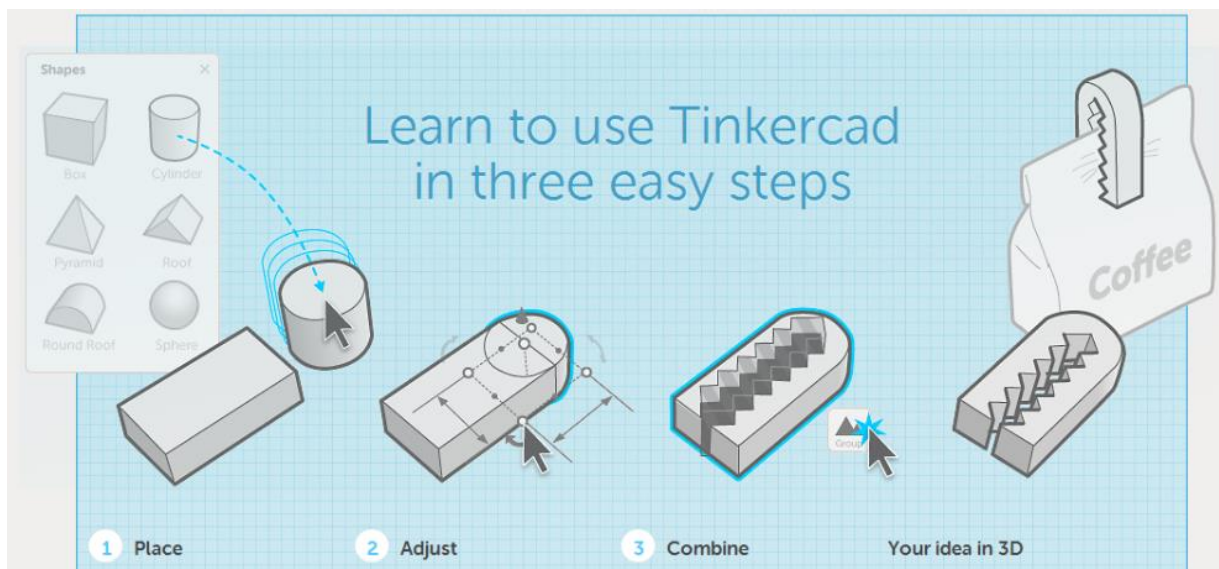**3D Modelling Project**

Introduction to 3D Design with TinkerCAD

Difficulty: Beginner

Introduction

TinkerCAD is an amazing tool that gives users the opportunity to make 3D design on a web browser. It uses the webGL framework to quickly render 3D models of objects on your web browser. TinkerCAD is very easy to learn as it uses the three step approach to build any 3D object.

Resources

The items to be used for the project are:

- Laptop with internet connectivity
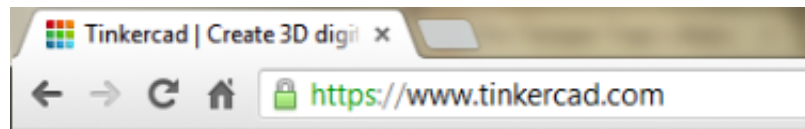- Internet Browser (Google Chrome)
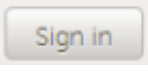
Additional resource for the project is:

- Working e-mail account

Procedure

Getting Started

➤ Start you preferred Internet Browser on your computer
➤ Go to the URL *tinkercad.com* on your internet browser

➤ **Optional:** If you don't have a TinkerCAD user account, Sign-up for one for free using the sign up button at the top right corner of the page
➤ **Optional:** Provide a username, email account and password for the TinkerCAD account creation
➤ If you have a TinkerCAD user account click on the Sign-in button at the top right corner of the web page
➤ If you do not want to create an TinkerCAD user account scroll down the page and click on the *Start the editor* button
➤ **Optional:** There is an instructional tutorial video available at the TinkerCAD home page which explains the basics of using TinkerCAD

Creating Design

➤ Once signed in you are directed to the All designs page where all your models and designs will be stored

