Overview

This lesson covers materials and UV texture mapping, two core methods for bringing color to your models.

Concepts Covered

- Basics of materials
- Applying one or multiple materials to a mesh
- Unwrapping a mesh
- Mapping an unwrapped mesh to a texture

Preparation

- Make sure Blender is installed on your computer.
- A 3-button mouse is highly recommended, but not necessary. See the "Mouse and Keyboard" section of the Introduction for more information.
- Start a new file on Blender. You should begin with the default cube in the center of the scene.

Part One: Materials

The most straightforward way to apply color to a model is by using a *material*. Many people initially think that an object's color is a characteristic of the object, and that if the object weren't there, the color wouldn't be there either. This isn't quite the case with materials. You can think of materials as types of paint: they can be *applied* to an object, but they exist *independent* of objects.

When a new mesh object is added to Blender, it doesn't have any materials applied to it. However, the default cube that begins in the center of a new Blender file *does* have a material applied to it. We'll start by investigating this material.

Select the cube, then go to the Materials tab in the Properties panel on the right. The Materials tab looks like a red and grey circle, as seen on the right.

The sections shown in the screenshot to the right are the only sections we'll need to worry about for this tutorial. To start, **left-click the white rectangle in the Diffuse section** (highlighted in blue in the screenshot). A color wheel will appear. **Left-click parts of the color wheel to change the color of this material.** As you change the color of the material, you should also see the color of the cube change, since the material is applied to the cube.

The red section lists all materials currently being used by the object. You can think of this as the object's paint palette. Any materials in this list can be used on part or all of the object. We'll go over how to do this later in the lesson.

First, let's change this materials name to be something more descriptive. Presently, it's just called "Material", as can be seen in the material list (red section) and the text field below it (green section). **Click the text field in the green section to rename "Material" to "Primary".** You'll see the name in the list (red section) update with this new name.

Add a sphere to the scene, move it so that it's outside of the cube, then look back at the Materials tab. The panel should now look like the screenshot on the right. The list of materials is still there, but it's empty; this object is currently using no materials. Let's give it a material to work with, one that we've already invented. **Click the drop-down menu below the materials list (red section)**. This drop-down menu will have all the materials you've invented in this Blender save file. Presently we've only made one: "Primary". **Click "Primary"** to add this material to the list of the object's materials. The sphere should change color to match the cube.

Now, try changing the color of the "Primary" material by clicking the colored rectangle in the "Diffuse" section of the Materials tab. *Notice how as you change the Material's color, both the sphere and the cube change!* This is because you're changing the *material's* settings, not the sphere's settings. The cube and sphere are simply linked to the same "paint", and you're changing the color of that paint.

