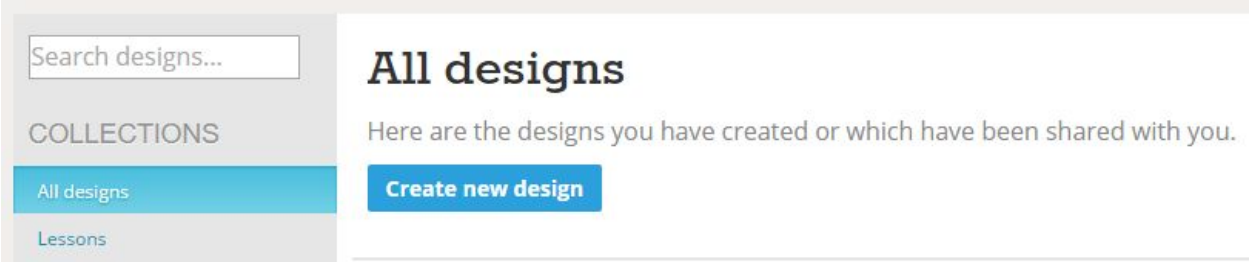
Creating New Designs:

To create a new Tinkercad design from scratch, navigate to the Tinkercad home page after login, click *All designs* under Collections, and click the *Create new design* button:

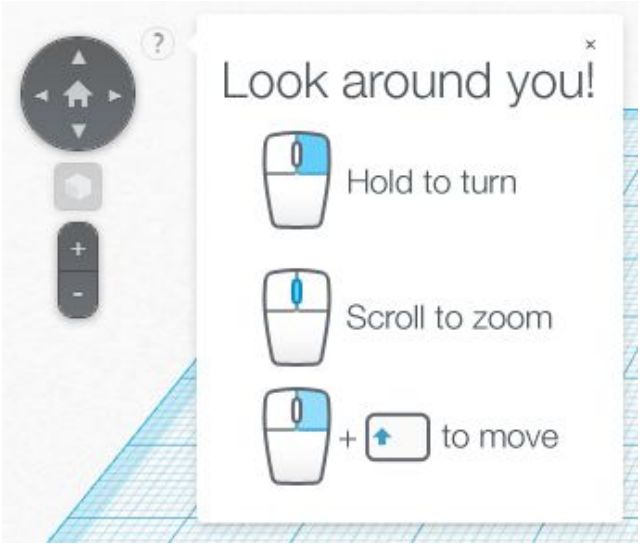


Adding Objects:

Once inside the Tinkerspace, look at the panel on the right side of the menu. That is the Objects Panel. Click on any link to expand the category. To add any object, simply click and drag the object onto the grid in the center of the window.

Navigation Options:

1. Use the navigation tools at the top-left of the lesson screen. The arrows turn the camera, the +/- buttons zoom in and out, and the cube button (greyed out in this photo) will center camera on the selected object. If no object is selected, it will be greyed out, but when an object is clicked it will have the same coloring as the other buttons.
2. Use the three-button mouse, as described in the image below:

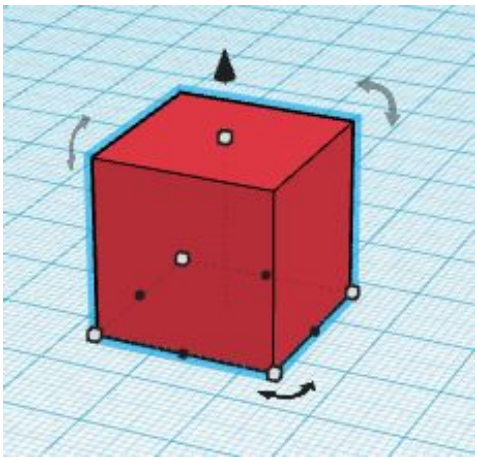


NOTE: There are actually two ways to move the camera using the mouse:

- SHIFT + Right Click and drag the mouse
- Click down on the Scroll Wheel and drag the mouse