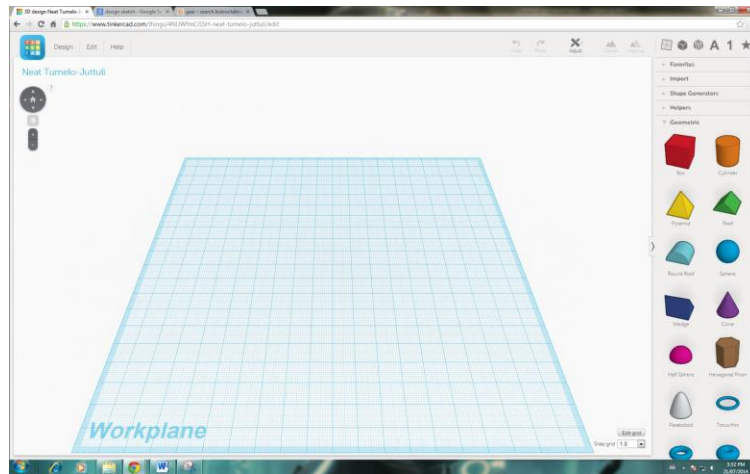➢ Click on the **Create new design** button to be directed to the webGL design environment

Figure 1: TinkerCAD design environment

➢ Click on the Cylinder button under the ▼ **Geometric** section of the right sidebar
➢ Click anywhere on the Workplane to place the selected Cylinder object on the wireframe plane
➢ Select the object on the wireframe by clicking on it
➢ Click on the white point at the top plane on the Cylinder object
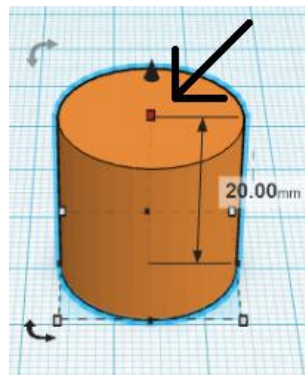

Figure 2: Cylinder object and dimension point

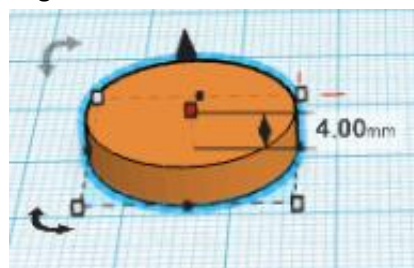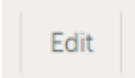➢ Drag the point down until the height measure 4mm

Figure 3: Vertically resized Cylinder object

➢ Select the resized Cylinder object

➢ Click on the Edit button [Edit] on the main top bar in the environment and select copy

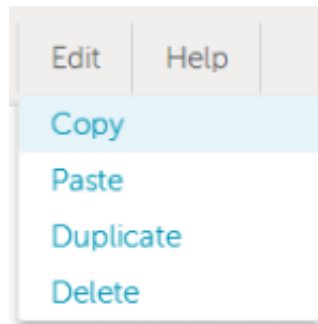| Edit	Help
Copy	
Paste	
Duplicate	
Delete	

Figure 4: Toolbar Edit menu options

➢ Click on Edit button again in the toolbar and select the Paste option to paste a copy of the Cylinder object

Note: You can also use *Ctr+C* to copy and *Ctr+V* to paste any selected object

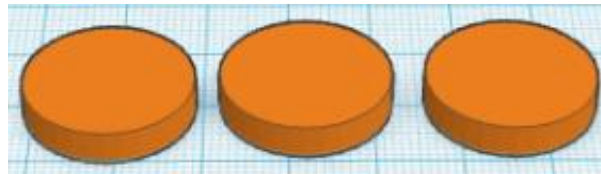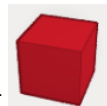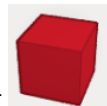➢ Do the copy and paste of the Cylinder object again to have a total of 3 Cylinder objects on the Workplane

