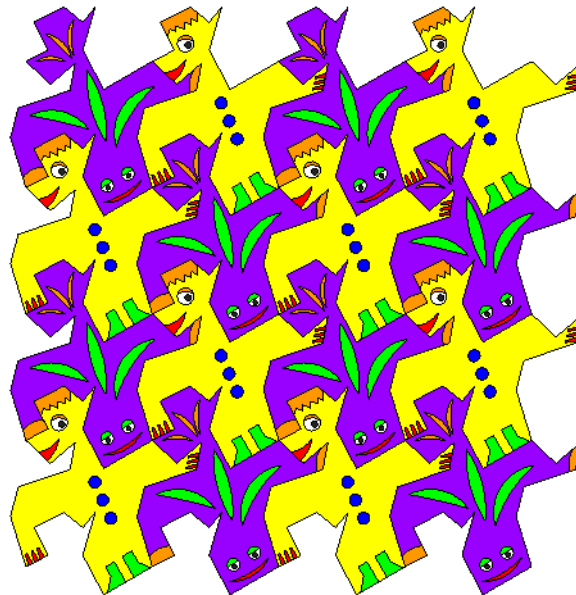# Escher Square Tiles, in Google SketchUp

This project combines a little bit of geometry with a lot of creativity. You start with a square, add, copy, and erase some lines, then add some personal touches, to get a very neat Escher tiling pattern.


Step 1: Create the Shape of the Tile

1. Open Google SketchUp. If your file contains a person standing on the ground near the origin, click the **Eraser** tool and erase him.
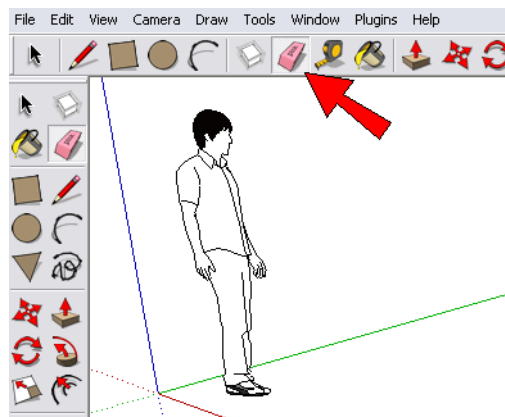
2. Switch to **Top** view (from the main menu, choose **Camera / Standard Views / Top)**. You should see the word "Top" at the top left corner.

3. Activate the **Rectangle** tool.

4. Click one point, then move the mouse until you see the "Square" popup. Then click again to complete the square.
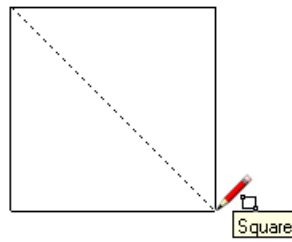
5. Now we'll change the edges of all four sides of the square. Start by activating the **Line** tool.

6. Add some jagged lines along the top edge, creating new faces both inside and outside the square. (You don't have to copy my lines; draw something different if you like.)
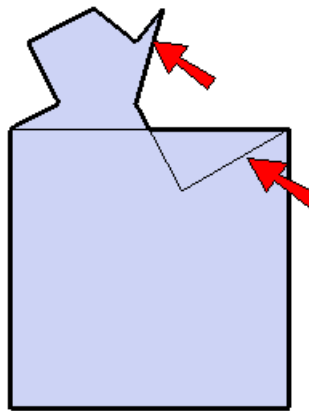
7. What gets added to the top of the square needs to be removed from the bottom, and vice versa. So these new faces need to be copied to the bottom of the square. First we need to select what's going to be copied, so activate the **Select** tool.
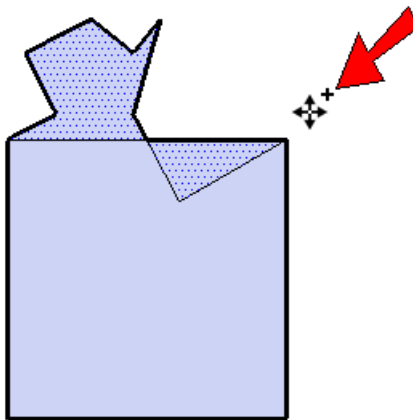
8.   Keeping the Shift key pressed, click the new faces. They should all become selected.
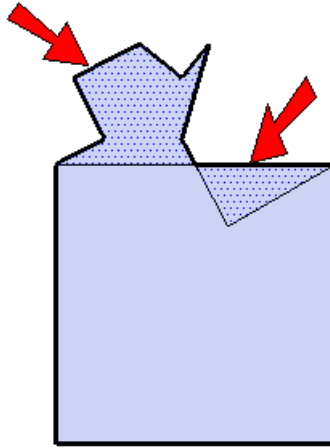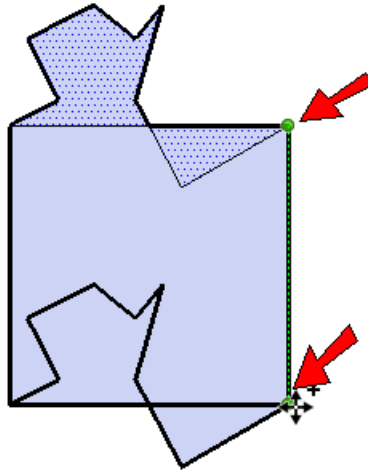
9.   Now activate the **Move** tool.

