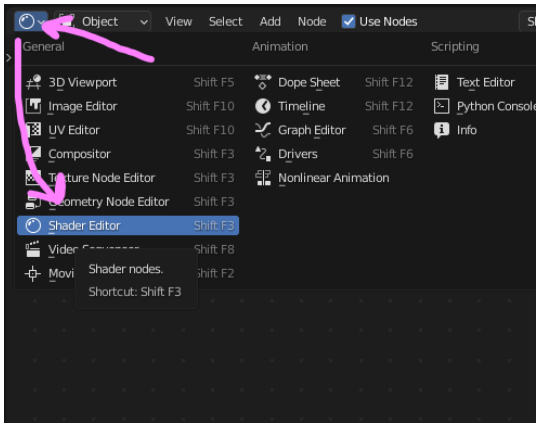
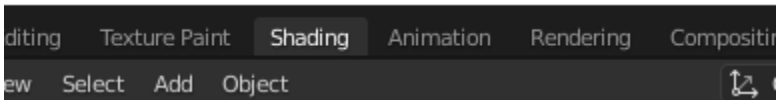
Shaders describe how light interacts at the surface of a mesh. Shaders use mathematical formulas to calculate the way that light rays reflect, transmit, and/or absorb as they interact with the mesh.

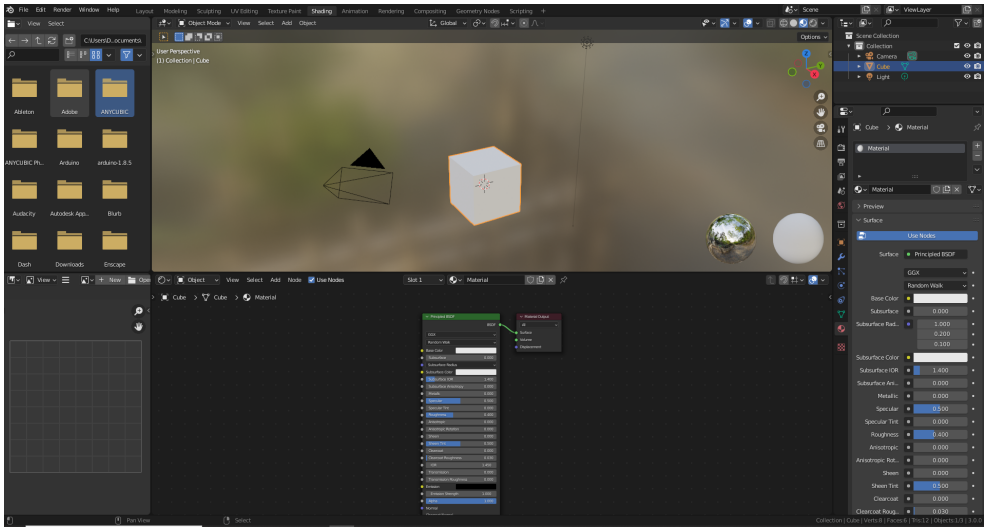
In Blender, we work with shaders within the Shader Editor mode, which is preloaded in the Shading workspace.



Open a new blender scene and switch to the Shading viewport by clicking the tab along the top.

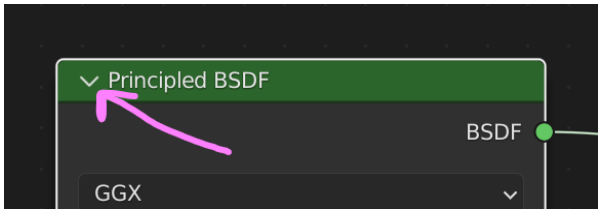


You will see a material preview area above showing the scene with the “materials preview” shading mode enabled. Below you will see the shading editor with a default node setup.

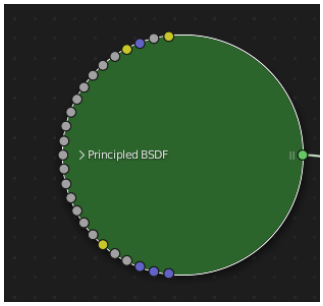


Use the scroll wheel to zoom in and out of the node editor.
Use the middle mouse button to click and pan the view.
Nodes can be added with the Add menu, which is available with the **shift + a** shortcut. Take a peek at the menu but don’t add anything yet

