CAD Basics
for 3D Printing

Tinkercad

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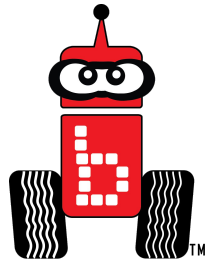
What is CAD?
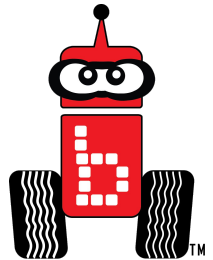
- CAD stands for "computer-aided design"
- CAD programs are where you design and create your 3D models to be printed by your 3D printer
- There are many CAD programs available
  - Tinkercad, Onshape, FreeCAD, SketchUp, LibreCAD

This tutorial will walk through using Tinkercad

Setting up Your Tinkercad Account

- Go to Tinkercad.com
- Click on the "Sign-Up" button in the upper right
- Enter your information to create an account

- From the homepage, select "Create" then "3D Design" in the upper-right corner to start your first design
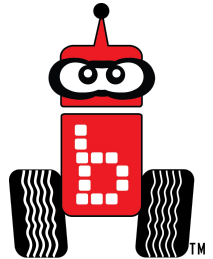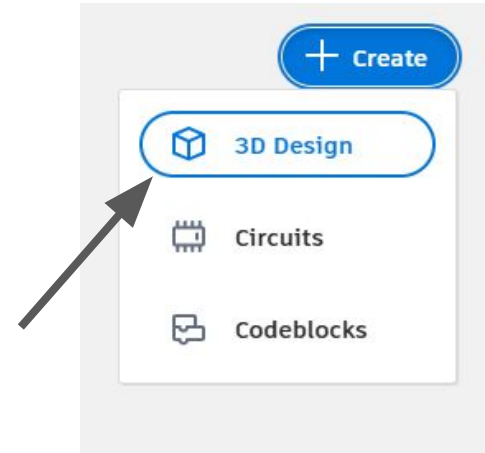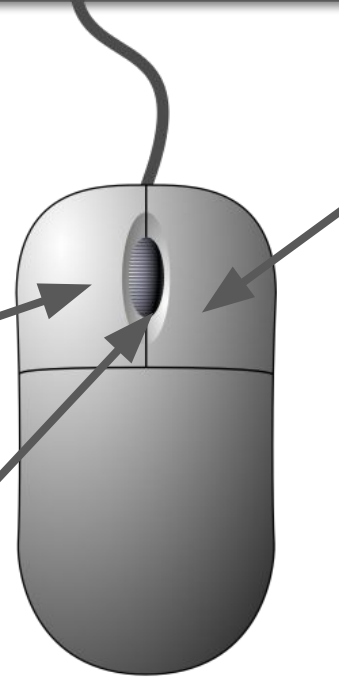
Navigating the Design Space

- Before starting your first design, become familiar with navigating the design space
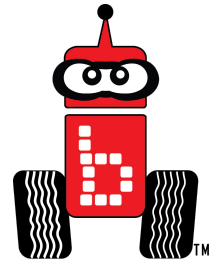
Left button: Used to interact with the design (e.g. placing shapes, dragging, etc.)

Scroll button: Used to move the whole screen left, right, up, or down when pressed. Zoom in and out by simply scrolling

Right button: Used to change the angle of perspective

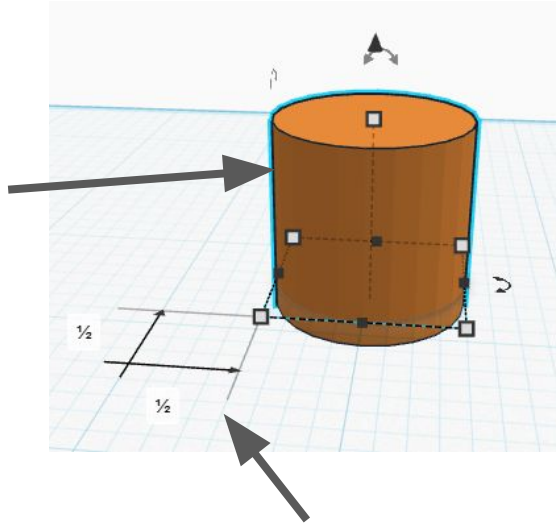or toggle the perspective cube

FRONT RIGHT

Placing and Using Shapes

- To place a shape, simply select it from the right-side menu and then move your cursor into the design space
- Left click to place the shape