10. Before clicking anything, press the Ctrl key (PC) or the Option key (Mac). (You don't have to keep this key pressed, just tap it.) This adds a "plus" sign to your cursor, which means you're about to make a copy of whatever is selected.

11. To make the copy, first click a point at the top of the square, then go straight down and click a point at the bottom.


12. Now we'll do the same thing along the left and right edges. But it can be tricky to get the new lines just right, so that they don't overlap with other lines. Draw lines along the right edge to create new faces.
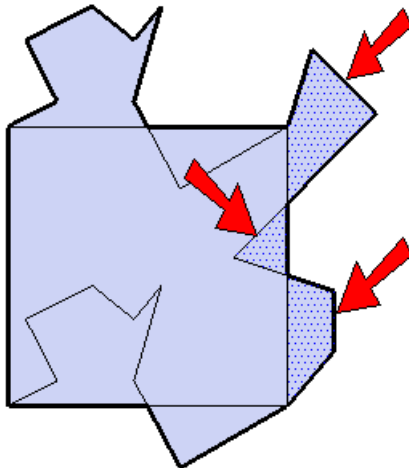
13. Copy these faces over to the left edge. Your edges might look "clean," but mine have resulted in an overlapping mess on the left side.
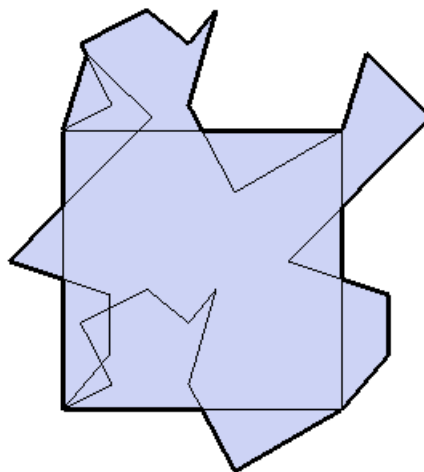
14. If you get overlaps like I did, then **Undo** (Ctrl+Z or Cmd+Z) and start over with new lines along the right edge. This is what I came up with; after creating and copying the new faces, both the left and right sides look fine.
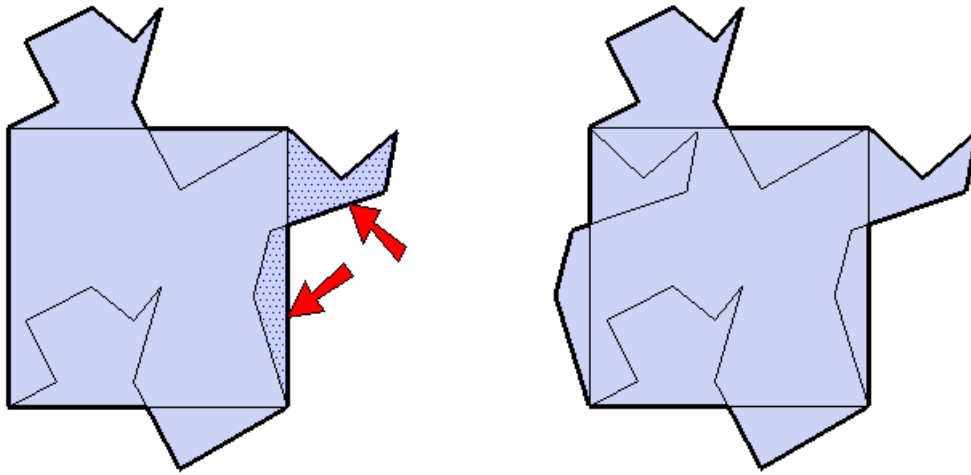
15. To complete the tile, we'll trim the extra lines. Activate the **Eraser** tool.

