

Project 9

Render a Kitchen

Creating a kitchen in 3D is one of those projects that help a lot in improving our skills. Since a kitchen can be created without having to resort to complex modeling skills, it suits the purpose of learning to assemble a full scene, adding some textures and learning some lighting tricks. Let's create one from scratch and learn some good tools of the trade along the way.

Mission Briefing

We will be building a simple scene of a kitchen, starting with a room that has a big window. The window will require some detailing, though not really much.

The main elements of the scene will be some cabinets (both on the floor and the wall), along with a kitchen sink and a stove. The cabinets will have a nice wooden texture on their drawers and doors, and a simple, circular type of knob. The sink will be quite basic, with a fake brushed metal material that we'll create for it. The stove will require more detailed work to give it a proper shape and add some minimalistic and cool grills (to be ready to hold the pots in the future!). We'll also add a hood, a faucet, and a simple background image.

What Does It Do?

With this project we will learn a few methods and tricks to solve different kinds of problems, from very basic methods for creating "boxy" shapes, through some tools that can aid a lot when trying to create models with exact measurements (though we will not be using exact measurements all the time), and a simple but very good lighting setup requiring just two lights and the usage of Ambient Occlusion.

We'll also have the opportunity to work with the Spin tool (to create circular extrusions), using some modifiers to speed up the work and ease scene management later, as well as general organization and data-sharing options that Blender offers us.

Why Is It Awesome?

The best thing about this project is that it isn't complex at all, but the final result will have a professional and realistic look. We won't even need to apply post-processing to the final render (though it could improve the final result, of course) since the render that comes straight out of the scene setup is good enough.

Another cool thing that this project will allow us to learn is a simple method to fake a brushed metal look, useful in cases where the camera is far enough from the object with the material.

The lighting setup will show us how good a render can be without resorting to complex lighting setups; in this case we are going to create a setup with only two lights and use Ambient Occlusion. The real key to it all is the Ambient Occlusion, but the other element allowing us to do it is the area lamp that we're going to use.

All in all, this project is a good way to learn a bit about architectural rendering.

Your Hotshot Objectives

We'll be working in five different parts on the project; each part will include the modeling and shading of the objects that we create in it:

- ▶ Room
- ▶ Cabinets
- ▶ Sink and faucet
- ▶ Stove and hood
- ▶ Lighting and background

Mission Checklist

As usual, we're going to need a few textures to apply on some objects of the scene; let's go to www.cgtextures.com, and download these textures (remember to put them in a `tex` folder inside the project's folder):

- ▶ **Wood → Fine Wood:**
 - `WoodFine0047` (reddish one, stripes running horizontally); download the medium version of the **Image 1** of the texture set. An easy way to find the right texture is to look at the URL when hovering the pointer on the thumbnail; in the URL there must be a part saying **id=42044**.
- ▶ **Skies Partial:**
 - `Skies0239`; this image has a thin part of green land in the bottom. Make sure to download the large version of it. The URL must have **id=14023**.

► **Buildings → Shops:**

- `Shops0204`; this image shows the front of a shoe store. Download the small version of the first image of the set. The URL must have **id=26859**.

The first image will be needed for the drawers and doors of the cabinets, the second one as a background to the window of the kitchen, and the last one will be used as a helper fake reflection map.

Room

Let's open Blender, delete the default camera and lamp, and then go to the **Scene** tab of the **Properties Editor** and set the units mode to **Metric (Units panel)**; this will make Blender show us the values of parameters and some measurements using the metric units system, which will be quite helpful. Finally, save the file as `kitchen.blend` in the project's folder.

Engage Thrusters

We'll start by creating the walls of the room.

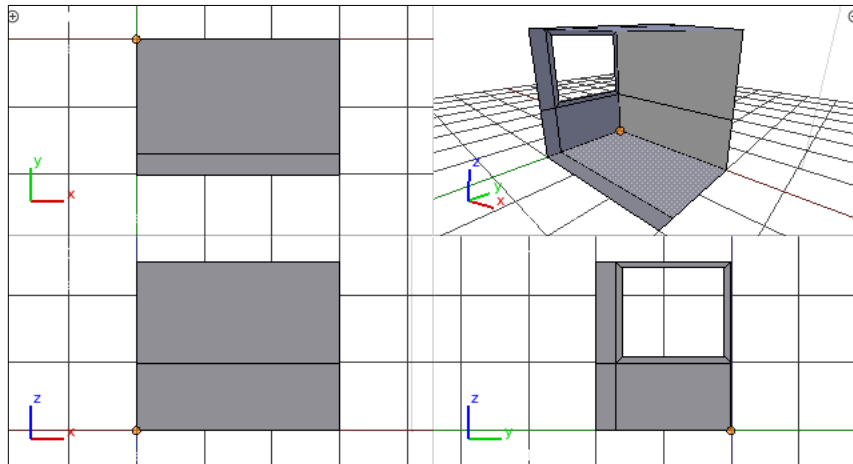
1. Select the default cube and set its name to `walls` (in the **Item** panel of the **Properties** sidebar); then switch to Front View (**View → Front**) and into Edit Mode (press the *Tab* key). Once in Edit Mode, go to the **Mesh Display** panel of the **Properties** sidebar and enable the **Edge Length** and **Edge Angles** options (under the **Numerics** label).
2. Now select all the vertices of the cube and scale them up by a factor of 1.25, constrained to the Z axis (press the *S* key, *Z* key, then type `1.25`). Then let's move all the vertices so that one of the vertices of the mesh gets properly positioned at the origin of the 3D world. To do that, let's move them by one meter on the X axis (press the *G* key, *X* key, then type `1`), then move them by `-1` meters on the Y axis (press the *G* key, *Y* key, then type `-1`), and finally move them upwards (Z axis) by 1.25 meters (hit the *G* key, *Z* key, then type `1.25`).

To open the mesh and be able to see inside we need to remove one of its edges.

3. Let's select the edge running along the Z axis that, if viewed from the top, would be located at the bottom right (it would be seen as a point, not as a line); once the edge is selected, let's delete it (**Mesh → Delete → Edges**). Now we have the corner in which all our scene will be constructed.
4. Now let's add an edge loop by using the **Loop Cut and Slide** tool (in the **Tool Shelf** sidebar) and clicking on one of the edges parallel to the Y axis, so that the resulting loop would look like a "C" if viewed from the Front View. Right after creating the new loop, let's select it and move it by `-70` cm on the Y axis (press the *G* key, *Y* key, then type `-0.7`). That way it will be 1.7 meters from the origin of the 3D world.

5. Another edge loop must be added to the mesh, this time running horizontally (after selecting the **Loop Cut and Slide** tool, click on one of the edges running parallel to the Z axis). Once added, let's select it and move it down so that the vertical edges below it are one meter long (let's use the labels indicating the lengths that appear over them while performing the transformation).
6. Let's also switch to Front View (**View → Front**), select the vertices at the rightmost, and move them one meter to the right (press the *G* key, *X* key, then type 1).
7. To complete the wall we just need to create an opening for the window. To do that, let's switch to Right View (**View → Right**), select the face touching the upper right corner of the "box", extrude it, and then scale the extruded the face down by a factor of 0.873 (the length indicators in the diagonal edges must show a value of 14.42 cm approximately). To have evenly distributed angles, let's now scale the face by a factor of 1.0172 along the Y axis (press the *S* key, *Y* key, then type 1.0172).
8. Finally let's switch to Face Select Mode, select the inner face from the extrusion and delete it (**Mesh → Delete → Faces**). Now we have the place to put the window in.
9. A small tweak to finish the modeling is to select the entire mesh (**Select → Select/ Deselect All**, once or twice) and go to **Mesh → Normals → Recalculate Inside**.

Let's take a look at a screenshot showing our progress so far:



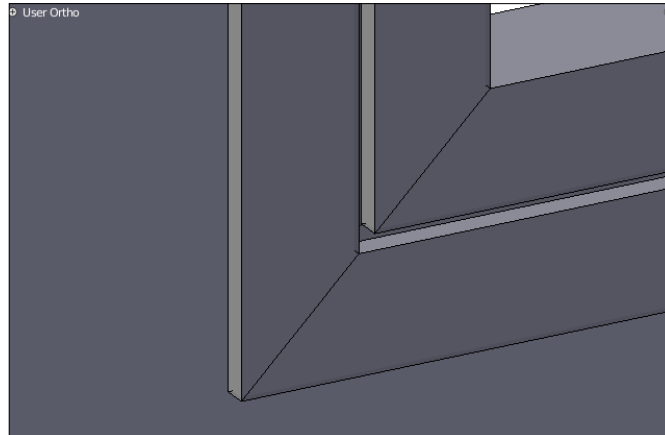
10. For the shading part, let's go to the **Material** tab in the **Properties Editor**, add a new material to the material slot (if there's not one yet), change its name to `wall` and set it as follows:
 - ▶ Diffuse panel:
 - Color: 0.9 Red, 0.9 Green, 0.9 Blue
 - Intensity: 0.9

- ▶ Specular panel:
 - Color: 1.0 Red, 1.0 Green, 1.0 Blue
 - Intensity: 0.24
 - Shader Model: CookTorr
 - Hardness: 12

That way we get a basic look with a low specularity and very bright look. To avoid having unnecessary textures, let's go to the **Texture** tab and make sure this material doesn't have any texture associated with it. Now let's work on the window.

