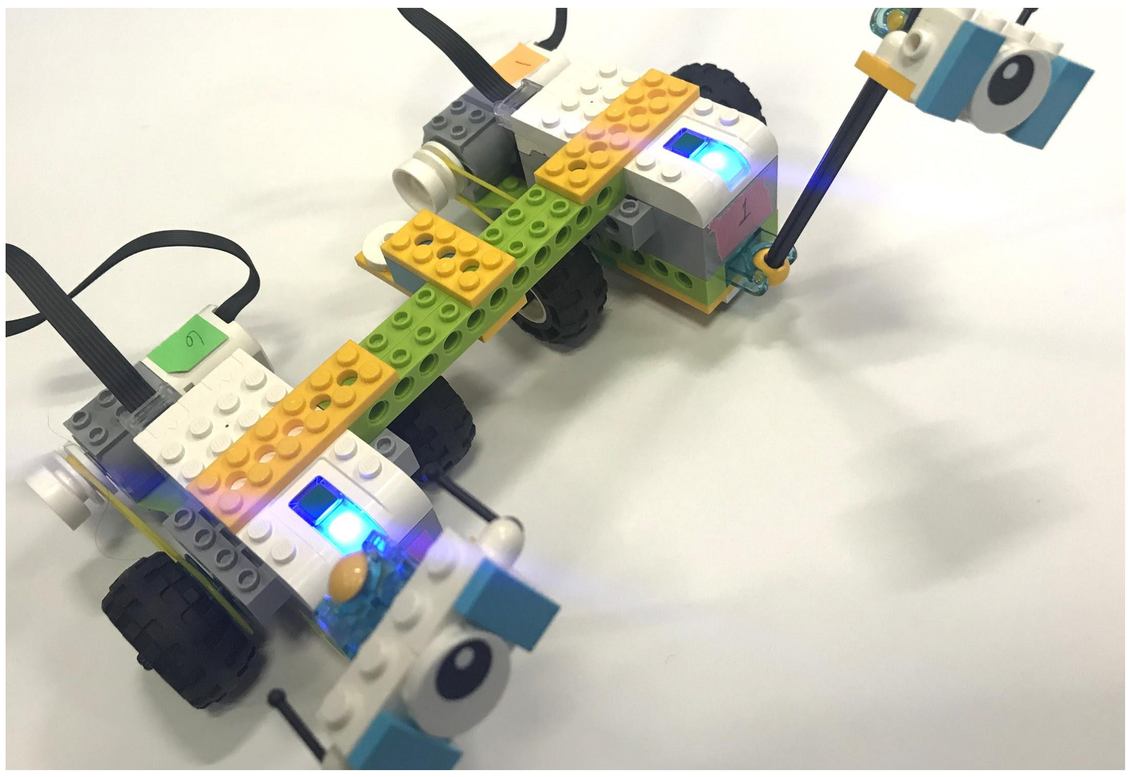
WeDo Mars Rover

WHAT: The Lego WeDo is a robotics kit that contains a motor, sensors, and a variety of Lego parts that can construct robots and kinetic sculptures. Program your WeDo creation using the tablet software.

YOUR CHALLENGE: Working with a partner, collect rock and soil samples from the Martian crust using your Mars Rover Robot.

CAN YOU:

➔ Program your rover to travel to each point of your track to simulate picking up samples.



EXTRA CREDIT:

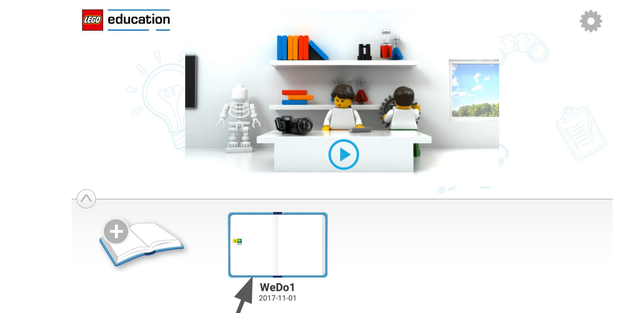
➔ You were just notified that you missed a sample. Can you program the rover to go backwards to retrieve it?

➔ Can you edit your code to use fewer blocks?

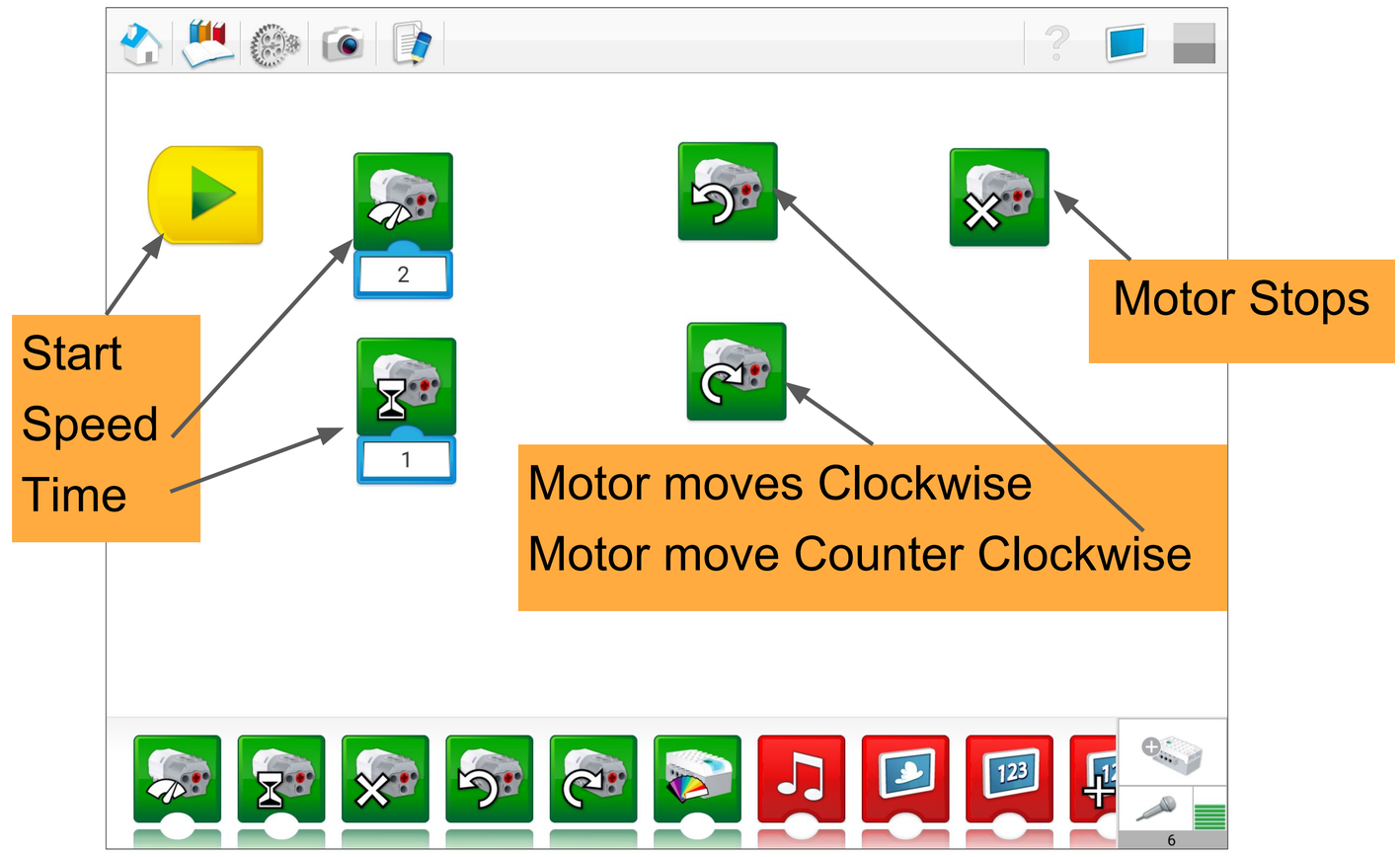
➔ Add a victory sound at the end?

