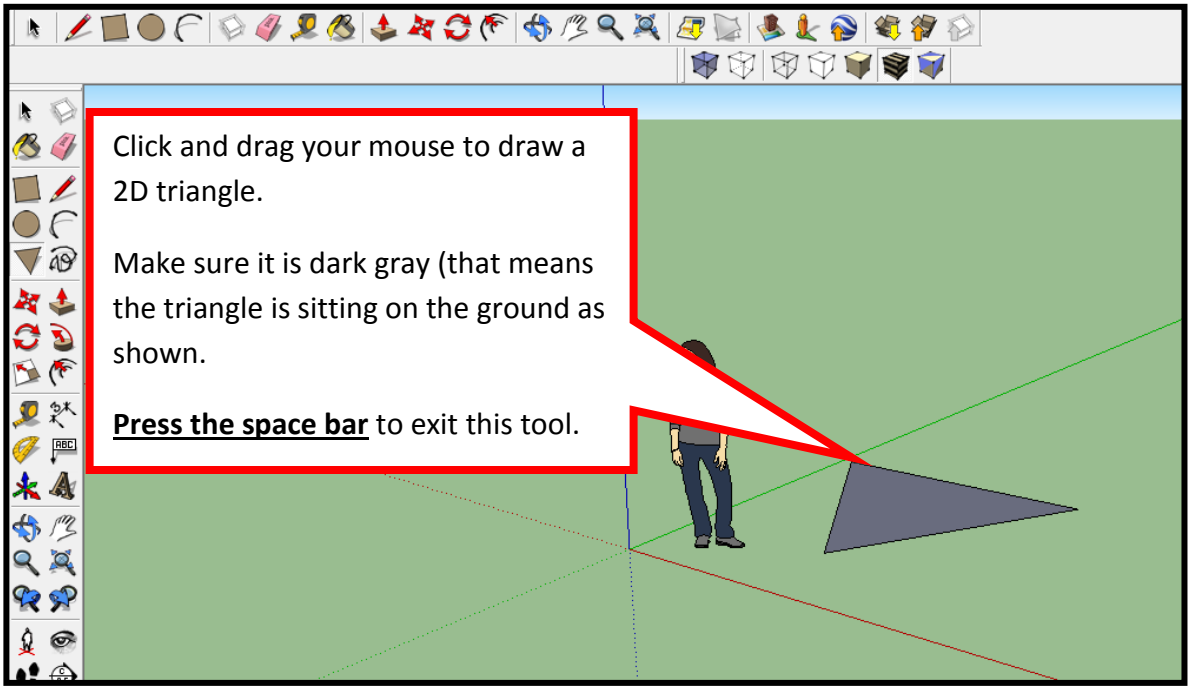
Wait! Don't click on the screen yet!

This isn't a triangle, you have tell it how many sides you want this polygon to be.

First type 3S

Now it will says Sides: 3.

