

CougarTech Team 2228		
TinkerCAD Training		
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TinkerCAD Training



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REVISION HISTORY

DATE	DESCRIPTION OF CHANGE
V171205	RJV: added short cut keys
V171122	Original

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1 INTRODUCTION

1.1 Purpose

The purpose of this document is to provide best practices and links to training videos for TinkerCAD

1.2 Scope

The scope of this training guide is to provide training to a simple 3D CAD for 3D printing objects need by the team.

1.3 Audience

The audience for this document is for the Team 2228 technical team.

1.4 References

1.5 Definitions

2 OVERVIEW

2.1 Description

TinkerCAD is a web based program using chrome browser as its desktop. The TinkerCAD 3D CAD program is an object based CAD program. 3D objects are created by adding and subtracting space with pre-defined objects.

TinkerCAD has the ability to generate “stl” files that are used by a 3D printer slicing program to generate G-Code to run the 3D printer.

2.2 3D Printing Process Steps

To print a 3D object the following steps are taken:

1. Make a 3D model and save the the model in a “objectName.stl” file
2. Load the “objectName.stl” file into a slicing program that sets up printer parameters and slices the 3D object for the printer to print the layer slices. The Slicer program generates G-Codes to do this.
3. The G-Code file is saved on a memory stick and is placed in the 3D printer to print the 3D object from the G-Code instructions.

3 FUNCTIONAL DESCRIPTION

3.1 Getting Started

1. Start Chrome Browser on your computer
 2. Go to the URL *tinkercad.com* on your internet browser
 3. If you don't have a TinkerCAD user account, Sign-up for one for free using the sign up
 4. If you have a TinkerCAD user account click on the Sign-in button at the top right corner of the web page
-

3.2 *Mouse Usage*

Left Button: Used to select

Left Button + Alt and drag: duplicates object and moves it

Right Button: Used to turn model

Right Button + shift: move in a straight line

Scroll: Used to zoom

Scroll Button: Pans the work area

3.3 *Some TinkerCAD Process Steps*

1. To add shapes, letters and numbers drag your desired selection from the palette to the right to the workplane.
2. You can raise the height of your form by dragging the Node (white square on top), which is right below the up arrow (black cone)
3. Dragging the corner point while holding shift will increase the X, Y and Z axis equally
4. To build on the side of an object, drag the workplane to that side
5. You can rotate how objects sit on the plane to give them new angles. This is done with the curved arrow
6. You can copy and paste your forms using the standard keyboard commands (Ctrl + C & Ctrl + V) When you paste, TinkerCAD will move your new form to the right:
7. When you want to remove the hole shape, drag your cursor over both objects to select them (or Shift + Left Click)

3.4 *Keyboard Shortcuts*

3.4.1 *Control Key Plus*

1. Cntrl - c: copy
2. Cntrl - v: paste
3. Cntrl - z: undo
4. Cntrl - Shift - z: redo
5. Cntrl - g: group
6. Cntrl - Shift - g: ungroup
7. Cntrl - d: duplicate inplace
8. Cntrl - L lock
9. Cntrl - a: select all

3.4.2 *Alt Key Plus*

1. Alt - move: hold alt key while starting to move will duplicate object

3.4.3 *Shift Key Plus*

1. Shift - Right mouse button: hold shift to pan view
 2. Shift - while moving: hold shift key while moving object to move in a straight line
 3. Shift - Control - Left mouse button: hold shift-control to pan
 4. Shift - Alt - left mouse button on a corner white dot: hold shift, alt while selecting a corner and move. This scales the object the same amount in all directions
 5. Shift - while rotating: select object rotate symbol: will rotate object in 45 deg increments
-

3.4.4 Letter Keys

F – Fit object to view
R – Ruler
W – Work plane

3.4.5 Other Keys

1. Arrow keys: nudge object one grid mark
2. Shift – arrow keys: move faster
3. Scroll – zoom in/out

3.5 Training Videos - new TinkerCAD

New TinkerCAD

https://www.youtube.com/watch?v=iyMUhf-Drko&list=PLvj8iYZWPooP3Qor_8z1UypPr7wSnujeo