Figure 5: Three Cylinder objects on the Workplace

➢ Select the Box object in the side bar and click on the Workplane to place a Box on the wireframe
➢ Use the top point on the object to resize the Box object to a height of 4mm
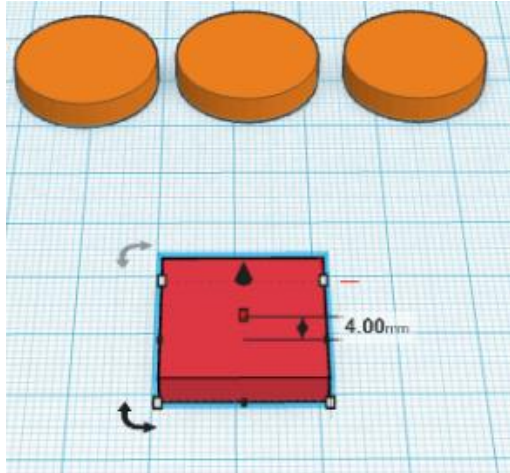➢ Move the resized Box object closer to the set of resized Cylinder objects

Figure 6: Resized Box object on the Workplane

Note: You can resize any object on the horizontal or vertical direction by selecting the object, clicking on the corner point at the base of the object and dragging the point away or towards the center of the object.
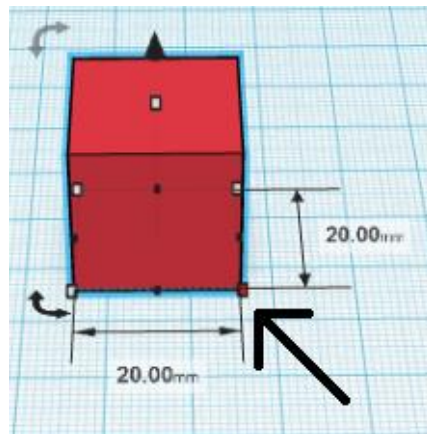

Figure 7: Resizing an object along an axis in TinkerCAD

➢ Add another Cylinder to the Workplane and select it
➢ Click on the bottom corner point of the Cylinder and hold the *Shift* key on your keyboard
➢ Drag the corner point diagonally while pressing the *Shift* key until the Cylinder has a diameter of 4mm
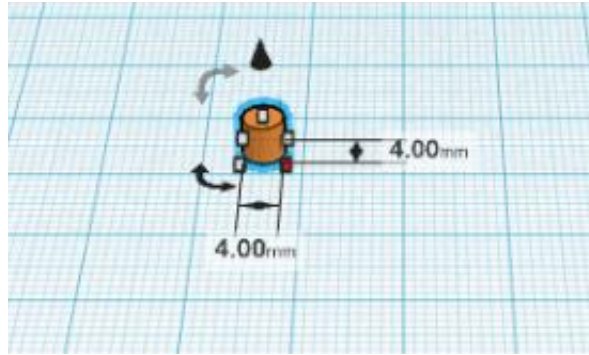
Figure 8: Resizing the Cylinder diameter

➢ Click on the top point on the selected 4mm diameter Cylinder object
➢ Pull the point vertically upwards until the Cylinder has a length of 60mm
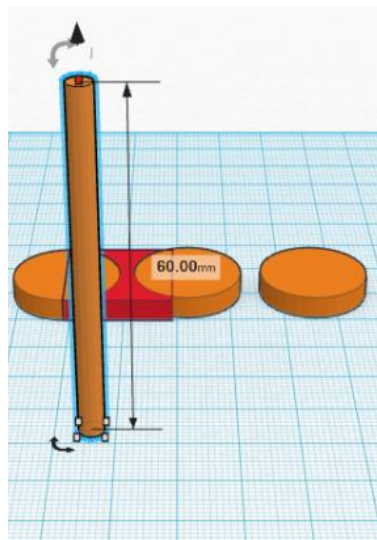