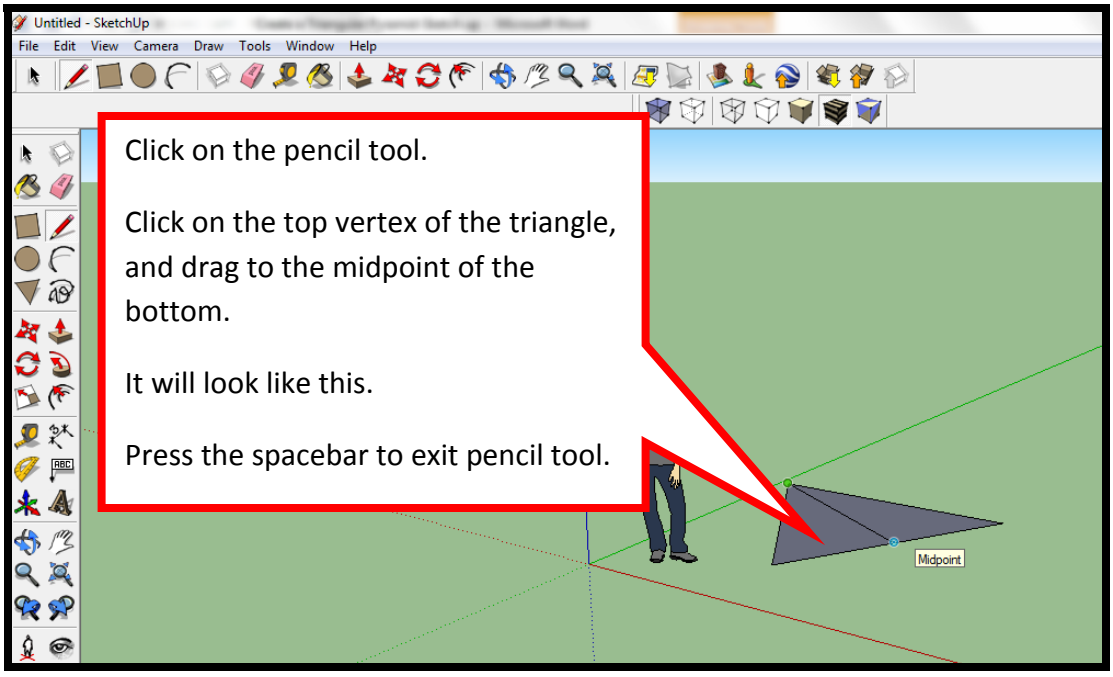
Notice now the blue shape outline has 3 sides.



Click and drag your mouse to draw a 2D triangle.

Make sure it is dark gray (that means the triangle is sitting on the ground as shown.

<u>Press the space bar</u> to exit this tool.

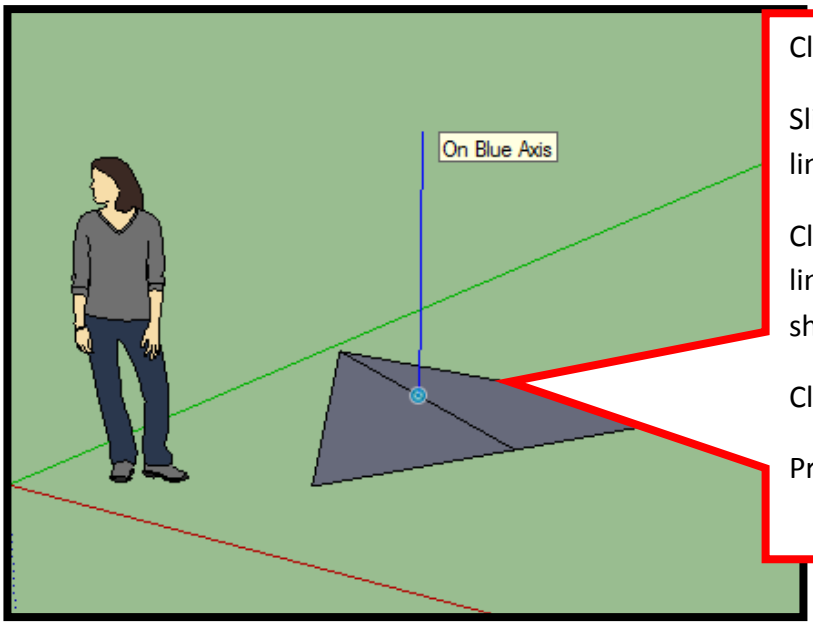


Click on the pencil tool.

Click on the top vertex of the triangle, and drag to the midpoint of the bottom.

It will look like this.

Press the spacebar to exit pencil tool.



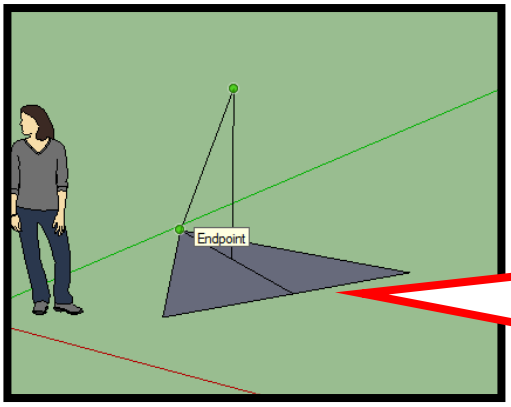
Click on the pencil tool again.