Basic Navigation

https://www.youtube.com/watch?v=TvfTd-K7xjM&list=PLvj8iYZWPooP3Qor_8z1UypPr7wSnujeo&index=2

Edit, Rotate, Scale

https://www.youtube.com/watch?v=GmtCqTzdxB4&list=PLvj8iYZWPooP3Qor_8z1UypPr7wSnujeo&index=3

Edit Grid, Snap to Grid

https://www.youtube.com/watch?v=3VnYPsbSmeA&index=4&list=PLvj8iYZWPooP3Qor_8z1UypPr7wSnujeo

https://www.youtube.com/watch?v=jw1AXPZAHnA&index=5&list=PLvj8iYZWPooP3Qor_8z1UypPr7wSnujeo

Shape Details

https://www.youtube.com/watch?v=jw1AXPZAHnA&index=5&list=PLvj8iYZWPooP3Qor_8z1UypPr7wSnujeo

Alignment

https://www.youtube.com/watch?v=3Mik0SIL5FA&index=6&list=PLvj8iYZWPooP3Qor_8z1UypPr7wSnujeo

Create Holes

https://www.youtube.com/watch?v=OGUMB0PNAwE&index=7&list=PLvj8iYZWPooP3Qor_8z1UypPr7wSnujeo

Complex Shapes

https://www.youtube.com/watch?v=swWZp_4y_Q8&list=PLvj8iYZWPooP3Qor_8z1UypPr7wSnujeo&index=8

Grouping and Mirroring

https://www.youtube.com/watch?v=07M8zoHMqgl&list=PLvj8iYZWPooP3Qor_8z1UypPr7wSnujeo&index=9

Changing Work Plane

https://www.youtube.com/watch?v=kqbABzi3Ddc&index=10&list=PLvj8iYZWPooP3Qor_8z1UypPr7wSnujeo

Transparency

https://www.youtube.com/watch?v=EEgoliH1AOg&index=11&list=PLvj8iYZWPooP3Qor_8z1UypPr7wSnujeo

Renaming File, Exporting, an Importing

https://www.youtube.com/watch?v=lhZVaynHBVU&list=PLvj8iYZWPooP3Qor_8z1UypPr7wSnujeo&index=12

Hiding and Locking

https://www.youtube.com/watch?v=K5GGK7LTZXQ&index=13&list=PLvj8iYZWPooP3Qor_8z1UypPr7wSnujeo

Shape Generators

https://www.youtube.com/watch?v=NxMZZE9xCOY&index=14&list=PLvj8iYZWPooP3Qor_8z1UypPr7wSnujeo

3.6 **TinkerCAD Video Tutorials - No Talking**

0-Tinkercad basic tutorial - Start & Sing up

https://www.youtube.com/watch?v=xbd_R9aPc-w&index=1&list=PLtmhShv-MyLCDAq07X_qrm1TRnBCZ8nx

1-Tinkercad basic tutorial - Control 3D view

https://www.youtube.com/watch?v=wa37nrj0pH0&index=2&list=PLtmhShv-MyLCDAq07X_qrm1TRnBCZ8nx

2-Tinkercad basic tutorial - Resize to dimension & Rotate object

https://www.youtube.com/watch?v=o-bGROLcrMq&index=4&list=PLtmhShv-MyLCDAq07X_qrm1TRnBCZ8nx

3-Tinkercad basic tutorial - Resize to dimension & Rotate object

https://www.youtube.com/watch?v=o-bGROLcrMq&index=4&list=PLtmhShv-MyLCDAq07X_qrm1TRnBCZ8nx

4-Tinkercad basic tutorial - Copy and paste & Group

https://www.youtube.com/watch?v=rSjP0c7rLSU&index=5&list=PLtmhShv-MyLCDAq07X_qrm1TRnBCZ8nx

5-Tinkercad basic tutorial - Hole & Subtraction (Group)

https://www.youtube.com/watch?v=ZPSmvYUvob0&list=PLtmhShv-MyLCDAq07X_qrm1TRnBCZ8nx&index=6