11. To make constructing the window a little easier, let's just select the edges forming the hole of the window in the walls, duplicate them (**Mesh → Add Duplicate**) and then separate them into a new object (**Mesh → Vertices → Separate**).
12. Then switch to Object Mode, select the new object and set its name to `window` (in the **Item** panel, **Properties** sidebar). Let's also switch to Edit Mode (*Tab* key) for this object.
13. Select all the edges, extrude them (press the *E* key) and then press the *Escape* key. Move the extruded geometry by 1 cm (0.01 units) along the global X axis. Right after that, let's perform a second extrusion, press *Escape*, and then scale the selection by a factor of 0.927. To get a nicely proportional corner, let's scale the selection only along the Y axis (press the *S* key, then *Y*) and move the mouse pointer until the labels showing the angles' values get as close to 135° as possible (hold the *Shift* key while moving the pointer to have finer control).
14. Continue by extruding again (press the *E* key, followed by *Escape*) and then scale down the extrusion by a factor of 0.9893. Then let's perform a scale constrained to the global Y axis (press the *S* key, then *Y*) until the angle values become close to 135°. Note the thin ring we just created, since we will select it later to perform an inset.
15. Once again, let's extrude the selected edges, press the *Escape* key to stop the grab operation and scale the selection by a factor of 0.9215. This time we must also correct the angles by scaling the selection constrained on the Y axis (press the *S* key, then *Y*) until the labels showing the angles' values indicate a value as close to 135° as possible.
16. To complete the frame of the window, let's just extrude the inner ring and move the extrusion -6 cm (0.06 units) along the global X axis. Let's also remember to select the faces forming the thin ring created in one of the previous extrusions, extrude it and move it -1 cm (0.01 units) along the global X axis.

To make sure that we are on the right track, let's take a look at a screenshot of how the corner of the window frame should look by now:



17. The final touch for the window is just adding some simple "muntins" to it. Let's select the inner ring of edges and position the 3D Cursor at the center of the selection by going to **Mesh → Snap → Cursor to Selected**. Then we need to add a cylinder (**Add → Mesh → Cylinder**) and set its parameters (in the **Tool Shelf** sidebar, lower panel) as follows:
 - ▶ Vertices: 8
 - ▶ Radius: 0.01
 - ▶ Depth: 1.12
 - ▶ Cap Ends: disabled
18. Now let's switch to Top View (**View → Top**) and move the cylinder by 2.7 cm (0.027 units) along the global X axis. Then let's duplicate the cylinder (*Shift + D*) and move it by 32 cm (0.32 units) along the global Y axis; to create the third muntin let's just duplicate this second one and move the duplicate -64cm (0.64 units) along the Y axis.
19. The only missing part is creating a horizontal frame. For that, let's switch to Right View (**View → Right**), select only the muntin in the center, duplicate it (*Shift + D*), rotate the duplicate by 90 degrees, and scale it constrained to the Y axis until it touches both sides of the inner part of the frame. Let's also select the entire mesh (**Select → Select/Deselect All**, once or twice) and go to **Mesh → Normals → Recalculate Outside**; that way we are sure the normals are pointing in the correct direction.
20. It's quite likely that the muntins will be using flat shading, so let's select them and go to **Mesh → Faces → Shade Smooth**.

21. Now let's create the material for the window; switch to Object Mode, then go to the **Material** tab of the **Properties Editor**, add a new material, and set its name to `whiteWood`; then set it as follows:
 - ▶ Diffuse panel:
 - Color: 1.0 Red, 0.98 Green, 0.94 Blue
 - Intensity: 0.9
 - ▶ Specular Intensity: 0.0 (Specular panel)

That will give us a simple flat, subtly warm, soft finish for the `whiteWood` material. It's a good idea to save our file now.

Objective Complete - Mini Debriefing

In this part we just worked out the room that contains our scene; the room itself is very simple, composed of just a corner with a window. To give it a little bit of detail, we just performed some work on the frame of the window.

The materials were very straightforward, using just basic diffuse and specular settings to accomplish the needed finishing.

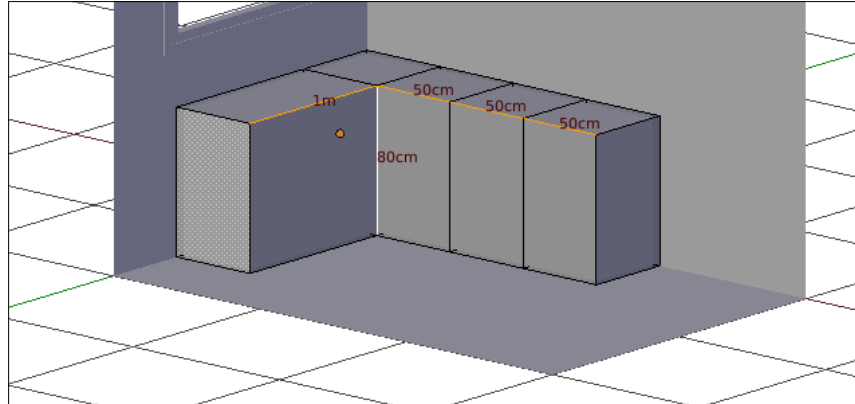
Cabinets

With the room ready, we can create the cabinets, both on the floor and high on the wall. The cabinets will be composed of a very basic "cubic" shape, a drawer, a door and a knob.

Engage Thrusters

1. Let's start by checking that we are in Object Mode (switch to it if not) and the 3D Cursor is positioned at the origin of the 3D World (press *Shift + C* to move it there).
2. Now let's add a new cube (**Add → Mesh → Cube**), set its name to `cab-floor` (from the **Item** panel, **Properties** sidebar) and switch to Edit Mode.
3. Select all the vertices (press the *A* key, once or twice) and scale it down by a factor of 0.5; this will give us a cube 1 meter (1 unit) long in each dimension. Now let's move the selection by 50 cm X, -50 cm Y, 50 cm Z; a nice and easy way to do that is to start the grab tool (*G* key), then type `0.5`, followed by *Tab* (notice the vertical bar indicating which axis are you typing the value in, in the status bar below the 3D View), then type `-0.5`, followed by *Tab*, then type `0.5` and then press *Enter*. After this, we must have the `cab-floor` object's corner and the room's corner at the exact same place (the origin of the 3D world).

- Now let's switch to Face Select Mode (*Ctrl + Tab*, then type *3*), switch to Front View (**View → Front**), select the rightmost face of the mesh, and move it -50 cm along the X axis (press the *G* key, *X* key, then type *-0.5*).
- Now add an edge loop by using the **Loop Cut and Slide** tool (Tool Shelf) and performing the cut parallel to the X axis (from Right View). Make sure to perform the cut at the very center of the edges, so that the split new edges are each 50 cm long.
- Right after that, let's select the leftmost face and move it -50 cm along the Y axis (*G* key, *Y* key, then type *-0.5*).
- Let's now make sure that we have the **Limit Selection to Visible** option enabled (first button on the right-hand side of the vertex/edge/face selection mode buttons, header of the 3D View) and that we are viewing the viewport shading in solid mode (*Z* key, once or twice); now select the face to the right-hand side (not the one that appears as an edge from our view angle), then switch to Front View (**View → Front**), extrude the face, press *Escape*, then move the extrusion by 1.5 meters (1.5 units) along the X axis (*G* key, *X* key, then type *1.5*).
- Then let's add two edge loops across the extrusion by using the **Loop Cut and Slide** tool (*Ctrl + R*) and scrolling the mouse wheel to increase the number of cuts. Finally, let's rotate the view freely (drag the middle mouse button), select the five faces that are located highest in the Z axis, and move them down 20 cm (*G* key, *Z* key, then type *-0.2*). Let's take a look at the "L" shape that we just created:



- Before continuing, let's check that the height of the cabinets is 80 cm, their "thickness" is 50 cm, the left arm is 1 meter long, and the right arm is 1.5 meters long. Let's also add a new edge loop to the left arm to split it into two parts, each 50 cm long. Pay attention to the faces that will have drawers or doors (the vertical ones, in the inner part of the L shape), since we will be working on them next.