- Toggle with shape settings by opening the drop down menu that appears in the upper right when a shape is selected
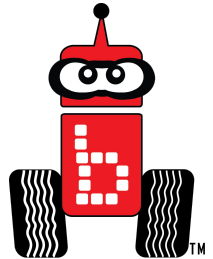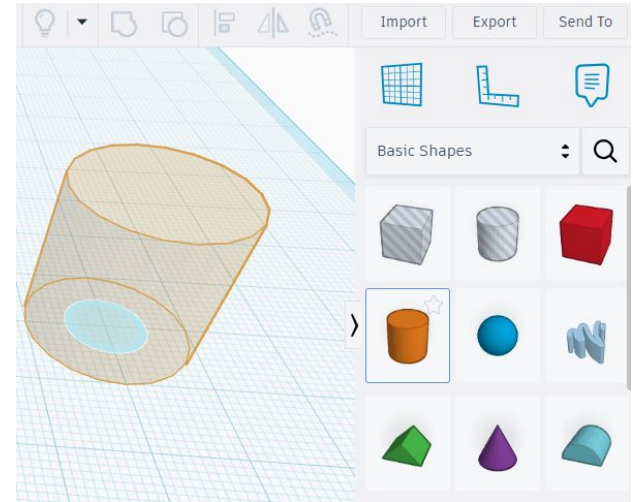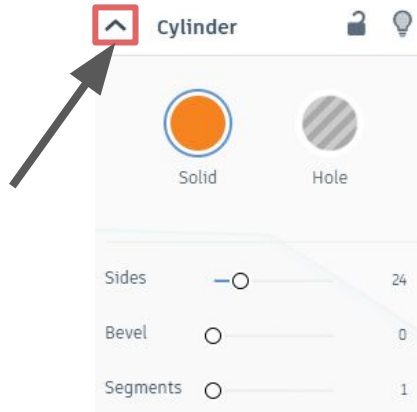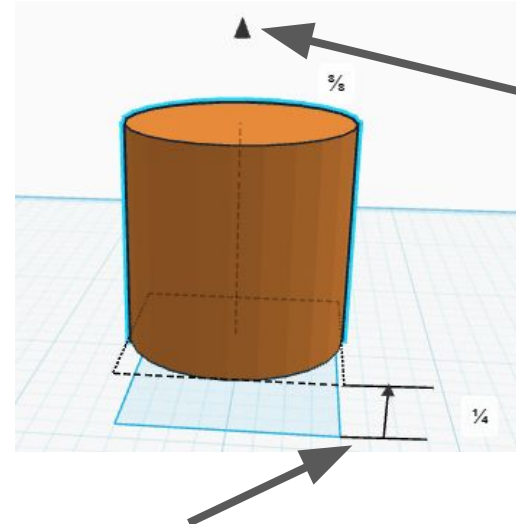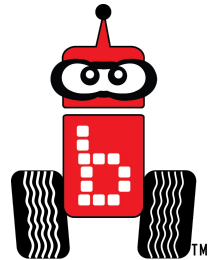
Manipulating Shapes - Directional Movement

Simply left click on the object you wish to move and drag it left, right, forwards, or backwards

Drag on the small upwards arrow to move up or down

These lines tell you how far you have moved in any given direction
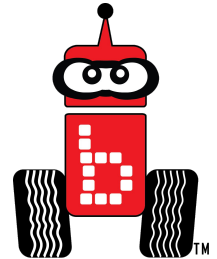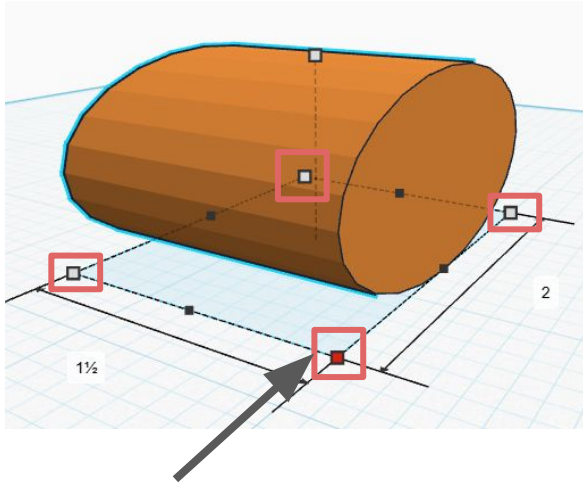
Manipulating Shapes - Rotation