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6-Tinkercad basic tutorial - Align & Flip (Mirror)

https://www.youtube.com/watch?v=rqnvNXCh-mw&index=7&list=PLtmhShv-MyLCDAq07X_qrm1TRnBCZ8nx

7-Tinkercad basic tutorial - Export (download for 3D printing)

https://www.youtube.com/watch?v=qhrNESMDxSU&index=8&list=PLtmhShv-MyLCDAq07X_qrm1TRnBCZ8nx

8-Tinkercad basic tutorial - Transparent object

https://www.youtube.com/watch?v=e7UTfr1572Q&index=9&list=PLtmhShv-MyLCDAq07X_qrm1TRnBCZ8nx

9-Tinkercad basic tutorial - Workplane & Ruler

https://www.youtube.com/watch?v=uGsW2ylcl8A&index=10&list=PLtmhShv-MyLCDAq07X_qrm1TRnBCZ8nx

10-Tinkercad basic tutorial - Ctrl + D (Pattern)

https://www.youtube.com/watch?v=2GYiMMxOt3A&index=11&list=PLtmhShv-MyLCDAq07X_qrm1TRnBCZ8nx

11-Tinkercad basic tutorial - Radius & Fillet

https://www.youtube.com/watch?v=iw7Lgttc-iE&index=12&list=PLtmhShv-MyLCDAq07X_qrm1TRnBCZ8nx

12-Tinkercad basic tutorial - Like a Shell

https://www.youtube.com/watch?v=0PpOk9tV7Yg&list=PLtmhShv-MyLCDAq07X_qrm1TRnBCZ8nx&index=13

13-Tinkercad basic tutorial - Import STL file

https://www.youtube.com/watch?v=4efE0WL-8Ns&list=PLtmhShv-MyLCDAq07X_qrm1TRnBCZ8nx&index=14

14-Tinkercad basic tutorial - Image file - 3D Modeling

https://www.youtube.com/watch?v=4sVSF20Qylw&list=PLtmhShv-MyLCDAq07X_qrm1TRnBCZ8nx&index=15

3.7 Other TinkerCAD Beginner Videos

How to use Tinkercad

<https://www.youtube.com/watch?v=KawWyBOqxvk>

3D Modeling For Beginners w/ TinkerCAD

https://www.youtube.com/watch?v=4Hw5Qs_OnBI

Getting Started in Tinkercad: A Tutorial for Complete Beginners

<https://www.youtube.com/watch?v=60xflu-lqAs>

How to Make Models for 3D Printing - Tinkercad Beginner's Tutorial

<https://www.youtube.com/watch?v=gsz2PNcAcPA>

3.8 *TinkerCAD Ruler Videos*

Tinkercad Tutorial Ruler and Dimensions

https://www.youtube.com/watch?v=Ydh6_kgg0lg

Dismiss Ruler in TinkerCAD

<https://www.youtube.com/watch?v=qUA9VSdG5Oc>

TinkerCAD Measurement

<https://www.youtube.com/watch?v=lpce4zO0fh8>

TinkerCAD 5 Using the ruler and dimensions

<https://www.youtube.com/watch?v=aQ9aRFZK8ol>

3.9 *Objects Size-Group-Mirror-Scale Videos*

Changing the size of an object

<https://www.youtube.com/watch?v=QhYK1sCMqVg>

Grouping and Mirroring

<https://www.youtube.com/watch?v=jCdhJb0vFbo>

10. Tinkercad basic tutorial - Ctrl + D (Pattern)

<https://www.youtube.com/watch?v=2GYiMMxOt3A>

3. Tinkercad basic tutorial - Resize to dimension & Rotate object

<https://www.youtube.com/watch?v=o-bGROlcrMg>

Tips & Tricks: Resizing Shapes in Tinkercad

<https://www.youtube.com/watch?v=NhJf2dXFgDA>

How to scale copy and paste in tinkercad

<https://www.youtube.com/watch?v=h5x41QgjIZQ>

TinkerCAD - Tips using Shift and Option

<https://www.youtube.com/watch?v=zkScHitySv4>

Most powerful tool in TinkerCAD? Duplicate!