10. Let's now switch to Object Mode, then go to the **Material** tab of the **Properties Editor**, click on the red sphere icon (just below the empty materials list), and select the `whiteWood` material. That way we share the same material between the window frame and the cabinet.
11. To create the drawers, let's switch to Edit Mode and make sure we are in Front View (**View → Front**) and the Viewport Shading is set to solid. Then select the rightmost face over which there will be a drawer. Let's duplicate it and separate it into a new object (**Mesh → Vertices → Separate**).
12. Now switch back to Object Mode, select the new object, set its name to `cab-drawer` (**Item** panel, **Properties** sidebar), and switch into Edit Mode again.
13. With the face selected, scale it down by a factor of 0.94 (press the *S* key, then type `0.94`). Then perform a second scale operation, restricted to the global Z axis, with a factor of 1.027. Next we need to extrude the face, press *Escape*, and then move the extrusion -1 cm along the Y axis (*G* key, *Y* key, then type `-0.01`). That way we give some thickness to the drawer.
14. Let's continue by extruding the front face of the drawer, pressing *Escape*, then scaling it by a factor of 0.944. Apply a second scale, restricted to the Z axis and use the angle values to determine how much to scale the face (remember to get the angles reading as close as possible to 135°).
15. In order to create the ring needed for the inset, we need to perform a new extrusion (using the selection that the previous extrusion left us with), scale it down by a factor of 0.975 and then scale it up (only along the Z axis) so that the values shown in the angle labels are as close to 135° as possible. Then let's select the thin ring that we just created with this extrusion, extrude it, press *Escape*, and then move the extrusion 2 mm (0.002 units) along the Y axis (*G* key, *Y* key, then type `0.002`).
16. To add the knob, let's switch to Edge Select Mode and Front View (**View → Front**), select one of the horizontal edges in the upper side of the drawer, and then put the 3D Cursor on it (**Mesh → Snap → Cursor to Selected**). Then add a new UV Sphere (**Add → Mesh → UV Sphere**) and set the parameters for it as follows (Tool Shelf):
 - ▶ Segments: 16
 - ▶ Rings: 16
 - ▶ Size: 0.021
 - ▶ Align to View: enabled

Let's also click on the **Smooth** button to get the knob shaded correctly.

17. Now let's switch to Top View (**View → Top**), select the vertex at the north pole (upper vertex in the screen), enable the Proportional Editing mode, set it to `smooth`, and then move the vertex in the negative direction of the Y axis, until the shape of the knob is almost flat on the upper part (use the scroll wheel to control the influence radius of the Proportional Editing mode). At this point, remember to disable the Proportional Editing mode. Then let's go to **Select → More**, extrude, press *Escape*, and then move the extrusion by 1.5 cm along the Y axis (*G* key, *Y* key, then type `0.015`).
18. To move the knob into the correct location, let's select the whole knob (**Select → Linked**, from the pre-existent selection) and move it so that it gets correctly separated from the drawer surface. Then switch to Right View and move it down so that it gets located inside the "ring" of the inset of the drawer; not at the center of the drawer, but in the upper part.
19. Since this first drawer will have the knob at the center, it's better for it to have lesser height; let's switch to Front View (**View → Front**), select the lower part of the drawer and move it up by 52.2 cm (0.522 units along the Z axis); that way we get a nice drawer.

Before starting to duplicate this drawer to create the bigger ones, let's make sure to assign the proper materials to it; that way we avoid having to go into each object later to link it with the material.
20. Let's switch to Object Mode, then go to the **Material** tab of the **Properties Editor** and add two slots to the materials list. Then add a material to each slot by clicking on the slot itself and then clicking on the **New** button, right below the materials list. Make sure that each slot has a separated material by checking that the names of the materials are different. The first material must be named `cabinetDrawer` and the second one must be named `cabinetKnob`.
21. Let's start with the settings for the `cabinetDrawer` material:
 - ▶ Diffuse Color: 0.0 Red, 0.0 Green, 0.0 Blue (Diffuse panel)
 - ▶ Specular panel:
 - Color: 1.0 Red, 0.825 Green, 0.48 Blue
 - Specular Shader Model: CookTorr
 - Intensity: 0.31
 - Hardness: 20
22. Now go to the **Texture** tab of the **Properties Editor**, add a new texture, set its name to `finewood`, its type to **Image or Movie**, and then set it as follows:
 - ▶ Mapping panel (the axis mapping options are the ones just below the **Projection** drop-down):

- X Mapping: Z
- Y Mapping: X
- Z Mapping: Y
- ▶ Image panel: load the image `WoodFine0047_3_M.jpg` from the `tex` folder.
- ▶ Influence panel:
 - Diffuse Color: Enabled, 1.0
 - Normal: Enabled, -0.3 (under the Geometry label)
 - Blend Mode: Add

Our material uses just the standard black color for the diffuse channel (to add the color from the texture) and a basic specularity with some tint. The trick with the texture is to get it running vertically on the drawer (the original texture is horizontal) by adjusting the axis mapping parameters. We also enabled the normal option to give some subtle roughness to the surface.

23. Let's go back to the **Material** tab, select the `cabinetKnob` material and set it as follows:
- ▶ Diffuse Color: 0.8 Red, 0.79 Green, 0.68 Blue (Diffuse panel)
 - ▶ Specular panel:
 - Color: 1.0 Red, 1.0 Green, 1.0 Blue
 - Specular Shader Model: CookTorr
 - Intensity: 1.0
 - Hardness: 26
24. Then let's go to the **Texture** tab, add a new texture, change its name to `spatter`, its type to **Clouds** and set it as follows:
- ▶ Clouds panel:
 - Basis: Voronoi F2-F1
 - ▶ Ramp: Enabled (Colors panel)
 - ▶ Mapping panel:
 - X Size: 5.0
 - Y Size: 5.0
 - Z Size: 5.0
 - ▶ Influence panel:
 - Diffuse Color: Enabled, 1.0
 - Blend: Mix

25. The settings for the ramp are as follows:

- ▶ Interpolation: Cardinal
- ▶ Color stop 1:
 - ❑ Color: 0.0 Red, 0.0 Green, 0.0 Blue
 - ❑ Alpha: 0.0
 - ❑ Position: 0.13
- ▶ Color stop 2:
 - ❑ Color: 0.30 Red, 0.38 Green, 0.30 Blue
 - ❑ Alpha: 0.21
 - ❑ Position: 0.34

This material is just a basic plastic material with simple noise to add a bit of texture to the overall look.

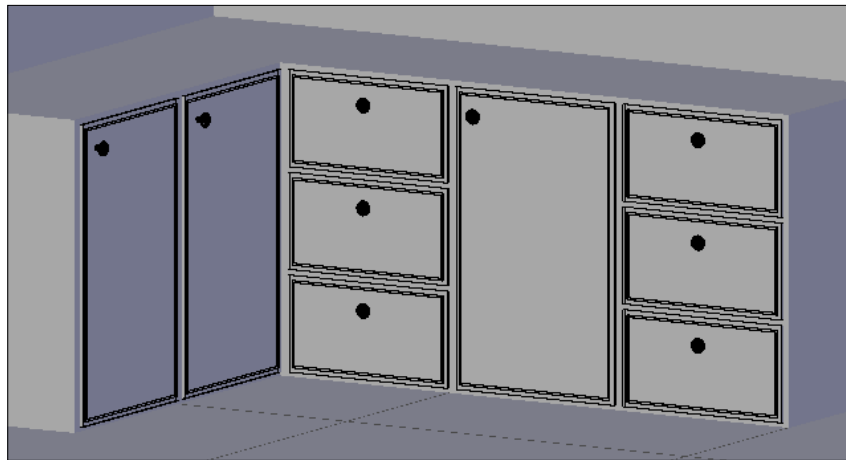
Now that we have the materials defined, it's time to assign each material to the faces that must have it applied.

26. Let's switch to Edit Mode, select only the vertices of the knob (select one vertex and then press *Ctrl + L*), go to the **Material** tab of the **Properties Editor**, select the `cabinetKnob` material, and click on the **Assign** button (just below the materials list); to assign the `cabinetDrawer` material, let's select only the drawer, select the `cabinetDrawer` material from the list, and then click on **Assign**.
27. Switch back to Object Mode, duplicate the `cab-drawer` object (**Object** → **Duplicate**) and move it -49.5 cm along the X axis (*G* key, *X* key, then type `-0.495`). This new object must be named `cab-drawer-big` (**Item** panel, **Properties** sidebar).
28. Since this will be a cabinet door, the current location for the knob isn't really appropriate; let's switch to Edit Mode, select only the vertices forming the knob, and move them -17 cm (0.17 units) along the X axis (*G* key, *X* key, then type `-0.17`). To give this door the correct height, let's select just the lower part of the door (including the lower part of the inset) and move it -52.5 cm along the Z axis (*G* key, *Z* key, then type `-0.525`). Switch back to Object Mode.

The two types of objects that we need are done; what we must do now is replicate them on the correct locations.