Transform Tools:

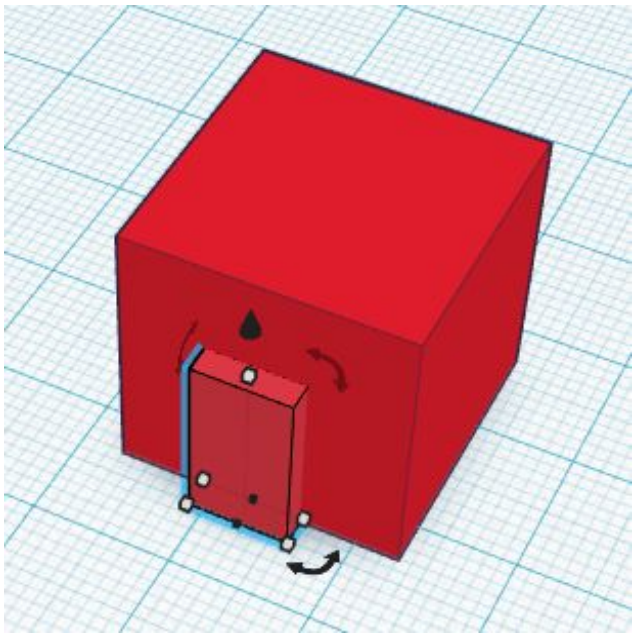
Now that you have an object on your screen, now we need to learn how to manipulate it:



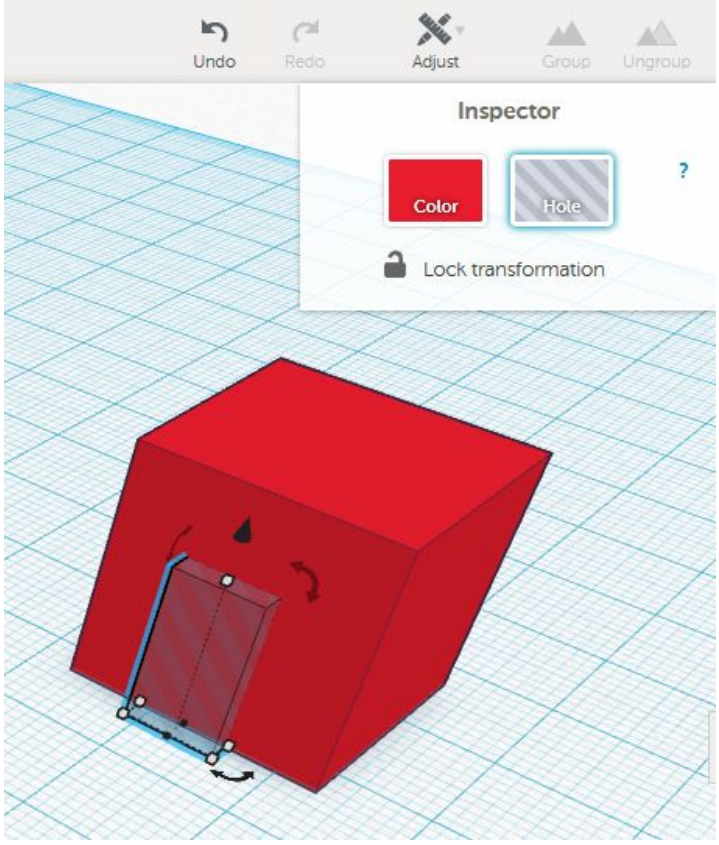
- **Transform** (movement): To move left, right, back and forth, click on the object's body and drag it around, or use your arrow keys on the keyboard. It's that simple! To move it up and down, click on the black cone that floats above the object (you can see it when you select the object), and drag the cone up or down.
- **Rotate**: Click on any of the curved arrows to rotate the object. Each curved arrow will move the object along a different axis.
- **Scale**: Click on the white or black dots to change the size of those sides. The four white dots on the grid changes the width and length, while the white dot on the top of the object, right below the black cone, changes the height of the object.