https://upload.wikimedia.org/wikipedia/commons/e/e5/Pathfinder01.jpg

WeDo 2.0 Tips



Select WeDo1 to get started



Start
Speed
Time

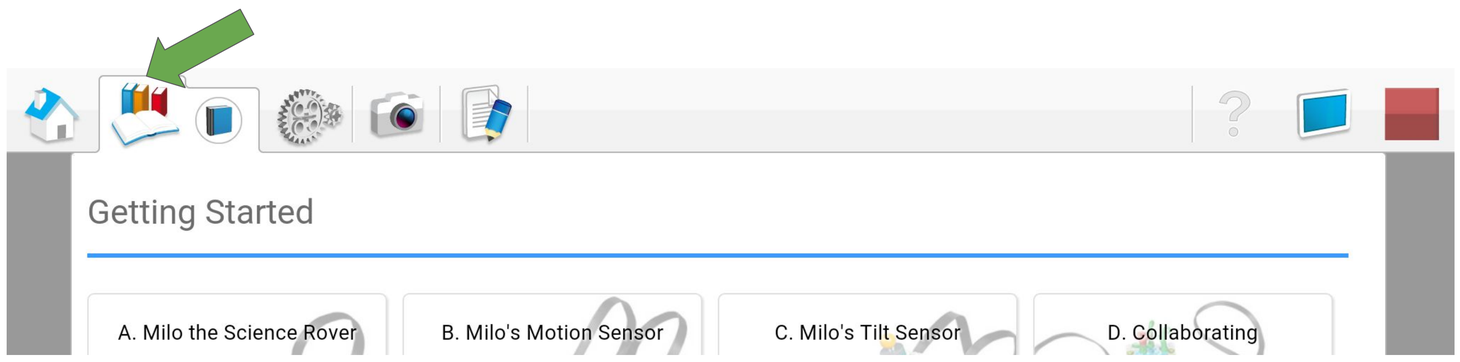
Motor Stops

Motor moves Clockwise
Motor move Counter Clockwise

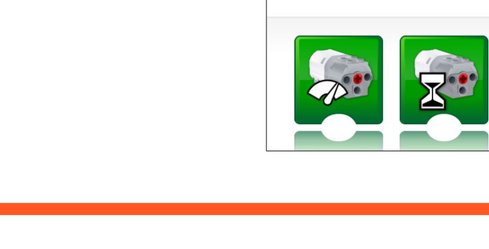
Starting from Scratch

1. Tap this icon to start a new program 

2. Tap the books to hide the “Getting Started” guides



3. Tap the picture of the WeDo Hub in the bottom right hand corner to start the pairing process



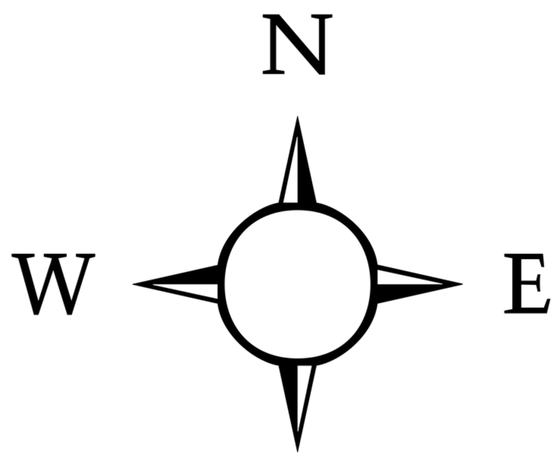
4. Press the green button on top of the WeDo Hub then select the right number Hub on the tablet. (Each WeDo hub has a numbered sticker on the front)

5. When the blue light comes on the WeDo Hub you are ready to start programming!

Bee-Bot City

WHAT: The Bee Bot robot is programmed by pressing the desired buttons and then pressing **go**.

Note: Be sure to press **clear** between each program! You can press more than one button (multiple instructions) before pressing go.



YOUR CHALLENGE: Help us build our Bee-Bot City!

1. Use the materials provided (string/pipe cleaner) to determine the length of a "Bee Unit": one Bee-Bot move forward.
2. Use recyclables: create a streetscape/neighborhood.
3. Use post-its or cardstock to label the environmental print, street signs, storefronts, city helpers, cardinal directions.
4. Can you program the Bee-Bot to move around the city?

CAN YOUR BOT:

- ➔ Turn at street corners?
- ➔ Repeat a move?
- ➔ Go up a low ramp?
- ➔ Turn at a 45 degree angle?

Coding Math Stories

WHAT: Scratch Jr. uses color-coded “blocks” that can be dragged down into the programming area to tell a character to do something (move, talk, jump, etc). These blocks can be snapped together to create more complicated instructions.

YOUR CHALLENGE: Create a math story problem in Scratch Jr. based on an addition or subtraction equation.

Add a character, click the blank slide to create your own!

Click on the green flag at the top of the screen to make your program go!

Make up to 4 unique scenes.

Always begin with a **yellow block** (like the green flag).

Drag and drop blocks onto programming area and snap them together.

CAN YOU:

- ➔ Create an equation with a missing addend?
- ➔ An action that uses a repeat or wait block?
- ➔ A character that has your face? (hint: camera feature)
- ➔ A character that talks using speech bubbles or sound?