To make the sphere a different color than the cube, the two objects need to be using different materials. **First, click the minus symbol to the right of the list of materials.** This will remove "Primary" from the list of materials that this sphere is using. **Now, we'll press the "New" button (the green section in the second screenshot)** to create a new kind of material, and to link the sphere to that material.
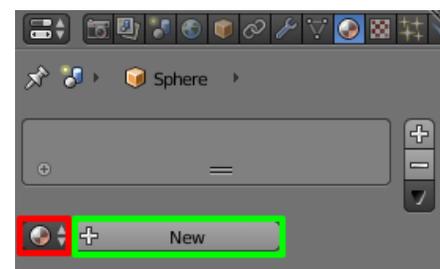
The new material is again called "Material". **Change the material's name to "Secondary"** by typing in the text field below the list of materials. **Then, change the material's color.** The sphere and cube should now look different.
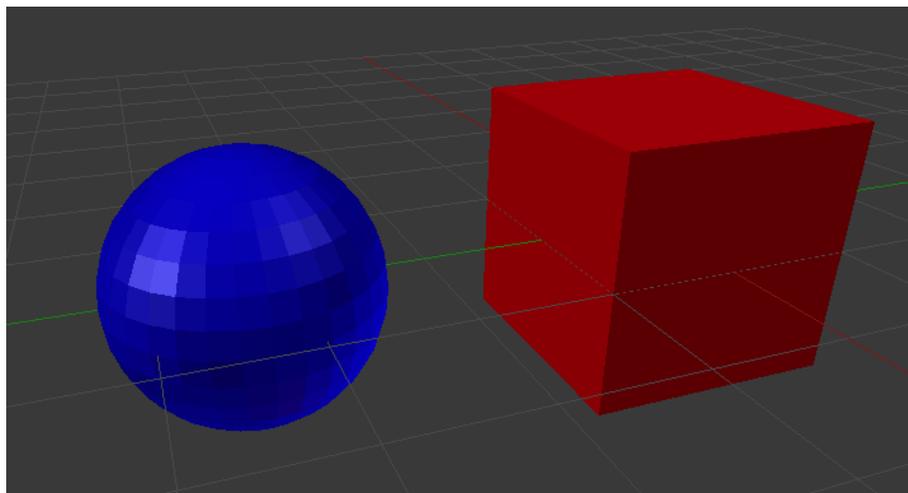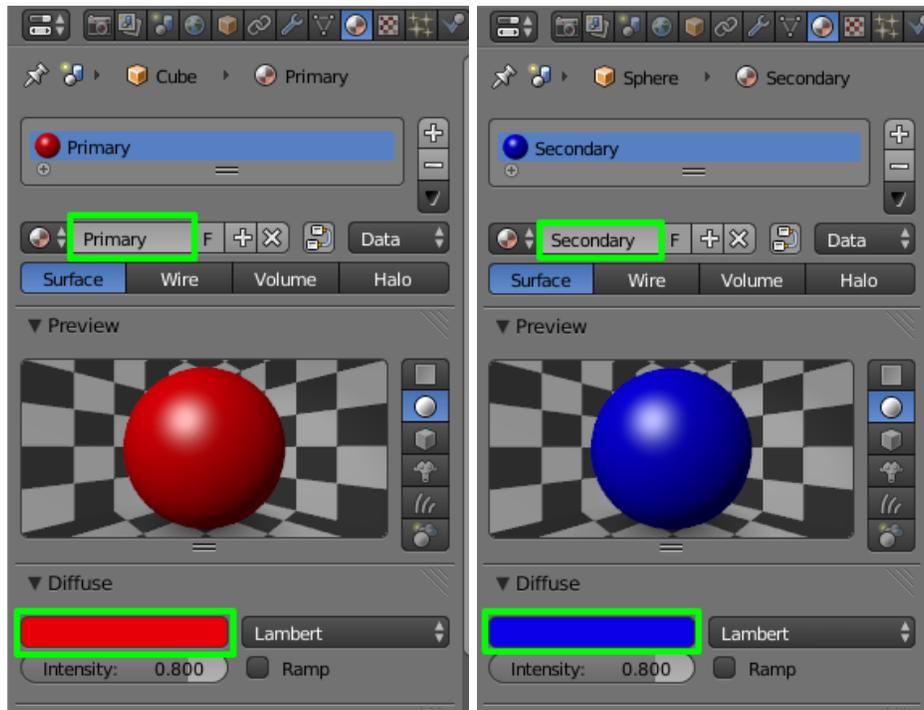
Part Two: Multiple Materials in One Object

We now know how to make any mesh object a solid color. But what if we want some parts of the mesh to be one color, and other parts a different color?

Select the sphere and go to the Materials tab. The list of materials currently just has one entry: "Secondary". **Click the + button to the right of this list** to add a new entry to the list. The + button isn't creating a new material; it's just creating a new slot for the object's list of materials, a new spot in the "paint palette". We can fill that slot with an existing material that we haven't yet used, or we can invent a brand new material.

Let's click the "New" button to create a new material. Name this material "Tertiary" and change its color to something different than "Primary" and "Secondary". Notice how no part of the sphere changes yet.