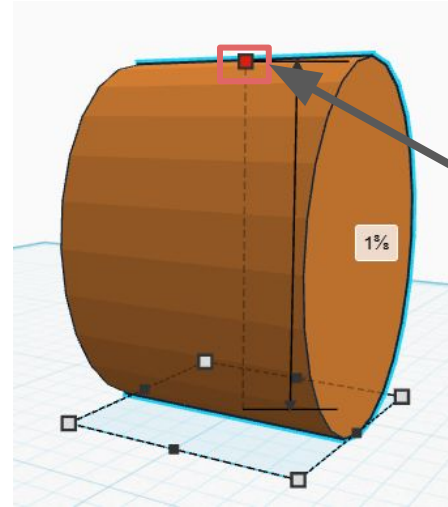Select and drag on the arched double-ended arrows to rotate an object

0°

-90°
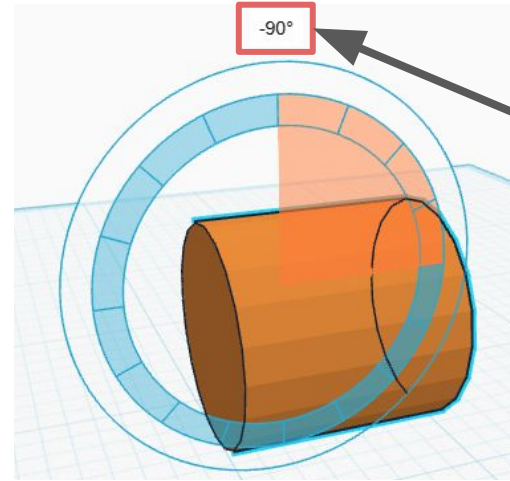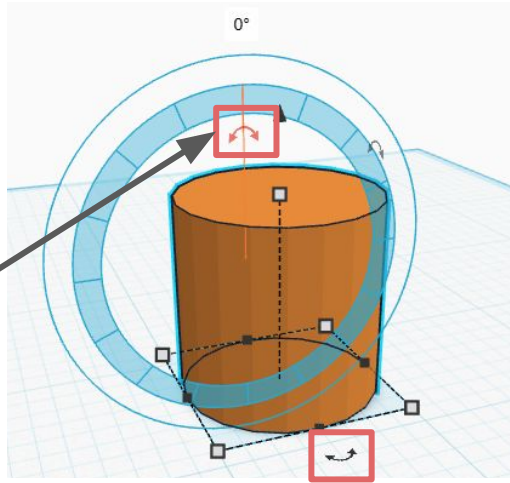
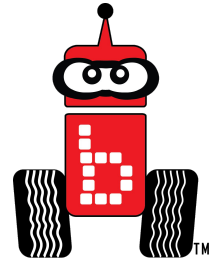The number above the object shows the angle of rotation
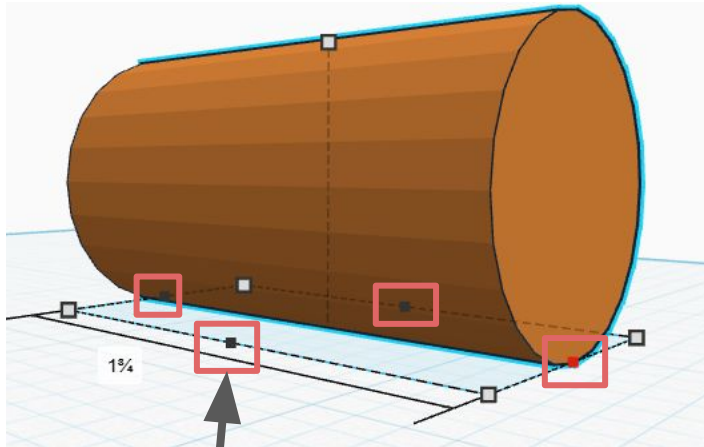
Manipulating Shapes - Dimensions