Figure 9: Increasing the Cylinder object length

➢ Add another Box object to the Workplane
➢ Use the dimension point at the bottom of the new Box object to change the base of the Box object to a dimension 12mm by 4mm
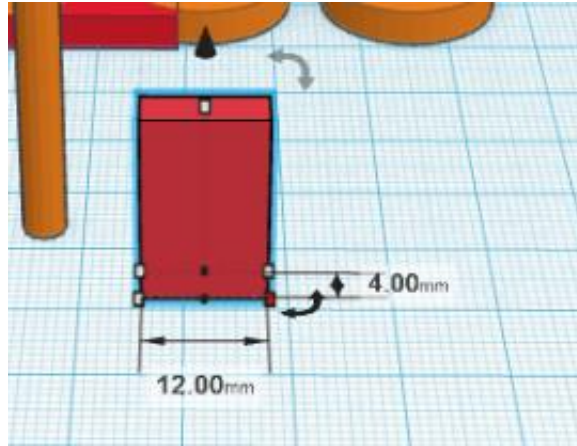
Figure 10: Resizing new Box object

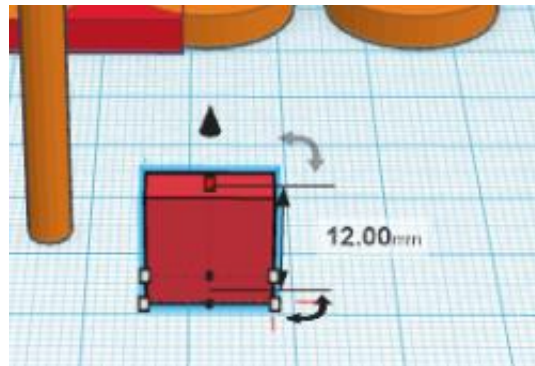➢ Use the dimension at the top of the Box object to change the height to 12mm

Figure 11: Changing the height of a Box object

➢ Add another Box object to the Workplane
➢ Change the dimension of the new Box object to change the cross section to 6mm by 4mm
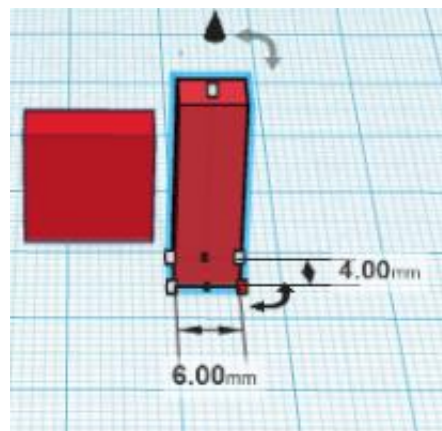

Figure 12: Box model cross-section
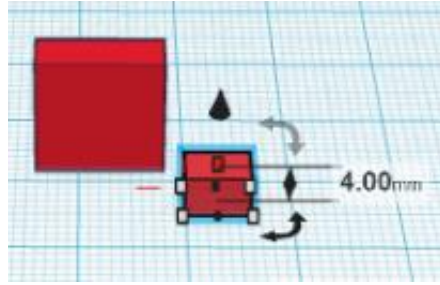
➢ Chang the height of the Box object to 4mm

Figure 13: Box object height change

➤ Select the 6mm by 4mm by 4mm box model and
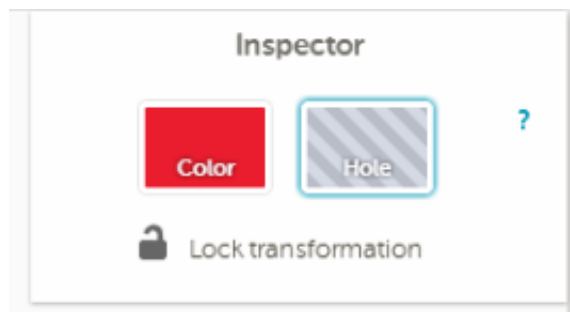➤ Using the *Inspector* menu at the top right of the page change the format of the object to *Hole*

Figure 14: Object Material selection

Note: You can change the material type of an object using the *Inspector* menu. Changing the material of an object to hole removes all the material within the boundaries of the object.