Making a House: Holes, Grouping, Duplicating, Workplanes and Alignment:

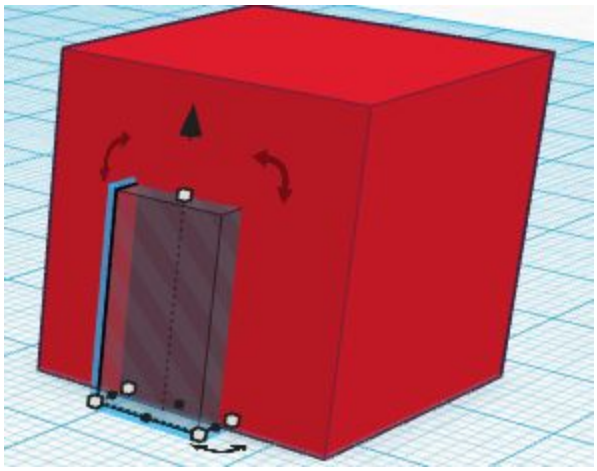
1. Start with a single square for the house walls. Students may resize.
2. Add a Door: Pull in another square and scale it to be a narrow, tall doorway. Move the door where you want it to be on the house. Make sure to rotate around to make sure it looks correct from every angle.



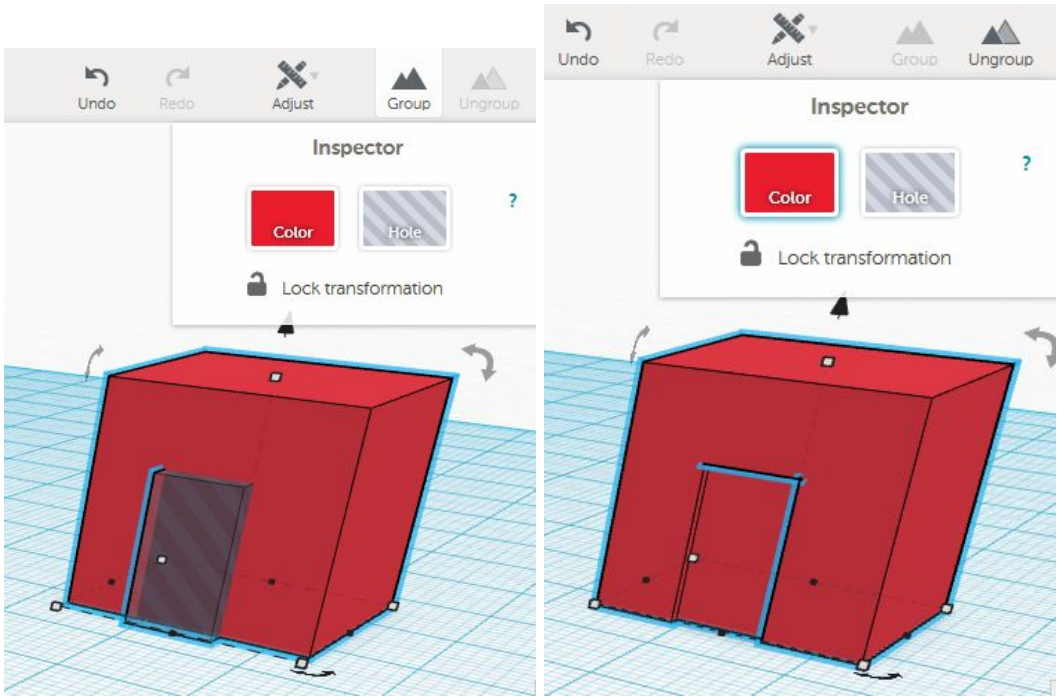
3. Instead of sticking out of the house, we want the door to indent the house a bit. When the door is selected, find the Inspector at the top-right of the window and click **Hole** to make the door see-through.