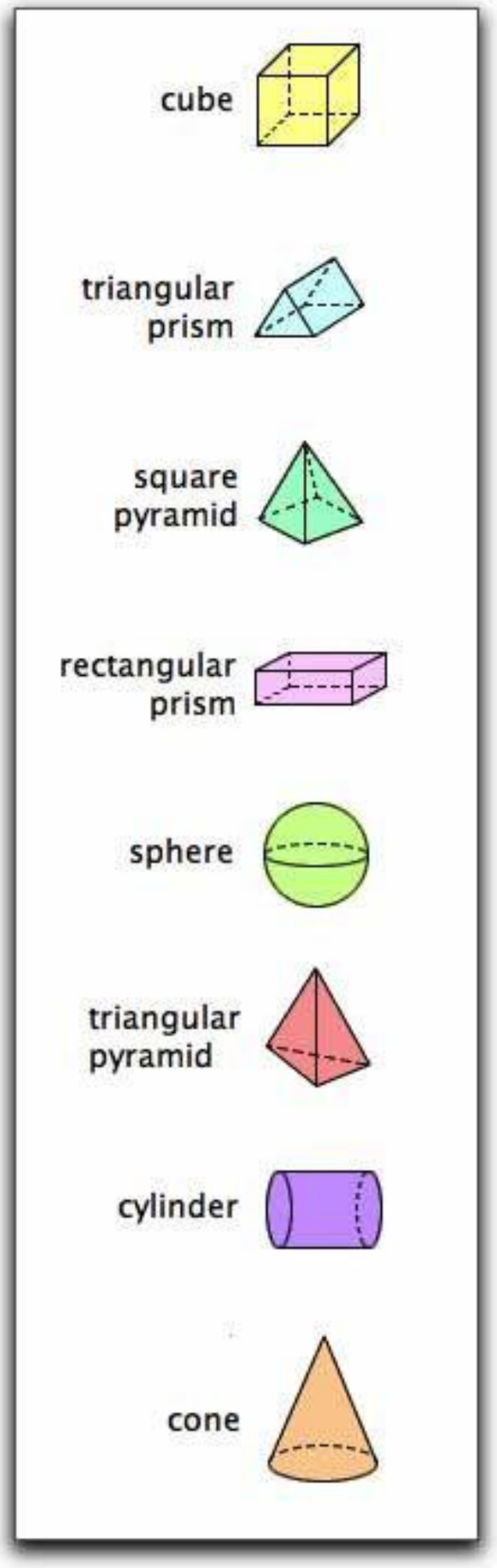
Geometry City

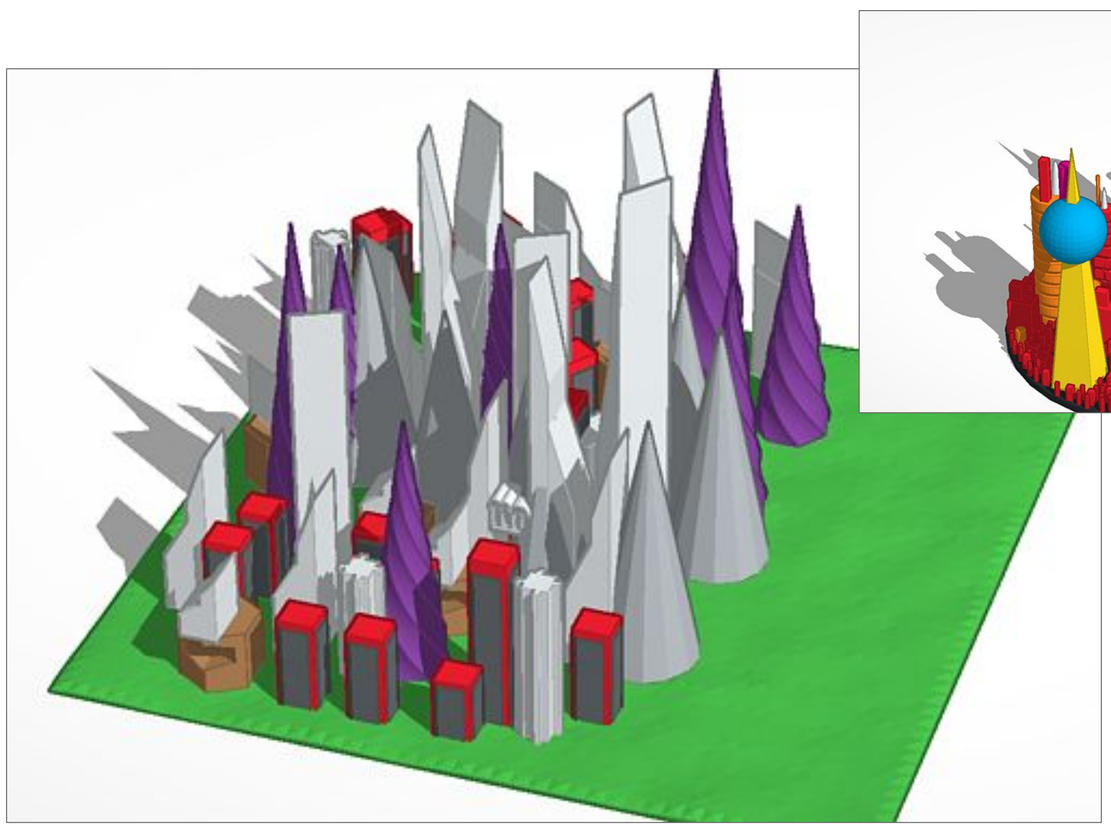
WHAT: Tinkercad provides a free, student friendly platform for 3D modeling. Students can use this space to conceptualize 3 dimensional shapes and designs. These products can be 3D printed or exported to other digital environments like Minecraft.

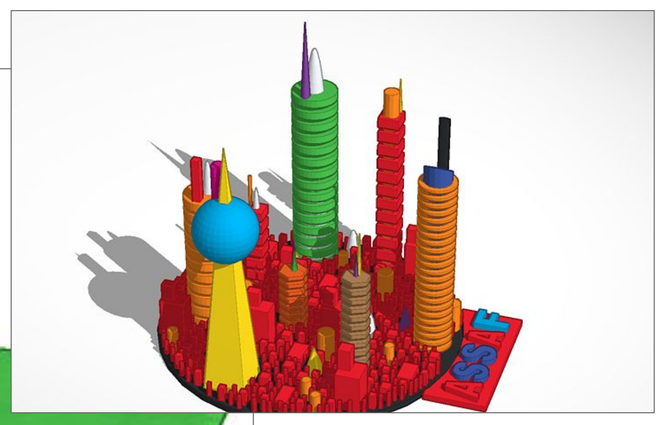
YOUR CHALLENGE: Design a city scape using 3-dimensional shapes. The foundation (base) of your city needs to have an area of 36 inches squared.

CAN YOU:

- ➔ Identify the attributes of each building? Or
- ➔ Can you create different buildings with the defining attributes of a cube? A prism?
- ➔ Design a public sculpture that has a cylindrical base?
- ➔ Include a waterway and engineer a bridge for cars and pedestrians to cross?





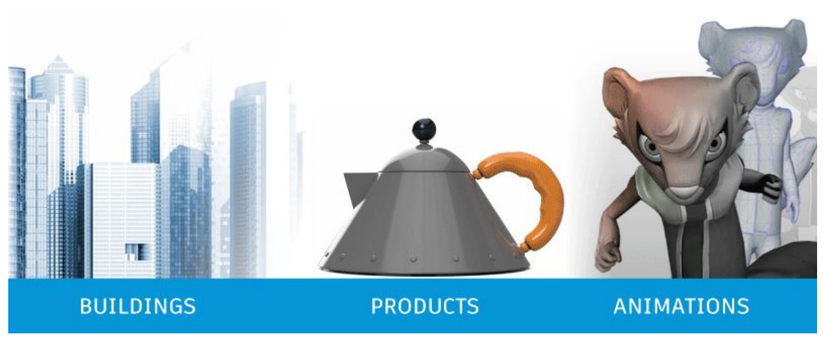


How to Teach Math Using Tinkercad and Fusion 360

By Tinkercad for Education

At its most basic, 3D design is the creation of an object which has three dimensions (height, width, depth). The output of 3D designs can range from skyscrapers to electric cars, even an animated character you might see in a Pixar film. Not only is 3D design a great entry point to a variety of STEAM fields, but the skills students develop directly relate to math proficiencies including the ability to:

- Understand and manipulate fractions
- Name and classify shapes
- Understand and manipulate angles
- Explore transformations
- Work with and convert units of measurement



To give you a sense of what this looks like in practice, here are a few concepts you might explore with your students using 3D design, categorized by grade and Common Core Math Standards:

