TinkerCad: Welcome to the Wide, Wonderful World of 3D That You Can Do Yourself!

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TinkerCad is a free web-based CAD package from AutoDesk. It is a solid modeler, so you always have legal 3D objects suitable for 3D Printing. You get to it at:

http://www.tinkercad.com/

Start Here

1. Our notes are available through a browser:
   http://cs.oregonstate.edu/~mjb/tinkercad

2. The TinkerCad program is available through a browser too:
   http://www.tinkercad.com

3. You can create your own TinkerCad account. The advantage of this is that TinkerCad will keep your 3D creations in cloud storage so you can get at it later. If you are under 18 years old, get your parents’ permission and have them help you.

4. To use our account, use:
   User: mjb@engr.oregonstate.edu
   Password: corvallis72542

5. If you use our account, then we can get to your designs later.

Logging In

Start Tinkering

How will you use Tinkercad?

In school?

Educator: Start here

Student: Sign in with a Class

On your own?

Create a personal account

Already have an account?

Sign In

Don’t go here

Nope, don’t go here

No, not here either. Don’t ever create your own new account on anything without your parents’ help!

Yes, go here!
Welcome back
How do you use Tinkercad?
In school
- Educators
- Students with Class Code
- Student accounts
On your own
- Personal accounts
Don't have an account yet?
Join Tinkercad

Yes, go here!

Email or Username: mjb@engr.oregonstate.edu
Password: corvallis72542

Yes, go here!

Logging In

Personal Accounts
Sign In
- Email or Username
- Google
- Apple
- More sign options...
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Your Classes
- 3D Designs
- Circuits
- Codeblocks
- Lessons
Create new class
Share your feedback
The First Screen You See

Who you are

Designs this account has worked on before

Click here to start something new

Create new design

TinkerCad’s Build Screen

Your 3D scene

More things to build with

Standard 3D objects to build with

Moving the Scene around in 3D

If you have a mouse:
• Rotate – right mouse button
• Scale – scroll wheel
• Pan (translate) – middle mouse button

If you don’t have a mouse:
• Rotate – touch and move the blue plate, or touch and rotate this cube
• Scale – pinch on the plate, or touch the + and - buttons
• Pan (translate) – two-finger touch on the blue plate
Un-do is Your Best Friend Ever!

If you have a keyboard, Control-Z also works.

Start by Dragging an Object into the Scene

With your finger or the left-mouse button, drag a shape into the scene.

The Small Symbols Let You do Things to the Object

These curved arrows allow you to tip the object.

The solid black arrow allows you to lift the object up in the air.

Touch or left-click in the object to move it left-right and in-out.

All the white and black dots allow you to change the size of the object in one or more dimensions.

Scaled, Lifted, and Tipped

This curved arrow allows you to rotate the object in the horizontal plane.
**Changing the Color**

With the object selected, click here and select a new color.

**Combining Objects**

Take 2 objects and overlap them. They might look like they are one object together, but they aren’t. You can tell by the overlapping edge lines.

**Combining Objects**

Select both objects (touch both, or left-click on one and then shift-left-click on the other) … … and then click on Group.

**Sometimes it is Easiest to Select Multiple things by Just Dragging a Selection Box Around Them**

Click here
Then drag to here with your finger or the left mouse button.
Combining Objects

You can tell they are now one object because you see no overlapping edge lines here, and they are a single color.

If you don’t like the single color-ness, select the Multicolor color. Your objects are still combined.

An even cooler trick – while the objects are overlapped, but before they are grouped, click on just one of them and then click on Hole. This makes that object a “negative object” (I call it a “Ghost Object”).

Now select both objects again, then click on Group like you did before. This causes the Hole object to take a “3D Bite” out of the other object. You can use this to make new shapes or can even create holes through shapes.
Changing the Name of Your Design

When you start a new design, TinkerCad gives it a funny name. This is OK, but please give it a more descriptive name, by clicking on the funny name and type in a new one:

![Funny Name Example]

If you want your design 3D Printed, be sure to set the descriptive name to something to do with your real name so we can get the 3D Print to you.