Change the height by pulling on the top light gray square

Change the length and width at the same time by pulling on any of the bottom light gray squares

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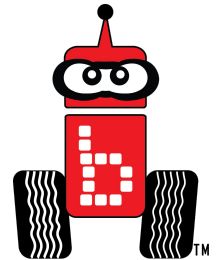
Manipulating Shapes - Dimensions

Change the length or width alone by pulling on the smaller, black squares
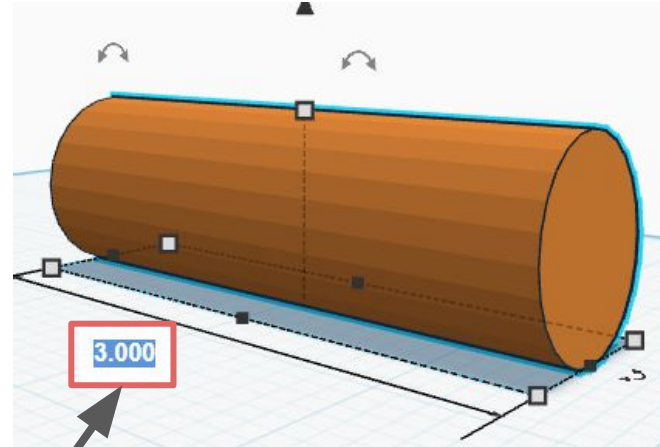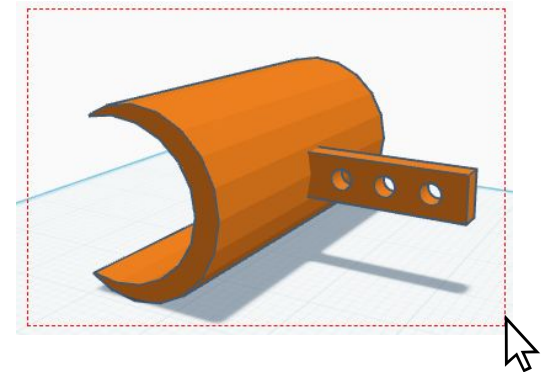
Set specific dimensions selecting the text in the white box and typing in the desired length
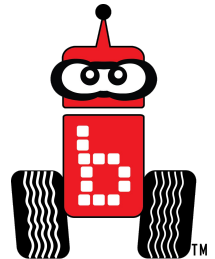
Merging Shapes

- Place at least two different shapes together
- Left-click and drag to box the shapes within the red dotted line
- Click on the "Group" button in the upper right
 - Directly to the right is the "Ungroup" button you can use to separate shapes

Now your shapes will be a single object you can continue designing with or print

Cutouts with Shapes

- Drag and drop the shape that will be used to make the cut
  - Click the gray-stripped icon to switch to hole
  - Overlay the shapes to create the desired cut out