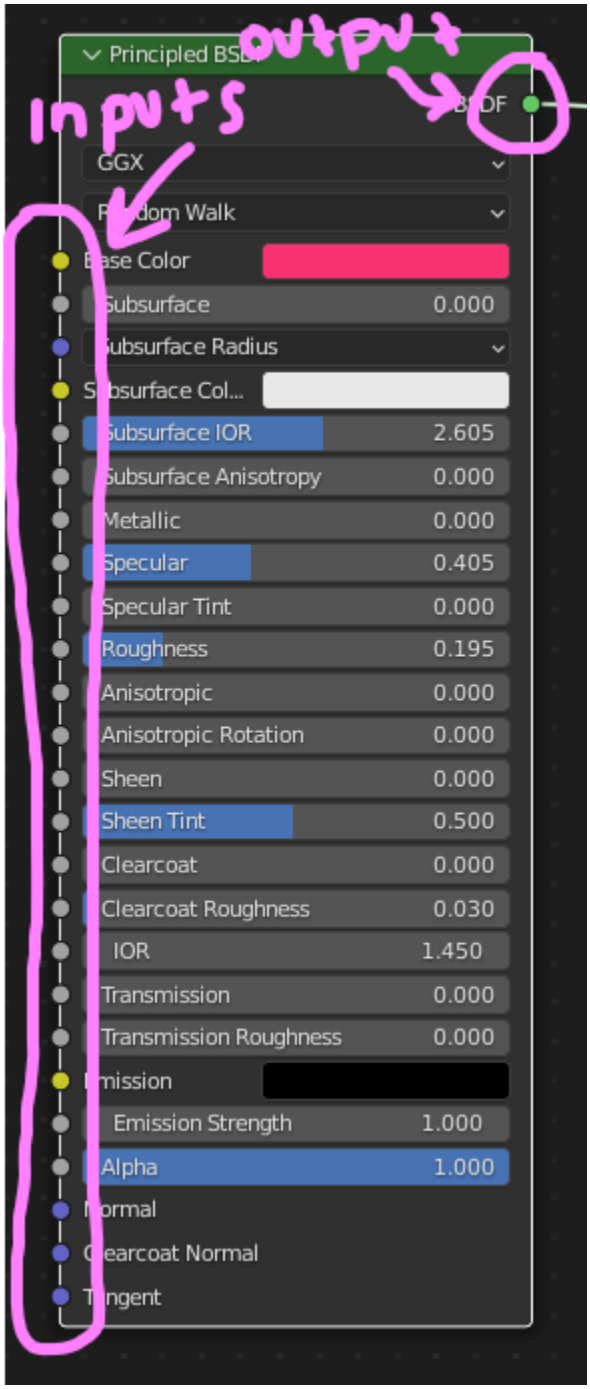
Nodes can be collapsed and reopened by toggling the arrow at the top left of the title bar



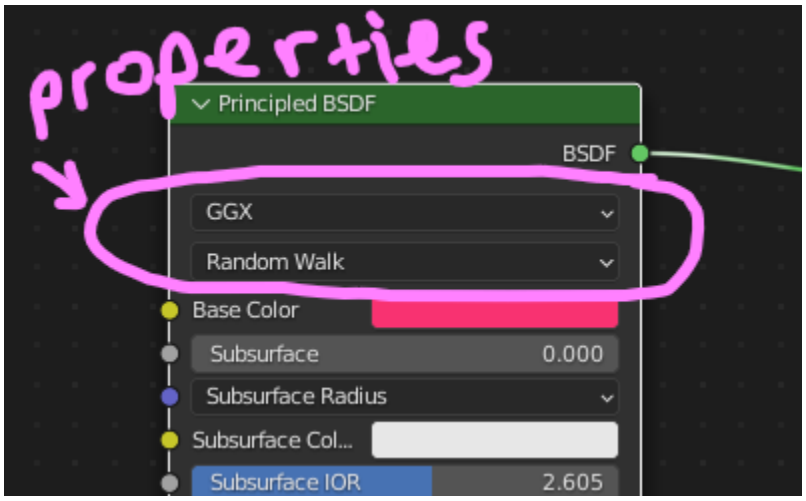
A collapsed node helps keep the space organized.



Looking at a node up close, we can see that there are inputs on the left and outputs on the right. Inputs and outputs are represented by dots called sockets. Input sockets on the left are arranged towards the bottom, and output sockets on the right are arranged towards the top. Sockets are color coded based on the type of input or output it accepts, more on this later.
When nothing is connected to the socket, then the value for the setting is set to a default value.