➤ Bring the new Box object with the hole-type material to the base of the larger Box object
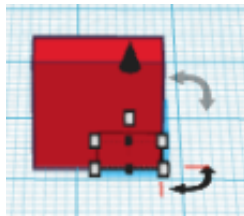

Figure 15: Relocating the hole-type Box object

➤ Raise the hole-type Box object using the black cone-shaped arrow
➤ With the smaller Box object still selected, click on the cone-shaped arrow and drag it up until the location of the hole-type box from the base is 4mm
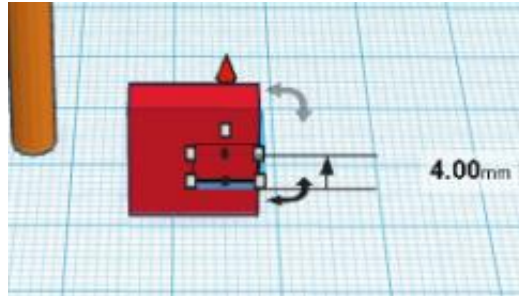
Figure 16: Moving an object on the z-axis

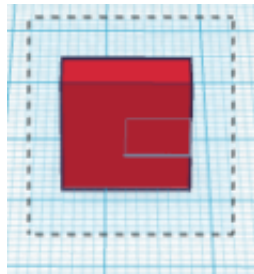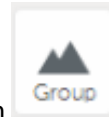➤ Highlight the Box object by right clicking on the mouse and selecting over the objects

Figure 17: Highlighting the Box objects

➤ While the objects are highlighted, click on *Group* button on the top bar of the page
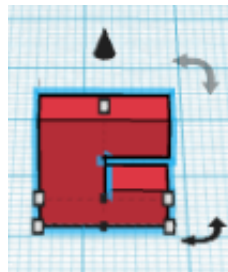➤ Using the group tool merges both Box objects to form a hollowed Box object

Figure 18: Box objects as a single object

➤ Bring the Box object close to the 4mm diameter Cylinder object by clicking and dragging the object
➤ Make sure the Box object touches and overlaps with the Cylinder object
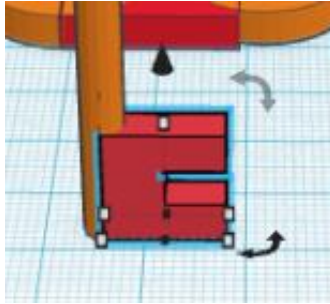
Figure 19: Relocating the shaped Box object

➢ With the Box object still selected, click and drag the cone-shaped arrow at the top of the object to bring the object to a height of 4mm from the base
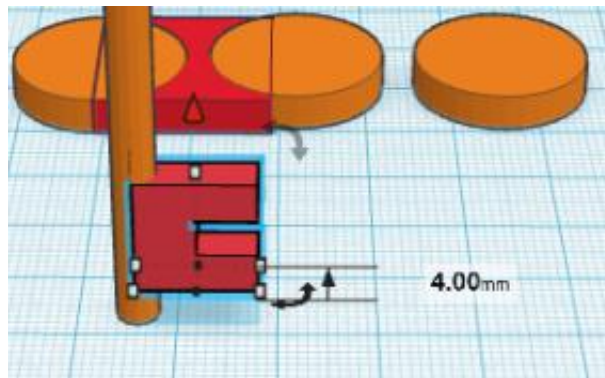

Figure 20: Changing elevation of shaped Box

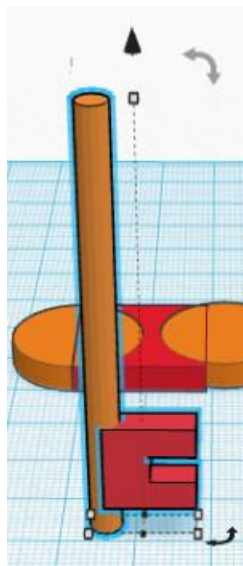➢ Using the mouse highlight both the Cylinder object and the hallowed Box object

Figure 21: Highlighting multiple objects
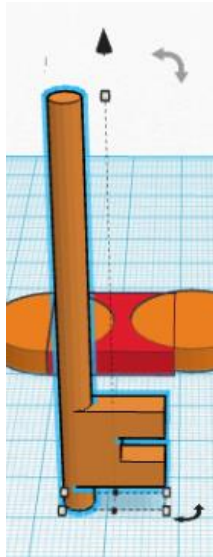
➢ Use the *Group* tool again to merge both objects