Basic Geometric Shapes

These are the standard built-in objects that you can use

![Basic Shapes Example]

Not Sure Where to Start?
Try One of These

Something Different: Scribbling

With the left-mouse button down, drag the Scribble icon into the scene
Something Different : Scribbling

The screen changes to this:

Grab this icon and, well, scribble with it (duh)

From there on, it acts like any other 3D object

You can color it. You can Group it with other 3D objects.

Here someone is subtracting a cylinder from their 3D Scribble.

3D Text!

1. Select and drag Text
2. Type your text in here
Unbeveled vs. Beveled 3D Text

Unbeveled text

Beveled text

Grouping the Text with a Block to 3D Print a Desk Sign

Unbeveled text

Beveled text

Other Stuff

Click here to see the other things you can design with!

Try them!

Shape Generators

A Shape Generator is a way of making different versions of a shape by interacting with a dialog box

The Fidget Spinner is in here

States and countries are in here
The Voronoi Shape Generator is Pretty Fun Too

More Fascinating Features

- 3D models from the Oregon Museum of Science and Industry (OMSI)
- 3D models from the Smithsonian Institution collection
- Wooly mammoth
- Apollo command module: very detailed – takes a long time to load
- Triceratops skull.
3D Printing with TinkerCad

The Process

"3D Printing" is defined by some sort of "additive" process. The current frenzy in 3D Printing consists mostly of systems that deposit layers of molten plastic.

Writing Your Design out for a 3D Printer

Select the object and click on Export, which says that you are trying to give your object away.

Most 3D Printers want an STL file as input, so click here and tell TinkerCad where you want this file saved.

The 3D Printing Geometry File

3D Printers are fed a file called an "STL File", which lists all the triangles in the object. Blender (as well as all other modeling systems) can produce this type of file for you.

```
solid
facet normal 0.00 0.00 -1.00
outer loop
vertex -2.000000 -2.000000 0.250000
vertex -1.980000 -1.980000 0.250000
vertex -1.980000 -2.000000 0.250000
endloop
endfacet
facet normal 0.00 0.00 -1.00
outer loop
vertex -2.000000 -1.980000 0.250000
vertex -1.980000 -1.980000 0.250000
vertex -1.980000 -2.000000 0.250000
endloop
endfacet
... 
endsolid
```
Object Rules for 3D Printing

1. The object must be a mesh and **consist only of triangles**.

   ![Object Rules for 3D Printing](image1)

   Fortunately, TinkerCad does this for you.

Object Rules for 3D Printing

2. The object must be a legal solid. It must have a definite inside and a definite outside. It can't have any missing face pieces.

   ![Object Rules for 3D Printing](image2)

   Fortunately, TinkerCad does this for you too.

Watch Out for Overhangs!

This layer will fall to the plate.

These layers will build fine.

Note that if you build it upside-down, it will probably work fine.

Watch Out for Overhangs!

Some 3D printers handle this by leaving unused material in place to support the overhangs.

Some 3D printers handle this by using software to add “support structures” to the overhangs.

http://twistedfilar.com/2013/08/when-3d-printing-goes-wrong/

Some 3D printers handle this better than others... 😊
Object Rules for 3D Printing

3. You can't make an object by simply overlapping two objects in 3D. If you want both shapes together, do a TinkerCad “Group” on them so that they become one complete object.

What Happens if You Do Overlap Objects?

Here’s what one of the 3D Printers in the OSU Library did:

Overlapped in 3D

TinkerCad Grouped

Not bad — it’s wrong, but it could have been lots worse …

Want to see 3D Printing in Action?

Oregon State University’s library has 3D Printers for use by OSU students. To see them via webcam, go to: http://webcam.oregonstate.edu/3dprinter

Click here to see the live, streaming view.

Writing Your Design out for another 3D Modeling Program

Select the object and click on Export, which says that you are trying to give your object away.

Most 3D Modeling programs will accept an OBJ file as input, so click here and tell TinkerCad where you want this file saved.
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