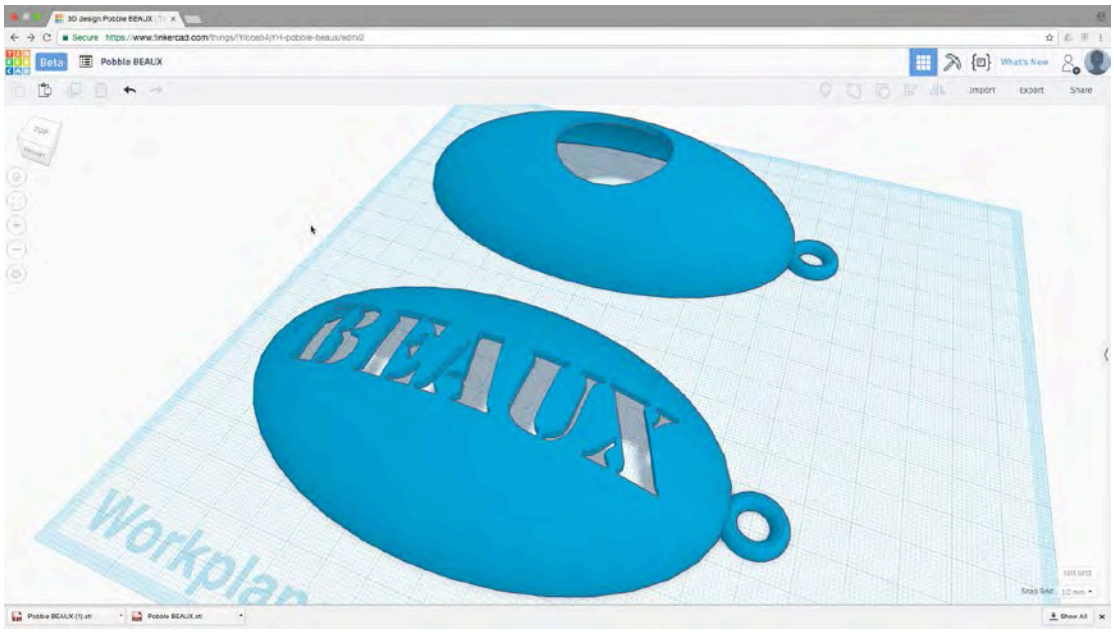
AUTODESK®
TINKERCAD®

Principles of Design Thinking: Tinkercad
Print Guide



Abstract
The principles of design thinking are problem-solving skills that transform professions, from entertainment to international development. Integral to the design-thinking process is the prototyping stage, which is when ideas become physical reality. The following beginner-level Fusion 360 demonstration tutorials are designed for engineers, machinists, makers, artists, teachers, students, or the just plain curious. The tutorials focus on developing the Pobble BEAUX: Carrier Bag Reuse Container to help eliminate single-use plastic bags.

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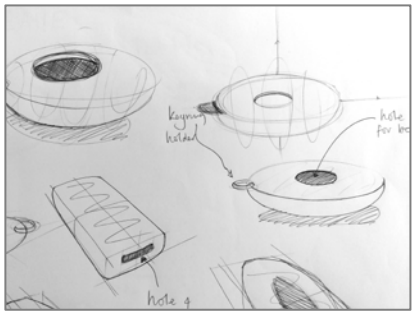
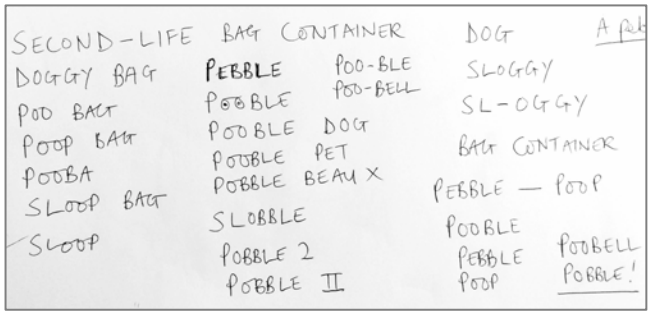
Background to the Pobble BEAUX project

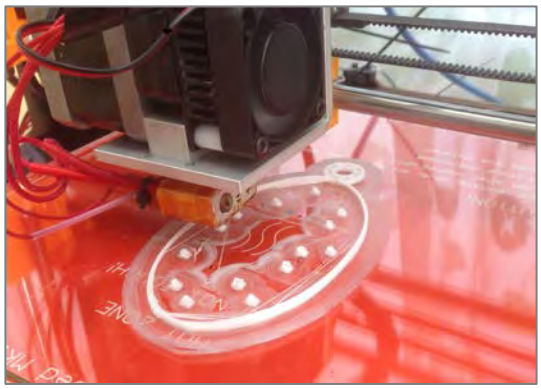
The Pobble BEAUX is a convenient personal product suitable for dog walkers. It allows users to easily store and reuse single-use plastic bags. The storage solution is not limited to dog walkers—it is designed for a wide variety of users, applications, and uses.

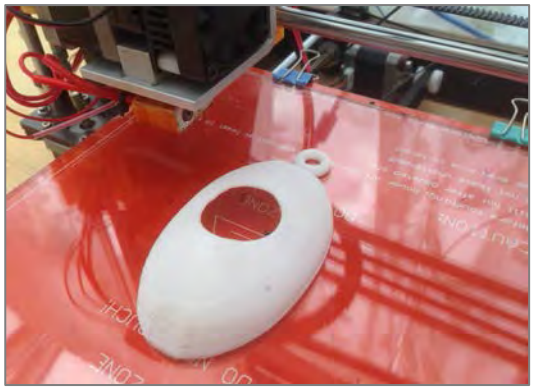
Pobble is smooth like a pebble, with no protruding sharp edges. It is a simple hollow design with a single hole to insert and remove bags. Its handy key-ring holder can be easily slipped in and out of a bag or pocket, or hung on a key ring and dog leash.





The Pobble BEAUX is specifically designed to be printed from a 3D printer using polylactide (PLA). PLA is biodegradable and bioactive thermoplastic aliphatic polyester derived from renewable resources, such as cornstarch (in the United States and Canada), cassava roots, chips, starch (mostly in Asia), or sugarcane (in the rest of the world). PLA is a popular and widely used 3D-print feedstock—particularly for small-scale use in affordable desktop printers used by small enterprises, schools, and hobbyists.





In the following beginner-level Tinkercad lessons, you will be guided through how to model and export the Pobble BEAUX for 3D printing, or import to Autodesk Fusion 360. After completing these lessons, you will be able to apply this new knowledge to your own designs.

Lesson 1: Create a half sphere with key-ring holder

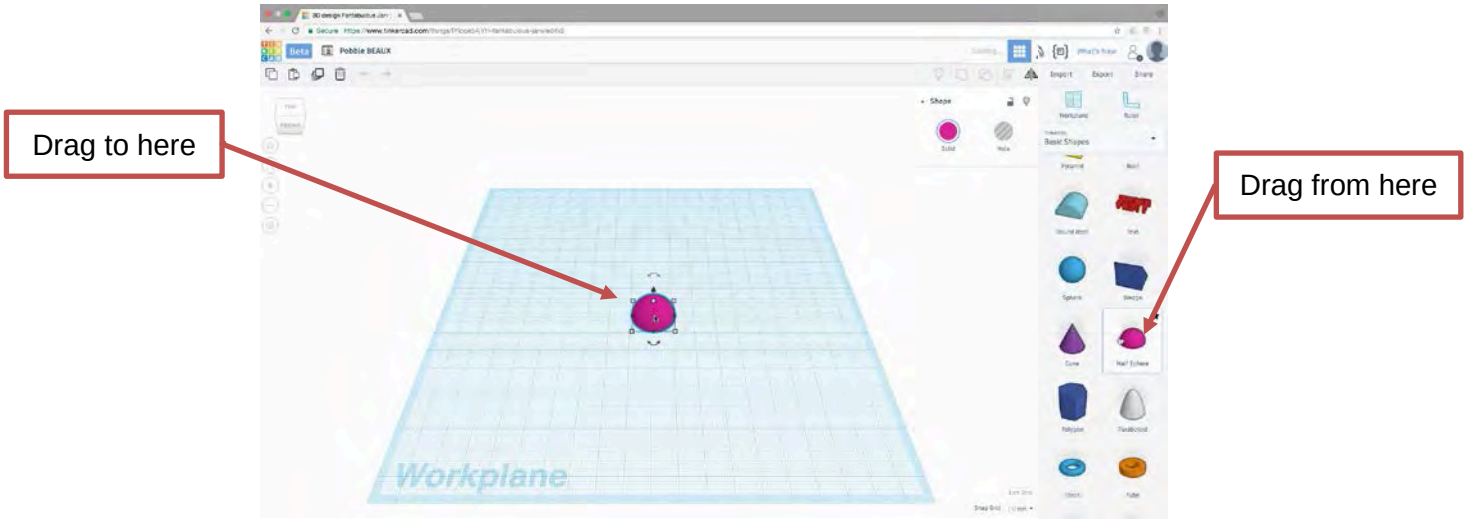
Watch the video to learn how to begin modeling the Pobble by creating a half sphere with a key-ring attachment using Tinkercad.

After completing this lesson, you will be able to:

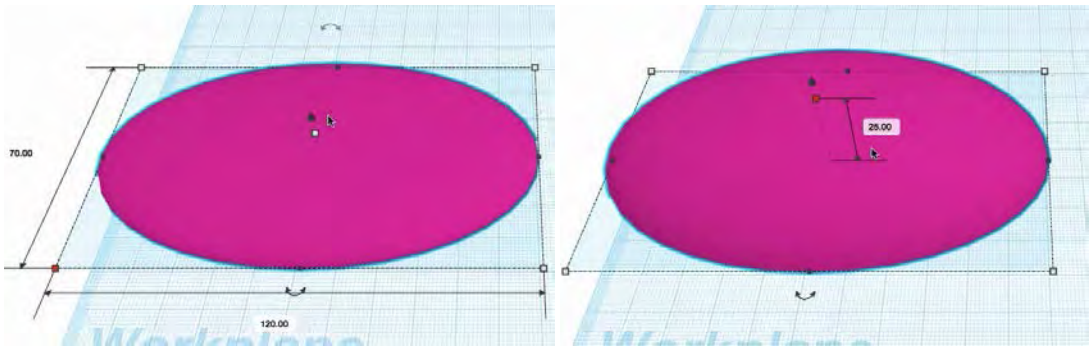
- Use Tinkercad to create a half sphere using solids and holes.
- Use Tinkercad shapes to create a key-ring holder.
- Use Tinkercad to align parts.