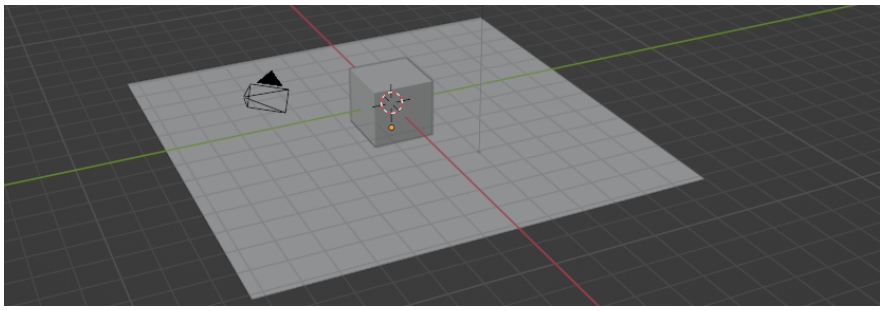
The area between the inputs and outputs, if available, is the properties area where additional settings can be established.



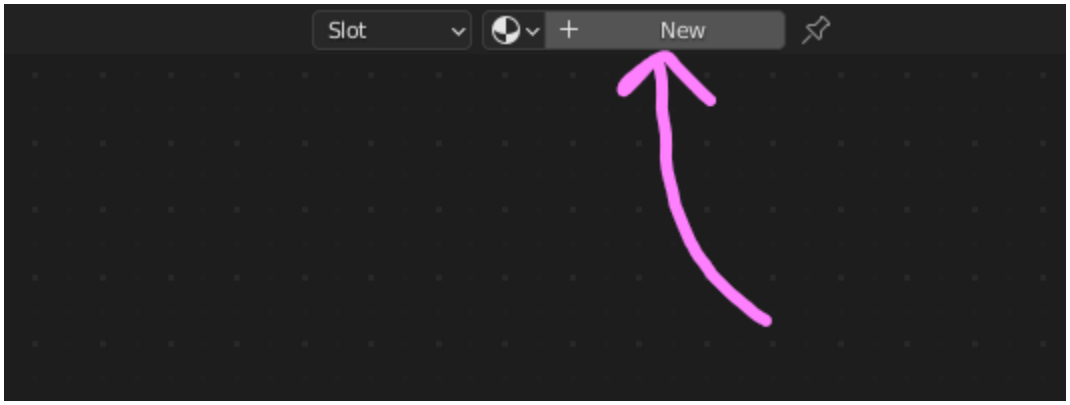
Nodes can be clicked and dragged to move them around. The can also be moved with the G key
Many of the usual transformations can be used in the node editor such as scale, rotate, show/hide, duplicate, delete, copy and paste.

The connections between input and output sockets are called links. Links can be created by clicking and dragging the link from one socket to another.
To disconnect a link, click and drag the input socket and drop it in an empty space.
Output sockets can be linked to multiple input sockets, but most input sockets can only have one link attached to them.

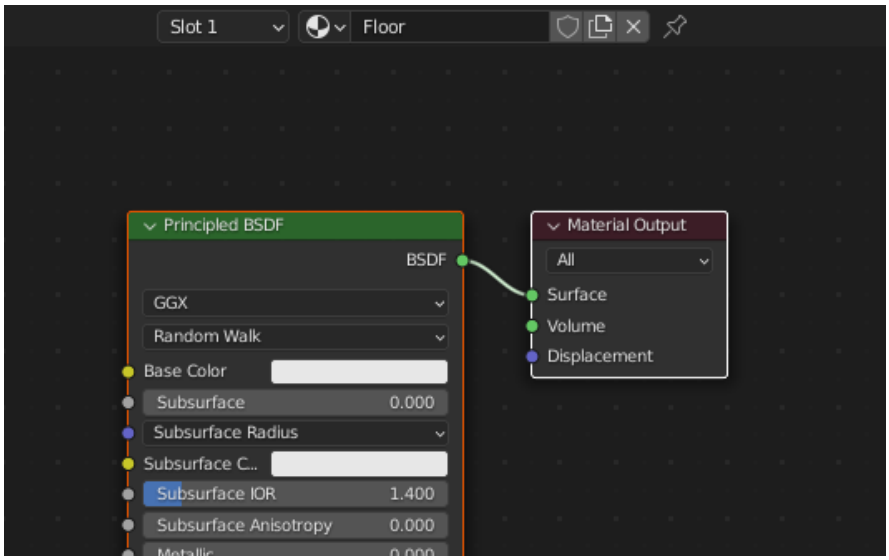
Press the n key to reveal the side menu of the shader editor. Notice there are more settings there, most of which are repeated from the materials properties tab.
—
Lets make some materials and set their properties via the node editor.
Go to Layout mode and add a plane. Set it as the floor beneath the cube.