<https://www.youtube.com/watch?v=UOnFWYUBChE>

The Align & Smart Duplicate Tools-no sound

<https://www.youtube.com/watch?v=eCGDScrjWto>

Duplicate objects and movement patterns in Tinkercad

<https://www.youtube.com/watch?v=2MJwH-qpwa8>

How to scale copy and paste in tinkercad

<https://www.youtube.com/watch?v=h5x41QgjZQ>

Beveled Edges in TinkerCAD

<https://www.youtube.com/watch?v=f1zLim1YMNM>

How to Bevel and Round Edges in Tinkercad

<https://www.youtube.com/watch?v=J-6X6in6Las>

11. Tinkercad basic tutorial - Radius & Fillet

<https://www.youtube.com/watch?v=iw7Lqtcc-iE>

TinkerCAD Chamfer and Fillet Corners

<https://www.youtube.com/watch?v=zv5GVVxx4QU>

3.10 *TinkerCAD Holes Videos*

Create holes

<https://www.youtube.com/watch?v=lxrsHSELHsw>

Tinkercad Lesson 2 Creating holes

<https://www.youtube.com/watch?v=PCZgaYVO1BA>

Use Holes to Reshape Objects

<https://www.youtube.com/watch?v=n85GD928tg4>

Tutorial How to Add and Remove Holes in Tinkercad

<https://www.youtube.com/watch?v=mXe2r5THrs0>

3.11 *Adjustment and Alignment Videos*

Aligning Objects & Precision Adjustment in Tinkercad

<https://www.youtube.com/watch?v=GGW3sUnb3Xk>

TinkerCAD - Aligning Objects

https://www.youtube.com/watch?v=Ru742pUG_Bc

Tinkercad 2 - Move, Rotate and Align

<https://www.youtube.com/watch?v=Aa7DdBdhHTw>

6. Tinkercad basic tutorial - Align & Flip (Mirror)

<https://www.youtube.com/watch?v=rqnvNXCh-mw>

Tinkercad Example 1: Aligning 2 Cylinders In A T Position

<https://www.youtube.com/watch?v=UIkcnjvNME>

TinkerCAD - Printing Problems, Alignment

<https://www.youtube.com/watch?v=Q1Bj9Yfv3gE>

4 Other TinkerCAD Topics

4.1 Images, SVG, TinkerCAD Videos

Png to SVG to TinkerCAD

<https://www.youtube.com/watch?v= KmS3pmM6aU>

Jpeg to SVG to TinkerCAD

<https://www.youtube.com/watch?v=BOSb03CFclc>

<https://www.youtube.com/watch?v=FkBjRDVeI5E>

SVG files

https://www.youtube.com/watch?v=-s66QiM0SCo&index=15&list=PLvj8iYZWPooP3Qor_8z1UypPr7wSnujeo