Step 1: Create a half sphere and specify the dimensions

1. Click and drag a Half Sphere from the Shapes panel and place it on the Workplane.

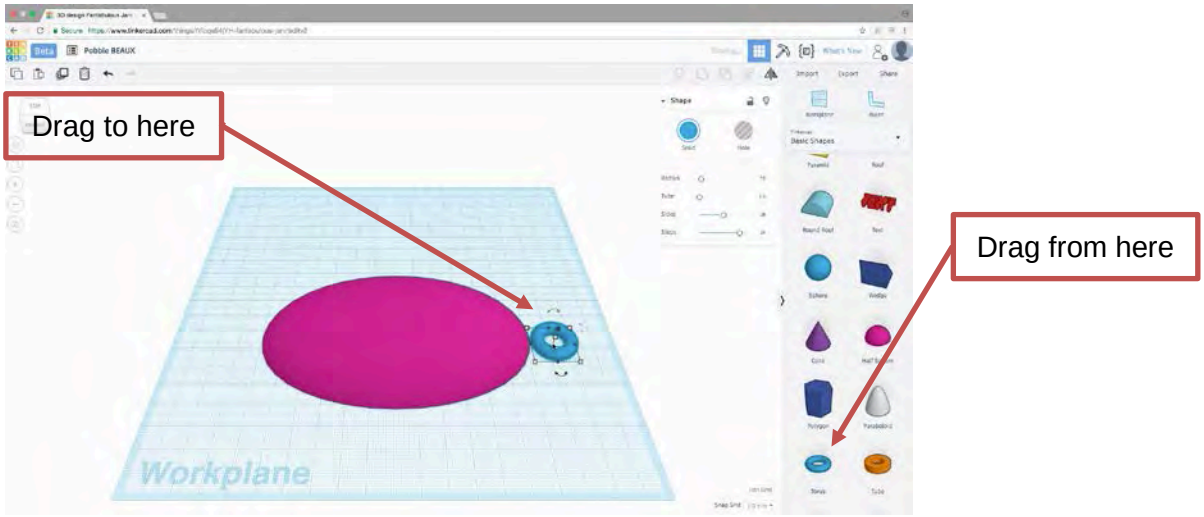


2. Click and drag to **120** mm length, **70** mm width, and **25** mm height, or enter the values directly.

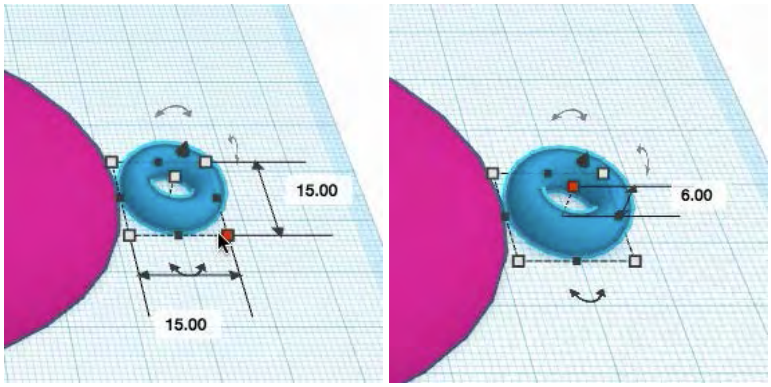


Step 2: Create a key-ring holder

1. Click and drag a torus from the Shapes panel onto the Workplane near the half cylinder.

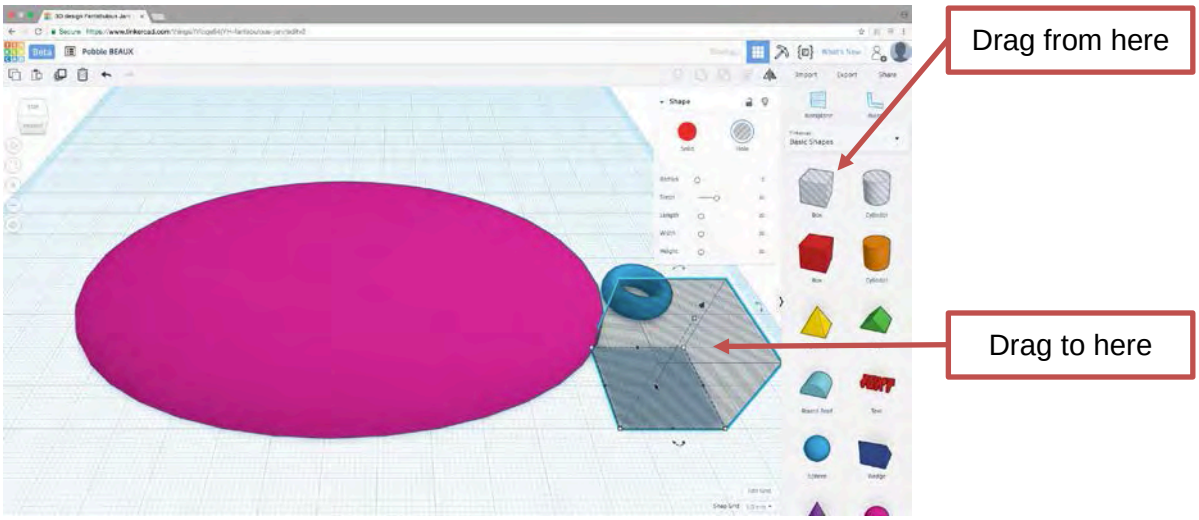


2. Click and drag to **15** mm length, **15** mm width, and **6** mm height, or enter the values directly.



Step 3: Remove the lower half of the key-ring holder

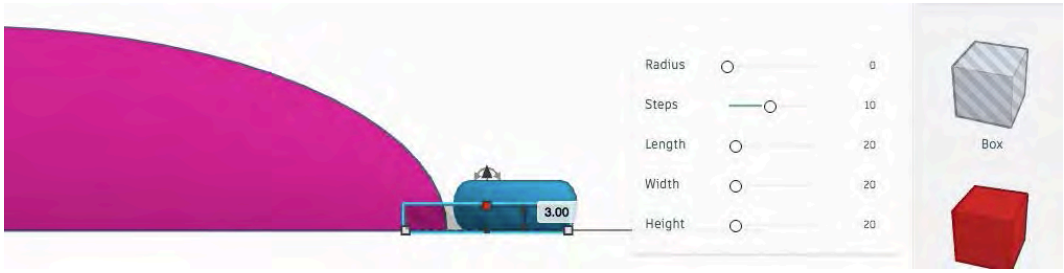
1. Click and drag a box (hole) from the Shapes panel, and place it on the Workplane near the half key-ring holder.



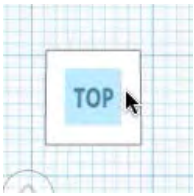
2. Use the View tools to switch to Orthographic view.

3. Click Front on the ViewCube.

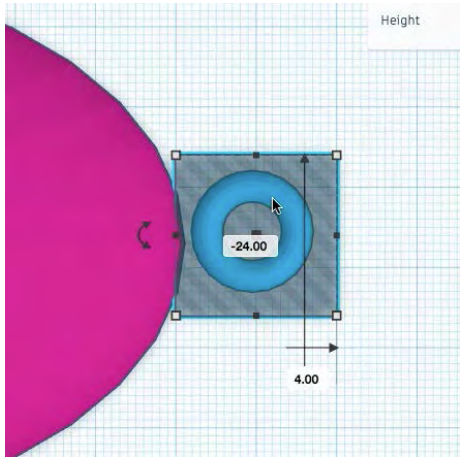
4. Click and drag to a height of **3** mm, or enter the dimension directly.



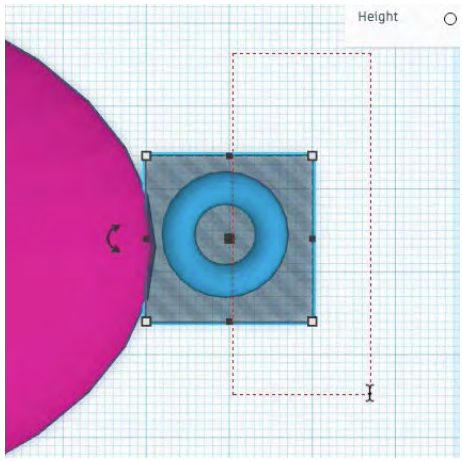
5. Click Top on the ViewCube.



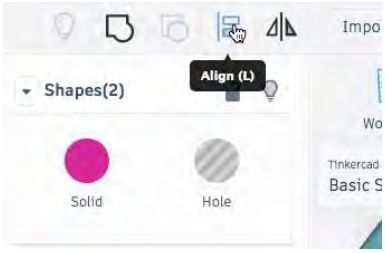
6. Click and drag the box (hole) to surround the entire torus.



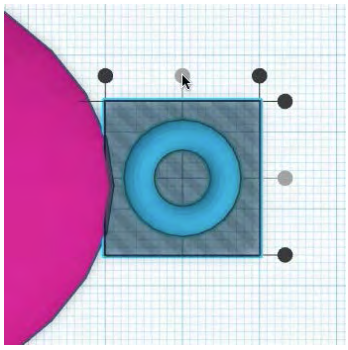
7. Click and drag to select both the box (hole) and torus.