16. Click each horizontal or vertical edge which was part of the original square. You're left with a brand new shape made of the new lines - this is the Escher tile.
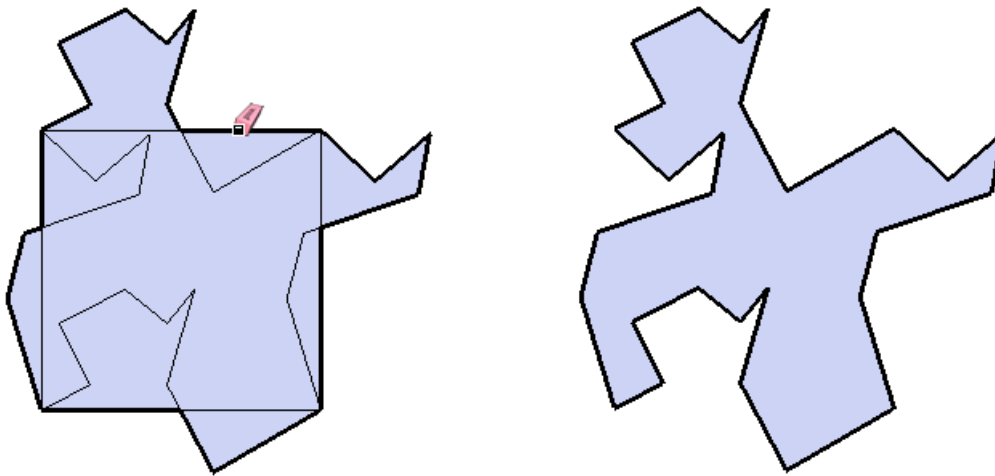
Step 2: Decorate the Tiles