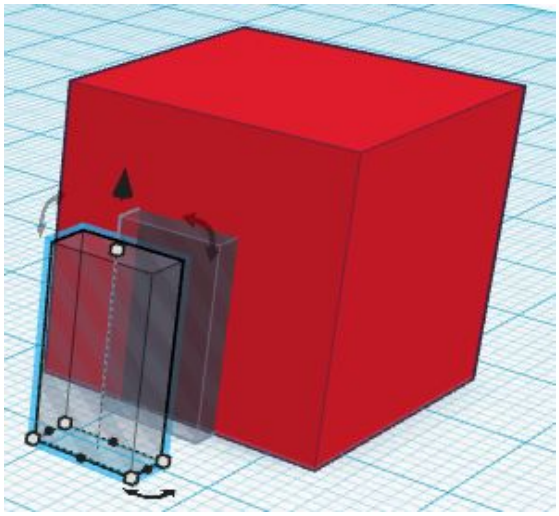
4. Now you need to make the door overlap with the house. Move the house, or scale the part of the door against the house, into the house so there's an overlap. The part overlapping with the house should now look black instead of grey.



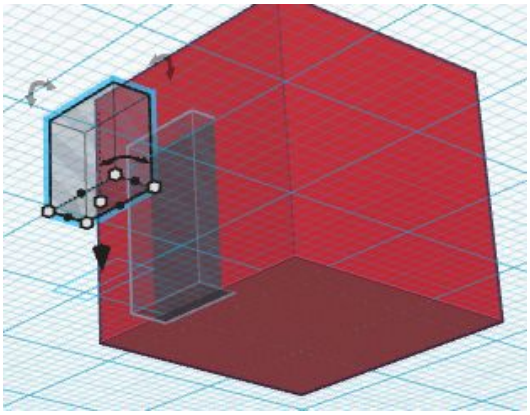
5. Select both the house and the door. You can do this by clicking and dragging your mouse and including both objects in your selection box, or by Shift+Clicking each object to add or subtract it from the selection. Once both are selected, click **Group** at the top-right of the screen, above the Inspector, to group the two objects together. Since the door is a Hole object, it is subtracted from the house object to create the indent.



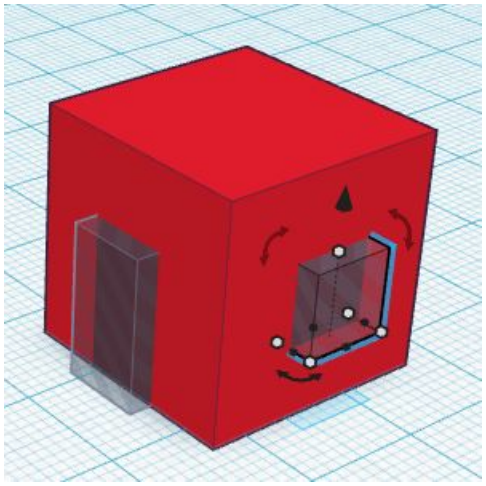
6. Click Ungroup at the top right to keep the objects separate for now, as we will work on the door some more.
7. With only the door selected, click the Ctrl+D for **Duplicate**. This will create another door object in the same position as the first. Use your arrow keys to move it away from the first door, so you may see it.



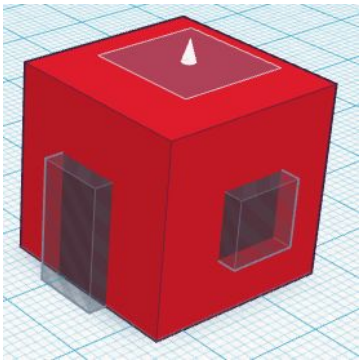
8. Tilt your view so you are looking at the new door from the bottom up. The cone is now on the bottom facing down. Click on the white dot in the center-bottom of the object, right above the cone, to scale the height upward, making the object shorter. This can now be used as a window.