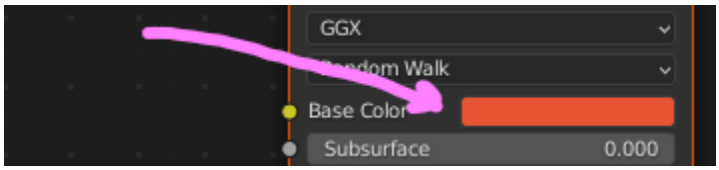
With the plane selected, enter the Shading viewport.
Click the NEW button to create a new material



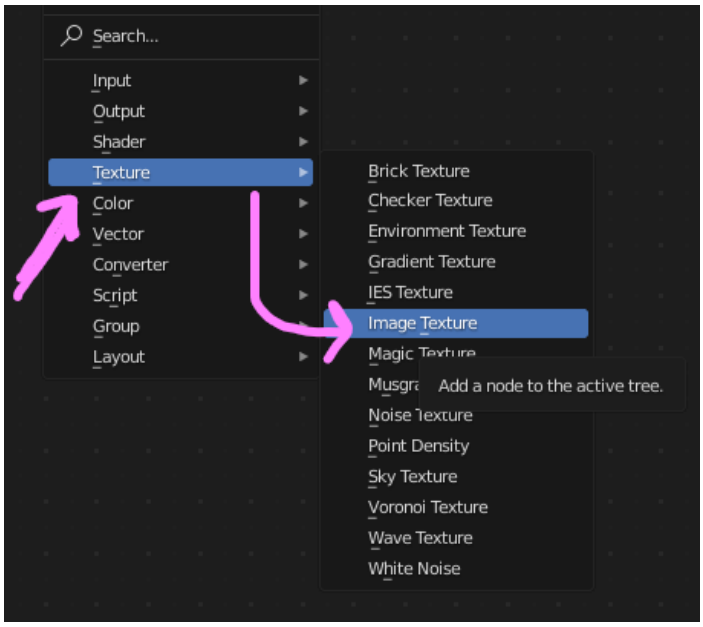
After the material is created, the default nodes will appear in the editor.
Rename the material to “floor”



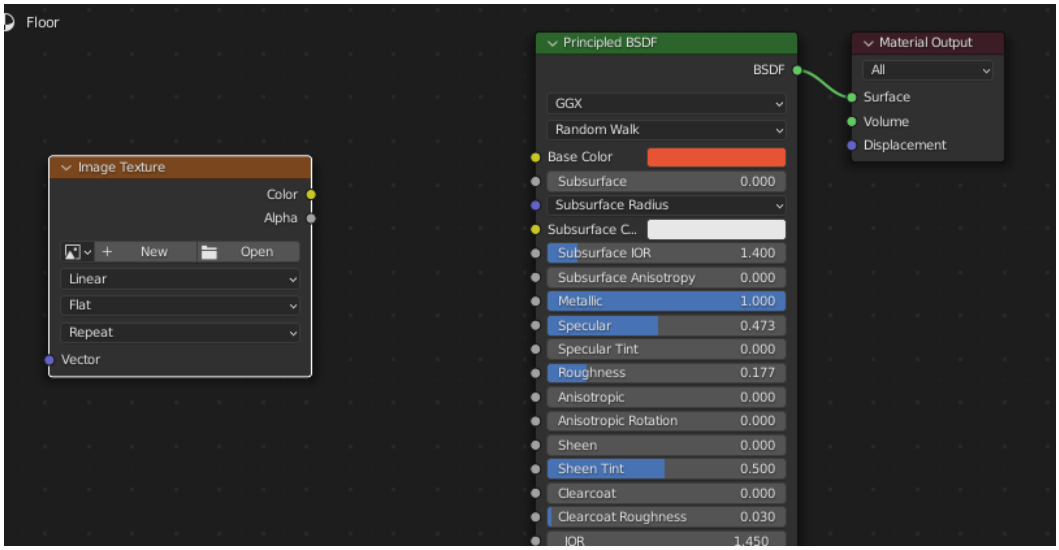
Change the color of the floor by clicking the color property in the node editor



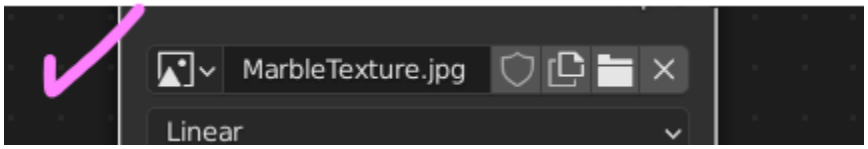
Notice that it updates the the color in the preview window above.
Instead lets use a image texture for the floor.
Press **shift+a** to see the “add” menu and navigate to texture → image texture