SVG file uploaded to KinkerCAD

<https://www.youtube.com/watch?v=1fl9g2Hh8tg>

Tinkercad Tips and Tricks #6 - Importing SVG and STL files

<https://www.youtube.com/watch?v=y4HHSCzmglo>

4.2 Support material for 3D printing Videos

TinkerCAD- Adding support

<https://www.youtube.com/watch?v=dbnYjpmVdmM>

TinkerCad Workflows - Rapid Design Tricks & Supports

<https://www.youtube.com/watch?v=-kDZadfsli8>

4.3 stl File Topics Videos

Downloading an STL file from Tinkercad

<https://www.youtube.com/watch?v=U7ihYeD3Mug>

Editing STL files THE EASY WAY

<https://www.youtube.com/watch?v=2Pm8PiRhGvQ>

Cut up a STL file in TinkerCAD

<https://www.youtube.com/watch?v=DnqD3gHJJ-s>

Import And Edit An STL File

<https://www.youtube.com/watch?v=QAH79kmp-J0>

13. Tinkercad basic tutorial - Import STL file

<https://www.youtube.com/watch?v=4efE0WL-8Ns>

4.4 Shape Generator Videos

TinkerCAD - Shape Generator #3

<https://www.youtube.com/watch?v=cuh6EUI-yt4>

Autodesk Tinkercad - Creating a Shape Generator

<https://www.youtube.com/watch?v=7ur9KFiiwZw>

Autodesk Tinkercad: Generating 3D Geometry with JavaScript

<https://www.youtube.com/watch?v=ibMF8GbFCcw>

Autodesk Tinkercad - Setting up parameters in a Shape Generator

<https://www.youtube.com/watch?v=9E7NjYvQ1Jw>

TinkerCAD Beta more shapes easier text. Also Gears and threads

<https://www.youtube.com/watch?v=qXAIPTUWsE>

Tinkercad Beta - New Features: Shape Controls

<https://www.youtube.com/watch?v=hGUvrDXpSrM>

4.5 TinkerCAD Topics Videos

Rounded box

<https://www.youtube.com/watch?v=k6nQpXWc6Co>

How to make gears

<https://www.youtube.com/watch?v=HulqoVPCRZE>

How to Split Objects

<https://www.youtube.com/watch?v=1SwSqROqLpY>

Making Curves in Tinkercad

<https://www.youtube.com/watch?v=iZlqRpFhRTY>

How To Create Curves In Tinkercad

<https://www.youtube.com/watch?v=2MPkXV6OVUA>

Using Connectors in Tinkercad

https://www.youtube.com/watch?v=IBEZ_alo6QA

How to Hollow Out Objects in Tinkercad - Shelling Tutorial

<https://www.youtube.com/watch?v=xxtONgRdxDY>

Tinkercad Slicing - Better than Sliced bread

<https://www.youtube.com/watch?v=Y4K-WMYT5es>

Tinkercad: Threaded Screw

<https://www.youtube.com/watch?v=E0obYR8Tv7w>

How to make a nut & bolt in Tinkercad

<https://www.youtube.com/watch?v=xG8iCu2IVc0>

Tinkercad - A part in a part

<https://www.youtube.com/watch?v=Zhd9JC6J0Uk>

Tinkercad: Threaded Hex Nut

<https://www.youtube.com/watch?v=JVXVPgAiz7o>

How to Hollow Out Objects in Tinkercad - Shelling Tutorial

<https://www.youtube.com/watch?v=txtONgRdxDY&t=48s>

Tinkercad Cutting Objects

<https://www.youtube.com/watch?v=3Zwtr115qHU>

Tinkercad Workflows - Rapid Design Tricks & Supports(part structure)

<https://www.youtube.com/watch?v=-kDZadfsli8>

4.6 Tips and Tricks

Tinkercad Tips & Tricks - Ruler Midpoint on High Five Fidget Spinner

<https://www.youtube.com/watch?v=ClvMuKz9vBs>

Tinkercad Tips and Tricks #6 - Importing SVG and STL files

<https://www.youtube.com/watch?v=y4HHSCzmglo>

Tinkercad Tips & Tricks - Teach Yourself Tinkercad Tutorials

<https://www.youtube.com/watch?v=-zxWEIGh7c8>

Tinkercad Tips and Tricks #4 - Relative Alignment using Align Tool

<https://www.youtube.com/watch?v=4A8lhq3qeJ8>

Tinkercad Tips & Tricks - Angles plus Duplicate and Repeat Feature

<https://www.youtube.com/watch?v=CEfgJh8CR2E>

Tinkertip: Align Tool

https://www.youtube.com/watch?v=zVVL_mIUTbE

Tinkercad Tips and Tricks #4 - Relative Alignment using Align Tool

<https://www.youtube.com/watch?v=4A8lhq3qeJ8>

Tip and tricks tinkercad

https://www.youtube.com/watch?v=G8zUeU_RzpE

5 3D Printer Free Slicer - Cura

5.1 Cura Slicer

Slic3r Prusa Edition - <http://www.prusa3d.com/slic3r-prusa-e...>

CURA 2.6.x - <https://ultimaker.com/en/products/cur...>

ideaMaker - <https://www.raise3d.com/pages/ideamaker>

Introduction to Slicing with Cura

<https://www.youtube.com/watch?v=biCWssfil2A>

How to install and use Cura 3d printer software

<https://www.youtube.com/watch?v=KqcW0EpDk2k>

How To 3D Print - Cura Settings and Printer Setup

<https://www.youtube.com/watch?v=M7flJnH5IIM>

Using Cura to 3D Print

<https://www.youtube.com/watch?v=6YZD6K7osco>

How To 3D Print with Cura Software Tutorial !