29. Let's start by selecting the `cab-drawer` object, then go to the **Modifiers** tab of the **Properties Editor** and add an **Array Modifier**. Make sure to use the **Fixed Count** option for the **Fit Type**, increase the Count to 3, enable **Relative Offset** and set the Z value for the **Relative Offset** to -1.05 (the X and Y values must be zero). This first modifier will get the drawers replicating vertically. Now let's add another **Array Modifier**, use **Fixed Count** for the **Fit Type**, leave the **Count** at 2, enable **Relative Offset** and set the X value for it to -2.1 (Y and Z must be zero). With these two modifiers we got the drawer replicated nicely and, along with `cab-drawer-big`, filling the entire right arm of the basic shape that we modeled initially.
30. For the left arm of the main "L" shape we just need to duplicate (**Object** → **Duplicate**) the `cab-drawer-big` object (in Object Mode), rotate it 90 degrees on the Z axis (R key, Z key, then type 90), then go to the **Modifiers** tab and add an **Array Modifier** set to use **Fixed Count**, 2 elements (**Count** parameter), **Relative Offset** enabled and an offset value of -1.05 in the X component (Y and Z must be zero). Then let's switch to Top View (**View** → **Top**) and move the repeating `cab-drawer-big` (it must have a name ending with `.001`) to be located just on the left arm of the main "L" shape for the cabinets that are on the floor.

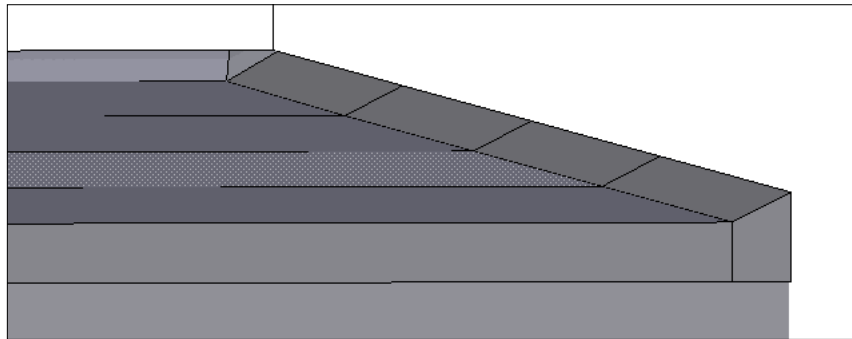
Let's take a look at the progress so far:



31. Next we must create the cover for these cabinets. Let's select the `cab-floor` object, select the faces forming the upper (according to the Z axis) "L", duplicate them (**Mesh** → **Add Duplicate**) and then separate them into a new object (**Mesh** → **Vertices** → **Separate**).
32. Now switch to Object Mode, select the new object, set its name to `cab-cover` (**Item** panel, **Properties** sidebar) and switch to Edit Mode. Select all the faces (if they are not selected already) and extrude them, then press *Escape*, and then move the extrusion 2 cm along the Z axis (G key, Z key, then type 0.02).

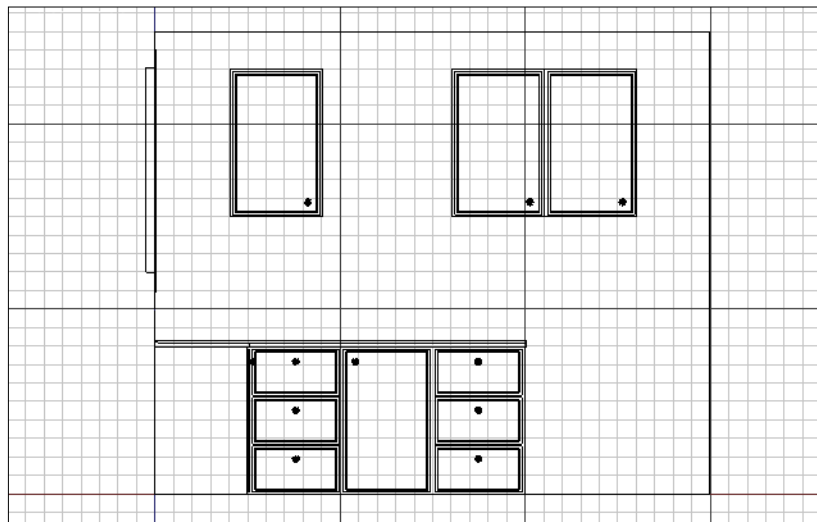
33. With the thickness for the cover already created, let's now work on giving it some extra tweaks. Switch to Top View, set the **Viewport Shading** to **Wireframe** (press the Z key, once or twice) and use the **Circle Select** tool (**Select** → **Circle Select**) to select the vertices that would be visible if we looked at the `cab-cover` from the front (having the **Viewport Shading** set to solid); let's also select the vertices in the inner corner of the "L". Press the *Escape* key to close the **Circle Select** tool and then move the selection -1 cm along the Y axis (G key, Y key, then type `-0.01`). Deselect everything (press the A key) and then select the vertices that would be visible if we looked at the `cab-cover` from the right-hand side (with **Viewport Shading** set to **solid**). Then let's move the selection 1 cm along the X axis (G key, X key, then type `0.01`).
34. To give the `cab-cover` a good shape in the border where it touches the wall, let's add two edge loops; start by adding an edge loop along the left arm of the "L" shape and move it in the negative direction of the X axis until the split edges are 2 cm and 49 cm long. Let's perform the same operation, adding a new edge loop (using the **Loop Cut and Slide** tool) along the right arm of the "L" shape of the `cab-cover`; then let's move it until the split edges are 49 cm and 2 cm long.

After adding these new edge loops, there must be a very thin set of faces on the border of the `cab-cover`, having an "L" shape; this new thin "L" shape must touch the wall.
35. Let's now select the outer vertices of this new, thin, "L" shape and move them 1 cm (0.01 units) along the Z axis (G key, Z key, then type `0.01`). A screenshot can help us make sure we get the right shape:



36. Let's now add the material to the `cab-cover` object; but this time we're just going to copy a pre-existing material (creating a separate copy, not reusing it). Switch to Object Mode, go to the **Material** tab in the **Properties Editor**, add a new material and change its name to `cab-cover`. Now select the `cab-drawer` object, go to the **Material** tab of the **Properties Editor**, select the `cabinetKnob` material from the list, click on the arrow pointing downwards (to the right-hand side of the **Materials** list), and select the **Copy Material** entry from the menu. Now let's select the `cab-cover` object again, go to the **Material** tab in the **Properties Editor**, click on the arrow pointing downwards to the right-hand side of the **Materials** list, and select the entry **Paste Material** from the menu. That way we copied the settings from the `cabinetKnob` material into the `cab-cover` material. This leaves us with two materials that have the same settings but are independent (thus not affecting each other when modifying the material settings). There's a catch, though; since the texture is shared between the two materials, any modification in the texture **will** affect both materials.

For the remaining cabinets, let's first take a look at a screenshot to guide us:



37. The steps to create these cabinets are quite straightforward. Starting with the existing ones, let's duplicate the last segment of the right arm of the `cab-floor` object (the one over which we modeled the first drawer) and separate it into a new object.
38. Name the new object as `cab-wallA`, move it up and to the left-hand side to position it near the window (but not too close). Let's also switch to Edit Mode for the `cab-wallA` object, fill any hole that the "box" may have (almost surely to the left-hand side) by selecting the vertices and pressing *F*, then let's move the front face of the box so that the thickness of the cabinet is just 40 cm.

39. To put the door in front of the `cab-wallA` object, let's just select one of the `cab-door` objects, duplicate it (*Shift + D*) and move it to get it correctly positioned. Let's also rotate it 180° (from Front View), so that the knob gets positioned below.
40. For the second and third cabinets that must go on the wall, it's just a matter of selecting both the box and the drawer of the first, duplicating them and moving each duplicate to the correct location. The previous screenshot is very helpful to know where to put the duplicates.

At this point we are done with the cabinets; let's now work on creating the sink and the faucet. Don't forget to save the file.

Objective Complete - Mini Debriefing

In this part we worked with fairly basic shapes (mostly square boxes) to create the cabinets for our scene. We started with a general ("L") shape for the cabinets on the floor, then created a drawer and a door, each with a knob. As a finishing touch we added a cover with a nice "beveled" shape on its border.

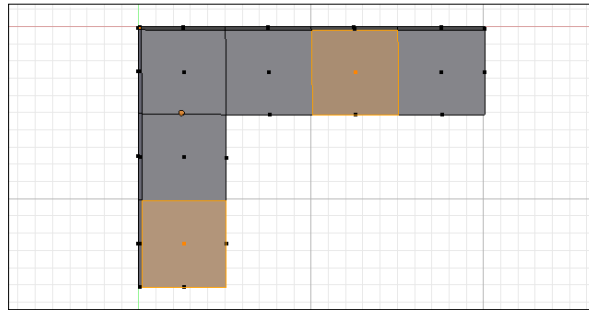
This time we used some small but useful tricks such as duplicating parts of an object to use as the starting point for another one, and creating slightly modified versions of the same basic shape (what we did with the drawers and doors).

Sink and Faucet

The sink is a key element in any kitchen scene. In this project we are going to create a basic sink and add a simple material to give it a simulated brushed-metal look.