Kindergarten

- Identify and describe shapes (CCSS.MATH.CONTENT.K.G.A). *For example, using Tinkercad, "Can you place a sphere next to a cube?"*
- Analyze, compare, create and compose shapes (CCSS.MATH.CONTENT.K.G.B). *In Tinkercad, use two pyramids to create a shape with six corners.*
- Describe and compare measurable attributes (CCSS.MATH.CONTENT.K.MD.A). *Use Tinkercad to create an object and then describe its measurable attributes.*
- Classify objects and count the number of objects in each category (CCSS.MATH.CONTENT.K.MD.B.3). *Use Tinkercad to create two categories of objects, then describe how each category is different and count the number of objects in each category (ex: 3 red cubes and 2 blue spheres).*

Elementary

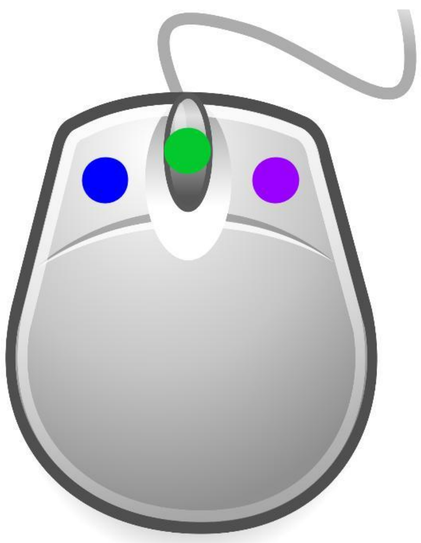
- Reason with shapes and their attributes (CCSS.MATH.CONTENT.1.G.A). *For example, using Tinkercad, "Can you create three different objects with the defining attributes of a cube?"*
- Reason with shapes and their attributes (CCSS.MATH.CONTENT.2.G.A). *For example, using Tinkercad, "Can you create a sphere that is 1/2 red and 1/2 blue?"*
- Reason with shapes and their attributes (CCSS.MATH.CONTENT.3.G.A). *For example, using Tinkercad, "Can you partition a shape into four equal parts, making each quarter a different color?"*
- *Represent and interpret data (CCSS.MATH.CONTENT.3.MD.B). For example, have students take measurements of a real-world object (a simple shape like a tissue box is a good start) and then create a 3D model of the object in Tinkercad using the measured dimensions.*
- Develop understanding of fractions as numbers (CCSS.MATH.CONTENT.3.NF.A.1). *For example, use a 3D printer to create the Beast Belly Fraction Game (pictured below). In this game, your students will use 3d printed tokens that represent various fractions to "fill the beast's belly" by creating a perfect 1 whole.*
- Geometric measurement: understand concepts of angle and measure angles (CCSS.MATH.CONTENT.4.MD.C.5). *For example, in Tinkercad, "Can you rotate an object by 120 degrees?"*
- Geometric measurement: understand concepts of volume (CCSS.MATH.CONTENT.5.MD.C.3). *For example, using Tinkercad, find the volume of a right rectangular prism by packing it with uniform cubes.*

Source: http://www.instructables.com/id/So-You-Want-to-Teach-Math-Using-3D-Design/

Tinkercad Tips

Tinkercad is a free online tool that can be used for 3D modeling. The 3D models can be exported to the .stl format which can be used with the 3D printer. You will need to create a free account before you can begin using tinkercad.

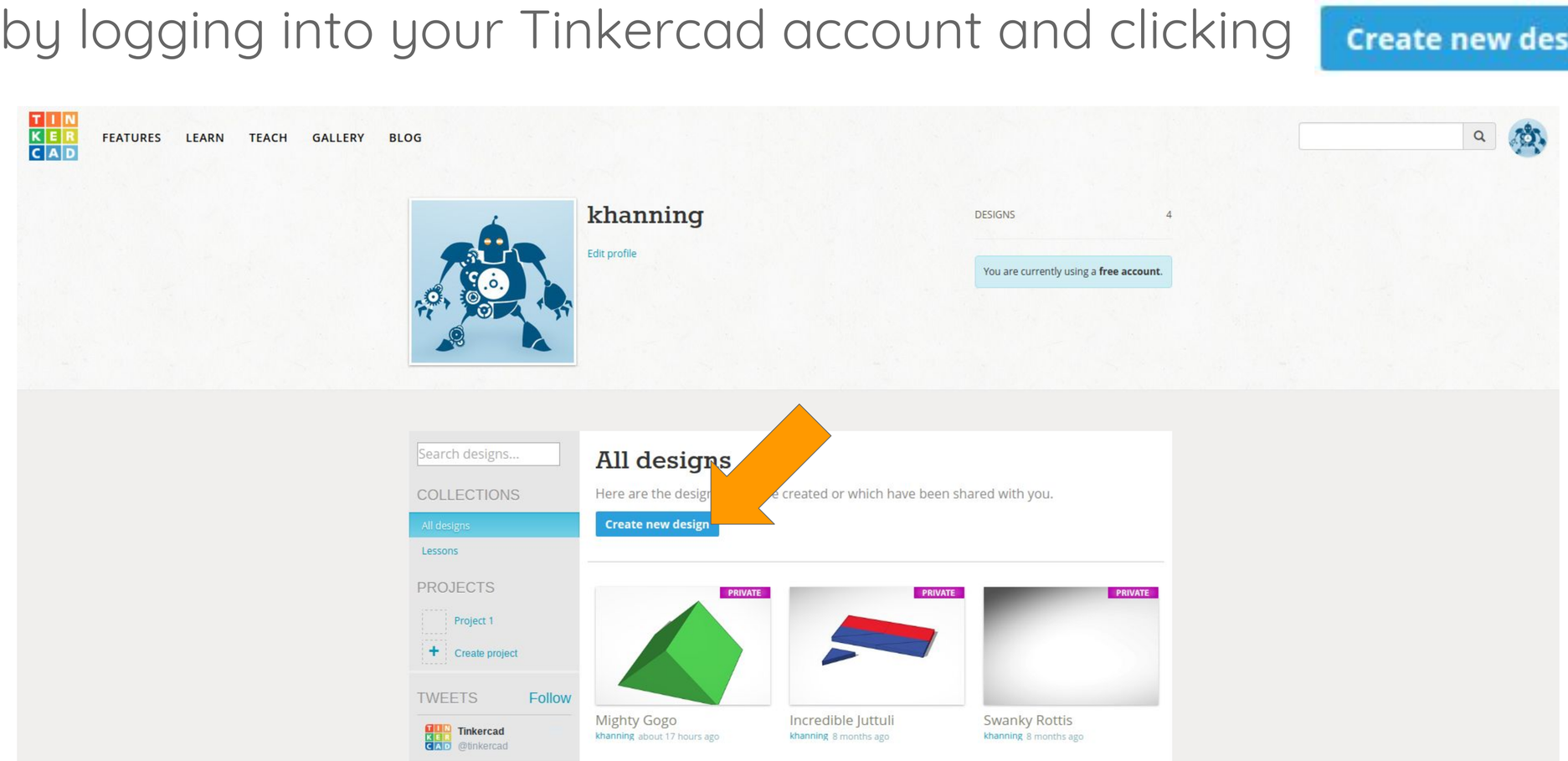
Mouse Controls



- **Left Mouse Button**
  Select and drag objects
- **Middle Mouse Button (Scroll Wheel)**
  Ctrl + Shift + Left Mouse Button also works if you do not have a scroll wheel
  Move camera perspective
- **Right Mouse Button**
  Ctrl + Left Mouse Button also works if you do not have a right mouse buton
  Rotate camera perspective