- Left-click and drag to box both the solid shape and the hole shape together within the red dotted lines
  - Click the "Group" button in the upper-right
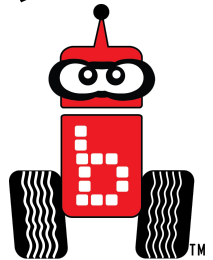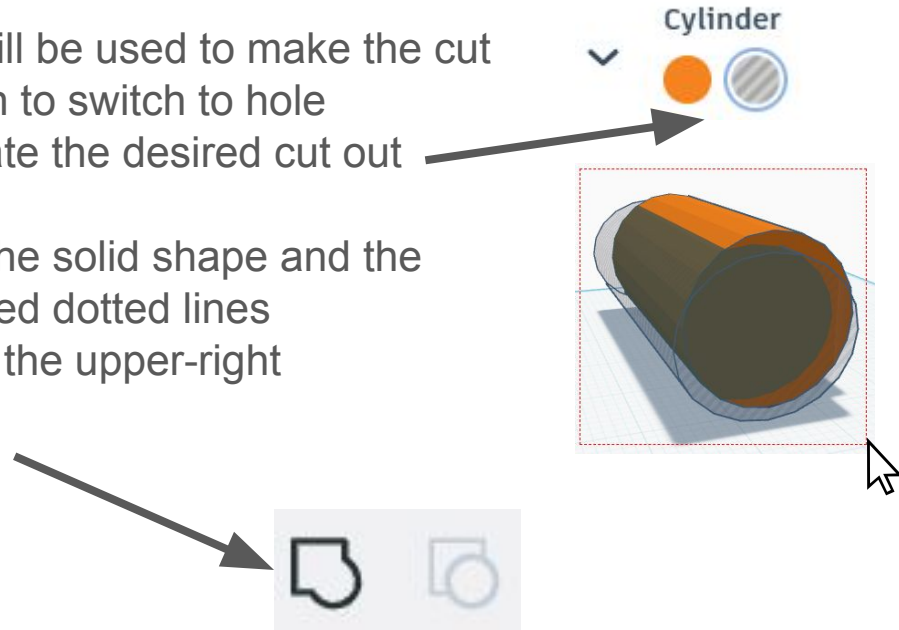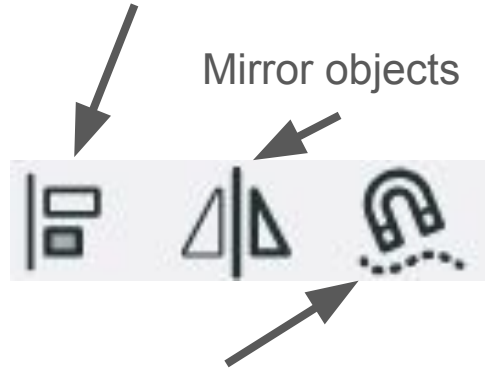
Additional Tools to Explore

Copy objects

Paste objects

Duplicate objects

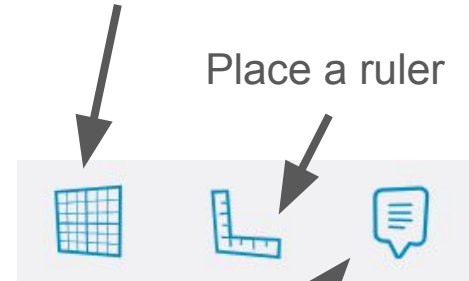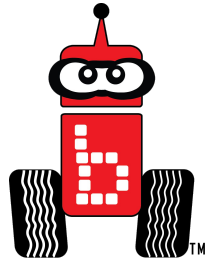Align two objects using nodes

Mirror objects

Easily stack objects with cruise
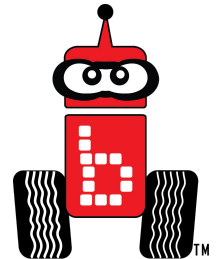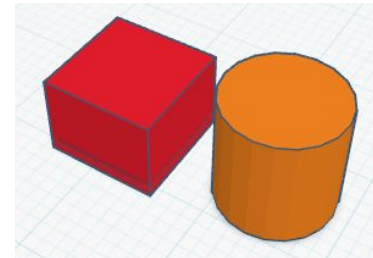
Change workplane (i.e. work on a vertical or angled surface)
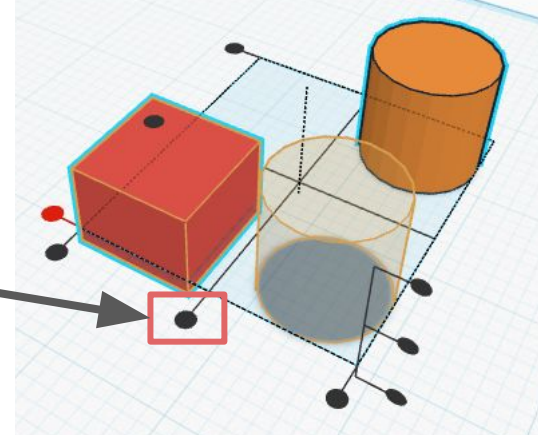
Place a ruler