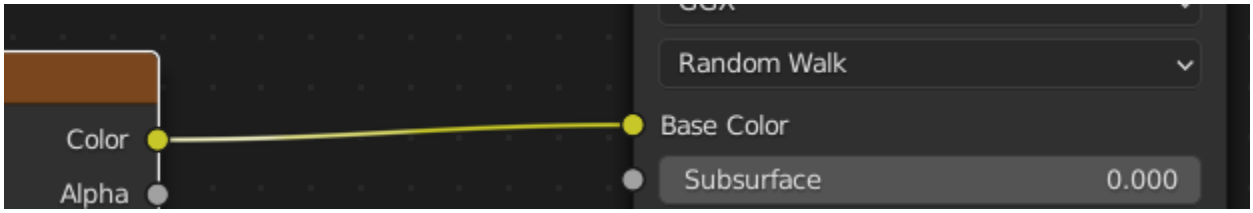
This menu is also available from the header dropdown menu above the node editor window.
Click to place the new image texture node. Place it to the left.
* NOTE: The node editor generally works from left to right. Inputs are on the left and outputs are on the right, and so the general flow is from left to right.



Next, we need to open the MarbleTexture.jpg image from our desktop to use as an image for our texture.
In the image texture node, click the OPEN button and find an image file. Once opened, it will show in the node properties



Next, connect the output color socket from the texture node to the input socket for the base color on the Principled BSDF node. To do this, click and drag the link from one socket to the other.

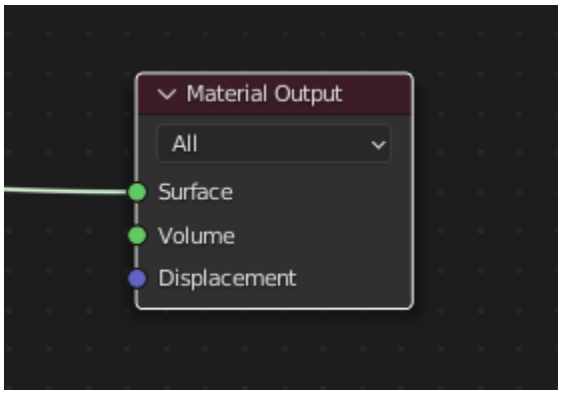


The preview image above should update to reflect the added image texture.
Notice that this is the same process that could be achieved using the image properties tab in the properties editor.
Nodes allow us to visualize the relationships easier, faster, and better.

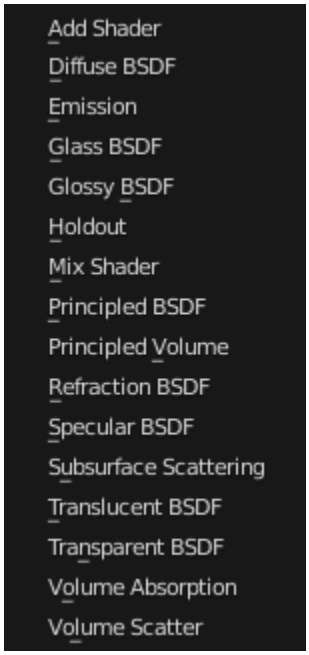
Take a moment and add some objects to your scene. Then spend some time finding images online and adding them as image textures to your objects.

—

A materials output node is the final node of the node tree and is essential to applying the node setup to the material.
Without it, there is no material.

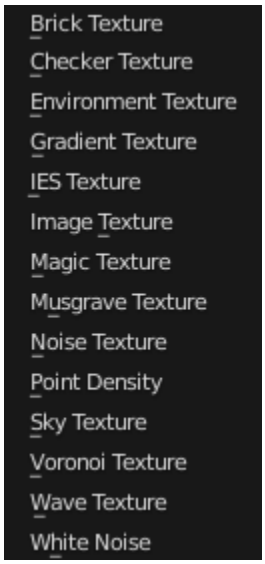


The material node only accepts input from a “Sahder” type of node. Shader type nodes are the titans of the node editor. They are the complex components that create the interesting effects on the surface of our mesh. Shader nodes are shown with a green title. The list of available shader nodes can be seen in the Add → shader menu list