8. On the SubNav bar, click Align.

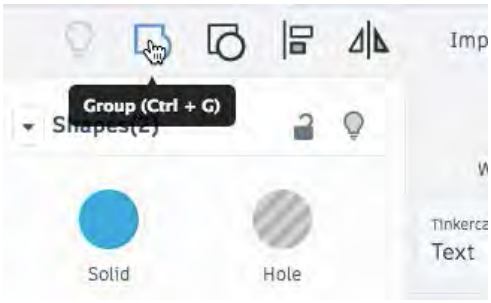


9. Select the black dots to align the center, both length and width.

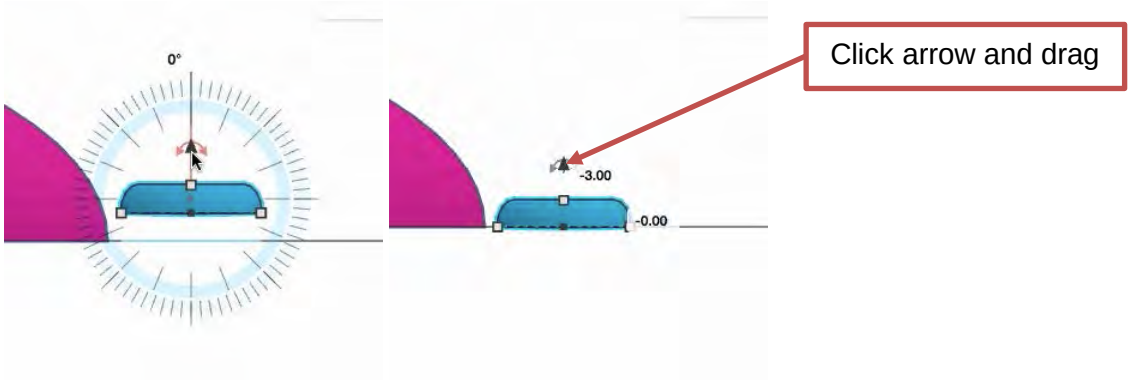


10. Click Front on the ViewCube.

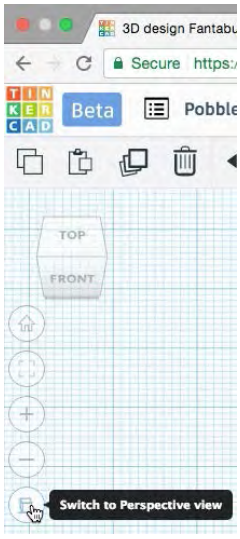
11. On the SubNav bar, click Group. This will also remove the lower half of the key-ring holder.



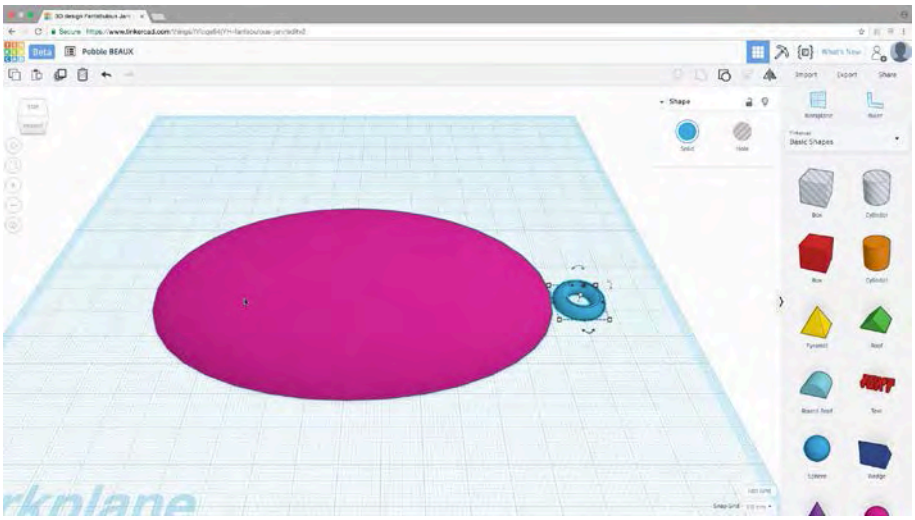
12. Click the arrow and drag the half key-ring holder down **-3** mm to align with the Workplane.



13. Use the View tools to switch to Perspective view.



14. Zoom out to the view model in the Workplane.



Lesson 2: Hollow out the new Pobble part and group with key-ring holder.

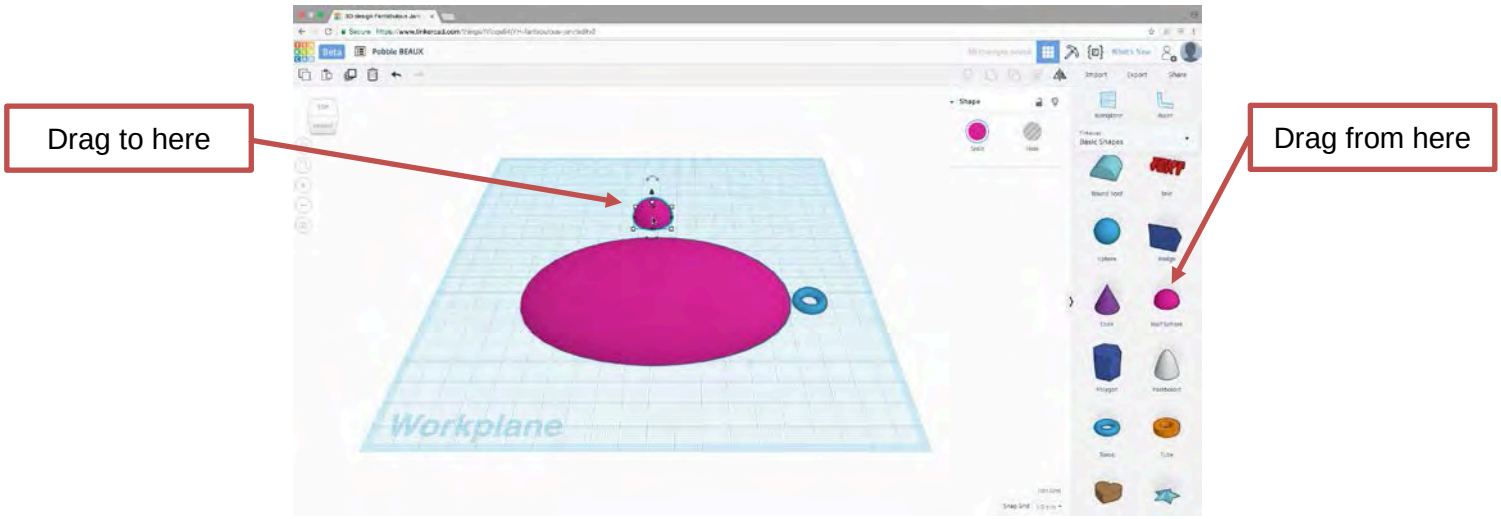
Watch the video to learn how to hollow out the new Pobble part using Tinkercad.

After completing this lesson, you will be able to:

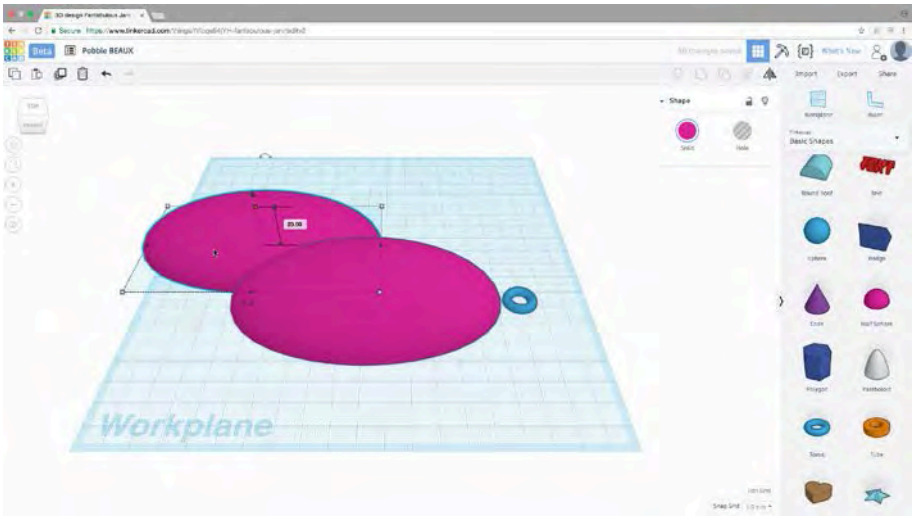
- Use Tinkercad to create a second half sphere and specify dimensions.
- Use Tinkercad to create a hole and hollow the first sphere.
- Use Tinkercad to align and group parts.

Step 1: Create a second half sphere and specify the dimensions

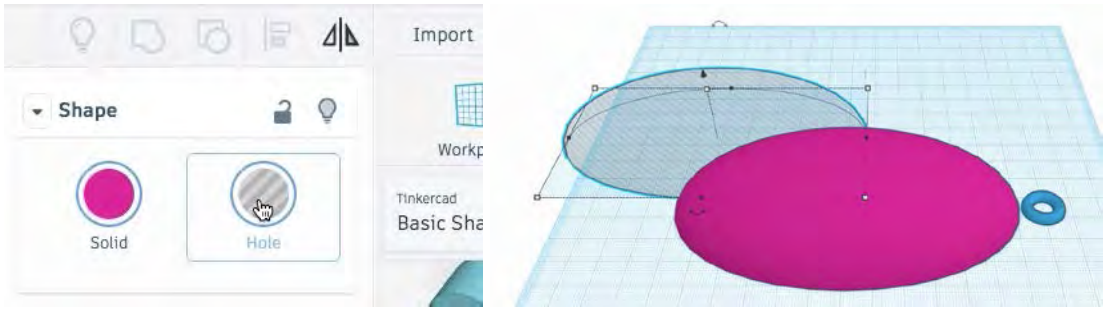
1. Click and drag another half sphere from the Shapes panel and place on the Workplane near the first half sphere.