Getting Started

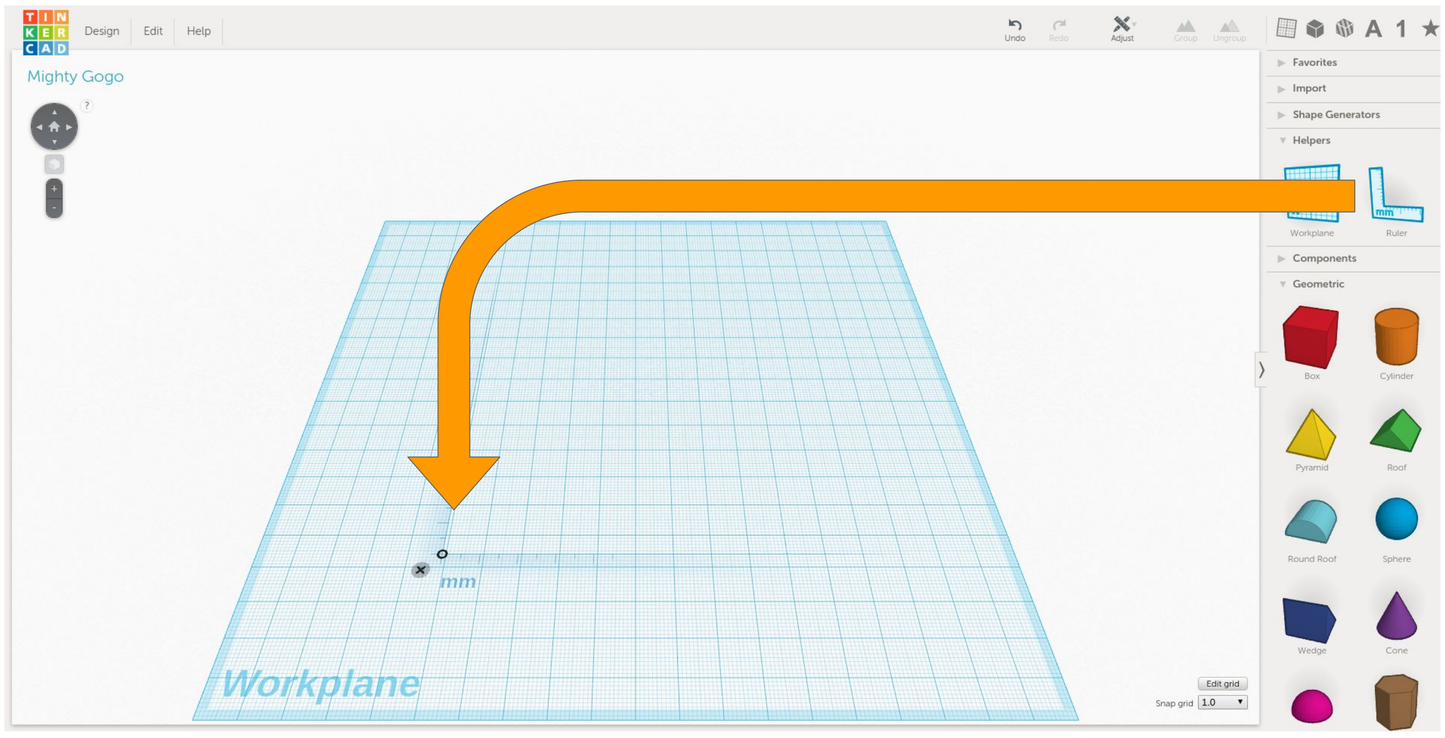
Begin by logging into your Tinkercad account and clicking **Create new design**



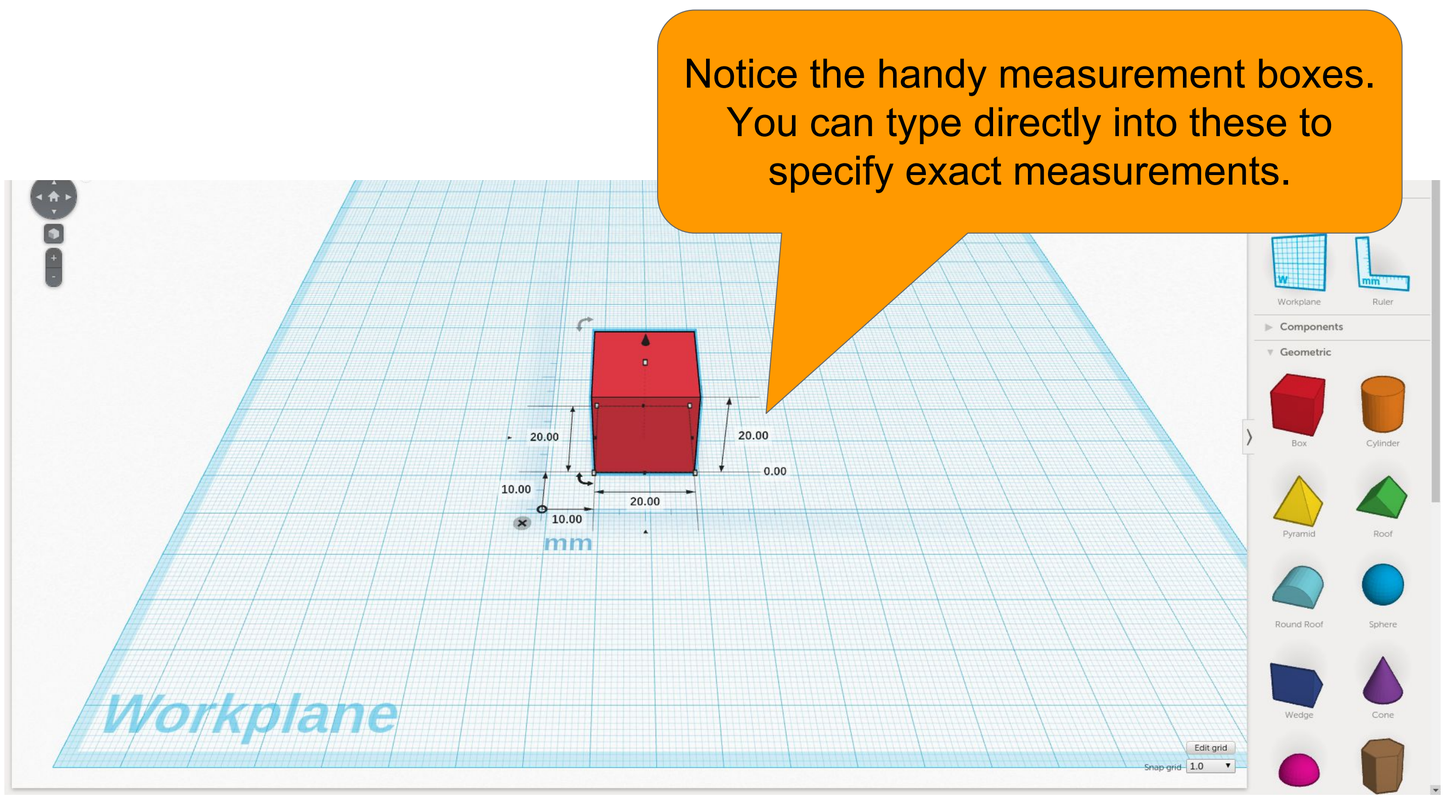
Tinkercad Tips

Ruler Helper

Always begin by dragging the **Ruler** tool onto the Workplane. The **Ruler** can be found under the **Helpers** category. It doesn't matter where you drop the ruler, only that you bring out the ruler before any other shape.