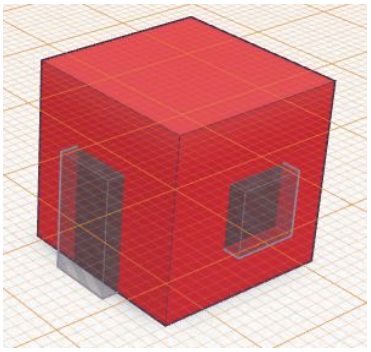


9. Place the window where you want it, and use the curved arrows to rotate it. Duplicate the window object to create more.

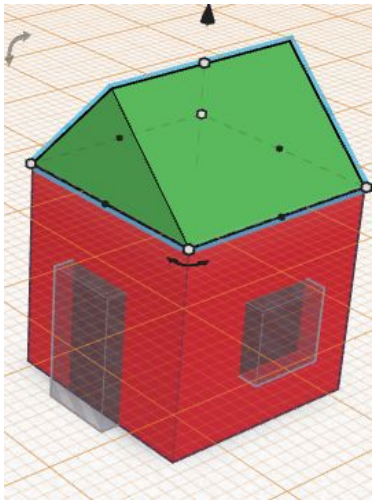


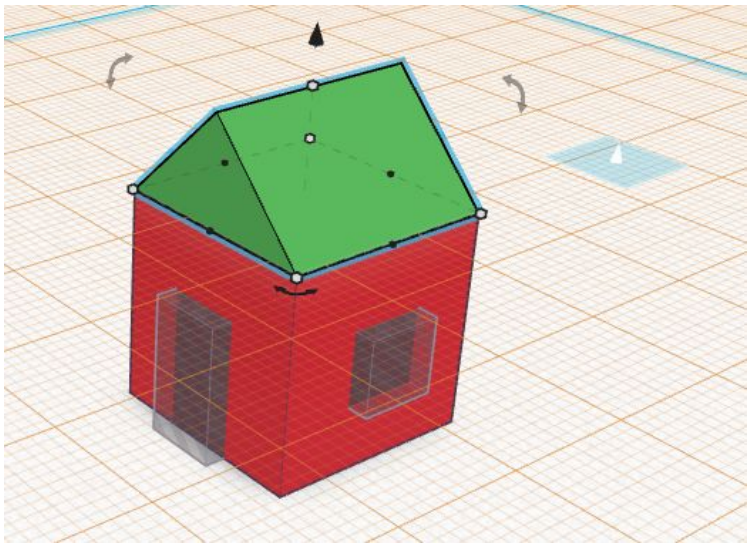
10. Next we add the roof. Instead of pulling a roof in and moving it up to meet the house object, wouldn't it be better if the roof just started on top of the house? We can do that! To start, click the "Helpers" category in the Objects Panel on the right. Click and drag the **Workplane** into the scene and place it on the face where you want the roof. This will move the grid on the ground to the top of the house object, so any object pulled into the scene now will be oriented to this new grid.

