3D Printing Project: Design and Print a Mars Colony with TinkerCAD

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CENTRE for INNOVATION and ENTREPRENEURSHIP

UnleashSpace

TinkerCAD

TinkerCAD is a browser based basic 3D modelling software. This tutorial will aim to give you a basic knowledge of 3D modelling through use of the TinkerCAD software. This tutorial also aims to show you how easily you can export your designs and print them using a 3D printer.

1.   Step One: TinkerCAD and Tutorials

Open up TinkerCAD in your browser of choice. And either log in or sign up to Autodesk. Once you are in the TinkerCAD window, run through the six basic tutorials in the Dashboard, under Lessons.
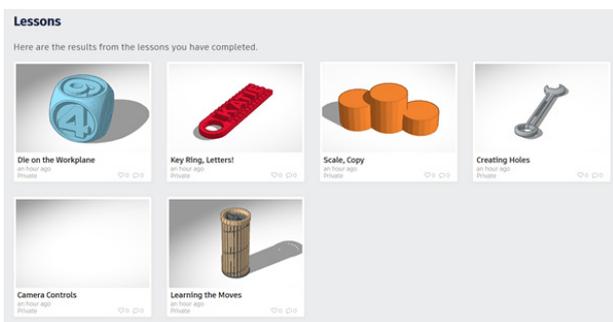
2.   Step Two: Mars Colony From Scratch.

This is an optional step if you want to play around with TinkerCAD and be more creative with this project. Basic conceptual Mars colonies are constructed of mainly domes (half spheres), hallways (half cylinders), doorways, and blocks. This step in the tutorial will run you through the basics of making and editing these shapes. This is by no means an exhaustive tutorial, and there are many more different shapes that can be utilised.
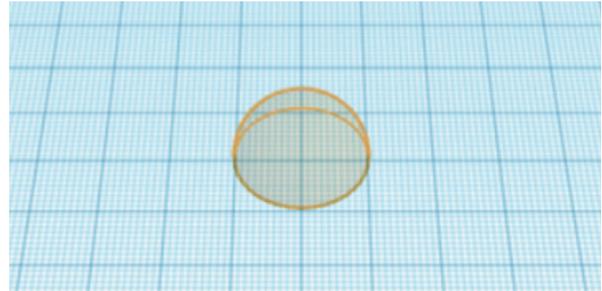
Once you are in the TinkerCAD dashboard, click on "Create new design"
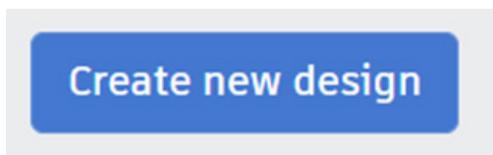

Domes

Select the Half Sphere tool from the design menu under "Basic Shapes".

Place it in the workspace.
The default size for our spheres and half spheres is 20 mm diameter.
Now we will make a doorway for our Dome.

Doorways

Doorways can either be half cylinders, or rectangles. For this example we will make a half cylinder doorway. Select the Round Roof tool from the design menu
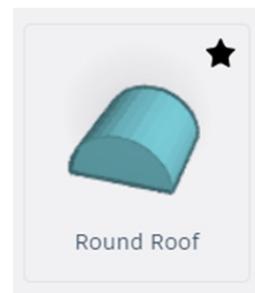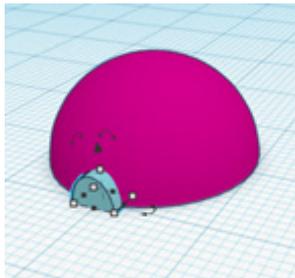

Place it in the workspace.
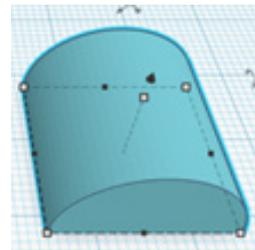
Now we are going to edit the size. Select the vertical sizing dialog box by clicking the upper limit check. Select a value for the height of the door. In this example, we have used a height of 3.
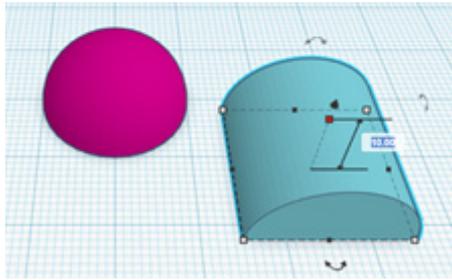
Enter the front and side dialog boxes in a similar fashion, and select values for these. In this example we have used values of 3 and 4 for the side and front respectively.

Arrange the now completed door onto the Dome as shown, then select both the Dome and the Doorway by either SHIFT + clicking each item individually, or by clicking and dragging around both items. Then group the items by selecting "Group" from the menu bar, or hitting CTRL + G on your keyboard. If you make a mistake, you can ungroup items by selecting your item, then selecting "Ungroup" from the menu bar, or by hitting CTRL + SHIFT + G on your keyboard.