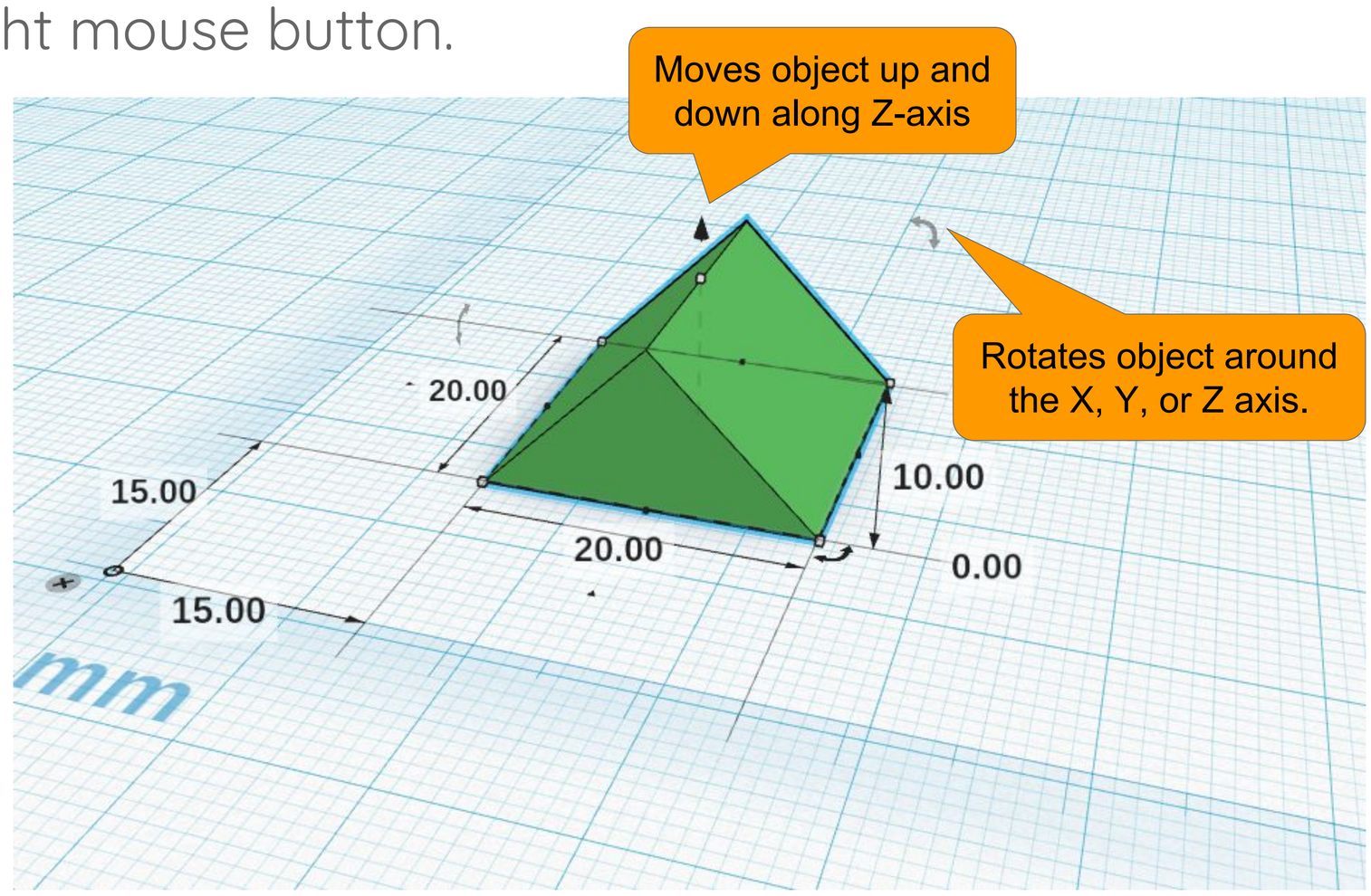
The ruler will make it much easier to align objects or specify exact measurements.



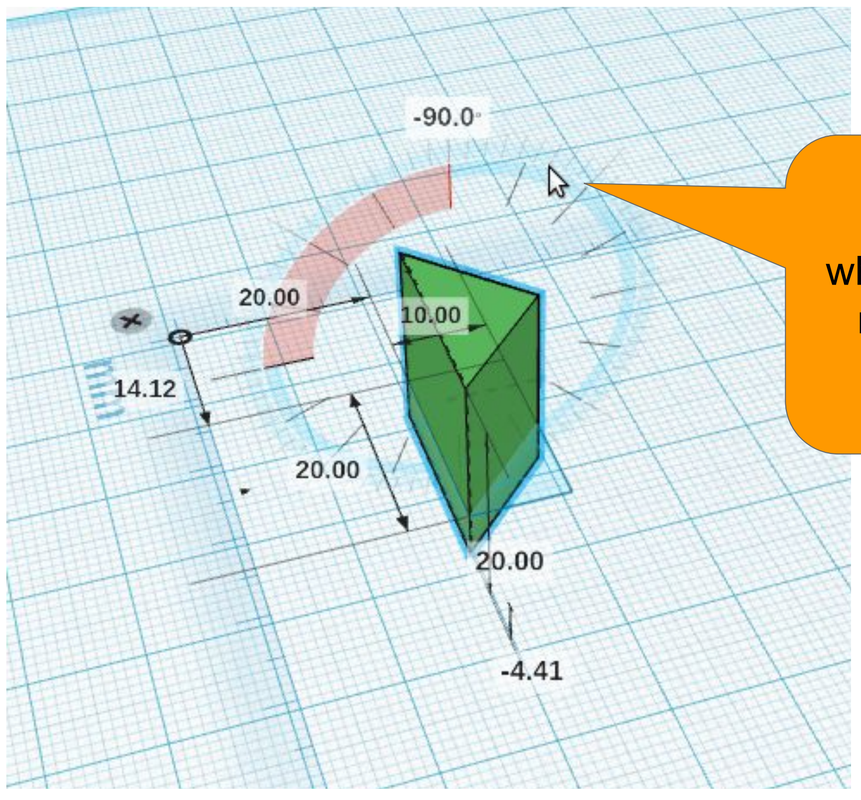
Tinkercad Tips

Rotating Objects

Sometimes you will have to rotate objects. To do this grab and drag the rotation handle across the correct axis. You may have to rotate the view using the right mouse button.