1. You can make any number of different tiles, but let's try two tiles this time. Select the tile and use the **Move** tool with the Ctrl or Option key, to make one copy.
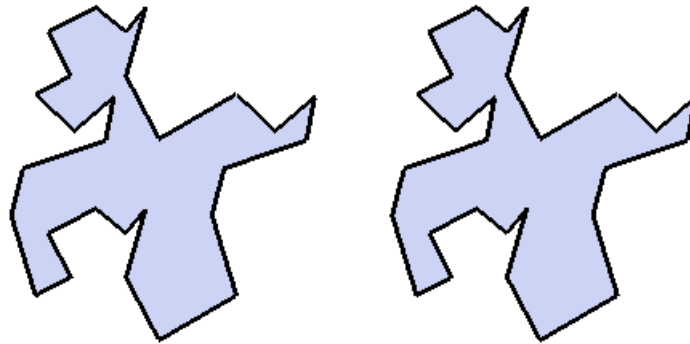
2. Here's where you can get creative. Use the **Line**, **Arc**, **Rectangle**, and **Circle** tools to decorate both tiles. You'll have to use your imagination to decide what the tiles look like. For my two tiles shown below, I made the one on the left look like a person looking off to the side, and the tile on the right sort of resembles an upside-down fish (OK, don't make fun of my drawing skills).
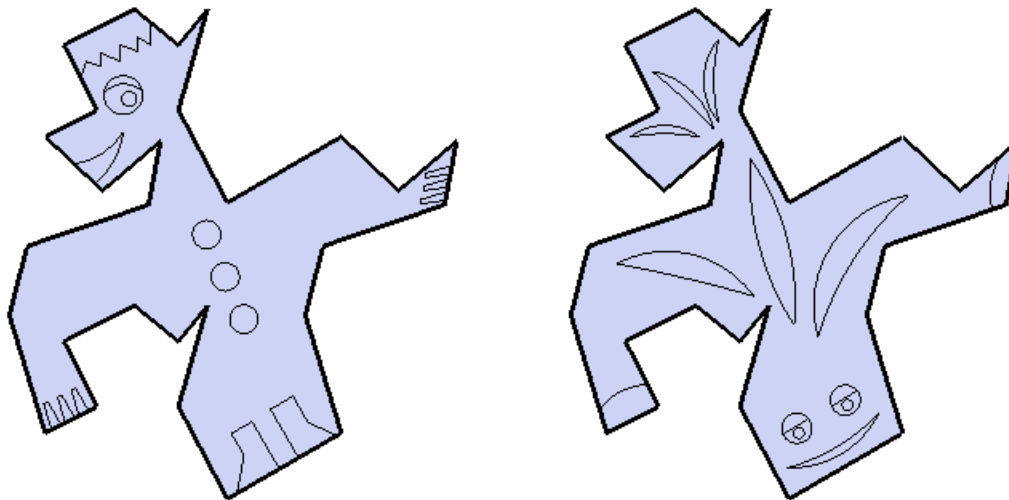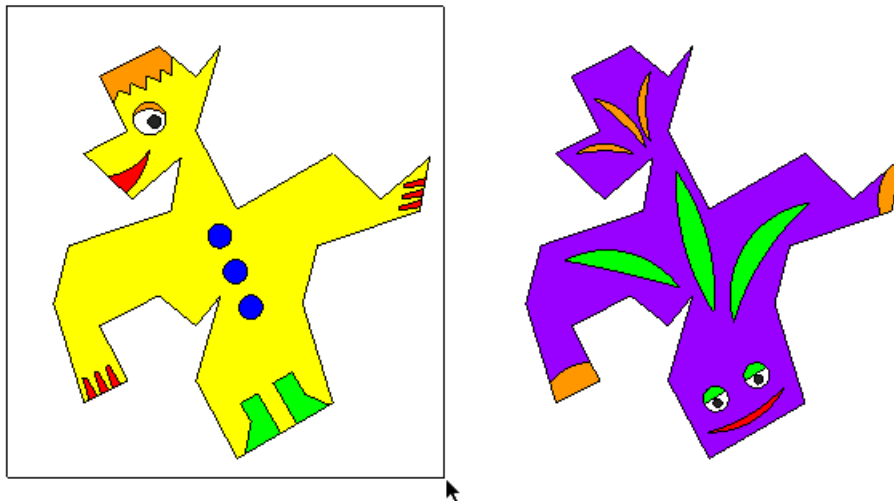
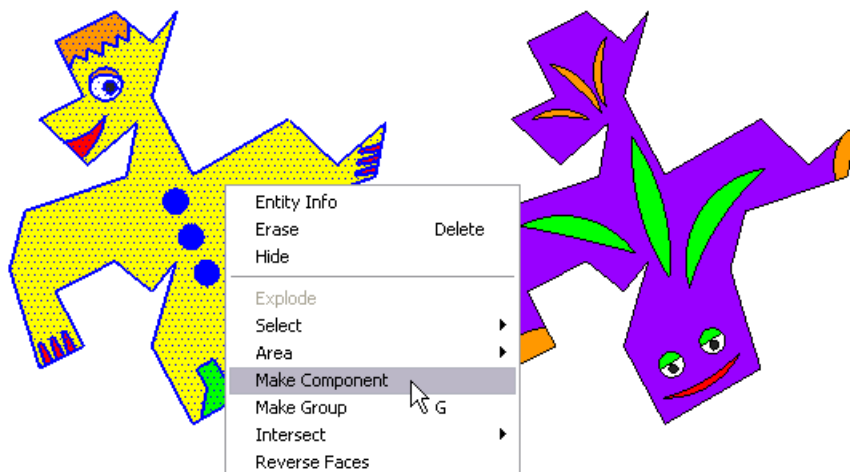3. These tiles need some color, so click the **Paint Bucket**.