Go into Edit Mode, and switch to "face selection" mode. We'll be choosing a few faces to paint with the "Tertiary" material by taking the following steps:

1. **Select the faces you'd like to change.**
2. **From the materials list at the top of the Materials panel, select the material you'd like.**
3. **Click the "Assign" button just below the materials list.**
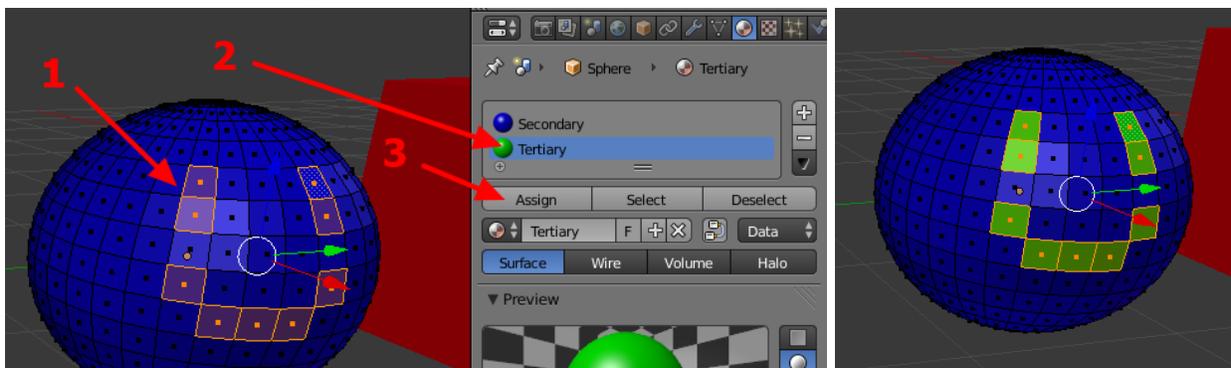
If you wanted to have more than just two materials in your object, you could continue adding more entries to the list of materials and inventing new materials to fill these slots.

Part Three: Texture Mapping

Creating materials and applying them to objects works best for objects that are a solid color, or have just a few colors with distinct dividing lines between colors. For anything more complex than that, we need to begin working with *UV texture mapping*.

UV texture mapping involves linking parts of a 3D mesh to a 2D image. (The "UV" stands for the two dimensions of the image, while "XYZ" are the dimensions of the 3D mesh.) In this way, you can apply image files to your 3D mesh.

Before we can apply a 2D image to a 3D mesh, we need to "unwrap" the mesh. Unwrapping a mesh means splitting up the mesh into pieces that can be "flattened" onto the 2D image, as seen in this image:
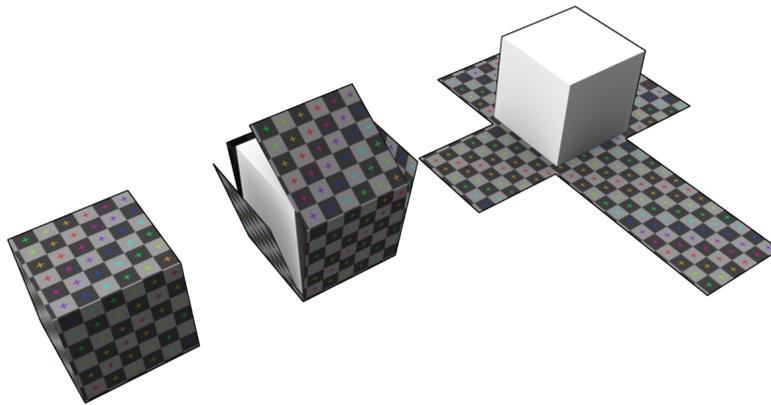

You can see that the cube's mesh is being "cut" along some of the edges, while other edges (specifically the bottom four) are staying intact. We need to tell Blender where these "seams" are, so that the mesh is properly unwrapped.