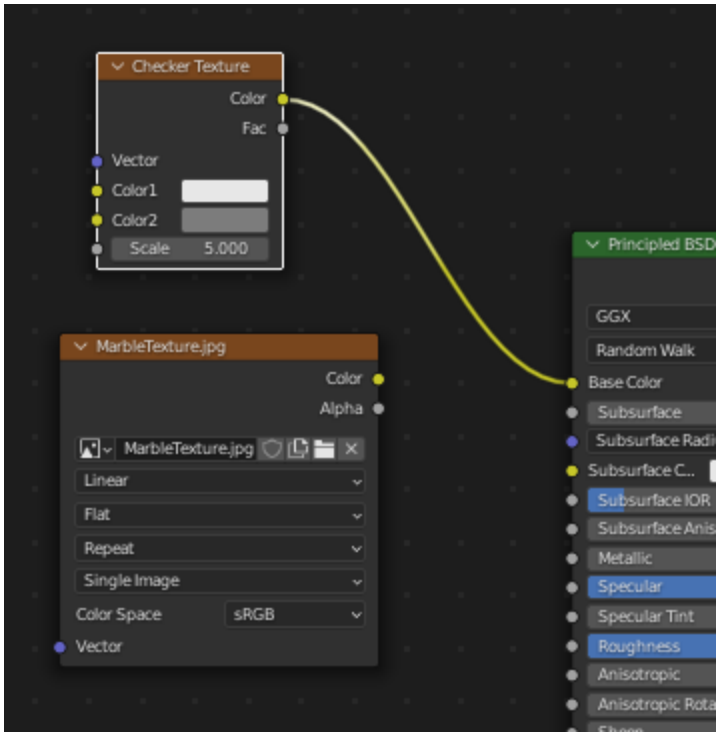


The default shader is the Principled BSDF shader and can be used for practically anything.
BSDF stands for “Bidirectional scattering distribution function” which is a complex mathematical system for defining how light reflects on the surface of objects.

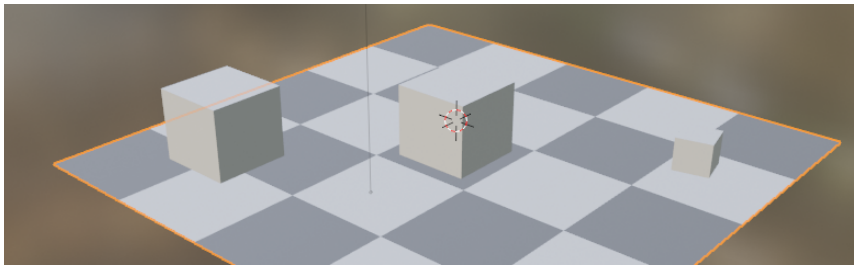
—
Lets look at some of the texture nodes that can be added. Texture nodes can be connected to a variety of other nodes to create interesting effects.
Press shift + a to see the add menu and browse through the nodes within the texture sub menu



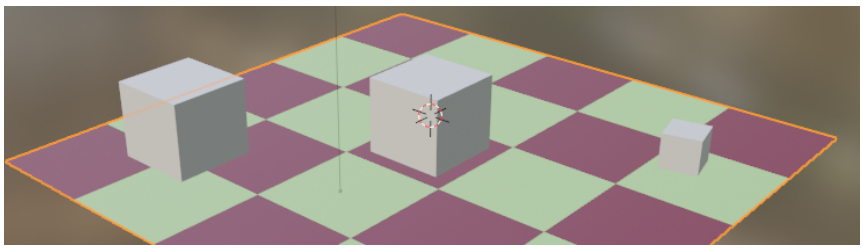
With your floor selected, add a checker texture node from the menu.
Next replace by dragging the output color socket from the checker texture to the input base color socket of the shader node. This will replace the connection that you may have previously had with the image texture.



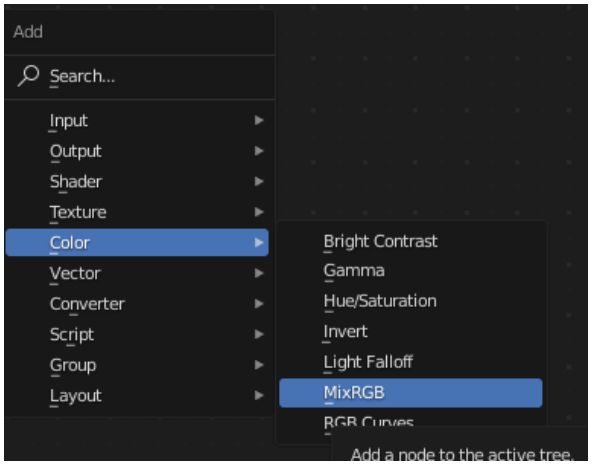
Your floor will now have the checker texture applied to it.