4. This opens the **Materials** window (**Colors** window on the Mac). Choose colors and paint each part of each tile. Keep in mind that the tiles will end up right next to one another, so their colors should be contrasting.
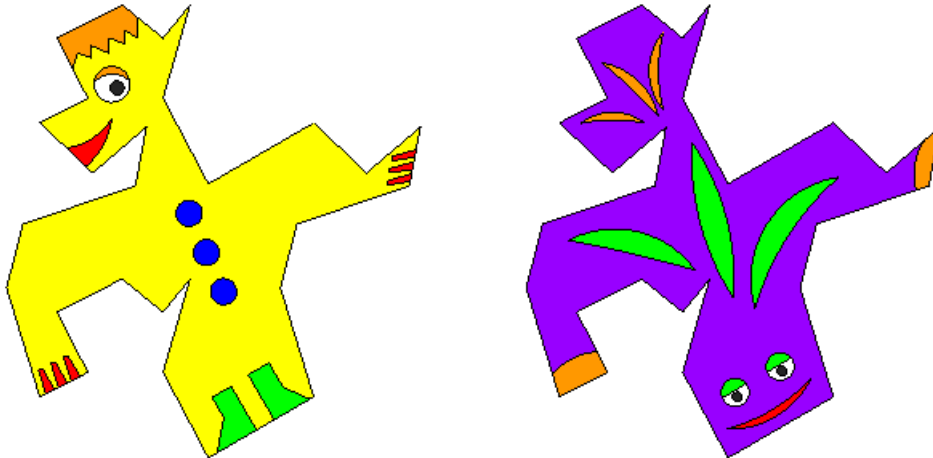
5. In order to make the tiles easy to move and copy, and to keep them from sticking to one another, each tile should become a single object, rather than a set of individual lines and faces. We'll do this by making each tile into a component. First, activate **Select** and drag a selection window around one entire tile.

6. Right-click on any selected part of this tile and choose **Make Component**.

Entity Info	
Erase	Delete
Hide	
Explode	
Select	▶
Area	▶
Make Component	
Make Group	G
Intersect	▶
Reverse Faces	

*There's also an option called **Make Group**. This would work too, but a component has this advantage: you can edit one and they all update.*
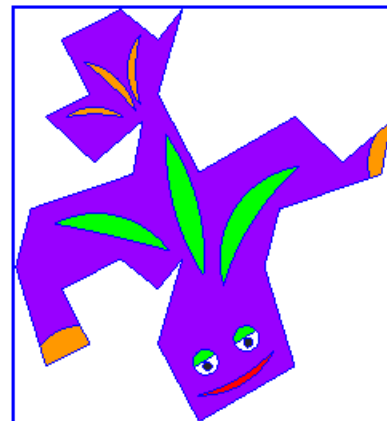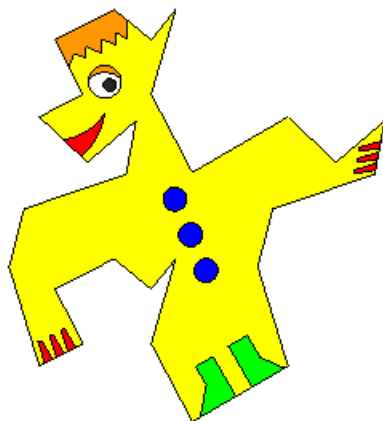
7. Give your tile a name, make sure **Replace selection with component** is checked, and click **Create**.
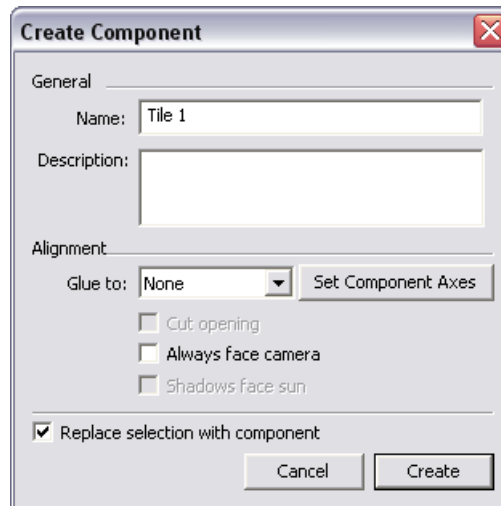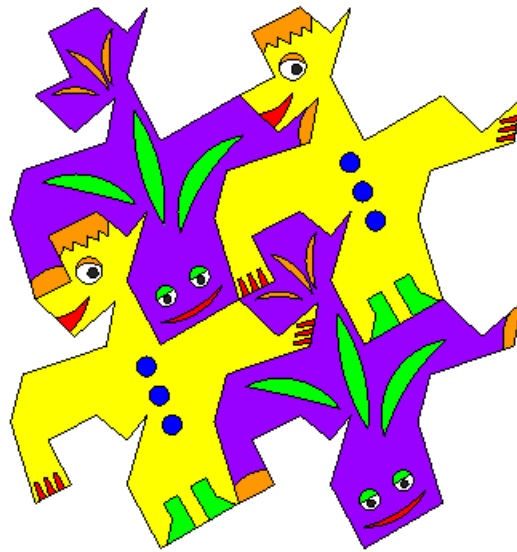