Start a new Blender file. Split the 3D View into two panels by dragging the upper-right corner of the panel to the left. We need to be able to work with our 3D model on one side of the screen, and our 2D image on the other side of the screen.
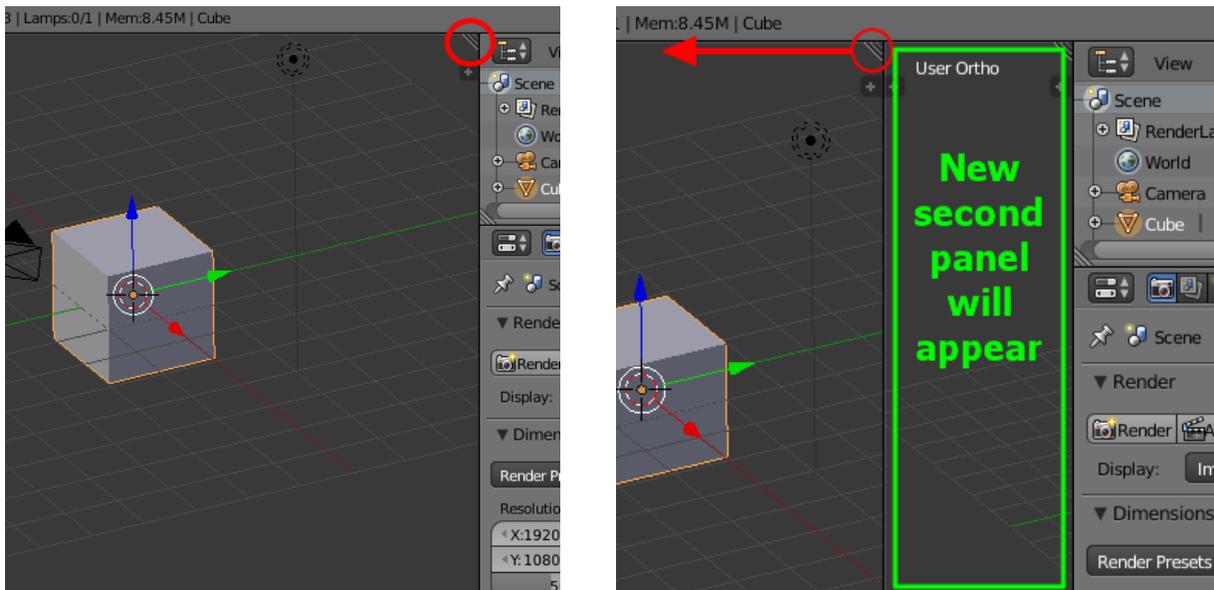