Prepare for Lift Off

Both the sink and the stove (the next part of the project) require that we perform some small adjustments to the `cab-cover` and the `cab-floor` objects. What we need to do is to open the holes in those objects where the sink and the stove will be located. In the next screenshot we can see the highlighted faces of the `cab-cover` that must be selected and deleted (**Mesh → Delete → Faces**):



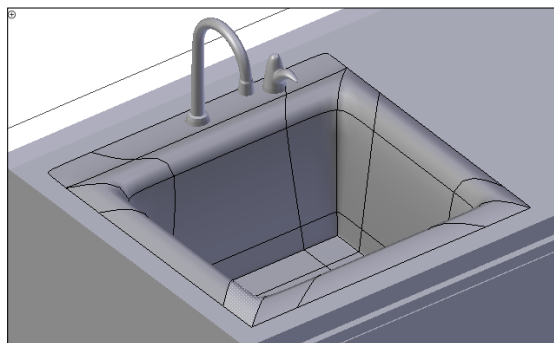
Remember that we must delete other faces just below the two shown in the screenshot (in the `cab-floor` object). Let's also keep in mind that the hole on the short arm of the "L" is the location for the sink, and the other one is the location for the stove.

Now let's select the border of the hole for the sink, extrude it, press *Escape*, and then scale it down by a factor of 0.87 (press the *S* key, then type `0.87`). Then let's scale only along the X axis until the labels showing the angles' values read 135° (or as close as possible). Right after that, let's switch to Edge Selection Mode, select the edge close to the border of the `cab-cover` (the border of the `cab-cover` is the raised part, touching the wall), and move it 5 cm along the X axis (press the *G* key, *X* key, then type `0.05`). Now we have the place for the sink ready.

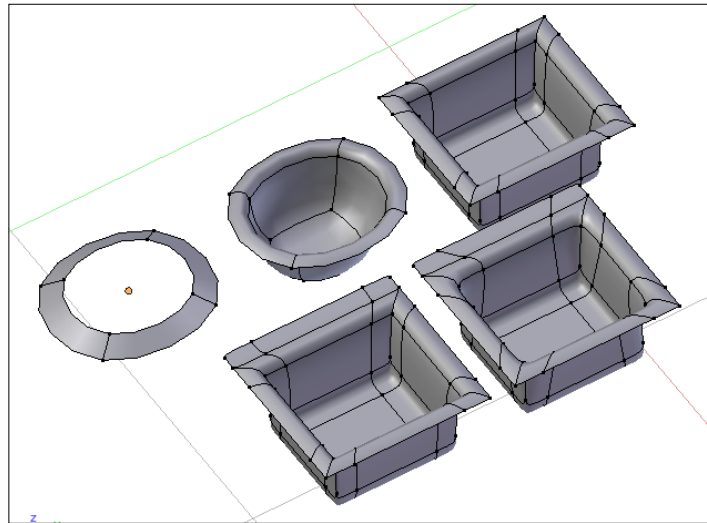
Engage Thrusters

1. Let's select the border of the hole for the sink, duplicate it (**Mesh → Add Duplicate**), press *Escape* and then separate the copy into a new object (**Mesh → Vertices → Separate → Selection**).
2. Now switch to Object Mode, select the new object, set its name to **sink** (from the **Item** panel, **Properties** sidebar), and enter Edit Mode.

Since explaining the process of modeling the sink and the faucet in words would be quite complex, let's use a couple of screenshots to guide our way. First, let's see the finished result:




In this screenshot we can see both the sink and the faucet. Take some time to look at the shape of the models closely, to get acquainted with what we are going to do. Now, let's use a screenshot showing the steps to model the sink:



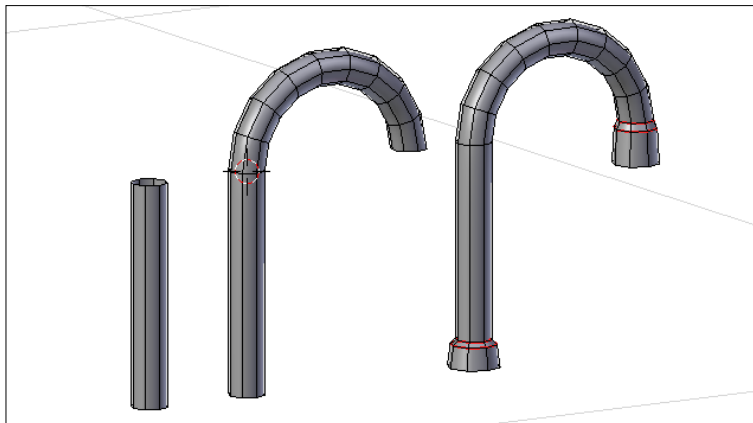
The first step is the one showing a simple ring, the next ones are alongside it and then below. The screenshot was taken from a non-standard view so that the shapes of the models can be seen more easily. Now we can follow the steps easily to create.

3. Let's start by going to the **Modifiers** tab in the **Properties Editor** and adding a **Subdivision Surfaces** modifier to the sink. Make sure to set the **View** parameter to 2 and enable **Apply modifier to editing cage during Editmode** (triangle icon, to the right-hand side of the name of the modifier).
4. Select the four vertices of our mesh, extrude them, then press *Escape*, and now scale the extrusion down by a factor of 0.75 (*S* key, then type 0.75). That will create a basic ring. Now let's move it 3 cm along the Z axis (press the *G* key, *Z* key, then type 0.03). At this point we should have the same mesh as shown in the first step of the screenshot.
5. After moving it up, let's extrude it, press *Escape*, and then move the extrusion -23 cm along the Z axis (press the *G* key, *Z* key, then type -0.23). To finish the initial shape let's go to **Mesh → Faces → Make Edge/Face**. That will leave us with the second step done.
6. For the third step, we only need to switch to Top View (**View → Top**) and add five edge loops (**Loop Cut and Slide** tool): two running horizontally, two running vertically, and one surrounding the face of the bottom. To get the correct shape, the edge loops must be put very close to the corners. This gives us the mesh shown as the third step in the screenshot.

7. The next thing to do is select the three edges of the sink that run parallel to the border of the `cab-cover` and are closer to it, then extrude them, press *Escape*, and finally move the extrusion -5 cm (0.05 units) along the X axis (*G* key, *X* key, then type `-0.05`). Since this "flat" protrusion will overlap with the `cab-cover`, let's move it 1 mm along the Z axis (*G* key, *Z* key, then type `0.001`). With these operations we get to step four, as seen in the previous screenshot.
8. For the final (fifth) step of the process, we just tweak some vertices in the corners of the sink to soften them. Look carefully at the image for the last step and compare it to the previous one to see the subtle difference. Finally, let's make sure to select the entire mesh and set the shading to **Smooth** (from the **Tool Shelf**).


 If the mesh starts to show weird black spots after setting the shading to smooth, we just need to select all the vertices and then go to **Mesh** → **Normals** → **Recalculate Outside**. To fine-check that the normals get oriented correctly, we just need to enable the **Face Normals** option in the **Mesh Display** panel of the **Properties** sidebar.

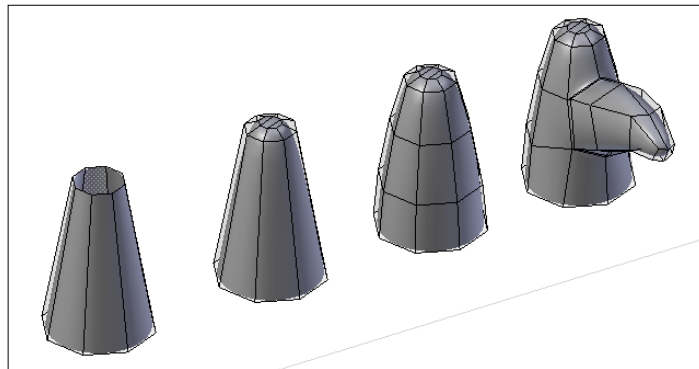
For the faucet, we're going to need more screenshots. Let's start with the first part:



9. Let's make sure we are in Edit Mode for the sink object, select the two corners of the last protrusion we created, and then go to **Mesh** → **Snap** → **Cursor to Selected**. Now let's switch to Object Mode and start working on the new object for the faucet.
10. Go to **Add** → **Mesh** → **Circle** to add a new object to the scene. Then let's set its parameters (**Tool Shelf**) to **8 vertices**, radius of 0.01, and disable **Fill**. For the name of the object, let's change it to `faucet` (**Item** panel, **Properties** sidebar). With the `faucet` object selected, let's switch to Edit Mode.