<https://www.youtube.com/watch?v=9coPHC04QZw>

How to Use Cura 2.4: Beginners Guide

<https://www.youtube.com/watch?v=qVJMCQKVqTU>

My Cura Settings!

<https://www.youtube.com/watch?v=y5rj4cjjG2M>

Cura 2.4, 2.5 & 2.6 Advanced Setting: How To Use! Part V

<https://www.youtube.com/watch?v=NqPwwwV8JBA>

Cura 2.4, 2.5 & 2.6 Advanced Setting, Material: How To Use! Part IV

<https://www.youtube.com/watch?v=S6GKsE0v25E>

Cura 2.4 , 2.5 & 2.6 Advance Settings, Infill: How To Use! Part III

<https://www.youtube.com/watch?v=wTB8zOpx6NM>

Cura 2.4, 2.5 & 2.6 Advanced Setting, Quality: How to use! Part I

<https://www.youtube.com/watch?v=079HX1ZuBG0>

Cura 2.4, 2.5 & 2.6 Advance Settings, Shell: How To Use! Part II

<https://www.youtube.com/watch?v=mHGb1xYZOig>

Cura 3D Printing Tutorial Episode 4 Print speed, Cooling, Supports and Print bed adhesion

<https://www.youtube.com/watch?v=A28A4zynpHw>

Cura 3D Printing Tutorial Episode 1 controls and layout

<https://www.youtube.com/watch?v=JiHqjVIA0eA>

Cura 3D Printing Tutorial Episode 2 Moving, Scaling and Rotating

<https://www.youtube.com/watch?v=5tSixbAsDtY>

Cura 3D Printing Tutorial Episode 3 Infill, layer height, shells and material
<https://www.youtube.com/watch?v=NTK9iEexoFo>

6 Design Examples

6.1 Design Example Videos

Camera Mount

<https://www.youtube.com/watch?v=MqEarBuMn1g>

<https://www.youtube.com/watch?v=S7WlewI3AJk>

Instructional video

<https://www.youtube.com/watch?v=qKVBm5MqDzU>

Build a Simple Flange

<https://www.youtube.com/watch?v=0GBH09Cvsh8>

Making a 3D Printable Phone Stand with Tinkercad

<https://www.youtube.com/watch?v=WPPCymRABos>

Tinkercad Tutorial -- A Rounded Box

<https://www.youtube.com/watch?v=k6nQpXWc6Co>

Tinkercad Tutorial -- A Simple Bowl

<https://www.youtube.com/watch?v=JQ28oQ2uoSE>

Tinkercad Tutorial -- Twisted Napkin Ring

<https://www.youtube.com/watch?v=FWpDc5FK3cc>

Tried to be fast... can you make a better TinkerCAD cool car?

<https://www.youtube.com/watch?v=vedm9wS2zaU>

Create a TinkerCAD tank...

<https://www.youtube.com/watch?v=TwHaH12-ga0>

Tinkercad wheel with 4 spokes

<https://www.youtube.com/watch?v=Km7OIXI1gcl>

Updated! Build a house in Tinkercad 2017 version

<https://www.youtube.com/watch?v=7cOSnCOQnRA>

Design a Minion with Tinkercad

<https://www.youtube.com/watch?v=5WeMZ7DI78E>

Tinkercad Tutorial - making a container with a screw lid

<https://www.youtube.com/watch?v=FhznDgee3X4>

Tinkercad Tutorial -- A Rounded Box

<https://www.youtube.com/watch?v=k6nQpXWc6Co&t=74s>

TinkerCad Tutorial - how to make a hinge

<https://www.youtube.com/watch?v=rwKPOXXYZ6A>

7 FIRST FRC Models

7.1 FRC 3D Printer Thingiverse Links

The following link list various 3D models for FIRST FRC applications.