Click the drop-down menu in the lower-left corner of this new panel, and choose "UV/Image Editor". This will change the right panel to a mode for editing images.
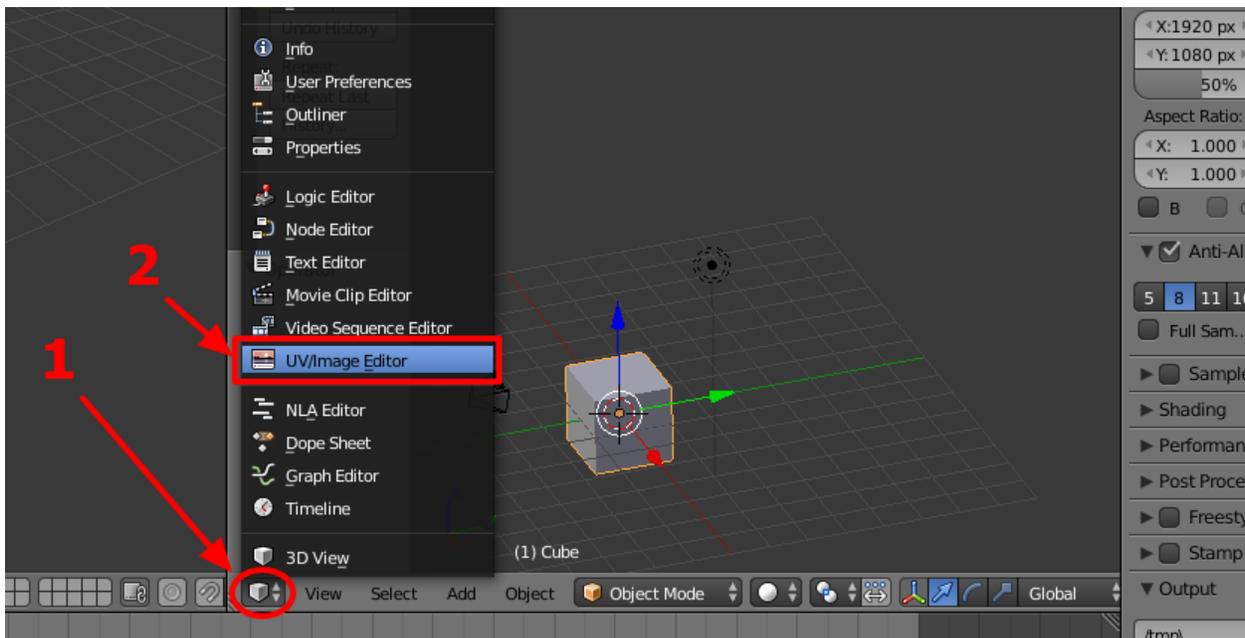
On the bottom bar of the Image Editor panel, click the "Open" button and find your dice texture file. You can use the file "dice_texture.png" provided with this document, or you can do a Google image search of "dice uv texture" to find other options.
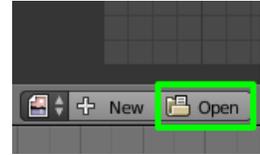
The Blender window should now look like this:
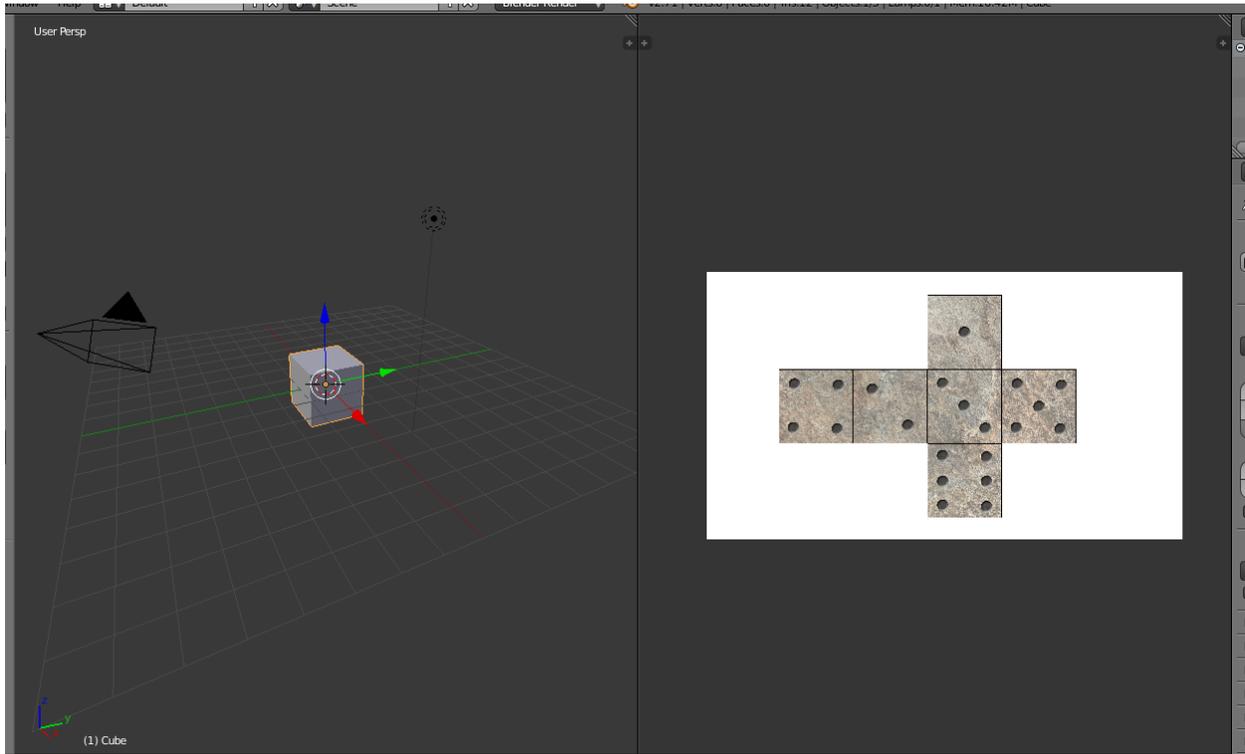
Select the cube in 3D View and press TAB to go into Edit Mode, then press Z to go into Wireframe Mode. Go into Edge Select mode and select the parts of the cube that should be "cut" (select the same edges as shown in the image to the side) in order for it to unwrap and end up shaped like the dice image.