2. Click and drag half sphere to **118** mm length, **68** mm width, and **23** mm height, or enter the values directly.

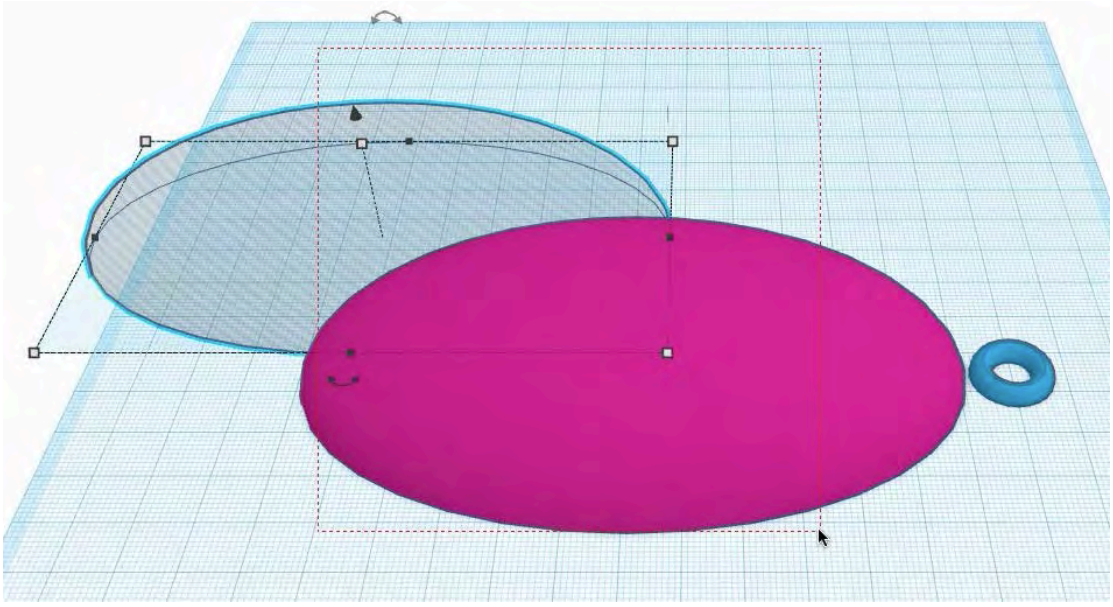


3. Select the half sphere. In the Inspector, click Hole to convert the second half sphere from a solid to a hole.

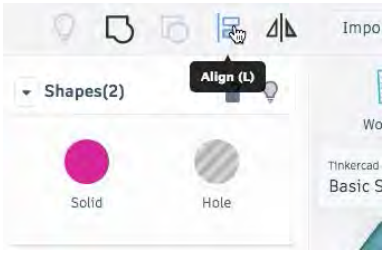


Step 2: Make the sphere a hole and hollow the first sphere

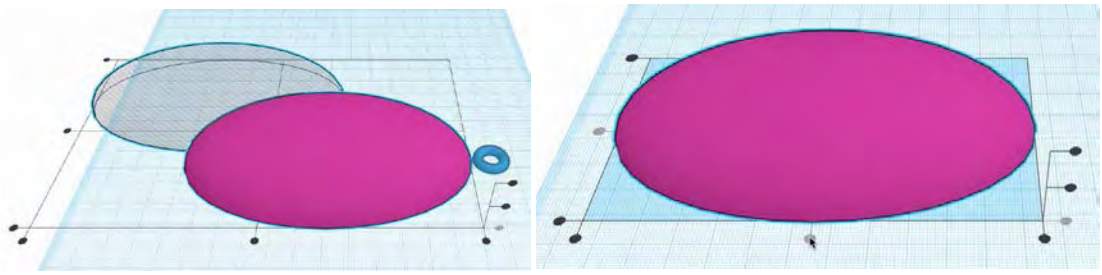
1. Drag a window to select both the sphere object and the sphere hole.



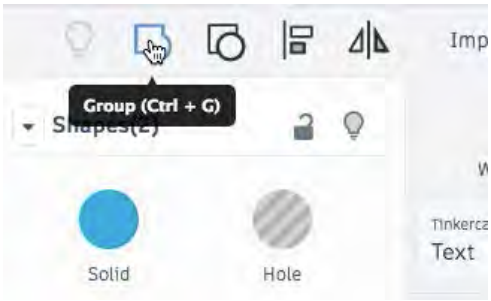
2. On the toolbar, click Align.



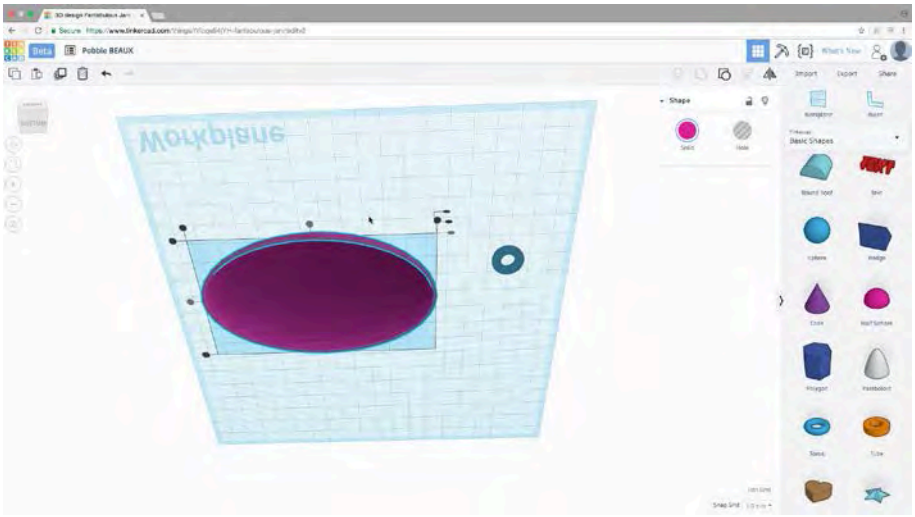
3. Select the black dots to align center, both length and width and to the Workplane.



4. On the SubNav bar, click Group. This will also hollow the Pobble part.

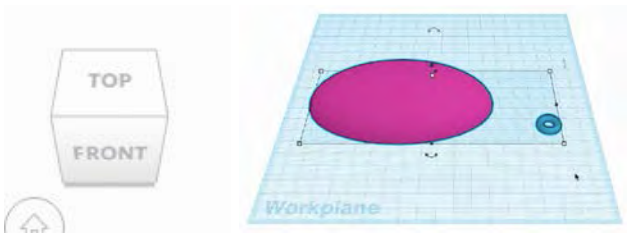


5. Use the ViewCube or Orbit to survey and confirm the new hollow cylindrical part.

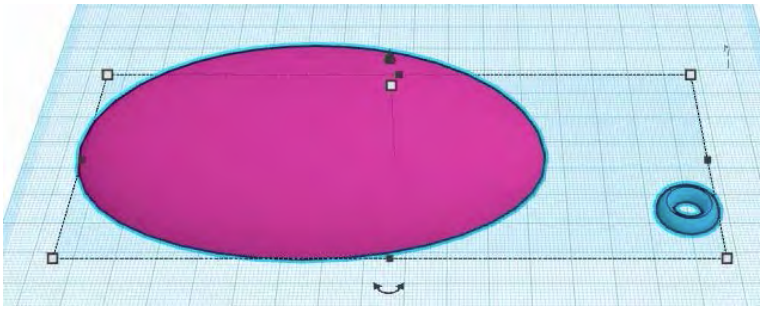


Step 3: Align and group key-ring holder with hollowed Pobble part

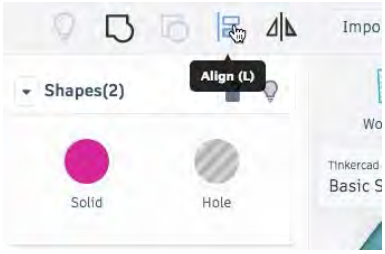
1. Use the ViewCube to obtain a top angled view.



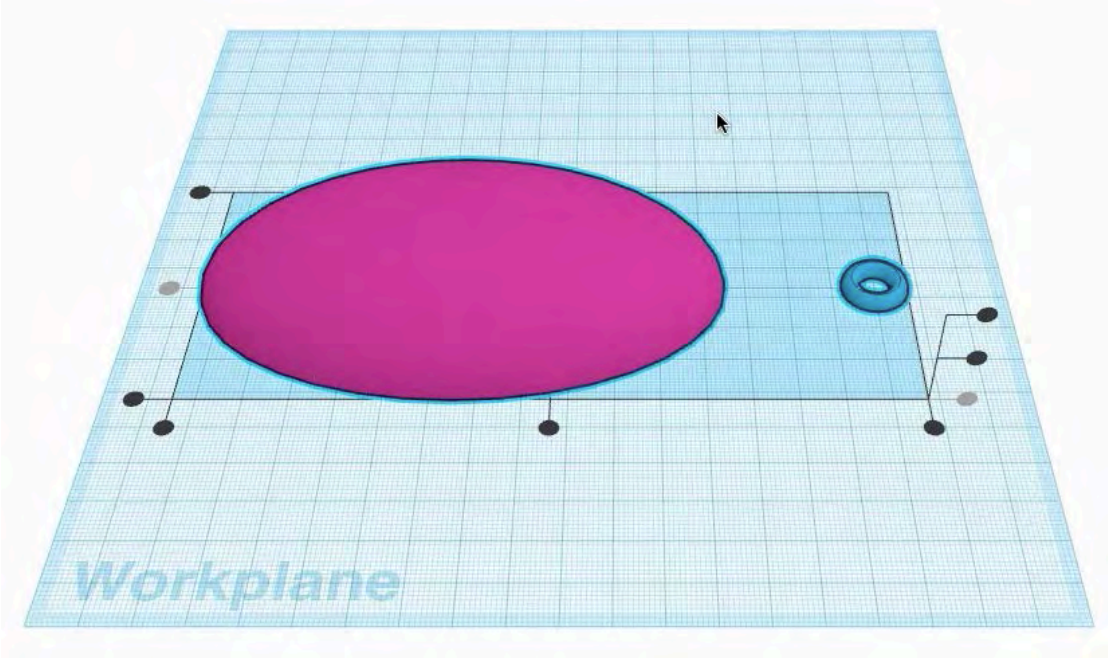
2. Drag a selection window to select the Pobble part and the key-ring holder.



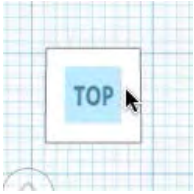
3. On the toolbar, click Align.



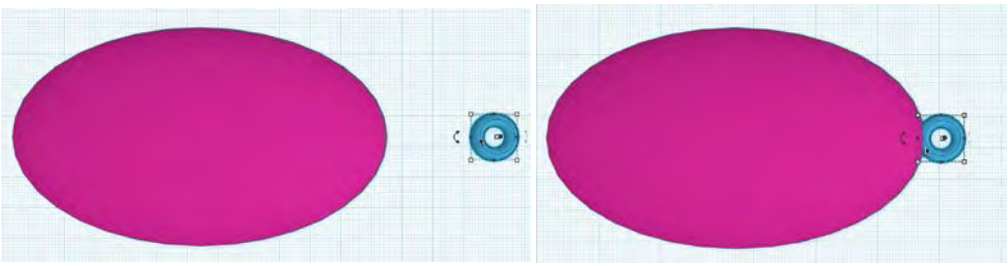
4. Align to center by width.