Leave comments in the design space

Additional Tools to Explore - Align

- Select multiple objects by left clicking and dragging to highlight
- Select the "Align" button in the top right
  - Toggle between the different nodes to view and select different alignments
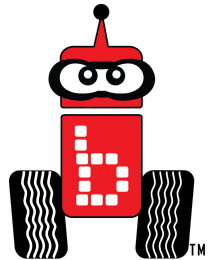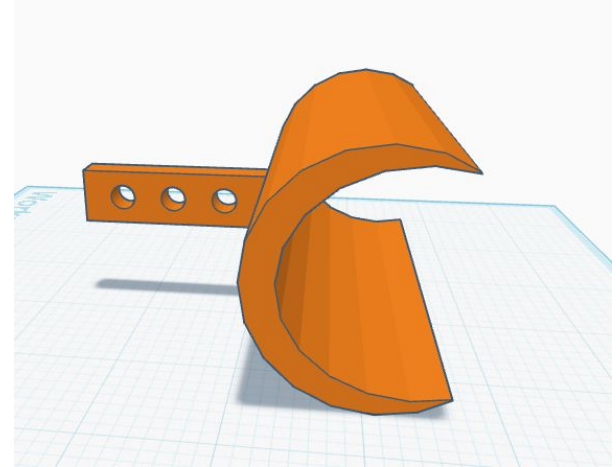
Additional Tools to Explore - Cruise Control

- Select the object you wish to stack
- Select the "Cruise" tool in the upper right

- Drag the white dot to stack the selected object on top of another
  - The two objects will automatically have touching surfaces
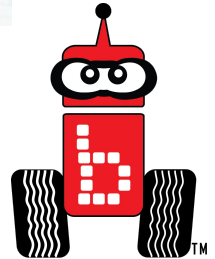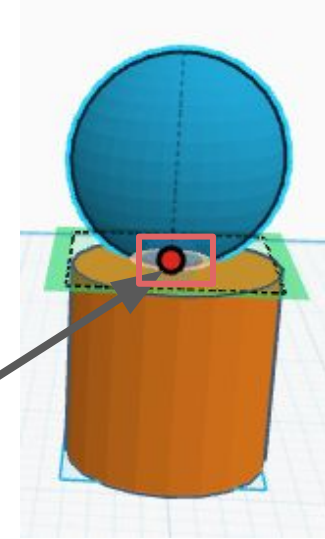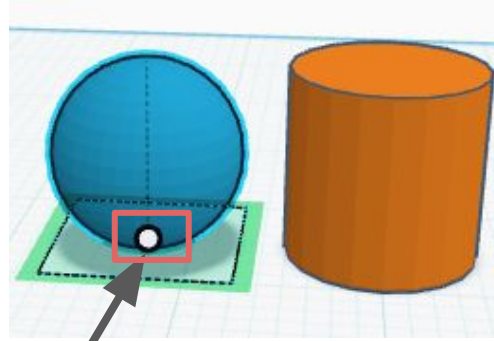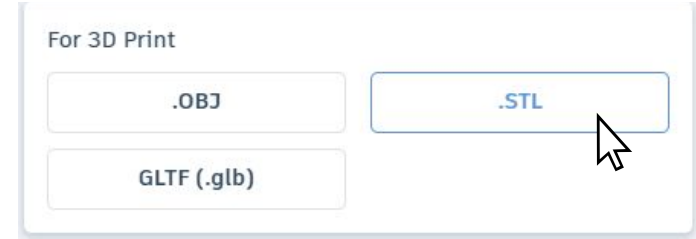
Putting it Together

Your turn!

Practice using the tools in Tinkercad to make your own design

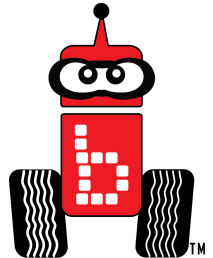# Exporting as .STL

- From an open project…
  - Select "Export" at the top of the right side menu
  - Select ".STL"
- From the homepage…
  - Select the project you want to download
  - Click "Download"
  - Select ".STL"
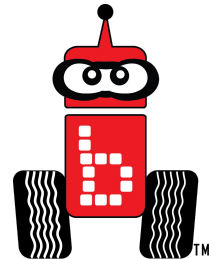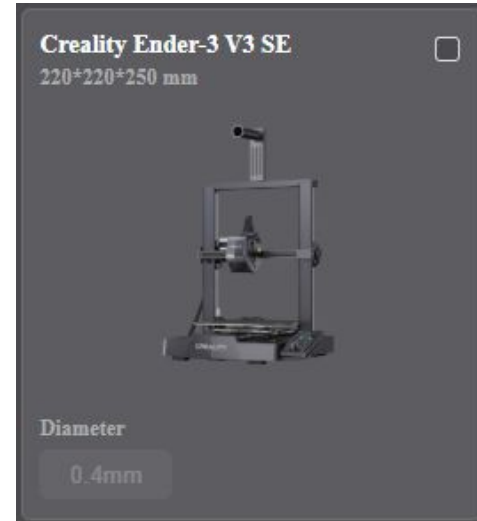
You now have an .STL file to print from!