With the edges selected, go to the "Shading / UVs" tab on the left panel, and choose "Mark Seam". Then deselect all the lines. You should should see that the lines you previously had selected now have a red outline. Lines marked in red like this will be "cut" when Blender unwraps the cube.
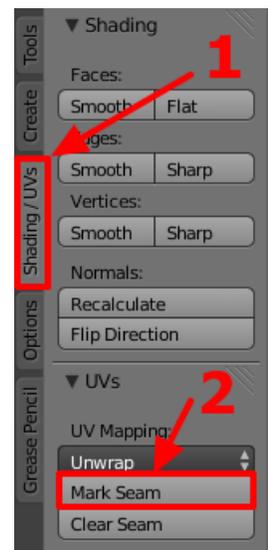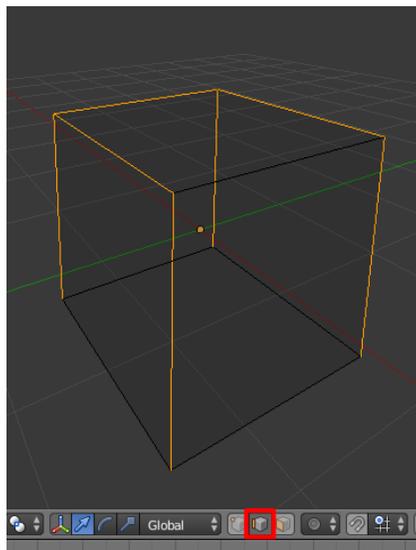
Now, select all of the cube in Edit Mode and press "U" on the keyboard. Choose "Unwrap" from the menu that pops up. In the lower-left corner of the 3D View, uncheck the "Correct Aspect" checkbox.
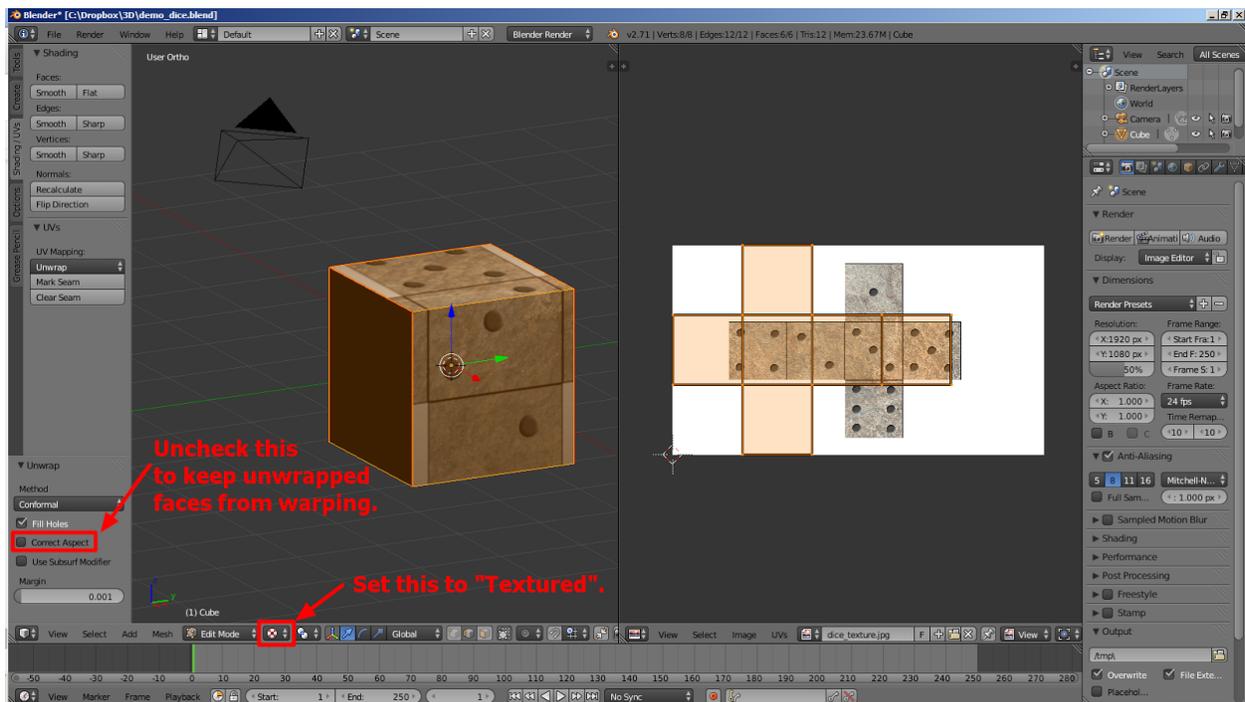
NOTE: Only the sides of the dice facing the light source will show in the image. If you rotate the dice or move the light source, you will see the other sides.