11. Start by switching to Front View (**View → Front**), select all the vertices (press the *A* key, once or twice), extrude, press *Escape*, and then move the extrusion 12 cm along the Z axis (press the *G* key, *Z* key, then type *0.12*).
12. With the extruded ring still selected, let's go to **Mesh → Snap → Cursor to Selected** to put the 3D Cursor at the center of the vertices forming the selection.
13. Now go to the Tool Shelf and click on the **Spin** button to run the Spin tool. It will create a small set of extrusions around the 3D Cursor. Now let's locate the parameters for the Spin tool (lower part of the **Tool Shelf**), set **Steps** to 9, **Degrees** to 180 and then **add** 5 cm (0.05 units) to the X value for the **Center**. That gives us a circular shape, as seen in the second step of the screenshot.
14. To complete this part of the mesh, we just need to add some detail to the tip of the circular mesh created by the Spin tool by extruding twice and tweaking by scaling the rings from the extrusions. Let's also add two new edge loops in the base of the mesh and tweak them (by scaling) until we get the shape shown in the third step of the screenshot.
15. To finish this part, we need to switch to Edge Select Mode, select the second and third rings from the base and the second and third from the tip (four in total), and then go to **Mesh → Edges → Mark Sharp**. Now go to the **Modifiers** tab, add an **Edge Split** modifier and disable the **Edge Angle** option (leave only the **Sharp Edges** option enabled). Right after that modifier, let's add a second one, this time a **Subdivision Surface** modifier and set the subdivisions level to 2 for **View**.

For the second part of the faucet, let's take a look at the screenshot showing us the process:



16. Start by switching to Top View (**View → Top**), then select the ring at the base of the first part of the mesh, duplicate it (**Mesh → Add Duplicate**), press *Escape*, and move it 12 cm along the Y axis (press the *G* key, *Y* key, then type *0.12*).

-
17. Now switch to Right View (**View → Right**) to start working on the model. With the duplicated ring selected, let's extrude it, press *Escape*, and move the extrusion up 5 cm (0.05 units). Then let's scale the top part by a factor of 0.3 (press the *S* key, then type *0.3*). This gives us the mesh shown as the first step in the previous screenshot.
 18. For the second step, we just need to perform one more extrusion, move it up slightly and scale it down by a factor of 0.5. Right after that, let's go to **Mesh → Faces → Fill** to automatically fill the ring with faces, then let's go to **Mesh → Faces → Tris to Quads** to do a basic cleanup of the automatically generated faces. This last step is needed to avoid having triangles, since they do not play very well with the **Subdivision Surface** modifier. At this point we have completed the second step from the screenshot.
 19. To improve the shape, let's add two edge loops running horizontally (using the **Loop Cut and Slide** tool) and then scale them up slightly. With this we get the shape shown as step three.
 20. The final operations are just a few extrusions and some careful hand-tweaking. Let's select two neighboring faces from in between the latest edge loops that we added, and perform three successive extrusions to form the protruding shape shown as step four in the screenshot. With the extrusions done, it's just a matter of playing around and tweaking carefully to get the final shape. The last touch to complete it is to add a new edge loop surrounding the very beginning of the base of the first extrusion; that way we give some sharpness to that part of the mesh.

At this point we just need to take a look at the first screenshot for this part of the project to make sure that we have both the sink and the faucet positioned as they should be. Now let's work on the material for these objects.
 21. Let's switch to Object Mode and select the `sink` object. Now go to the **Material** tab in the **Properties Editor**, add a new material, change its name to `brushedMetal`, and set it up as follows:

- ▶ Mirror panel: Enabled
 - Reflectivity: 0.6
 - Gloss Amount: 0.8

These basic settings will just give the material strong reflectivity and blur it quite a lot.

22. Now let's go to the **Texture** tab of the **Properties Editor**, add a new texture, change its name to `fake-refl`, its type to **Image or Movie**, and then set it up as follows:
 - ▶ Mapping panel:
 - Coordinates: Reflection
 - Projection: Sphere
 - Size: 0.1 X, 0.1 Y, 0.1 Z

- ▶ Image panel: Load the image `Shops0204_1_S.jpg`
- ▶ Influence panel:
 - Diffuse Color: Enabled, 1.0
 - Blend Type: Mix

This texture adds a bit of color variation to the blurry reflection of the basic material; that way we get a quite believable brushed metal look (when seen from a distance, as in this scene).

23. The only missing step to perform is to select the faucet object (in Object Mode), go to the **Material** tab of the **Properties Editor** and then select the `brushedMetal` material from the drop-down list of the available materials. Remember to save the file now.

Objective Complete - Mini Debriefing

In this part we concentrated on creating the sink and faucet for our kitchen. The modeling required applying some common techniques such as adding extra edge loops close to the corners to get them looking sharp and using the **Mark Sharp** option to apply the **Edge Split** modifier in a very controlled way.

The shading of the two objects was quite easy, requiring only that we set up a simple blurry reflection and add an image texture to give some richness to the colors on the surface.

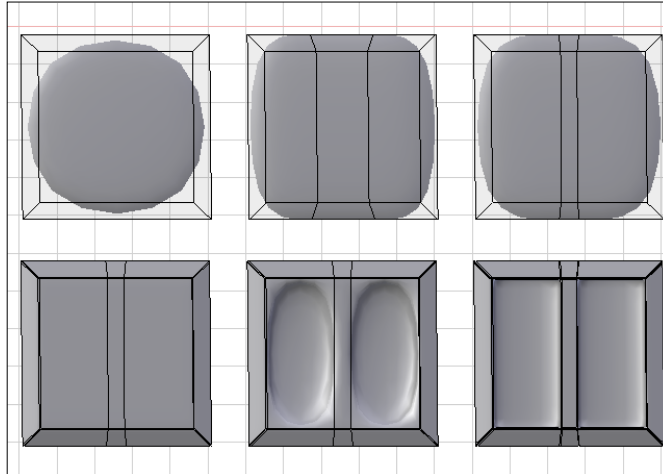
Stove and Hood

Now let's work on the final part that requires modeling, the stove and the hood. For the stove we are going to create a very nice shape, with a very basic set of grids to support the pots (not modeled in this project). The hood will be quite easy to model, and the `brushedMetal` material that we created previously will give it a very nice finish.

Engage Thrusters

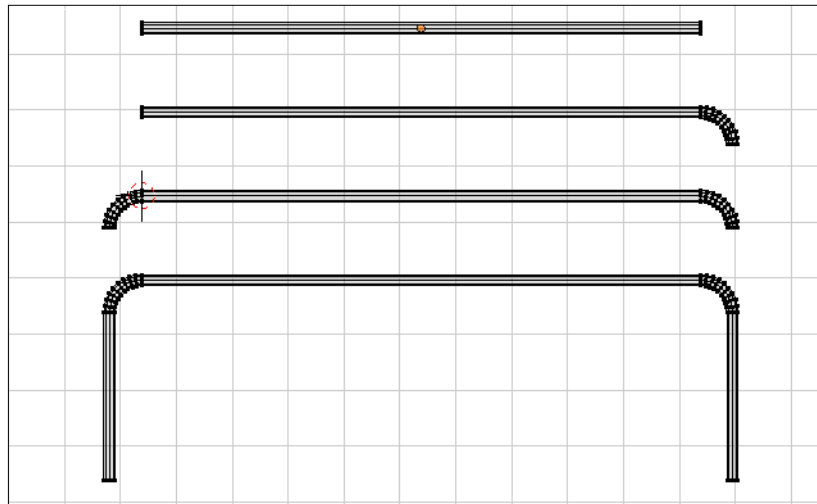
1. Let's select the `cab-cover` object (in Object Mode) and switch to Edit Mode. Then select the ring of faces that form the hole where the stove will be positioned, duplicate it (**Mesh → Add Duplicate**) and separate it into a new object (**Mesh → Vertices → Separate → Selection**).
2. Now switch back to Object Mode, select the new object, change its name to `stove` (**Item** panel, **Properties** sidebar) and switch to Edit Mode and Top View (**View → Top**), to start working on the actual model.

For this model, let's also use a screenshot showing the steps:



3. Make sure to have the four vertices selected, extrude them, press *Escape* and then scale the extrusion by a factor of 0.84. Then let's scale again, this time only along the X axis, to adjust the angles' values to 135°. Then let's move the selection 1 cm along the Z axis (press the *G* key, *Z* key, then type 0.01) and go to **Mesh** → **Faces** → **Make Edge/Face**. To get the mesh shown as in step one in the screenshot we just need to add a **Subdivision Surface** modifier. To do that, let's go to the **Modifiers** tab in the **Properties Editor**, add a **Subdivision Surface** modifier, and set the view subdivisions value to 2.
4. To add the two edge loops running vertically, let's use the **Loop Cut and Slide** tool and increase the number of cuts by scrolling the mouse wheel. Once the edge loops are added, we should have the shape shown in step two.
5. For the third step we only need to select the two edge loops that we added in step two, and scale them along the X axis by a factor of 0.25 (press the *S* key, *X* key, then type 0.25).
6. The next thing to do is add four edge loops (two horizontal, two vertical), one by one, and slide them to get the corners of the mesh very sharp. After doing this we should have the mesh shown in step four.
7. The two final steps are done by selecting the two biggest faces of the mesh, extruding them, pressing *Escape*, then moving them -3 cm along the Z axis (press the *G* key, *Z* key, then type -0.03). Now add two more edge loops running horizontally (across the sunken faces) to sharpen the corners. Another couple of edge loops must be added running vertically, but this time across the "bar" that separates the two sunken parts. With this we have the structure of the stove done, as shown in step six of the screenshot.

