**Design Decisions**

**Development choices**

The scene I selected was one made by simple objects found on a desk. These objects in particular did not have major irregular forms that would make it more complicated to create a closer 3D representation of them. For instance, the tablet was thought as a cube whose dimensions were scaled to obtain a rectangular surface and reduce its thickness; just to add a little extra detail to it, I considered using three different textures to differentiate the tablet screen, sides and front border, despite the fact that the tablet was completely black.

The notebook was another object that did not have major complex forms, it is mainly formed by the same principle of a deformed cube with different textures applied on the cover (which I took a picture of the real object cover and edited it) and the pages. The details that required more time were the ring binders, as their shape needed the use of a line of tori, for which I needed to create a function that would create the vertices, normal vectors and texture coordinates for a torus.

The pen originally started as a cubical shape with a pyramid in the tip, but for the final presentation I decided to change it to a smoother surface by using a cylinder and a conical shape for the tip of the pen. I would also like to note that I added a grey color to the head of the pen to get a better visualization, even though the original S pen is completely black.

Finally, the lamp was the object formed by many shapes as it required the use of a deformed cube for the base, and cylinders for the poles and shades. Just like the ring binders, to create these shapes I created a function that could calculate the vertices, normal vectors and texture coordinates.

**Navigation**

The controls set up for the navigation inside the scene were the same used throughout the course. Navigation is possible in all directions with the use of the keyboard using WASD (W and S keys move the camera forward and backwards, and A and D move the camera to the left or right) and QE keys (Q moves the camera up, E moves it down), and the use of the mouse by moving it in any direction providing a change in the angle of the camera, as well as zooming when scrolling. All of these movements are possible whenever the scene is seen from a perspective projection, as objects will be shown with the consideration that dimensions decrease the farther they are from the camera. On the other hand, the orthographic projection view only allows navigation in the x and y axis, as well as the angular change in view, but objects remain the same size as this type of projection considers all objects to keep their dimension regardless of their position to the camera.

To change the projection from a perspective view to an orthographic one the key “O” can be pressed at any time, and to go back to a perspective projection, the key “P” can be pressed and enable a better navigation.

**Custom functions**

Throughout this project there were several areas that required additional functionality that was not included with the materials provided, such as the need for a way to draw complex shapes such as cylinders or tori, for this, I included two functions that would create the vertices location, the normal vectors and the way texture coordinates should be applied to the shape, I also added extra customization to move the cylinder or torus in any direction if I needed to create a connected piece such as the poles of the lamp. This functions helped to obtain all the coordinates I needed without repeating code each time I had to create a cylinder for the lamp, or the many tori I used for the rings in the notebook.

Furthermore, I consider modifying several functions provided by the tutorials, such as the way images where being loaded, because it required the same portion of code to validate that such images were loaded correctly, so I simply included a verification method inside the loading function so only one line of code was required to both load an image and validate it. I also modified the shader codes to allow light sources to display the same color they are applying to the scene rather than keeping them all as white; so, a yellow light will have a yellow colored light source, providing a better effect to the scene.