The properties of the checker effect can be manipulated in the properties area of the node. Try changing the color of the checkers

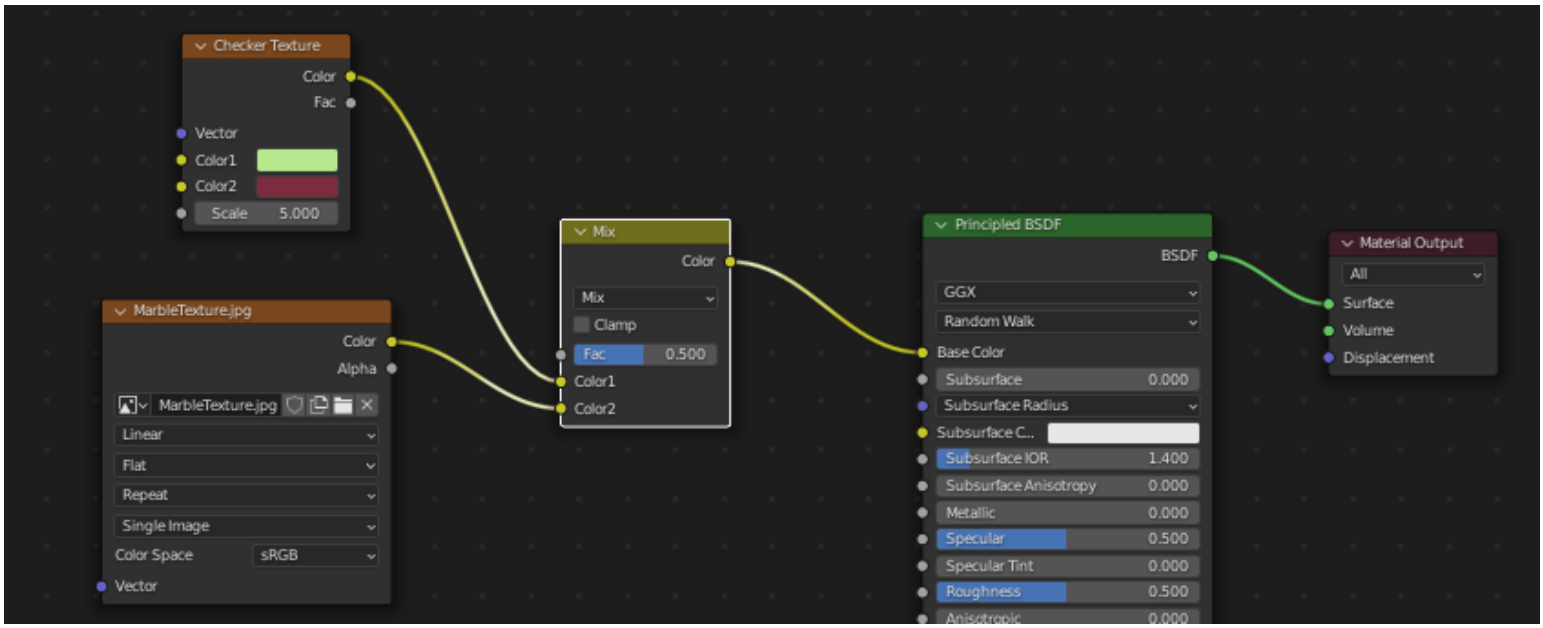


Next lets add a mix node to mix the color of the checkers with the color of the image texture.
Press shift+ a to see the add menu and select Color → mixRGB