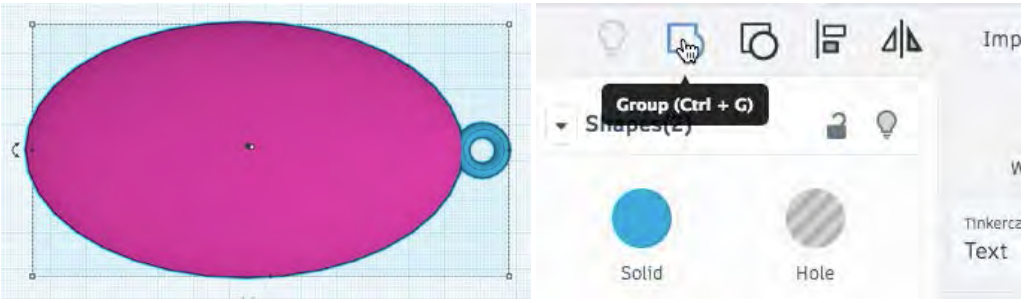
5. Click Top on the ViewCube.

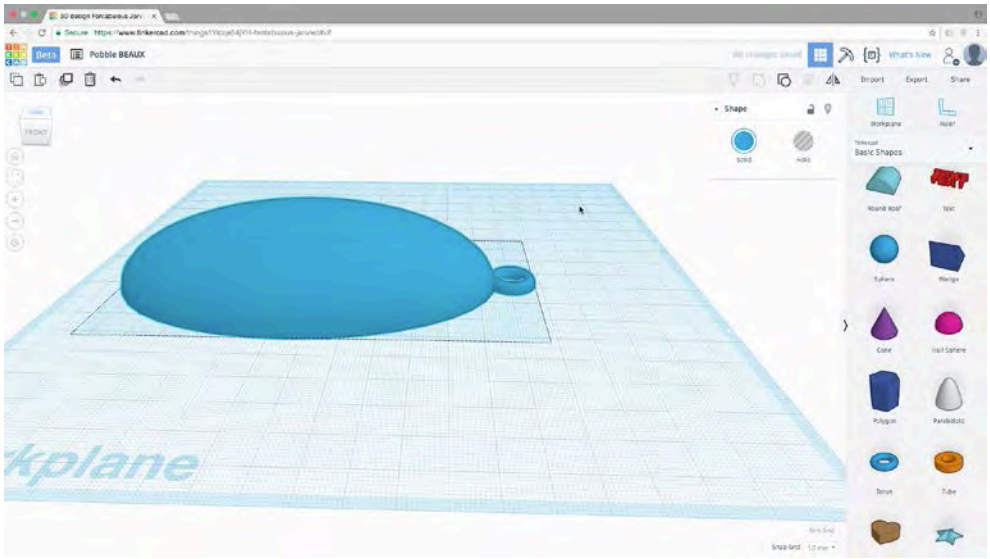


6. Click and drag the key-ring holder to merge with the hollowed Pobble part. Hold Shift to snap to a horizontal line.



7. Drag a selection window to select all parts. Click Group.





Lesson 3: Create a duplicate hollowed Pobble part

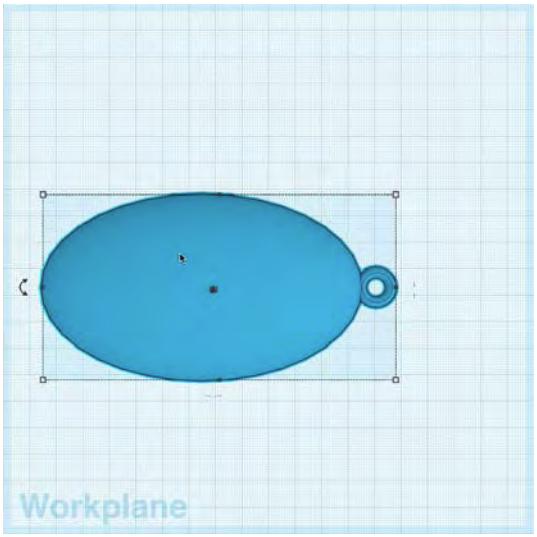
Watch the video to learn how to duplicate parts in Tinkercad.

After completing this lesson, you will be able to:

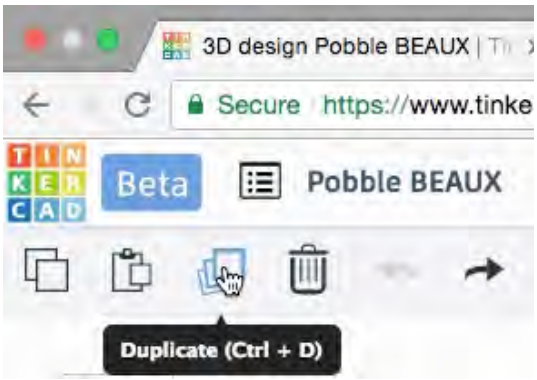
- Use Tinkercad to create a duplicate of the hollowed cylinder part.

Step 1: Duplicate the part

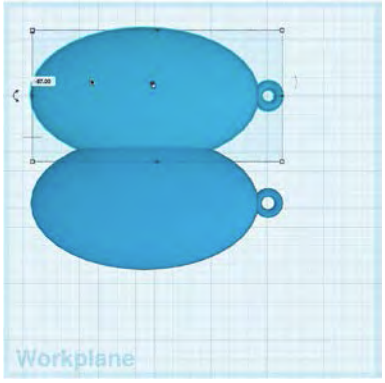
1. Select the hollow Pobble part.



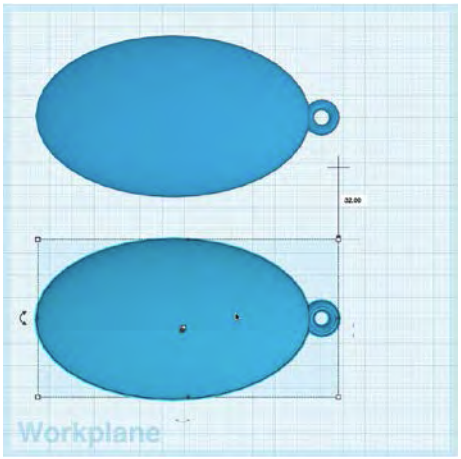
2. On the toolbar, click Duplicate (Ctrl + D).



3. Click and drag to move the duplicate Pobble part to empty space.



4. Click and drag to move the original Pobble part to empty space.



Lesson 4: Create a hole in the duplicate Pobble part

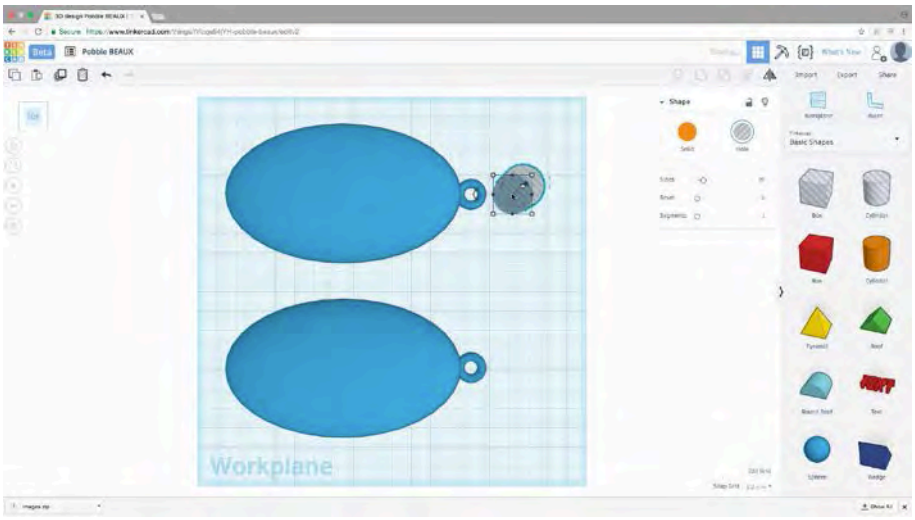
Watch the video to learn how to create the hole in Pobble and to insert and remove bags.

After completing this lesson, you will be able to:

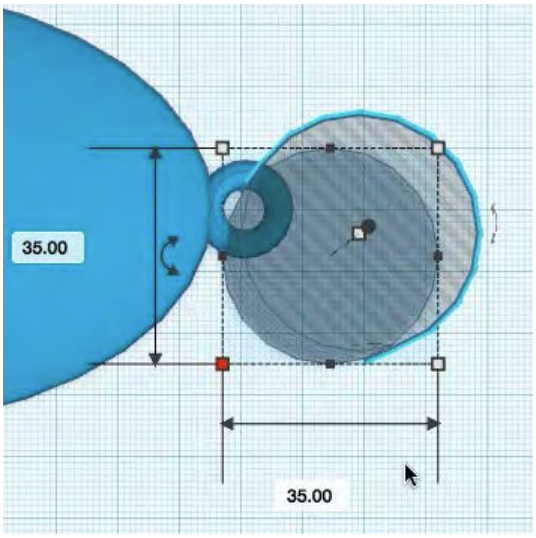
- Create and cut a hole in the Pobble part.
- Use Tinkercad to align and group parts.

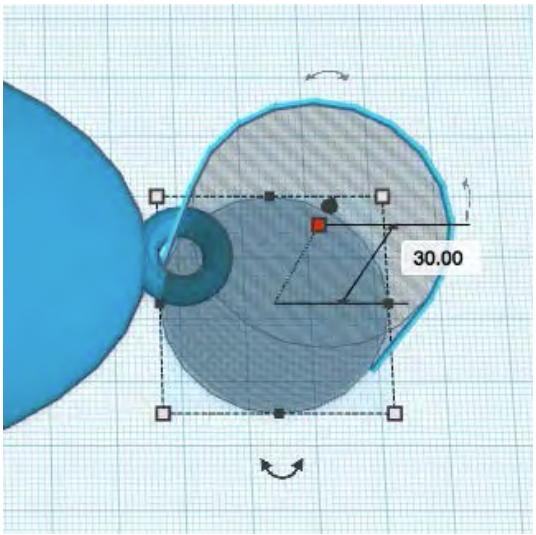
Step 1: Create the hole

1. Click and drag a cylinder (hole) onto the Workplane as near to the duplicate Pobble part as possible.

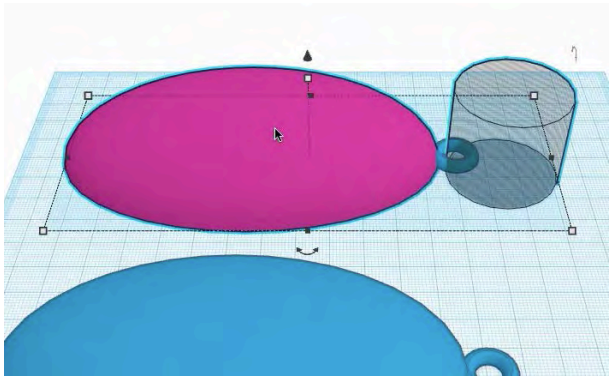


2. Click and drag the cylinder (hole) to **35** mm length, **35** mm width, and **30** mm height, or enter the values directly.