When the tile is a component, it appears surrounded by a box.
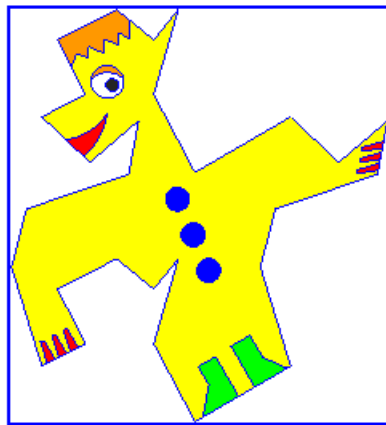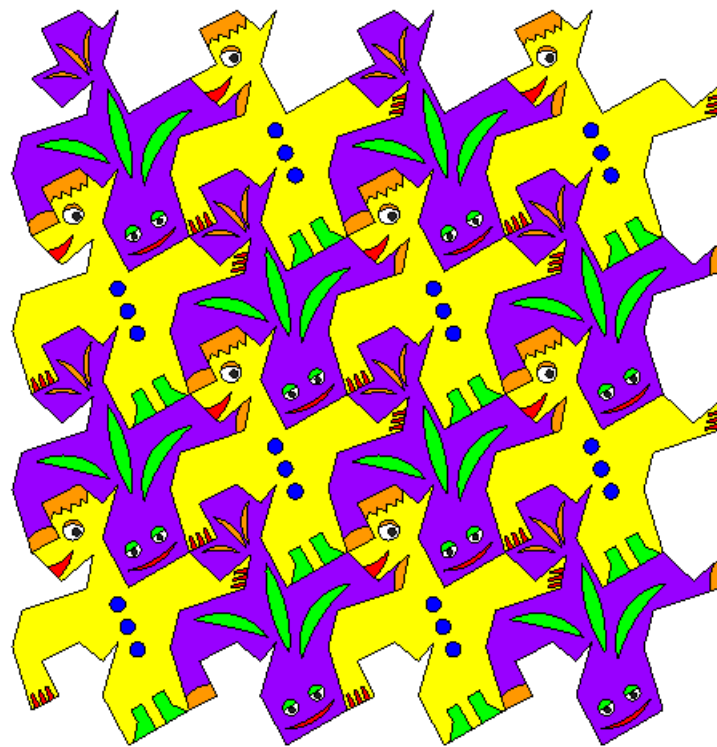

8. Select the other tile and make it into a component as well.

9. Now comes the fun part: use the **Move** tool to join the two tiles, which fit together like puzzle pieces. Then use **Move** again to make copies.

Here's my set of tiles after making a few more rows:

10. Because these tiles are components, you can make changes to all identical components at once. To do this, right-click on any tile and choose **Edit Component**. Make your changes (I changed my yellow tile to be blue, and gave it larger dark blue spots). Then right-click outside the component and choose **Close Component**.
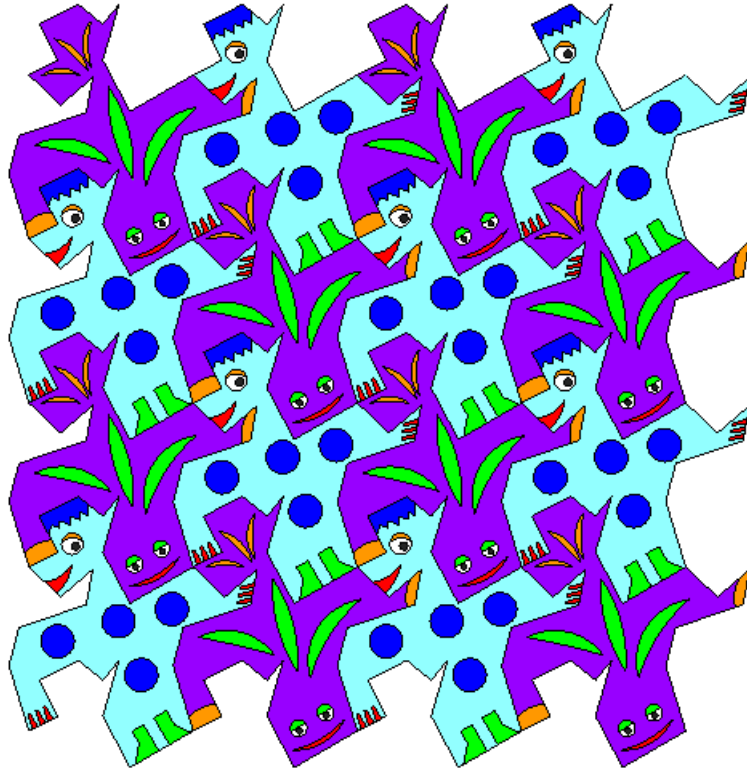
Try This: Freehand

SketchUp has a fun tool for drawing freehand curves. In the main menu, choose **Draw / Freehand**. To use this tool, just drag the cursor where you want to draw (it takes a little getting used to).

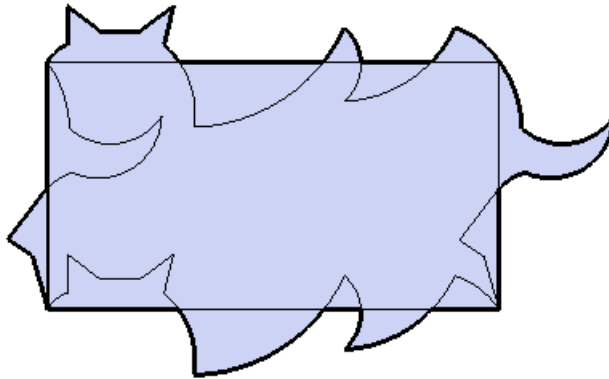Start with a square again, and create your new lines and faces with the **Freehand** tool.
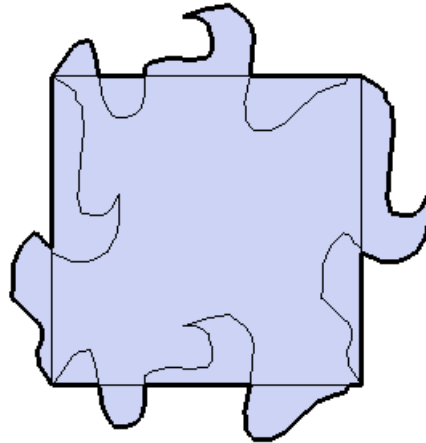
For my example, I made one tile look like an elephant carrying a load on its back, and the other like a moose with horns (and lipstick). This looks really neat when tiled:
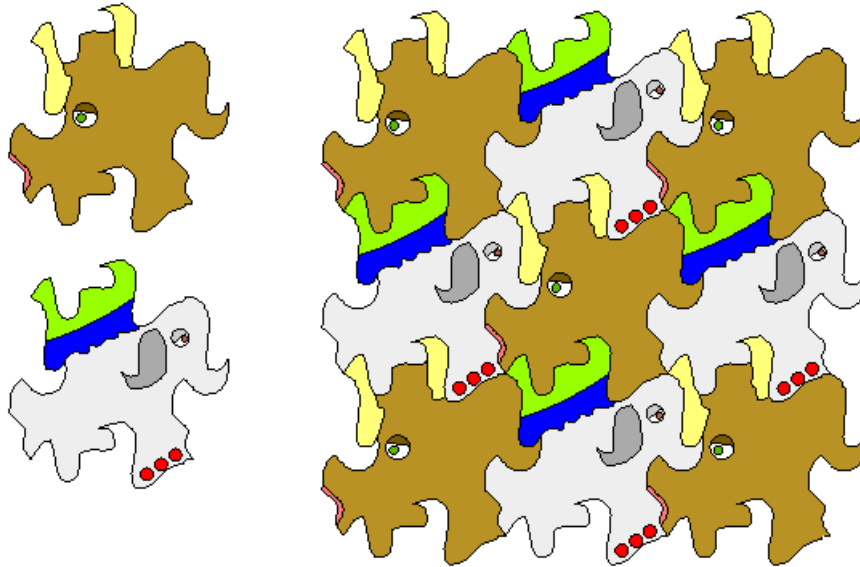
Try This: Rectangle