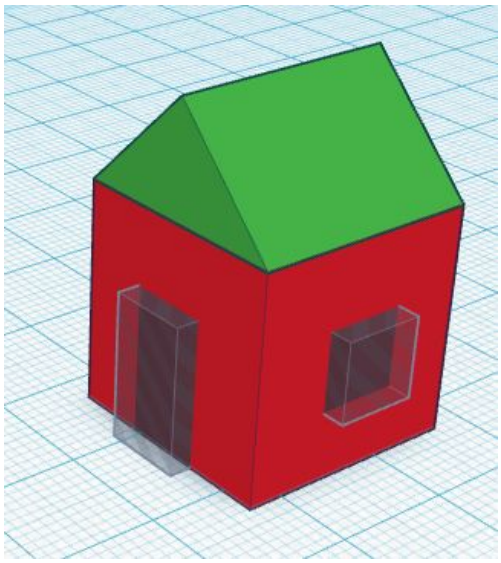




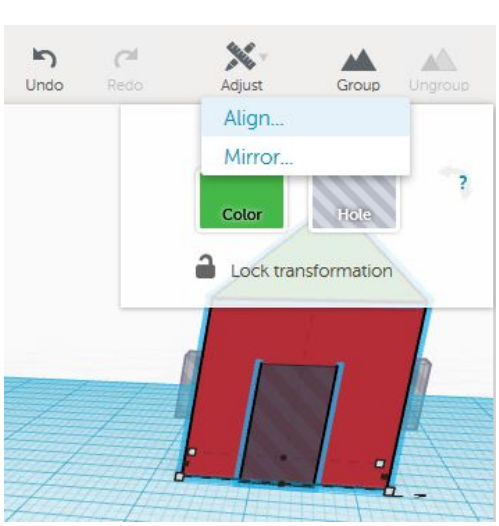
11. Click and Drag a Roof into the scene over the house. Once placed, you make use the Workplane to put the grid back to its normal position by dragging the Workplane into empty space in the window.

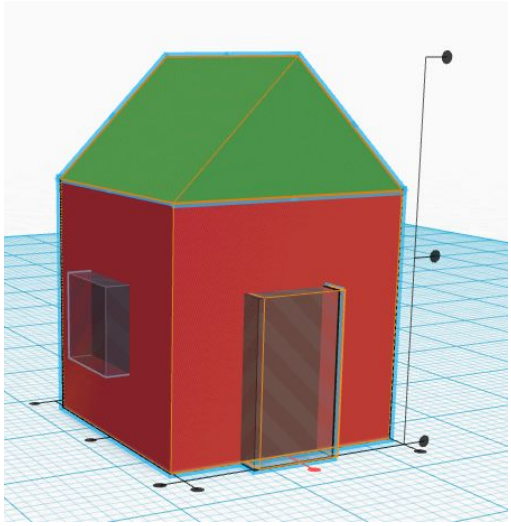


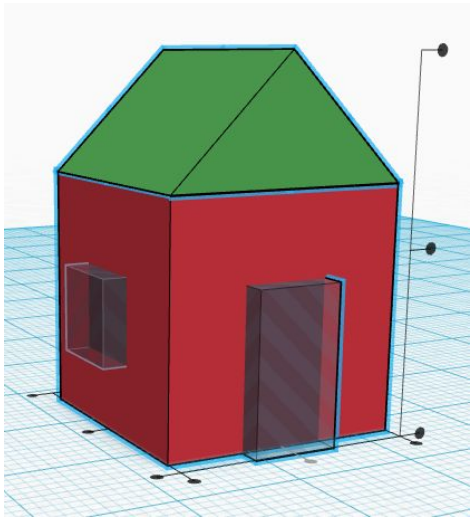




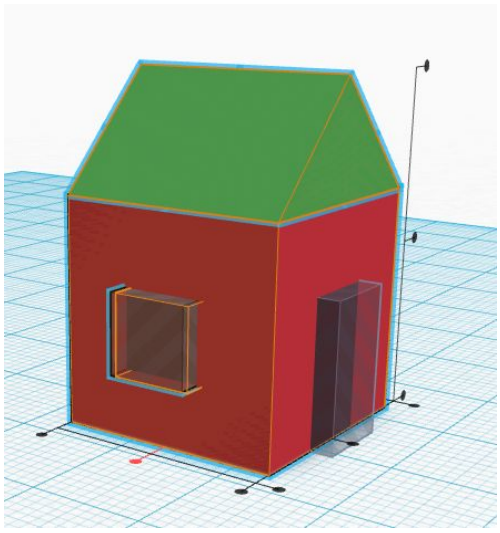
12. Finally, let's **Align** the objects so they are all placed where they need to be, relative to each other. First, select the house, door, and any window or door on the back of the house--do not select the windows on the sides. Then, at the top-right, click the Adjust menu and choose Align. Dots and lines will appear to represent points of alignment you can choose. We want these objects to be aligned through the center, so you will choose the center dot directly in front of the door. Click that dot and the selected objects will center themselves. Once properly aligned, that alignment dot will turn grey.