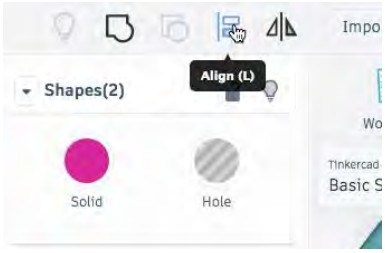




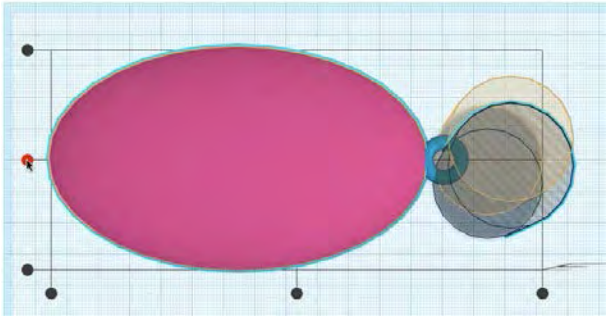
3. Select the duplicate Pobble part and the cylinder (hole).



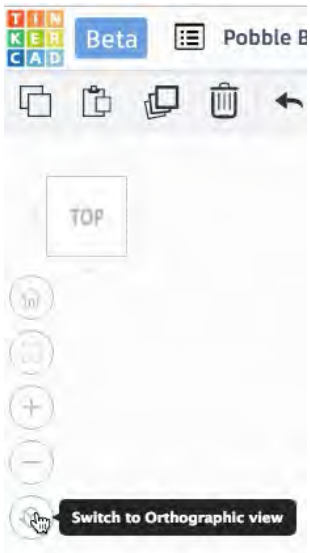
4. On the SubNav bar, click Align.



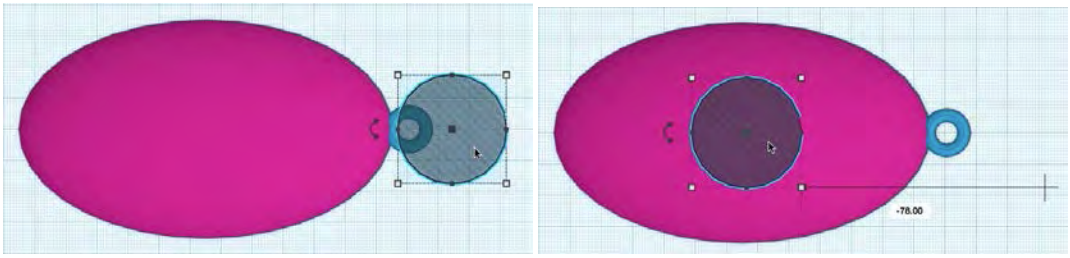
5. Click the black dot to align the Pobble part with the cylinder (hole) by length.



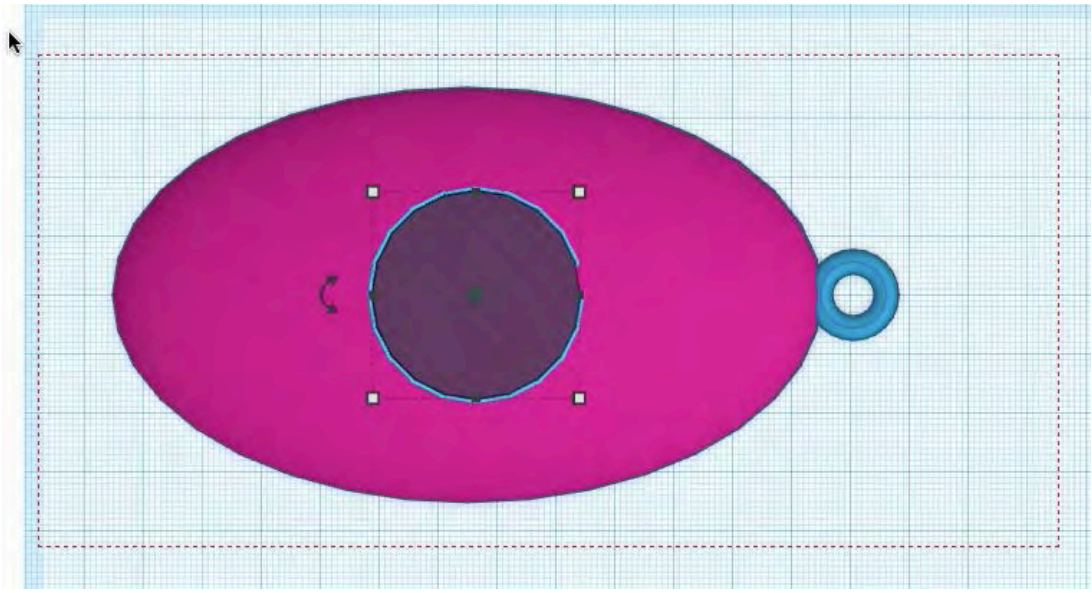
6. In the View tools, switch to Orthographic view.



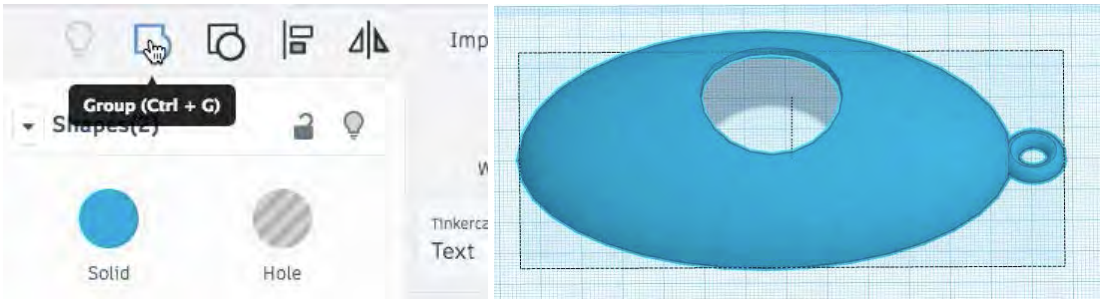
7. Click and drag the cylinder (hole) to a desired location.



8. Drag a selection window to select all parts.



9. Click to Group. The hole will also be cut.



Lesson 5: Add text to the Pobble part

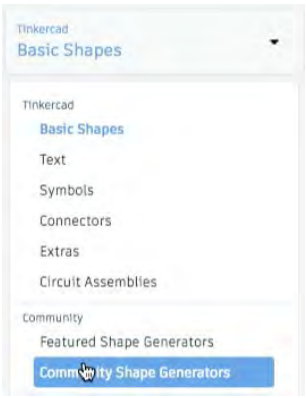
Watch this video to learn how to add text to Pobble.

After completing this lesson, you will be able to:

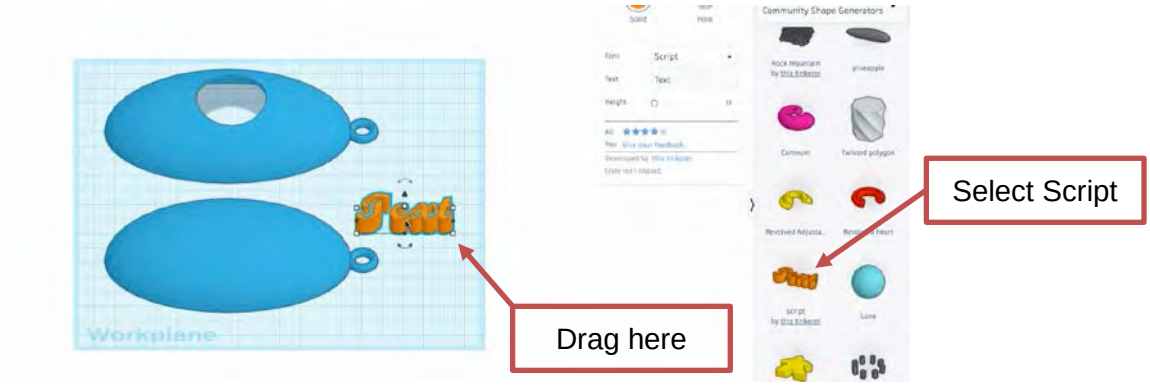
- Position and add text to Pobble in Tinkercad.

Step 1: Select the Stencil text from Script Community Shape Generator

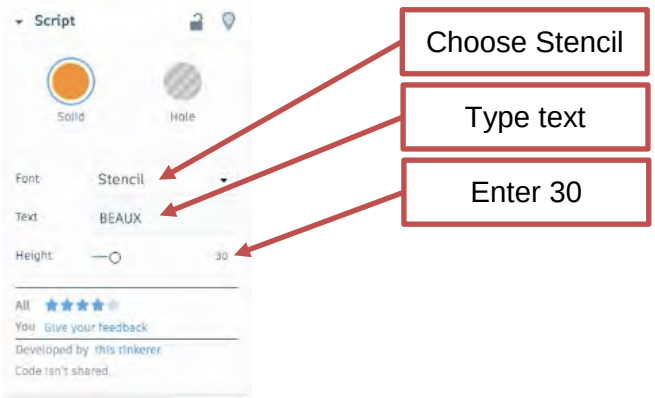
1. In the Shapes panel, click Shapes Panel. Click Community Shape Generators.



2. Scroll through, locate, and click the Script shape generator. Drag it onto the Workplane as near to the original (first) Pobble part as possible.