You should see the result of the unwrapping in the 2D view. The faces of the cube have been laid out as if the 3D model was cut along the red lines and then flattened. To see how the cube looks with this new texture mapping, **switch your view mode to "Textured"** in the drop-down menu next to "Edit Mode".

The unwrapped faces do not currently lineup with the dice image. **Mouse over the 2D Image section and press "A" once or twice to select all faces in the UV Image Editor. Then use G, R, and S to move, rotate, and scale the unwrapped mesh, so that it lines up with the texture.**
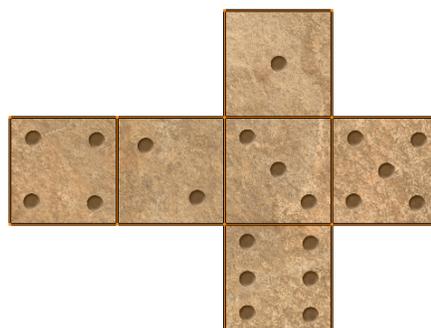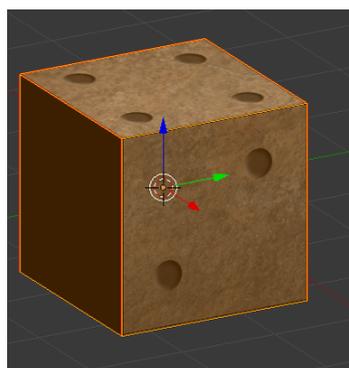
The final step in applying this texture is setting up a Material and Texture that, when the scene is rendered, looks to the UV Mapping we've set up.

Go to the Materials tab and create a new Material by pressing the "New" button.
You don't need to change any settings of the Material; it's just acting as a base for the Texture we're about to add.

Now got to the Textures tab and create a new Texture by pressing the "New" button.

In the settings for this new Material, we'll need to change a few things:

1. **Set the Type to "Image or Movie".**
2. **Under the Image section, click the drop-down menu…**
3. **… and choose the image you used for your object.**
4. **In the "Mapping" section (not the "Image Mapping" section!) set the Coordinates to "UV".**

Confirm that your Texture is set up properly by pressing F12 to render the scene. Your object's render should look the same as it does in the 3D View window.