Figure 22: Merged Cylinder and Box objects

Note: You can easily highlight multiple objects or elevated objects by clicking on the mouse and dragging over some parts of the object

➢ Change the orientation of the Workplane by clicking on the right arrow twice on the Orientation wheel

Figure 23: Workplane Orientation wheel

➢ With the merged object still selected, mouse over the bi-directional arrow at the top right corner of the object and rotate the object to 90° or parallel to the Workplane
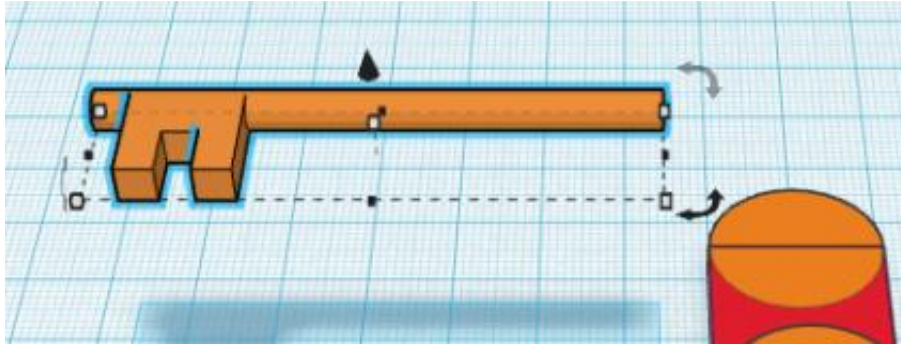
Figure 24: Merged object parallel to the Workplane

➢ Bring the merged object down to the Workplane by clicking on the cone-shaped arrow and dragging it down vertically
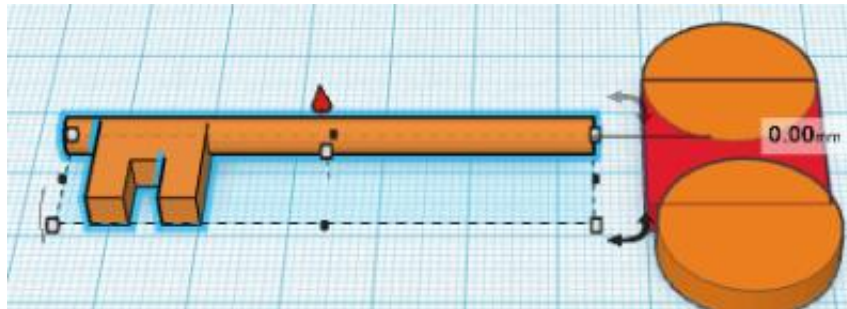

Figure 25: Reducing elevation of merged object

➢ Set the Orientation back to default using the Home button ![home] on the Orientation wheel

➢ Change the orientation of the Workplane by clicking on the up arrow ![up arrow] on the Orientation wheel until the Workplane is flat on your computer screen

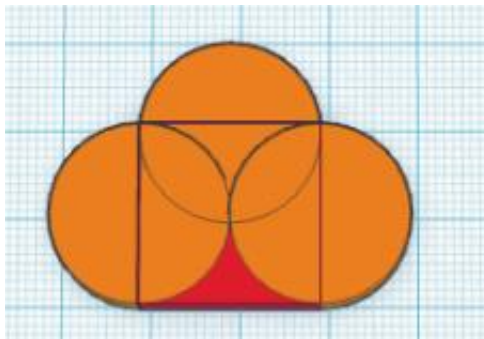➢ Move the three Cylinder objects to intersect within the Box object at the

Figure 26: Intersecting Cylinder and Box objects

➢ Move the merged Box object to the center of the intersecting Cylinder and Box objects
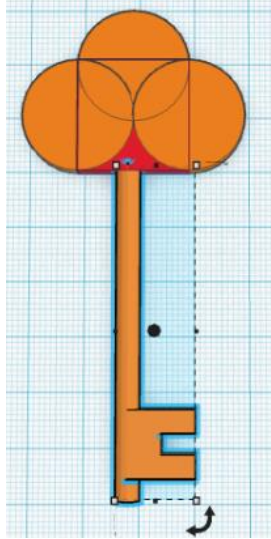
Figure 27: Intersecting all objects