Now we are going to make a domestic block, using the Box, Round Roof, and Workplane functions.

Select the Box function and place your box in the workspace. Then, identify an appropriate size for the box, and edit the box the same way as was done via the doorway example. This tutorial used the dimensions of 5 height, 10 width, and 10 depth for the box feature.
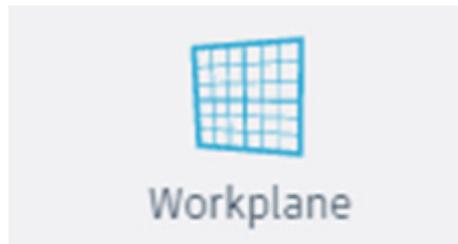

Next, select the Workplane function, and select the top of the box for your new workplane.
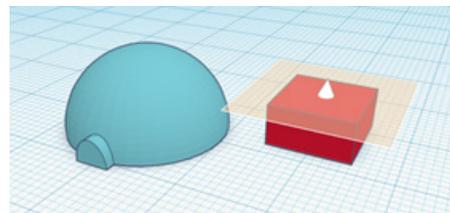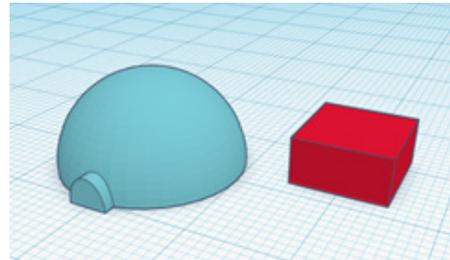
Next, select the Round Roof function, and place it in the new workspace. Adjust the shape to fit the box underneath. The dimensions used in this tutorial for this roof were 5 height, 10 width, and 10 length.

Exit the new workplane by selecting the workplane tool and then selecting any blank space in the new workplane.

Group the features together to make a domestic building block.
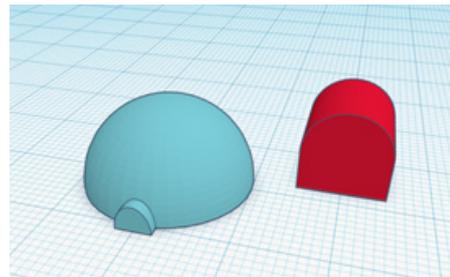
Next we will make a corridor to connect the two buildings together.

Corridor

Use the Round Roof function to make a long cylinder, much the same as the doorway. The sizes used this time were 6 width, 12 length, and 3 height. Arrange the three items together in your workspace, and group them together when satisfied. Shown is the final model from the tutorial.
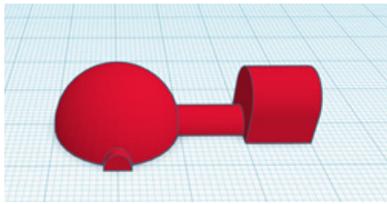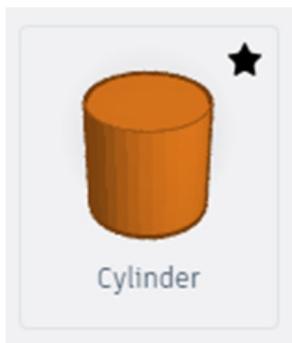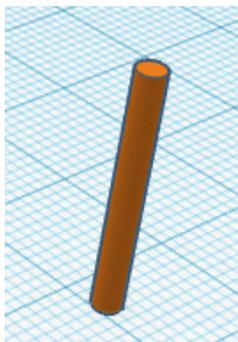
Satellite Dish

We will now be using the Dome, Cylinder, Cone, and Round Roof functions to make a simple satellite dish.
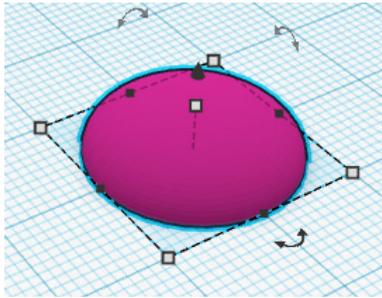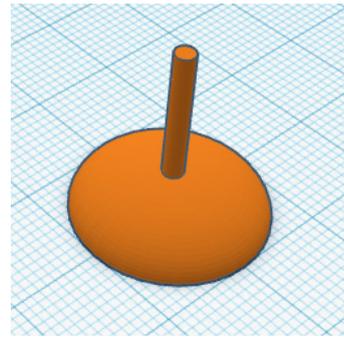

Use the Dome function as before to make a base. The dimensions used for this one were 5 height, and 20 diameter.
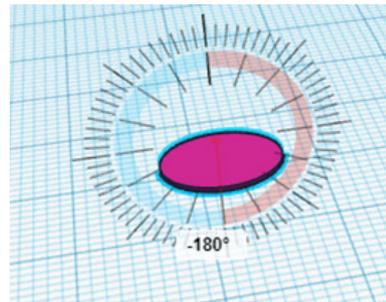

Use the Cylinder function to make the post. This feature had dimensions of 20 height, and 2 diameter.