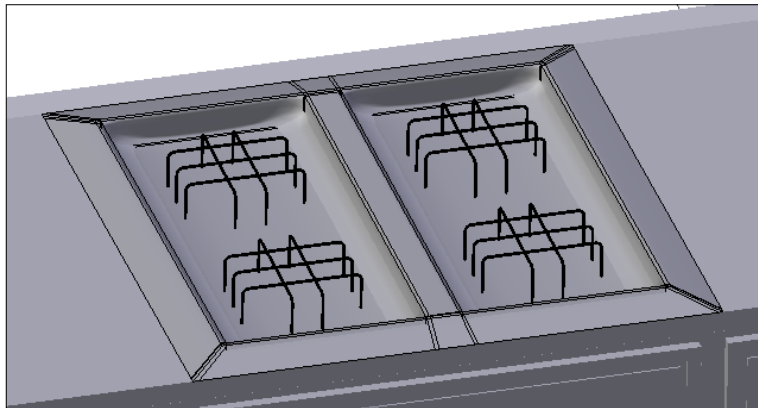
- To complete the stove we must create a set of grills that serve to hold the pots. Let's start by selecting one of the edges in the upper part of the stove and then go to **Mesh → Snap → Cursor to Selected**. Now that we have the 3D Cursor positioned properly, let's switch to Front View (**View → Front**), add a new cylinder, and set its parameters as follows: 8 vertices, 0.001 radius, 0.1 depth, cap ends disabled. Now rotate the cylinder 90 degrees (press the *R* key, then type 90) to get it oriented horizontally. To guide you through the process, take a look at the following screenshot:



In the screenshot we can see the simple cylinder at the top; then we add a circular segment to each side and then we add an extrusion down to give it some height. Let's see how to build it.

- Switch to wireframe mode for the Viewport Shading, select only the eight vertices on the right-hand side of the cylinder and go to **Mesh → Snap → Cursor to Selected**; this will position the 3D Cursor in the middle of the selected vertices.
- Now let's go to the Tool Shelf and click on the **Spin** button to use the **Spin** tool; to give the spin the right shape, let's locate the tool parameters in the Tool Shelf and subtract 5 mm (0.005 units) from the Z value of the **Center** parameter. That will move the circular extrusion downwards to form the right shape.
- Now go to the left-hand side of the cylinder, select only the 8 vertices there, then go to **Mesh → Snap → Cursor to Selected** and then invoke the **Spin** tool (**Spin** button in the Tool Shelf). This time we must subtract 5 mm (0.005 units) from the Z value of the **Center** parameter and invert the sign of the Y value of the **Axis** parameter.

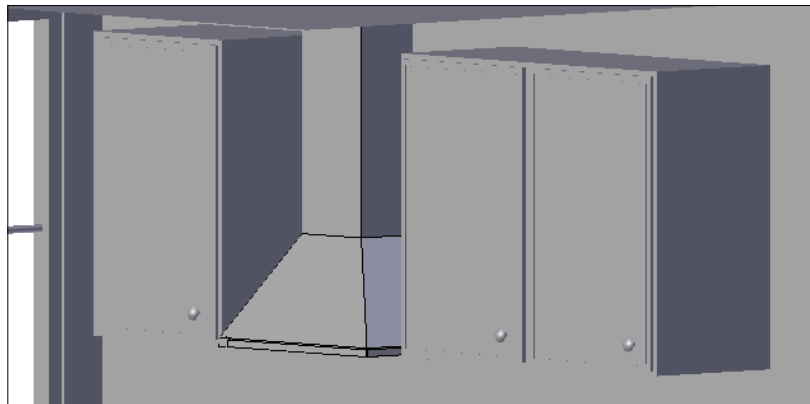
12. Right now we should have the shape shown in the third image of the screenshot. Then it's just a matter of selecting the two rings (16 vertices in total) at the tips of the spin extrusions, extruding them, pressing *Escape*, and moving the extrusions down by 3 cm (press the *G* key, *Z* key, then type -0.03). To finish the basic piece for the grill, let's just select all its vertices (put the mouse pointer over it and press the *L* key) and set its shading to smooth (**Smooth** button, in the Tool Shelf).
13. To replicate the basic piece and form a complete grid, let's switch to Top View (**View → Top**), select the entire piece, duplicate it (**Mesh → Add Duplicate**), press *Escape*, and then move it -3 cm along the Y axis (press the *G* key, *Y* key, then type -0.03). Repeat these steps to create a third piece; then select two entire pieces, duplicate them (**Mesh → Add Duplicate**), rotate them 90 degrees (press the *R* key, then type 90) and move them to the center of the initial three pieces. At this point we should have an entire grill done.
14. We only need to select all the pieces forming the grill, switch to Top View (**View → Top**), move it to the correct place inside the stove, then create three duplicates and move them to the other positions inside the stove (do it one by one). At the end we have a finished stove, as shown in the following screenshot:



15. Now let's add the material to the stove. Switch to Object Mode, go to the **Material** tab of the **Properties Editor**, add a new material (look for the **New** button, just below the empty materials list), change its name to `stove`, and set it as follows:
 - ▶ Diffuse Color: 0.0 Red, 0.006 Green, 0.004 Blue (Diffuse panel)
 - ▶ Mirror panel: Enabled
 - Reflectivity: 0.15
 - Fresnel: 5.0
 - Gloss Amount: 0.4

That's it; it will give us a fairly basic but nice material for the stove. Even though the material settings are very simple, the good thing is that using blurred reflections (gloss amount less than 1.0) gives very nice results without too much effort.

16. Now we must create the hood. Let's go into Edit Mode for the stove, select the entire mesh, and go to **Mesh → Snap → Cursor to Selected**; then switch back to Object Mode and go to Top View (**View → Top**). Now add a plane (**Add → Mesh → Plane**), set its name to `hood` (from **Item** panel, **Properties** sidebar), and switch to Edit Mode.
17. Start by selecting the entire plane and scaling it down by a factor of 0.29 (press the *S* key, then type `0.29`). Next, move the plane -3 cm along the Y axis (press the *G* key, *Y* key, then type `-0.03`). Then switch to Edge Select Mode, select only the lower edge that runs horizontally and move it 12 cm (0.12 units) along the Y axis (press the *G* key, *Y* key, then type `0.12`).
18. Now switch to Front View (**View → Front**), select the entire plane and move it 70 cm (0.7 units) along the Z axis (press the *G* key, *Z* key, then type `0.7`). Now switch to Face Select Mode, extrude the face, press *Escape*, and then move the extrusion 2.5 cm along the Z axis (press the *G* key, *Z* key, then type `0.025`). Then perform a second extrusion, press *Escape*, then move the extrusion 30 cm along the Z axis (press the *G* key, *Z* key, then type `0.3`). After moving the second extrusion, scale it down by a factor of 0.4 (press the *S* key, then type `0.4`). Finally, let's perform a third extrusion, press *Escape*, and then move it up 75 cm (press the *G* key, *Z* key, then type `0.75`).
19. Before assigning the material to the hood, let's select the entire mesh and go to **Mesh → Normals → Recalculate Outside** to make sure the normals are oriented correctly.
20. Then switch to Object Mode. Let's take a look at a screenshot showing the finished hood, between the cabinets on the wall:



21. Since we are going to use the same material for the hood and the sink, we just need to go to the **Material** tab of the **Properties Editor**, click on the button with the red sphere icon, and select the `brushedMetal` material from the list.

That's it, we are done with the modeling and shading of our scene. Let's save the file before continuing.

Objective Complete - Mini Debriefing

For this part we used almost the same methodology as for creating the sink; we started by duplicating a part of a pre-existing mesh, separating it into a new object. Most of the time we were just extruding, scaling, and tweaking around.

Two useful tips we used are adding extra edge loops (close to other ones) to sharpen the shape of the mesh and using the Spin tool to create circular-extruded corners.

Classified Intel

Don't forget that the **Spin** tool uses the location of the 3D Cursor as the initial value for the **Center** parameter; thus it's highly recommended to move the 3D Cursor into a good place before applying the tool, by using the **Cursor to Selected** snap command.

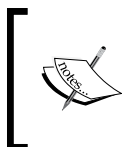
Lighting and Background

This task will be very short; we just need to add a very basic lighting setup consisting of two lights and Ambient Occlusion. Then we will add a simple background for the window of our kitchen.

Engage Thrusters

1. We will start by setting up the camera for the scene. Let's go to **Add → Camera**, then go to the **Object** tab of the **Properties** sidebar, locate the **Transform** panel, and set the parameters as follows:
 - ▶ Location: 3.55 X, -3.586 Y, 1.852 Z
 - ▶ Rotation: 84.54° X, 0° Y, 37.6° Z

That's it for the camera, very easy.



A good way to set the camera is by switching to Camera View (**View → Camera**) and using **Fly Navigation (View → Navigation → Fly Navigation)** to move it around the scene as needed. Remember also that in Camera View it's possible to select the camera and use the **Grab** tool (**G** key) to pan the view.