Slide your mouse up and down this new line until you see the blue midpoint.

Click on the midpoint circle and drag your line up so that it is on the blue axis as shown.

Click again to end your line.

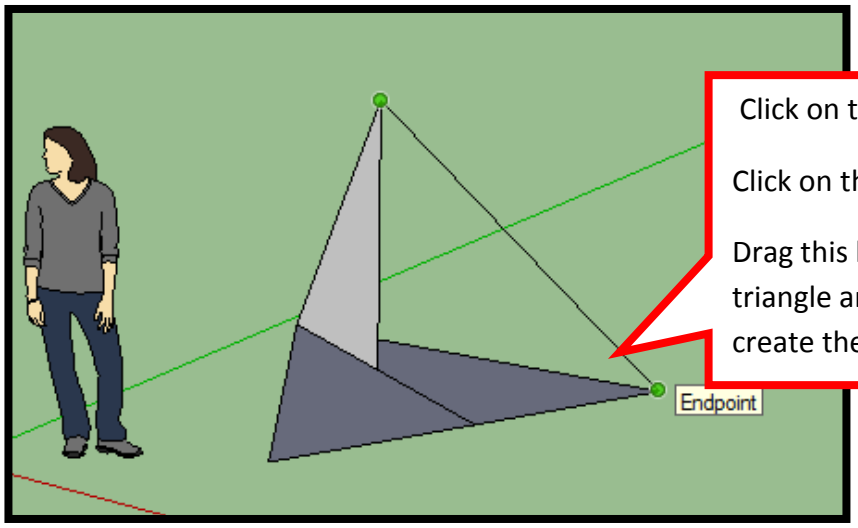
Press the spacebar to exit the pencil tool.



Click on the pencil tool again.

Click on the top of the line (endpoint.)

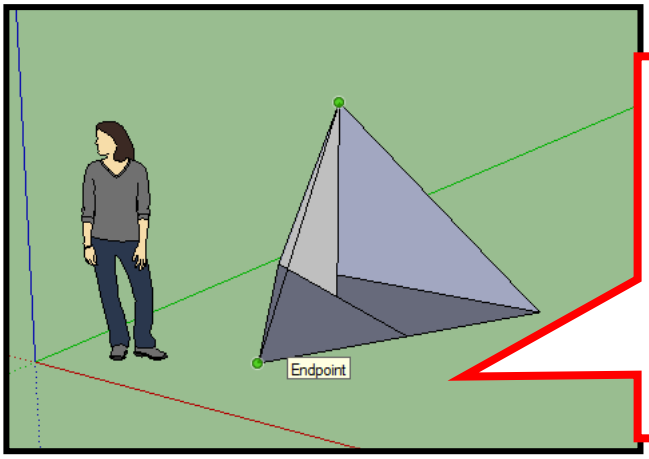
Drag the line to top vertex of flat 2D triangle and click when you see the green endpoint to set the line.



Click on the pencil tool again.

Click on the top of the line (endpoint)again.

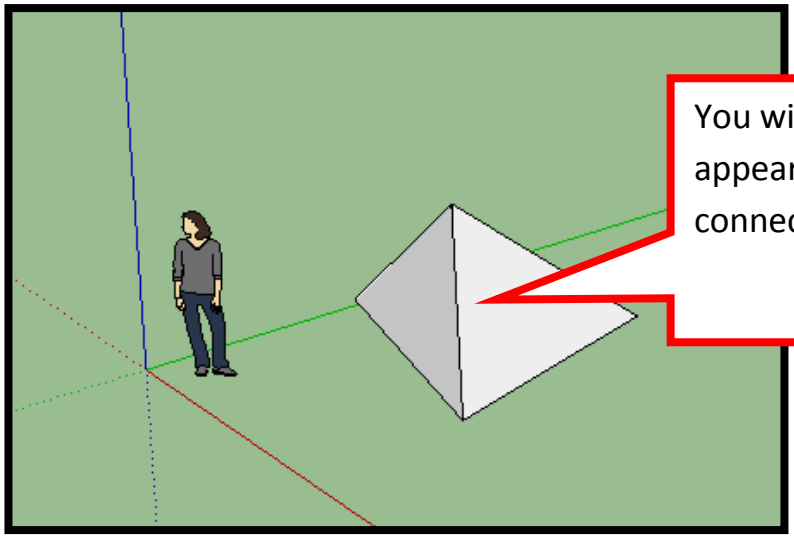
Drag this line to right vertex of the flat 2D triangle and click when you see endpoint to create the 2nd line.