Arrange the post to the base, and group them.

Now, use the Half Sphere function to make the satellite dish. The dimensions used here were 10 diameter, and 1 height. Rotate the dish around the X-axis to set the flat side facing up.


As before, we are going to use the Workplane function to create an object on top of another object. In this case, we are going to set the antenna onto the satellite dish. Select the Workplane function, then select the flat side of the satellite dish.
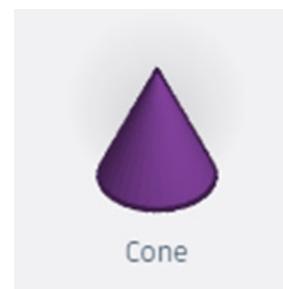

Then, select the Cone function.

Create a small cone, and arrange and group onto the half sphere. The dimensions of this cone were 1 diameter, and 3 height.
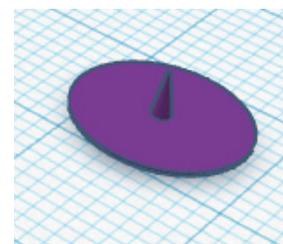

Exit the new workplane by selecting the workplane tool and then selecting any blank space in the new workplane.

Then, copy the dish assembly using CTRL+C. Select the Workplane function, and then select the top of the post.
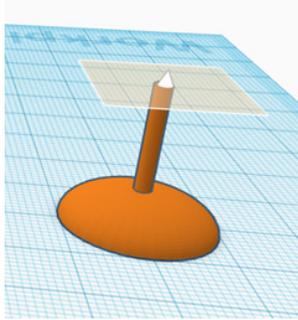
Paste the dish assembly onto the post, arrange, and group. Then, exit the new workplane by selecting the workplane tool and then selecting any blank space in the new workplane.
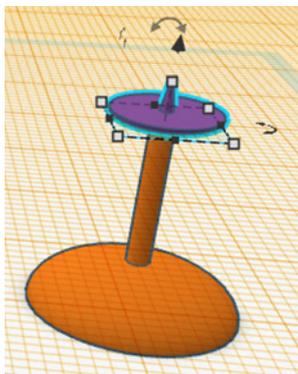

Lastly, connect the satellite dish to the previous colony assembly with a corridor as covered previously in this tutorial. You may need to make the corridor longer or shorter, depending on where you wish the satellite dish to be placed. Remember to group your design when you have finished arranging the components.
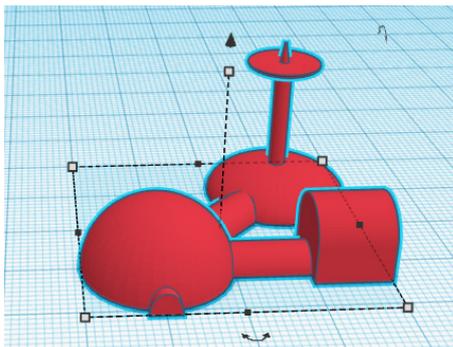
Feel free to either add more components, or to finish your design here!

3. Step Three: Examine other designs online

If you would prefer to borrow other, more complex designs and edit them, there are many designs available in the gallery.
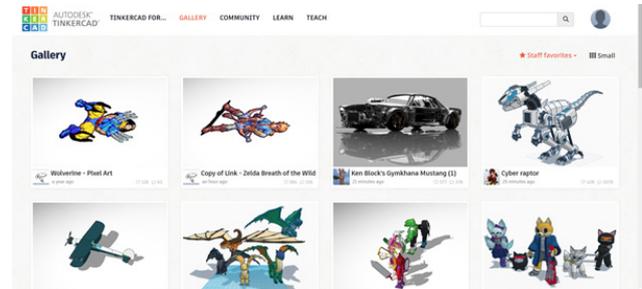
Open up the Gallery tab, and search for "Mars Colony" in the search bar, and you should see some interesting designs that other users have made available to the public. These can be copied, and you can open them up in your workspace and make changes to your own copy.

4. Step Four: Printing your final design

We are going to print out the tutorial design that we made in Step Two. Click on your design from the main menu, and select "Download for 3D Printing" from the options.

Select .STL from the download options, and your file should begin downloading.

Import your .stl file into the Makerbot Print software, and make any changes to scale or orientation that might be necessary.

Sign off with a Creative Technologist, and print!