

Introduction to Tinkercad

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Tinkercad is a free, easy-to-use, web-based Computer Aid Design (CAD) application designed to teach students the basics of CAD by creating simple projects that can be 3D printed, milled on CNC (Computer Numerical Control) routers, or cut with laser cutters.

To use the application, you must first create an account. Go to tinkercad.com and click the Sign-up button. *Create your own personal account.* You can create a new account with your email address or sign-in with a Google or Apple account. Creating an account allows you to save your work in their Cloud.

Click on the Tinker menu at the top of the screen, then “3D Design” to launch the CAD application. Then click “Start Tinkering”. Then “Create”, “3D Design”.

Exploring the Application

- Tinkercad automatically assigns a two-word name to your project displayed at the top left of the screen. *Click on it and change it to something meaningful.* Tinkercad automatically saves the design and you don’t want to be stuck with some ridiculous name.
- Mousing over an icon, reveals it’s name. Most are self-explanatory.
- Think of the Workplane as the base of the 3D printer or router. *However, you can place objects (shapes) below the surface of the Workplane!*
- **Right-click** and move the mouse to view the Workplane in 3D space. Notice how the cube on the left rotates as well.
- You can also **Left-click** on the cube to rotate as well. **Single-clicking** on the cube’s surface squares that surface to the screen. *This is very useful when aligning objects (shapes).*
- You can use the **mouse-wheel** to zoom in and out.
- The “Settings” button enables you to change the units and the dimensions of the Workplane to match those of the 3D printer, router, or cutter.
- The Snap Grid feature is very helpful, but you can disable or fine-tune if desired.
- On the right side of the screen are the basic shapes you will use to create your design on the Workplane. These basic shapes are common to most CAD programs. *There are also more complex shapes available to be explored later.*
- An object’s color can be changed by clicking on its Solid icon. But the color doesn’t matter to the 3D printer.
- The cross-hatched shapes represent negative space or “holes”. *But any shape can be selected as a solid or hole.*
- Left and Right arrow icons in tool bar are Undo and Redo.

Your First Design – a simple pencil tray or open box

1. Grab the red box and place it in the center of the Workspace.
2. You can set the dimensions by either using the sliders or grabbing and pulling the corresponding end points. *Set the width to 100mm.*
3. Use the **right-mouse-button** to rotate the box in 3D space.
4. Click “Front” on the Cube.
5. Grab the “hole” box and place inside the red box.
6. Set the width to 98, the length to 18, height to 30.
7. Select all objects. Click the “Align” button at the top right tool bar. Then click the “Center” circle to place the hole in the center of the red box.
8. Zoom in to see a box with 1mm sides, but a hole thru the entire box. *Note the hole extends through the top of the box. This makes the hole easier to work with.*
9. Click on “Left View”
10. Click on the hole to select. While holding the “CTRL” key on the keyboard, press the UP arrow key. This will move the hole 1mm off the bottom.
11. Select both objects.
12. Press the “Group” icon at the top of the screen. This “cuts” the hole into the rectangle.
13. Go to “Left” view, grab the top gray square and increase to 100mm. *Note how all dimensions change AND the wall thickness changes proportionally!*
14. Click the “Export” button to create and download the .STL file for your 3D printer.

Your Second Design – A Stem Vase

1. Create a NEW Design and rename.
2. Place a cylinder on the Workplane.
3. Set the “Sides” to 64 for maximum smoothness.
4. Go to “Front” view. Grab top and extend to 100mm.
5. Create a hole 110 mm high and center align and group. Note cylinder is floating above Workplane.
6. Drag cone onto Workplane. Increase base to 25mm x 25mm by clicking and extending outside black squares.
7. Select all and align both centers.
8. Increase size of base to 35mm x 35mm and align again.
9. Select all and Group
10. Click the “Export” button to create and download the .STL file for your 3D printer.

NOTE: The cone base is solid, which in this case may be desirable to add weight to the vase. If desired, one could use a “hole” cone to hollow out the base, or use a cylinder “hole” to poke through the base.

Your Third Design – A Modified Vase

1. Rename previous design.
2. Create a 25mm sphere and center.
3. Select all and group.
4. Poke an 18mm cylinder “hole” through the object. Use align function, raise hole upwards several mm and Group.
5. Export

Your Fourth Design – Create a Candle Holder with a Torus and Half Sphere.

1. Select and shape a Torus Shape to 20 x 20 x 20mm
2. Use CTRL-Up to raise Torus above Workspace
3. Select and shape a Half Sphere to 25 x 25mm
4. Select both and align.
5. Use CTRL-Down to lower Right into place.
6. Group and Export.

Your Fifth Design (Advanced) – Using an Adjustable Ring

1. Scroll to the end of Basic Shapes and select and placed a Ring on the Workspace
2. Note the grid pattern. Adjust the positions to modify the space.
3. Place resulting shape on a base to close the bottom hole.
4. Export and verify the result in Cura.

Things to consider:

- Tinkercad doesn't always save your design as expected. Best to exit and restart between major design changes,
- Object colors don't matter to the 3D printer, but they help keep objects separate in Tinkercad.
- Always check your final design in Print Preview.
 - Can the printer print a wall as thin as specified? If not, increase wall thickness
 - Will supports be needed? *Internal supports may not matter since they may not be visible. External supports affect surface smoothness.*
- Best to print at a smaller scale first to verify design.
- There are numerous Tinkercad tutorials on YouTube. Watch them and notice how quickly one can move through a design once you understand the basics.
- Explore the Shapes Library. There you will find Letters, Numbers, States & common objects that can save you many hours.
- Don't get discouraged!