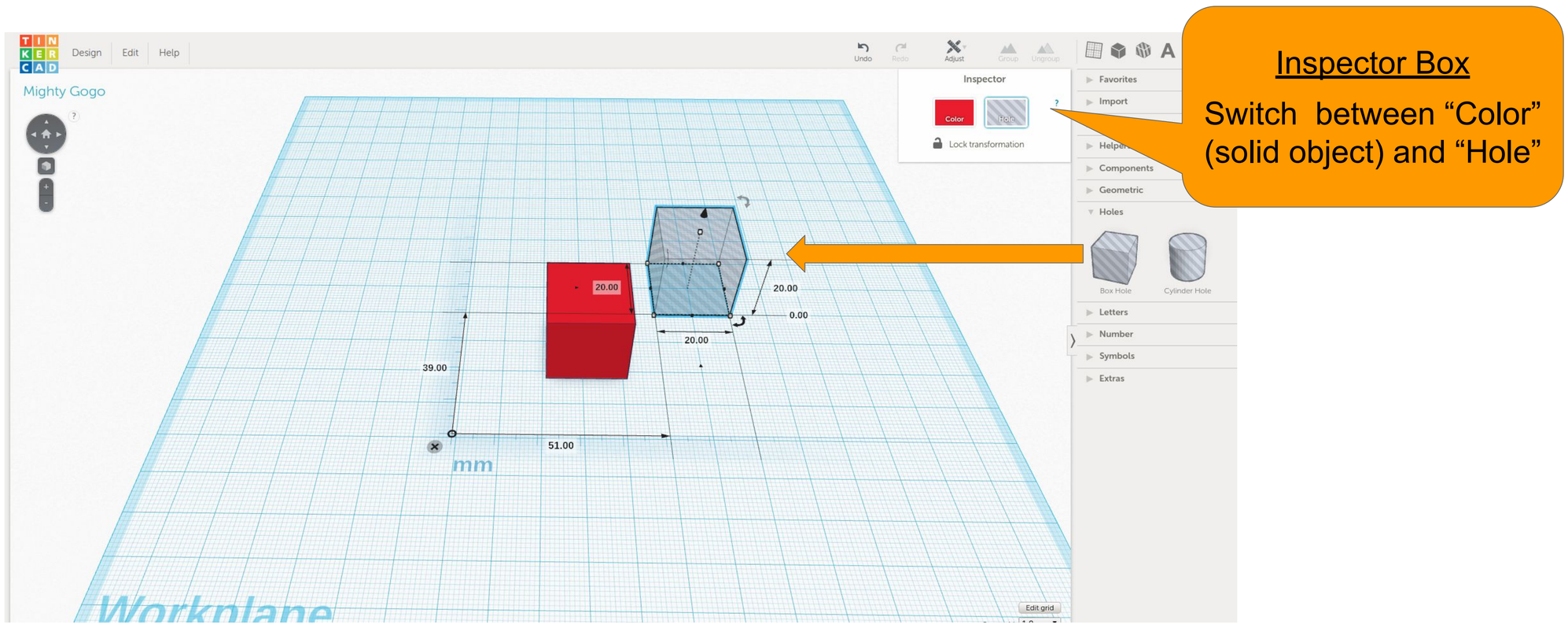
Sometimes you might need to rotate the camera perspective to see all of the rotation handles (↻). Click and drag with the right mouse button (or hold Ctrl + left mouse button) to rotate the camera perspective.



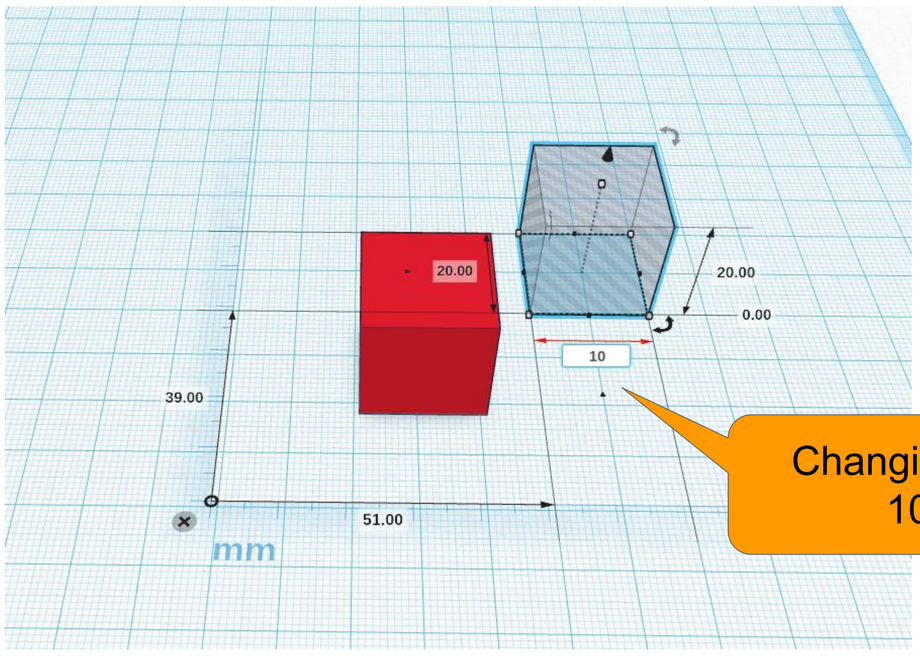
Tinkercad Tips

Making A Hole

To make a hole you can use the **Box Hole** and **Cylinder Hole** tools or you can use any shape by changing from “Color” to “Hole” in the inspector box.



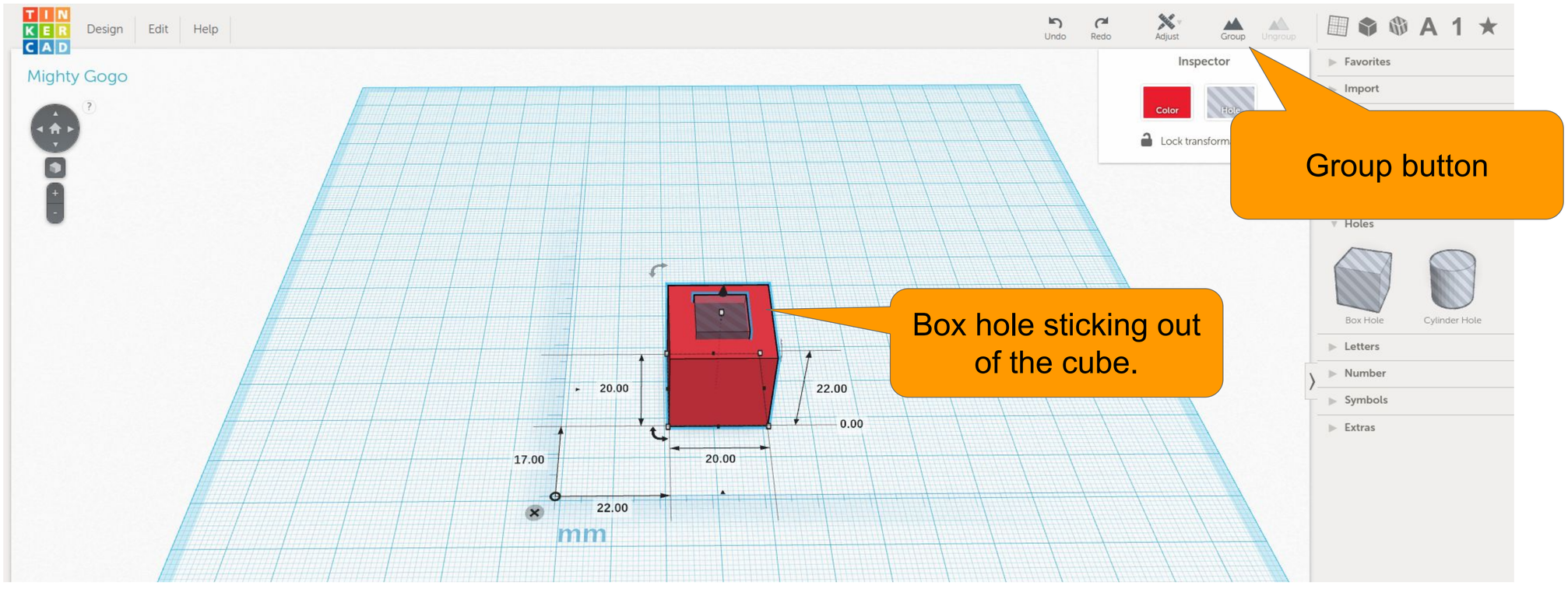
Let’s say we want to cut a 10mm hole out of this 20mm box. First I will bring a **Box Hole** onto the workplane and resize it to 10x10x10 by typing in the measurement boxes (You may have to rotate the camera to see all the boxes).