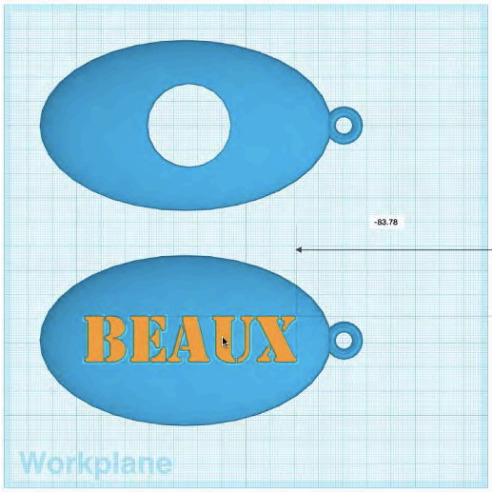


3. Click Top on the ViewCube. In the Inspector; change the font from Script to Stencil. Enter BEAUX (pet's name) or other text and change the Height to **30**.

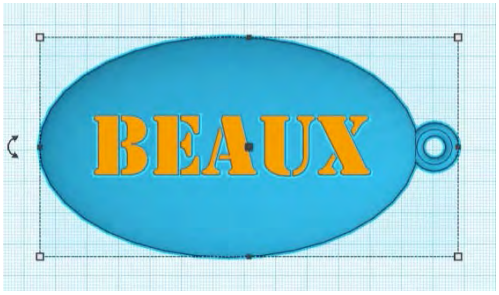


Step 2: Position and cut the text from Pobble

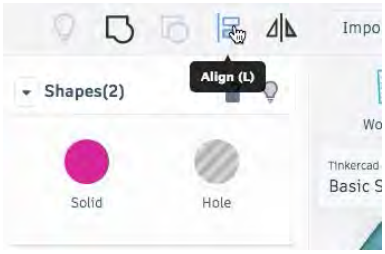
1. Click and drag the new text to the Pobble part.



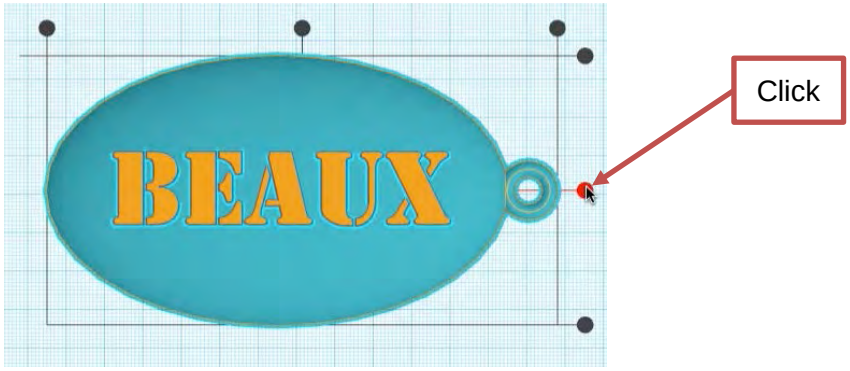
2. Select the new text and the Pobble part.



3. On the SubNav bar, click Align.

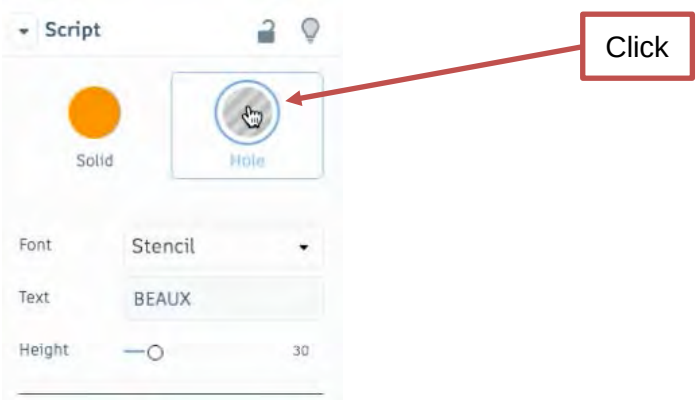


4. Select the black dot to align the text width to the Pobble part.

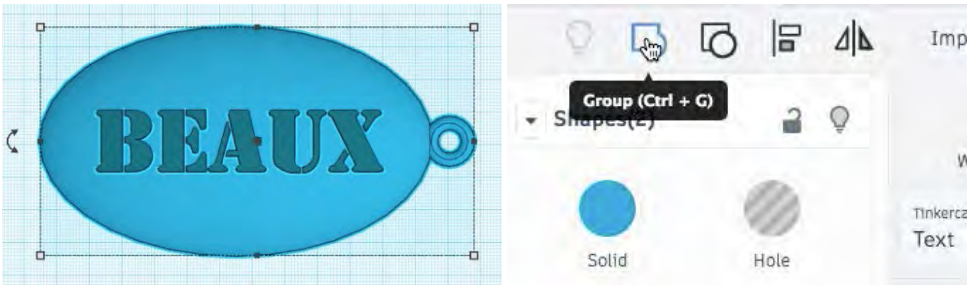


5. Select the BEAUX text.

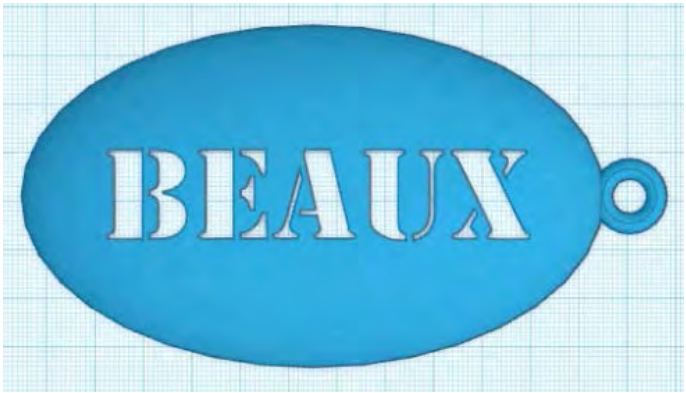
6. In the Inspector, click Hole.



7. Select all the text and Pobble part. On the SubNav bar, click Group.



8. All the elements will be grouped, and the text will also be cut from the Pobble part.



Lesson 6: Lock both Pobble parts to prevent further edits

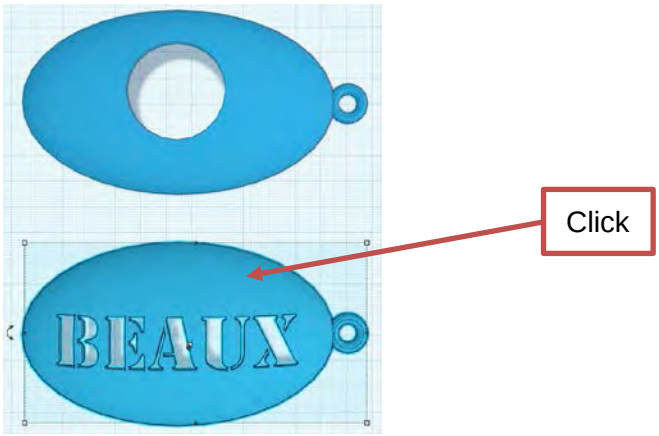
Watch this video to learn how to lock parts to prevent editing in Tinkercad.

After completing this lesson, you will be able to:

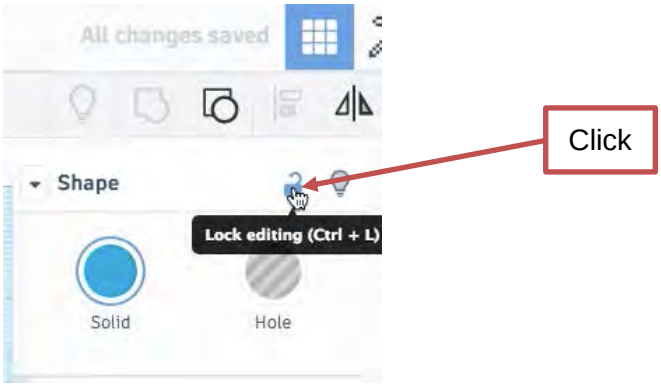
- Lock parts to prevent editing in Tinkercad.

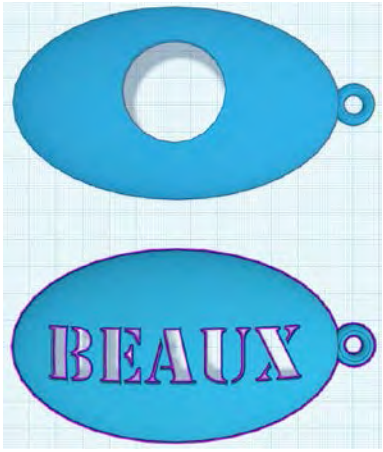
Step 1: Lock the original Pobble part

1. Select the part.



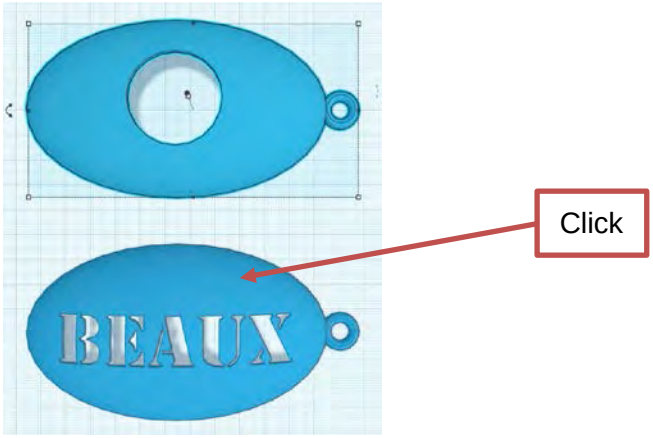
2. Click Lock Editing (Ctrl + C).