You don't have to start with a square. Try creating Escher tiles by starting from a rectangle.
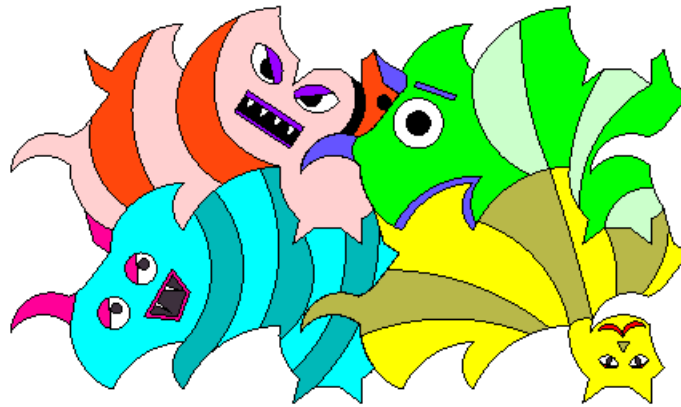
In my example, the first tile was easy to decorate - it's shaped (sort of) like a cat.
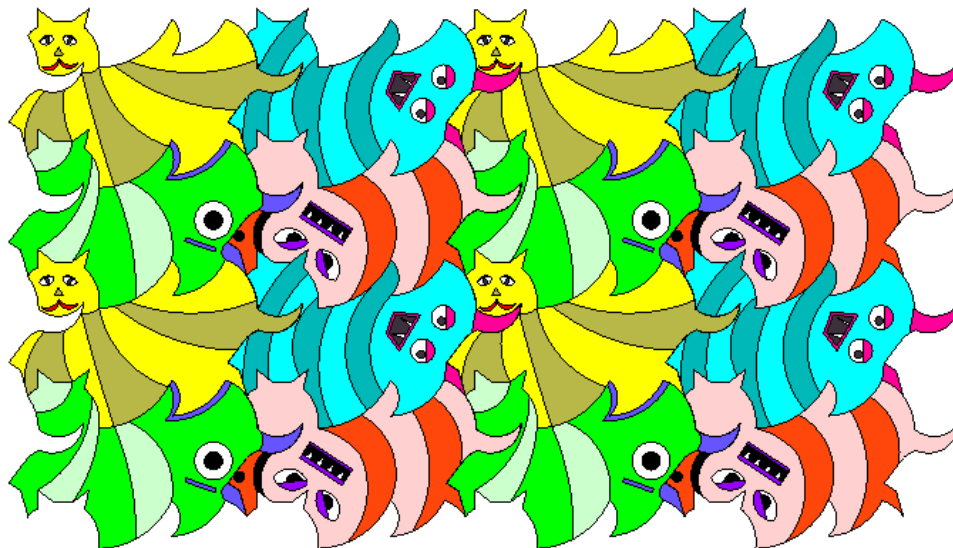
For the next tile, I spun the model around to view the tile a different way. Sometimes ideas come more easily when you change your view.
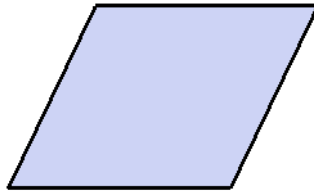
I added two more, for a total of four tiles:

I love how this one looks when tiled!

Try This: Rhombus

Maybe you've figured this out, but this will work with any rhombus.

As long as the top and bottom edges are equal, and the two side edges are equal, you can make great tiles. I've shown my patterns both upside-down and right side-up, to show off my cool tiles.