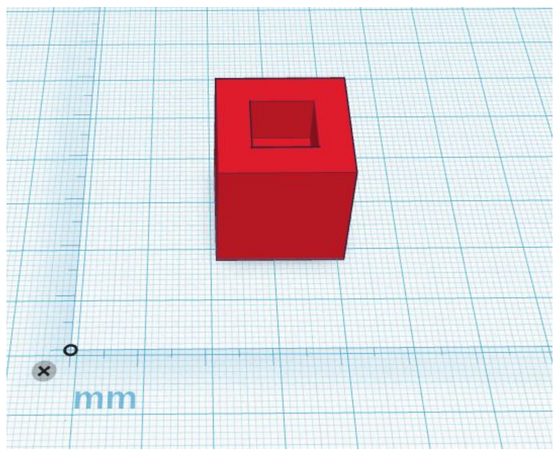
Tinkercad Tips

Making A Hole (cont.)

Now place the **Box Hole** where you want make a hole in the cube. Once the hole is in place, hold the Shift key and click both objects so they are both selected. With the cube and the hole objects selected click the Group button. It may take a minute for the grouping to process, once it is ready the hole object will disappear.



Click off of the object to deselect it, you will see the newly created hole!

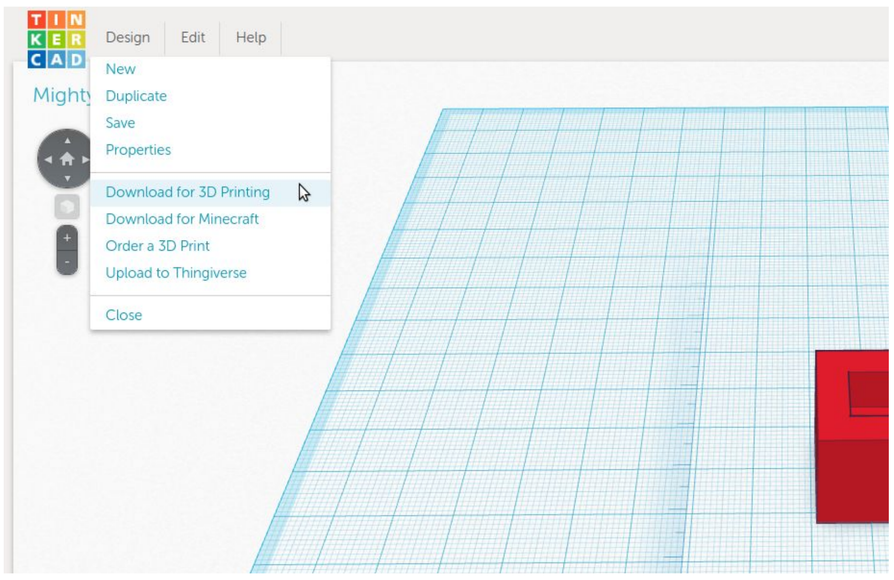


You can always modify the hole by clicking back selecting the object and clicking the Ungroup button

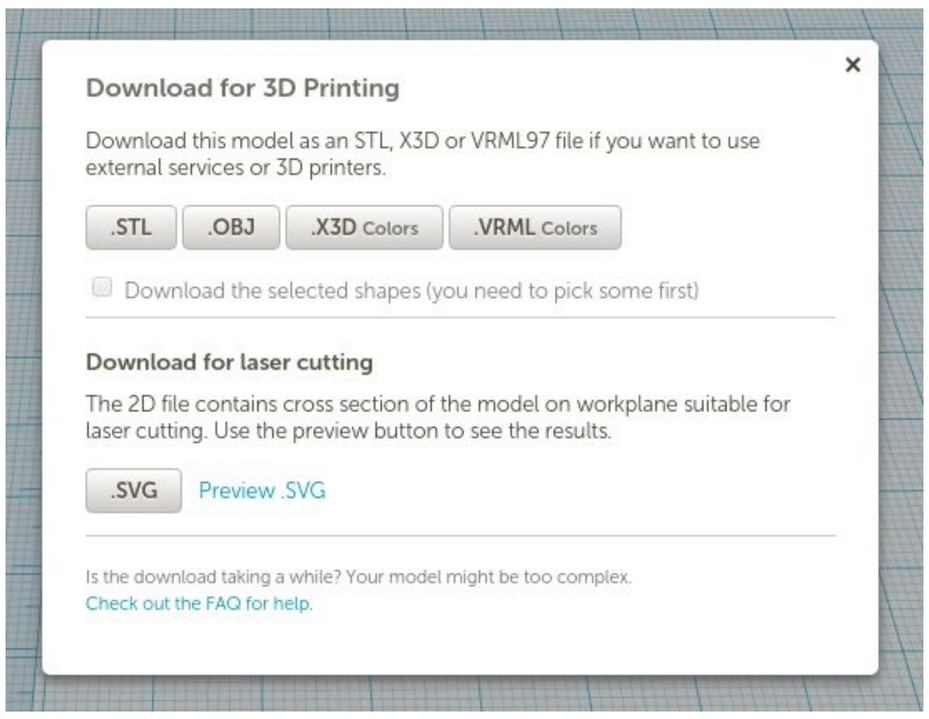
Tinkercad Tips

Download for Printing

Once you are happy with the design we need to download it so we can prepare it for the 3D printer. Click on Design then “Download for 3D Printing”.



We want an .stl (stereolithography) file, which is common 3D model format used with many 3D printers.



That’s it! Now we have a 3D model that is ready to be prepped for 3D printing. Unfortunately, 3D printers can’t read .stl files directly. What we need to do next is a process called “slicing”. Slicing is the process of converting a 3D model to instructions for the 3D printer which is known as GCODE.

Guiding Questions

Bee-Bot:

1. How did you figure out the length of one bee-unit?
2. In what real-world situation would programming a robot be relevant?
3. What would you do differently next time?

WeDo:

1. How did working with in a team influence this challenge?
2. What strategies did you use to figure out the interaction between the two motors?
3. What did you notice about this process?
4. What would you do differently next time?

Scratch Jr.:

1. How did you choose to visually represent your equation?
2. What did you notice about your interaction between your character and your algorithm?
3. What would you do differently next time?

TinkerCAD:

1. How did you use specific attributes of figures to design your city?
2. What would happen if you were restricted to using figures with circular bases?
3. What would you do differently next time?