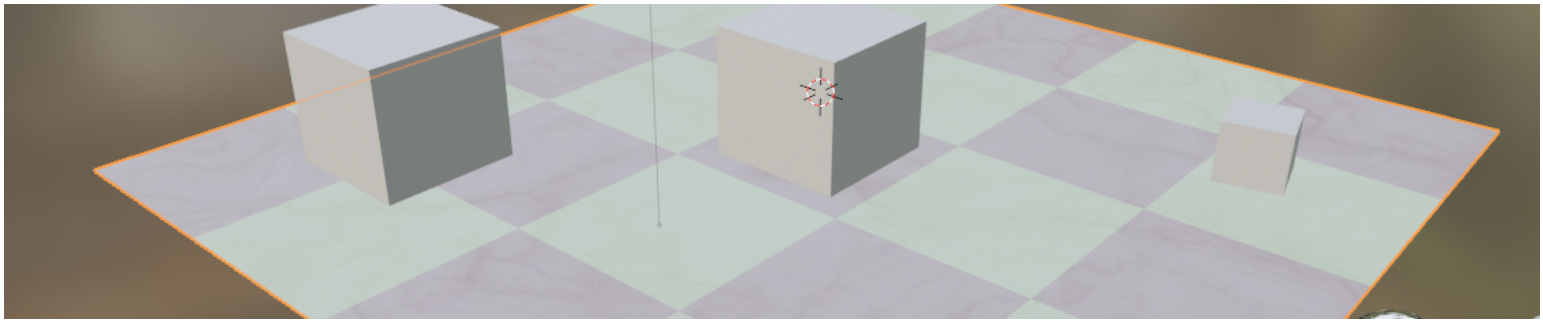


Place this node to the right of the image and texture nodes and the left of the principled BSDF shader.
Some readjustment of the existing nodes may be necessary to get it to fit in the space.

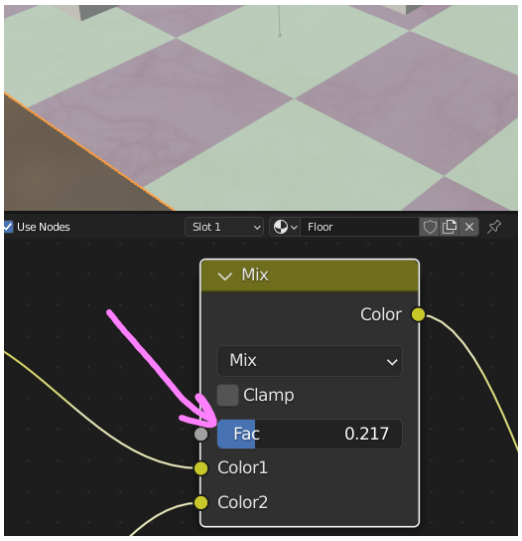
Next, connect the outputs from the two texture nodes into the inputs of the two sockets on the mixRGB shader. Finally, connect the output of the mix shader to the Base Color socket of the Principled BSDF shader.

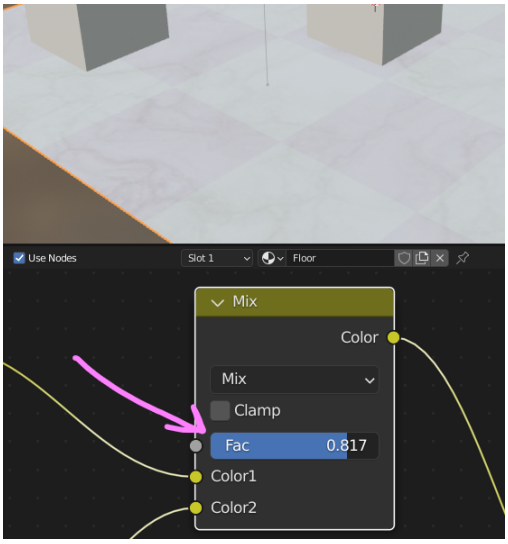


Your node setup should look like the above.
Your material preview should now show the two image textured blended together.

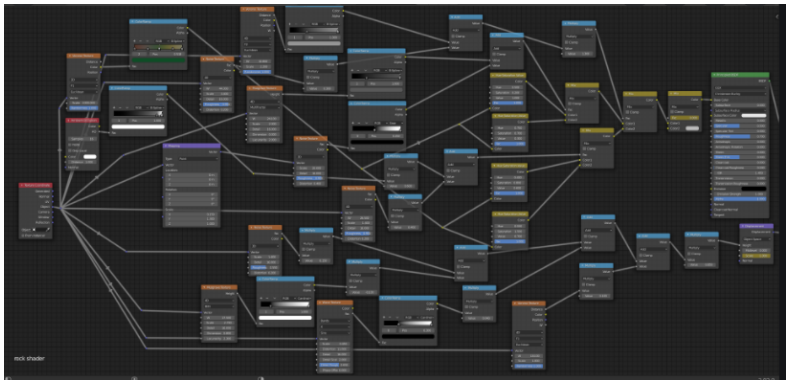


Try sliding the factor value of the mixRGB node to one side or the other which determines which imagetexture will have a stronger weight.





Congrats, you have now built up your first node Tree using a handful of shader nodes.
The idea with shaders is that we can build complex node tree structures that describe the interaction of the light at the surface of our meshes.
There is no limit to how many nodes you can use or how complex the shader can become.



Obviously things can get messy and it is best to always try to keep connections organized visually to help with troubleshooting problems later down the line.