<https://makerware.thingiverse.com/CDSrobotics/collections/frc-parts/page:1>

7.2 Typical FIRST FRC 3D Models

Servo cable connector:

<https://www.thingiverse.com/make:122854>

RoboRio mounting case and cable alignment

<https://www.thingiverse.com/thing:656030>

<https://www.thingiverse.com/thing:641856>

RoboRio pin cover

<https://www.thingiverse.com/thing:660244>

RoboRio retention clip

<https://grabcad.com/library/roborio-10x3-retention-clip-1>

<https://grabcad.com/library/roborio-10x3-retention-clip-heavy-cable-1>

775 motor case

<https://www.thingiverse.com/thing:1344981>

Windows motor gear hub

<https://www.thingiverse.com/thing:1464800>

NAVX cover

<https://www.pdocs.kauailabs.com/navx-mxp/installation/creating-an-enclosure/>

<https://www.tinkercad.com/things/iyv5MGy6qLL-navx-bracket-for-roborio>

Microsoft LifeCam HD-3000 web camera mount

<https://www.thingiverse.com/thing:1494829/apps/tools/>

8020 framing, bearing block, corner brackets

<https://robodawgs.wordpress.com/2013/11/16/robodawgs-3d-printing-cuts-frc-robot-weight/>

7.3 Other CAD Models

Magnetic encoder mount for toughbox

<https://grabcad.com/library/toughbox-hexshaft-magnetic-encoder-spacer-1>

RoboRio Mounting Bracket

<https://grabcad.com/library/roborio-mounting-system-1>

FRC Windows Motor Gearbox 2 stage

<https://grabcad.com/library/first-robotics-window-motor-gearbox-2-stage-1>

8 TinkerCAD Arduino Circuits

8.1 TinkerCAD Circuits

Arduino Electronic Circuits in Tinkercad Tips and Tricks #5

<https://www.youtube.com/watch?v=WOCRImnMGRE>

How to use an Ultrasonic Sensor in Tinkercad

<https://www.youtube.com/watch?v=WSulad9Ehd4>

TinkerCAD circuits - Explore your world

https://www.youtube.com/watch?v=4Y5Zhs_Yx70

Tinkercad Circuits Tutorial

<https://www.youtube.com/watch?v=ouGNXYNilrY>

Making series and parallel circuits using Tinkercad

<https://www.youtube.com/watch?v=upuGkCdGEKA>

CircuitsLab: Tinkercad intro

<https://www.youtube.com/watch?v=fp9LorUw5pc>

How To Light An LED - Electronics Lab

<https://www.youtube.com/watch?v=wa6YIGck-0Q>

Lighting an RGB LED with a Push Button on Tinkercad

https://www.youtube.com/watch?v=79Aiq3Rss_I

How to set up an RGB on Tinkercad

<https://www.youtube.com/watch?v=NxrMBOKNZSI>

Driving a DC Motor using L293D IC | Arduino R3 || Tinkercad

<https://www.youtube.com/watch?v=0JLzjBo44Hq>

Arduino Simulator – TinkerCad

<https://www.youtube.com/watch?v=THwdsHWqNsQ>

tinkercad Circuits arduino LED blink

<https://www.youtube.com/watch?v=lrFAlhwRNtU>

Lighting an RGB LED with a Push Button on Tinkercad

https://www.youtube.com/watch?v=79Aiq3Rss_l&t=57s

Tinker Cad Circuits - Push Button

<https://www.youtube.com/watch?v=yMUIld1-MMg>

TinkerCAD Arduino Uno LED Resistor

<https://www.youtube.com/watch?v=myXYwf3PqQg>

Building a virtual circuit using Fritzing

https://www.youtube.com/watch?v=4pL7_Qc11JA

FRITZING TUTORIAL 01 - An Introduction to PCB design

<https://www.youtube.com/watch?v=M4CvUSkP9hw>