- ➢ Add another Cylinder object to the Workplane using the right sidebar
- ➢ Change the diameter of the new Cylinder to 4mm using the *Shift* key and dragging the corner of the object
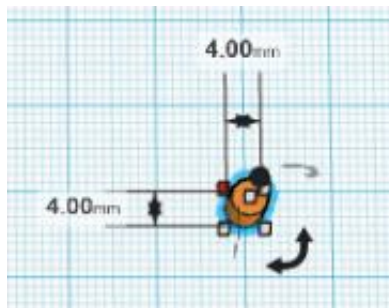

Figure 28: Resized Cylinder object

- ➢ Change the Cylinder object to hole-type using the *Inspector* menu
- ➢ Copy and paste the hole-type Cylinder object twice to make two more copies of the object
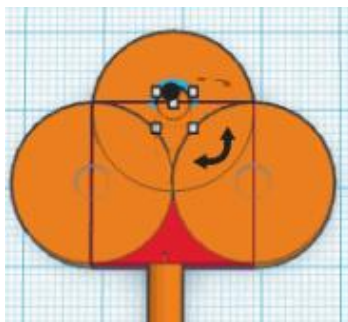- ➢ Relocate the hole-type Cylinder objects to the center of the intersecting Cylinder objects

Figure 29: Relocating the hole-type Cylinder objects

➤ Select on the top most hole-type Cylinder object
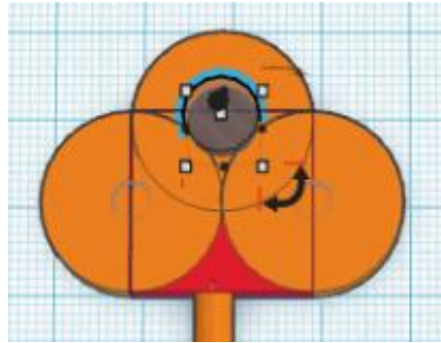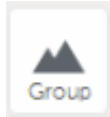➤ Change the diameter of this hole-type Cylinder to 8mm and make sure it is centered

Figure 30: Resizing the hole-type Cylinder

➤ Select all the object on the Workplane and use the *Group* tool [Group] to merge them together
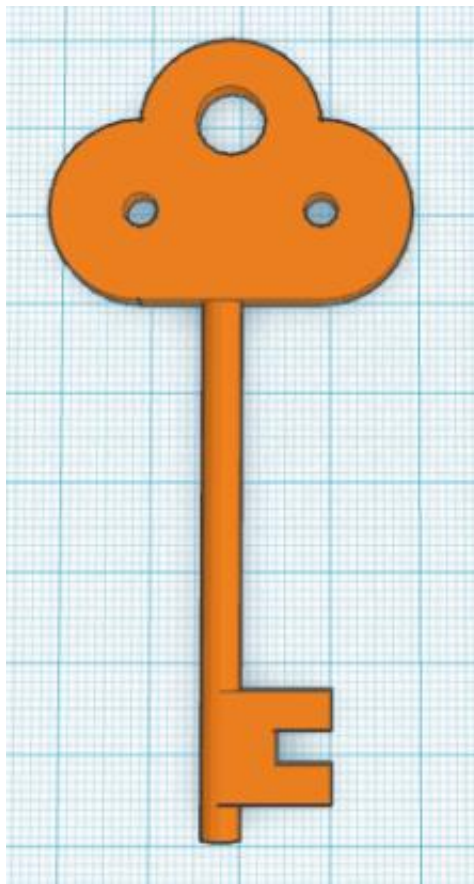

Figure 31: Completed Key object

Exporting Design

➢ Once your design is done you can export the design for 3D printing

➢ Select **Design** from the top menu on the page

➢ From the design options select **Download for 3D Printing**

➢ From the **Download** window click on **.STL**

➢ This will open a **Save As** window where the 3D model can be save locally with .STL file extension