2. Next, let's add the first light of our lighting setup. Go to **Add → Lamp → Sun**, then go to the **Object** tab of the **Properties Editor**, locate the **Transform** panel, and set its parameters as follows:
 - ▶ Location: -2.12 X, -1.75 Y, 3.95 Z
 - ▶ Rotation: 45.92° X, -3.56° Y, -63.25° Z
3. Then let's go to the **Object Data** tab (sun icon) of the **Properties Editor** and set it as follows:
 - ▶ Lamp panel:
 - Color: 1.0 Red, 0.9 Green, 0.81 Blue
 - Energy: 1.0
 - ▶ Shadow panel:
 - Shadow Method: Ray Shadow
 - Samples: 8
 - Soft Size: 0.06
4. This light will provide a basic, uniform lighting entering through the window to our kitchen. This light will have a subtle yellow tint. Let's also set its name to `sun` (from the **Item** panel, **Properties** sidebar).
5. Now let's add a second light; go to **Add → Lamp → Area** and change its name to `window-sky` (from the **Item** panel, **Properties** sidebar). Then go to the **Object** tab of the **Properties Editor**, locate the **Transform** panel, and set its parameters as follows:
 - ▶ Location: -0.083 X, -0.85 Y, 1.75 Z
 - ▶ Rotation: 90° X, 0° Y, -90° Z
 - ▶ Scale: 1.0 X, 1.0 Y, 1.0 Z

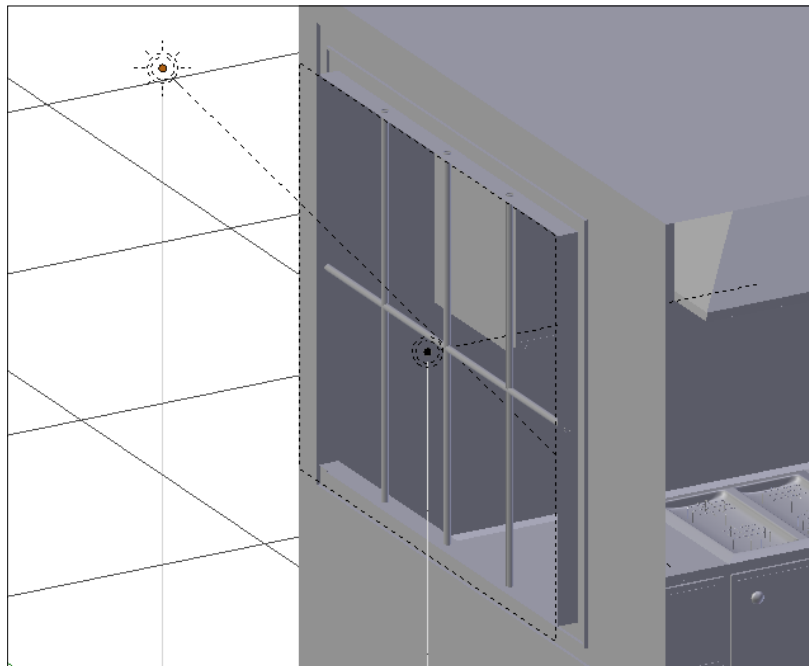
The scale option is indicated because it **must** be left untouched from the original value, to avoid messing up the lighting setup (area lamps are very sensitive and scaling them affects their lighting quite a lot).

6. For the actual lamp parameters, let's go to the **Object Data** tab of the **Properties Editor** and set it as follows:
 - ▶ Lamp panel:
 - Color: 0.64 Red, 0.82 Green, 1.0 Blue
 - Energy: 1.0
 - Distance: 1.0
 - Gamma: 1.0

- ▶ Area Shape panel:
 - Shape: Rectangle
 - Size X: 1.4
 - Size Y: 1.15
- ▶ Shadow panel:
 - Method: Ray Shadow
 - Samples X: 16
 - Samples Y: 16

This time we set a bluish light, using the Ray Shadow method to calculate shadows and with a high level of detail for them (16 for both X and Y). The rectangular shape is needed to accommodate the shape of the window properly.

Before setting the **Ambient Occlusion** parameters, let's take a look at a screenshot showing these two lamps in our scene:



7. The third component for our lighting setup is enabling **Ambient Occlusion**. Let's go to the **World** tab of the **Properties Editor** and set it as follows:

- ▶ Ambient Occlusion panel: Enabled
 - Factor: 0.3
 - Mode: Add
- ▶ Gather panel:
 - Method: Raytrace
 - Distance: 0.5
 - Sampling Method: Adaptive QMC
 - Samples: 16
 - Threshold: 0.001

The **Ambient Occlusion** will add some very nice, subtle, soft shadowing to the scene, dramatically increasing the quality of the rendered image. We used a value of 0.3 to have a subtle effect and raised the quality using the Raytrace method, along with high sampling values and very low threshold. The distance is set according to the scale of our scene, so that the "size" of the shadows plays nicely with the size of it.

At this point we could launch a render job and get a quite nice image; the only missing part is having a believable background in the window. Let's add it to finish the project.

8. Make sure that we are in Object Mode, then go to **Add → Mesh → Plane** and change the name of the new object to `bg-sky` (from the **Item** panel, **Properties** sidebar). Now let's go to the **Object** tab of the **Properties Editor**, locate the **Transform** panel, and set its parameters as follows:

- ▶ Location: -2.851 X, 1.001 Y, 1.743 Z
- ▶ Rotation: 90° X, 0° Y, -90° Z
- ▶ Scale: 2.242 X, 1.058 Y, 1.058 Z

These will leave the background plane placed correctly for our camera to see it, but also avoid casting any shadow from the lights onto other objects.

9. Now let's go to the **Material** tab of the **Properties Editor**, add a new material, change its name to `bg-sky`, and set it as follows:

- ▶ Diffuse Color: 0.0 Red, 0.0 Green, 0.0 Blue (Diffuse panel)
- ▶ Shadeless: Enabled (Shading panel)

These very simple settings are necessary to have an empty (black) color to start from (we will **add** the texture over it) and enable the **shadeless** option to ensure that the texture will be rendered with the original colors (without shading calculations).

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10. To add the actual background image, let's go to the **Texture** tab of the **Properties Editor**, add a new texture, change its name to `sky-pic`, its type to **Image or Movie**, and set it as follows:
 - ▶ Image panel: Load the image `Skies0239_L.jpg` from the `tex` folder.
 - ▶ Influence panel:
 - Diffuse Color: Enabled, 1.0
 - Blend: Add

With this texture we just add the background image to the empty (black) canvas that we set in the global material settings.

And that's it, our scene is ready to be rendered.

Objective Complete - Mini Debriefing

This final part was just about adding a simple lighting setup, using two lights and Ambient Occlusion. We also added a background image to give some depth to the rendered image.

The lighting setup required just two lights: a sun light to create the strong highlight coming from above and entering to our scene through the window, and an area lamp, used to simulate the blue light coming from the atmosphere and entering our scene, also, through the window (hence the location of the area lamp). These two lights alone could not handle the entire lighting of the scene, so we added an extra element to the lighting setup: a basic Ambient Occlusion, with high quality to get very soft shadows.

The background plane was very easy to create and its material was created using the standard method of starting from an empty (black) material and then adding the image to it. For this background we also used the shadeless option, to get it rendered exactly as the image is, with no shading calculations at all.

Mission Accomplished

And that's it, a quite simple scene with a very nice final render result. We worked from scratch to create a simple room, including a moderately detailed window. We also created some nice cabinets with a very good fine-wood finish (by virtue of the texture we used), a sink with a nice (fake) brushed metal material, and a modern looking stove with a beautiful dark material.

For the lighting we learned to create a very basic setup that gives us extremely nice results: using just two lights and adding some Ambient Occlusion goodness, we were able to apply a clean, clear, and beautiful lighting to the scene.

Let's take a look at the final result of all the hard work that we've done:



You Ready To Go Gung HO? A Hotshot Challenge

There are many ways to improve our kitchen; let's enumerate some of them:

- ▶ Blurring the image used in the background plane could help to reinforce the sense of depth.
- ▶ The perspective of the background image doesn't match the perspective of the scene very well. Searching for a background image with a different perspective would be helpful to solve that.
- ▶ Adding detail and a complex material to the wall would improve the final render a lot.
- ▶ Modeling more objects for the scene would be great; there are some obvious ones such as pots, plates, and so on.
- ▶ We didn't apply any post-processing to our scene, but working the finished render through the compositor would allow us to add some finesse to our image.
- ▶ Adding a fine bevel to the borders of the drawers, cab-cover, and cabinets would give a nice touch to the final image.
- ▶ An easy way to improve the scene would be by replacing the current knobs with more complex ones.
- ▶ Since the internal render engine could fall short in achieving the level of realism that we want, it would be great to work on exporting our scene to an external render engine and get our project to the next level. **Luxrender** and **Yafaray** are Open Source render engines, and there are commercial ones such as **VRay** and **Maxwell Render**.