For 3D Print

| .OBJ | .STL |
| GLTF (.glb) | |

3D Printing - Slicing Software

- Download Creality Print at Creality.com
- Launch the program
  - Select "Creality Ender-3 V3 SE" as your printer from the menu that pops up when you open the program

A workspace should generate that matches your printer's plate
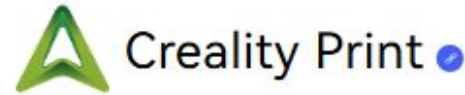
3D Printing - Checking Units

- Check the units in settings
  - Click on the settings icon in the upper left
- Open the "Units" dropdown menu to toggle between millimeters and inches
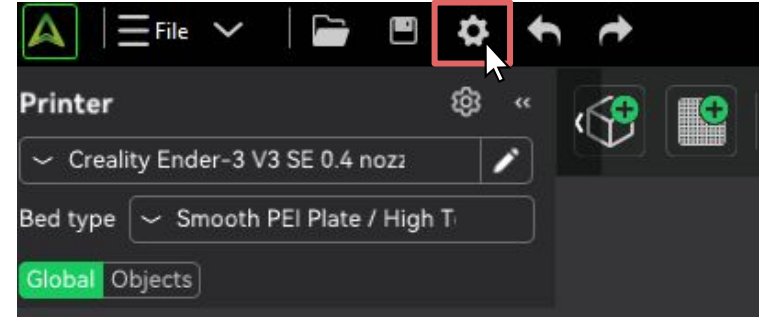
When exporting your design from CAD software, make sure the exporting units match the units of the slicing program (e.g. if Creality print is set to inches, export designs in inches)

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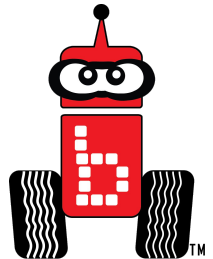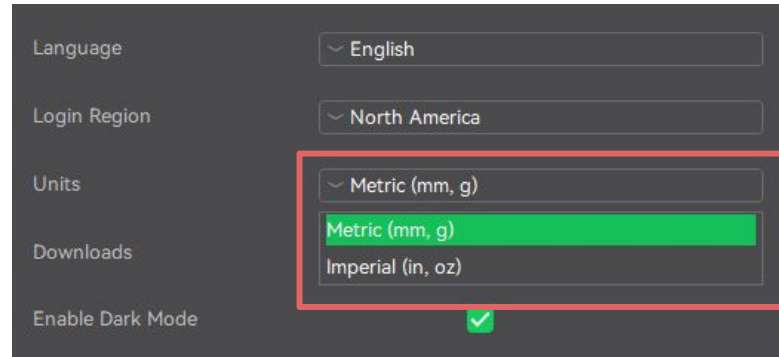
3D Printing - Importing Designs

- Select the add button in the upper left corner
  - Select your print from your files (.STL file)
  - Select "Slice plate"
- Double-check that dimensions are correct
- Insert a SD into the computer
- Select the upwards arrow next to "Send print"
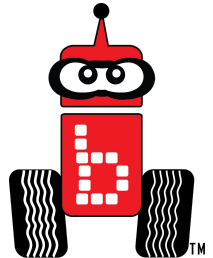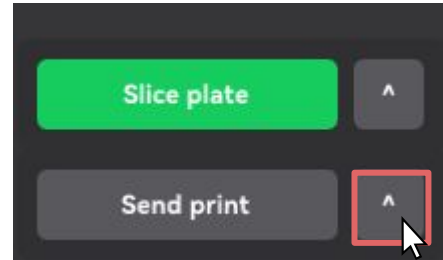
3D Printing - Printing Designs

- Select "Export to Local" from the pop-up menu
  - Save to your SD
- Eject the SD from your computer and insert it into the 3D printer on the left-hand side
- Select "Print" and then choose the file to be printed

Your design is now being printed!