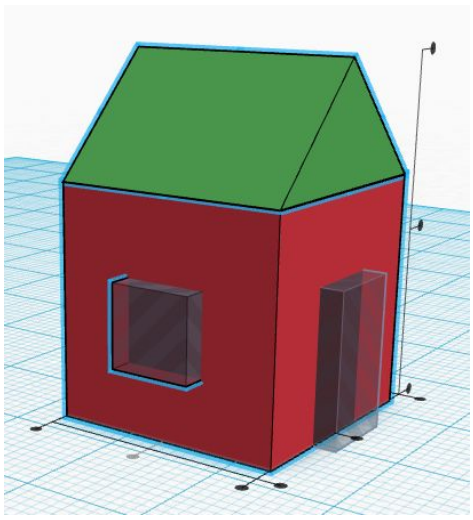




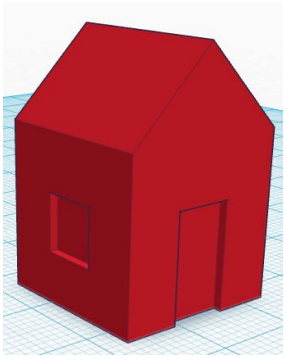


13. Do step 12 for the house, roof, and 2 side windows. The alignment dot you will choose in this case will be the one in the center below one of the side windows.



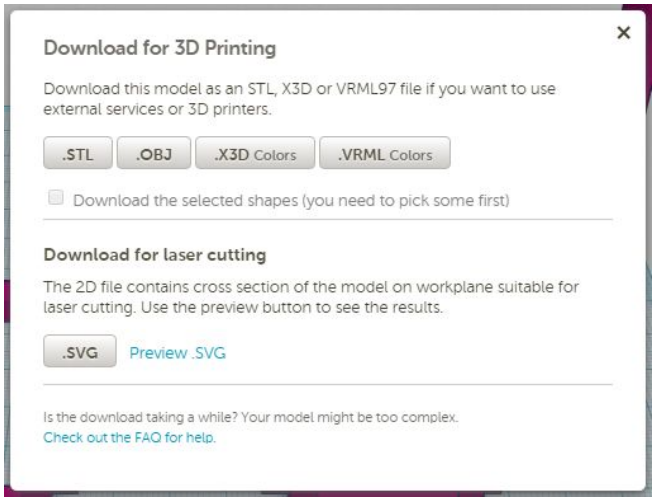


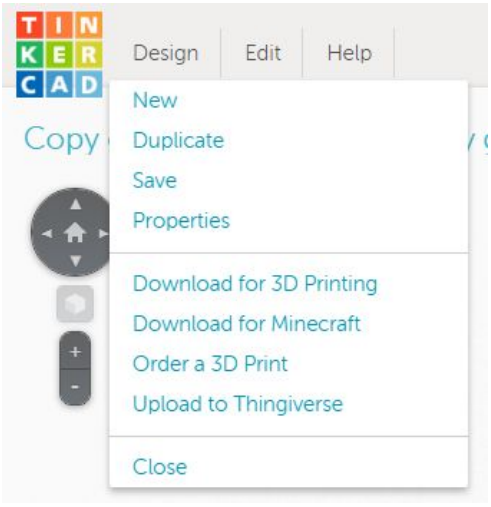
14. To finish the house, select all by pressing Ctrl+A and then choose Group at the top-right. The colored objects should turn the same color and the hole objects should subtract themselves from the colored objects.



How to Download a Model for Printing:

1. If the student is in the Tinkerspace, click *Design → Download for 3D Printing* at the top-right of the page. Click *.STL* in the pop-up window to download the model for printing.





2. If the student is NOT in the Tinkerspace, have them navigate to their home page, click on *All Designs* under Collections and click on “Private” on the model thumbnail. Click *Download for 3D Printing* in the pop-up window and choose *.STL* in the next pop-up window to download the model for printing.