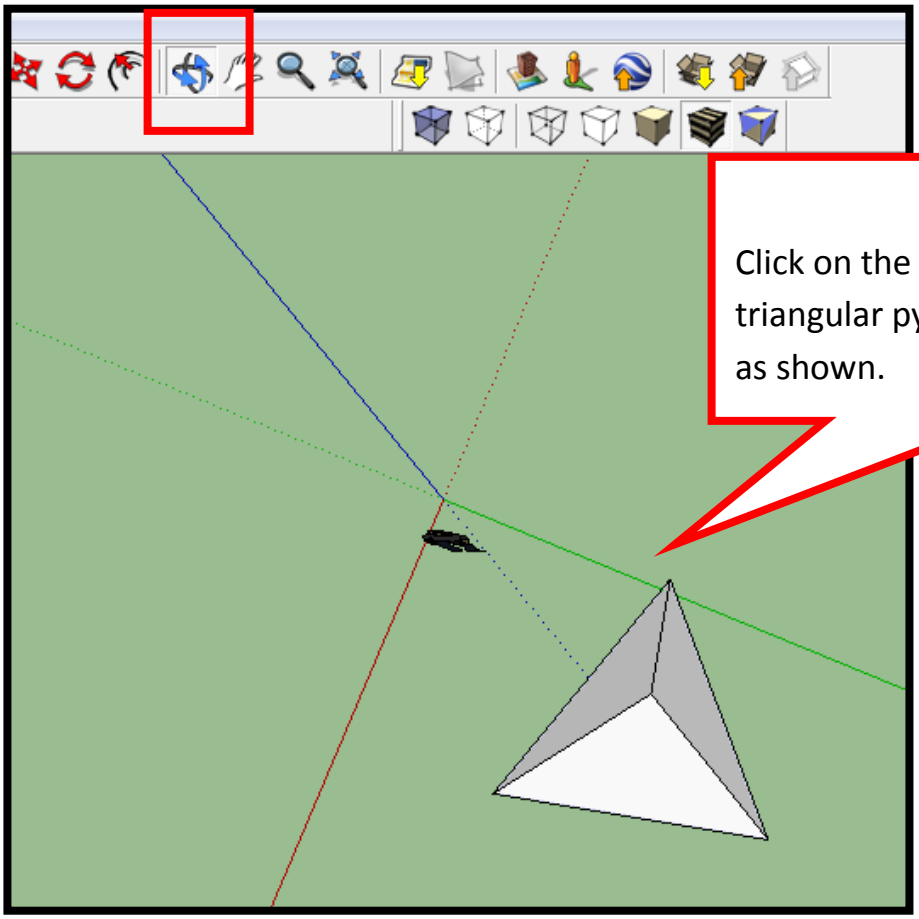
You should still have the pencil tool.

Click on the top of the line (endpoint) one last time.

Drag this line to left vertex of the flat 2D triangle and click when you see endpoint to create the 3rd line. Something magical will happen!

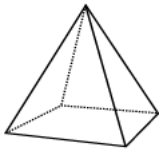


You will now see your triangular pyramid appear because all the sides are now connected.

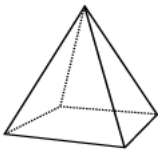
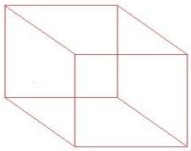
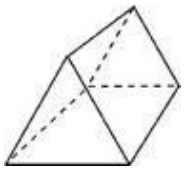


Click on the orbit tool and rotate the triangular pyramid so you can see the top as shown.

Extension Questions:

1. How many edges does this square pyramid have? 

2. Which of these figures has 3 rectangular faces and 2 triangular faces?

3. How many vertices does this rectangular prism have?