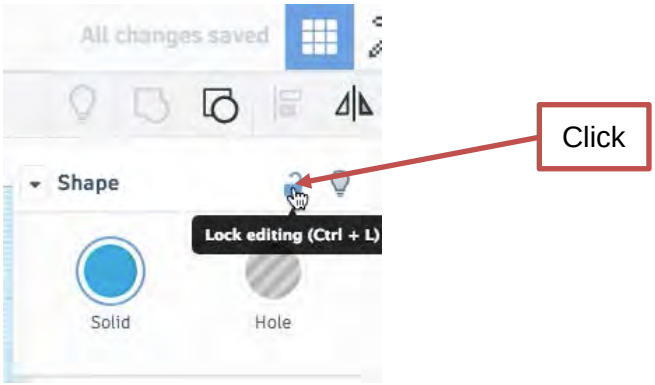


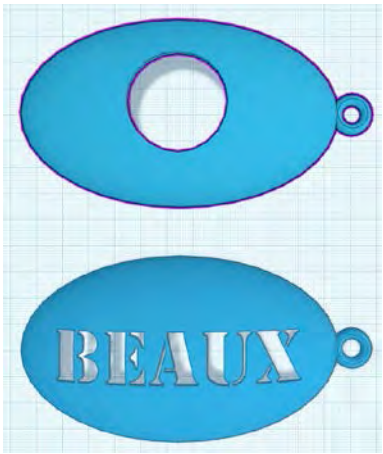
Step 2: Lock the duplicate Pobble part

1. Select the part.



2. Click Lock Editing (Ctrl + C).





Lesson 7: Create and download a Pobble file for 3D printing

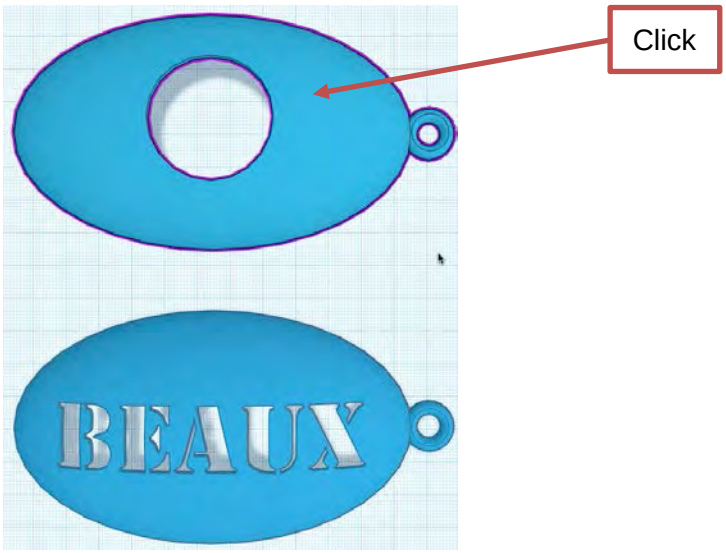
Watch this video to learn how to create and download an STL file for 3D printing.

After completing this lesson, you will be able to:

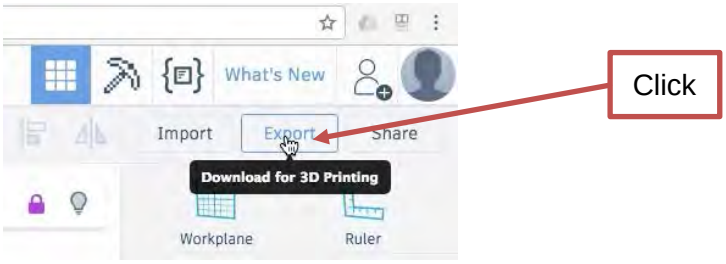
- Create and download an STL file for 3D printing using Tinkercad.

Step 1: Create and download an STL file for 3D printing

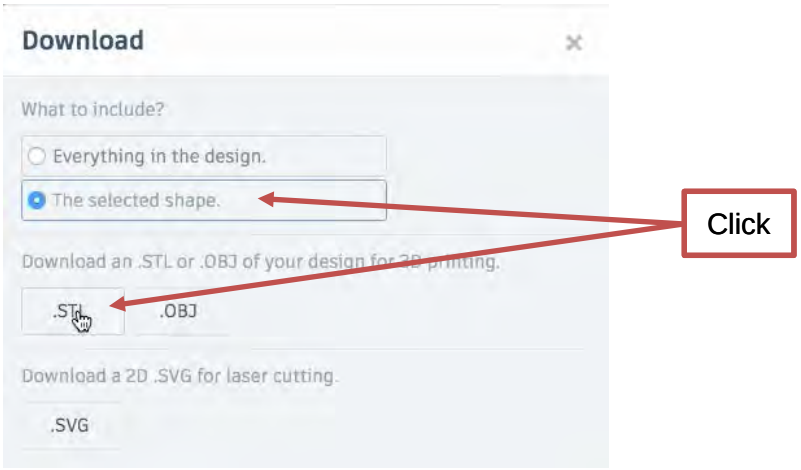
1. Select the original Pobble part.



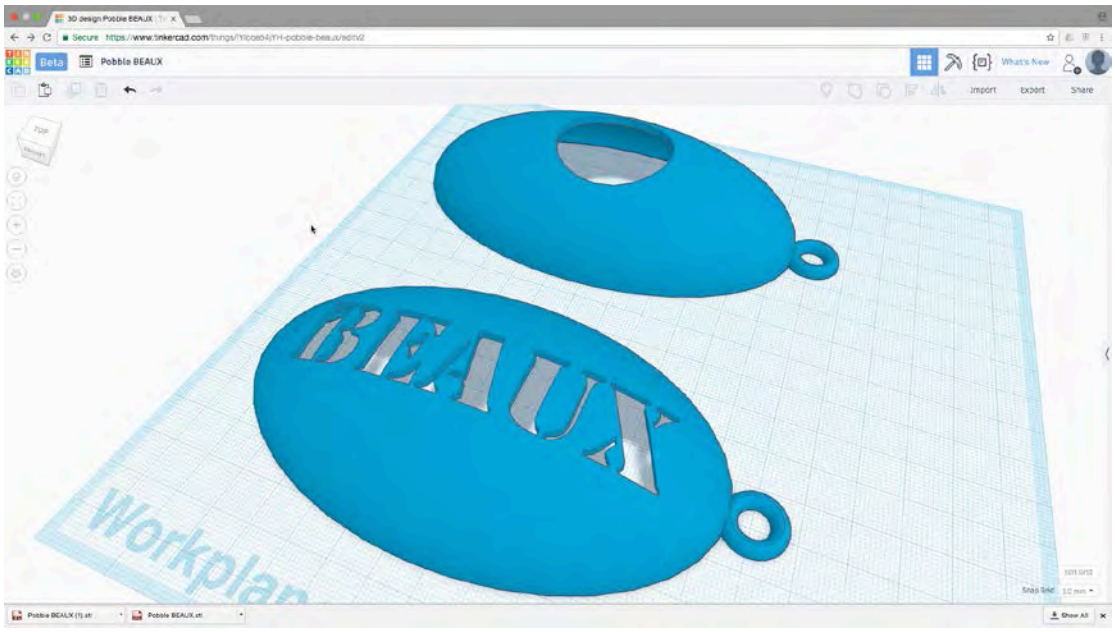
2. Click Export.



3. Select The Selected Shape. Click to download the STL file.

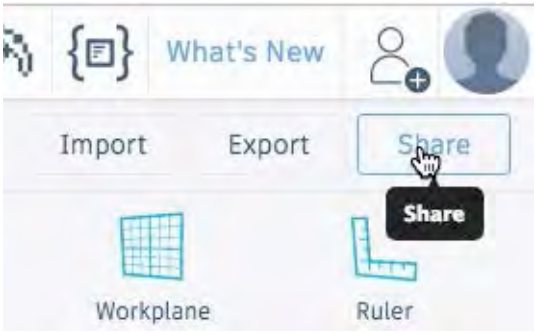


4. Repeat for duplicate Pobble part.

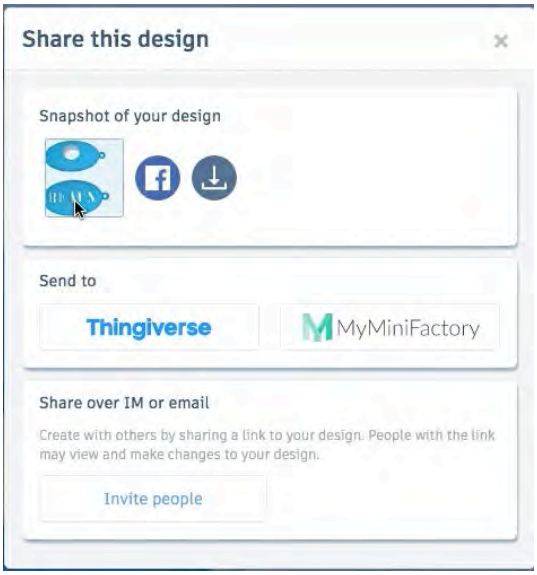


Step 2: Share the design

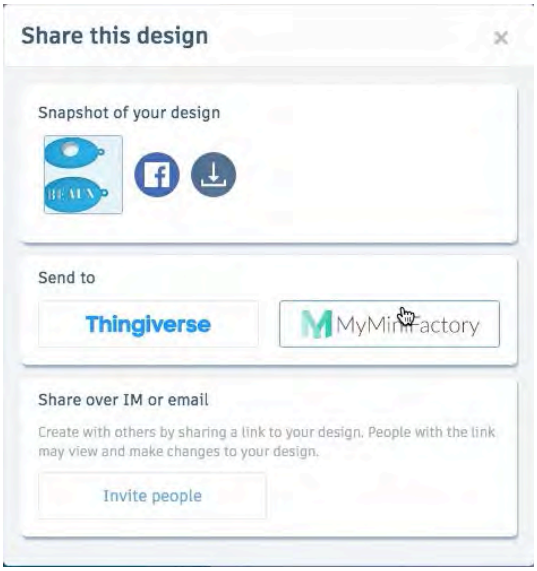
1. On the SubNav bar, click Share.



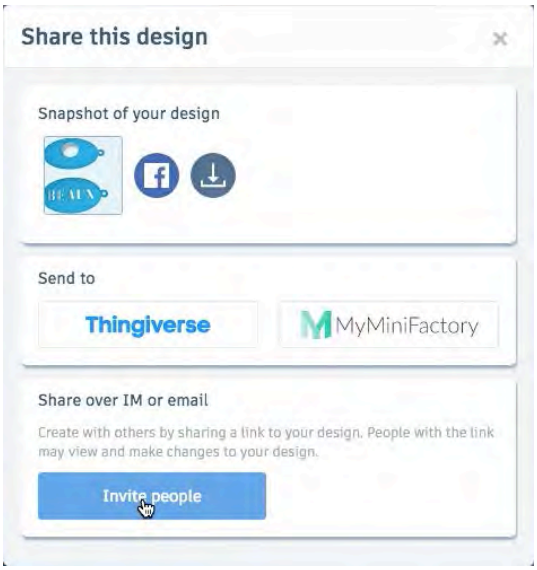
2. Click to share via Social Media, or download.



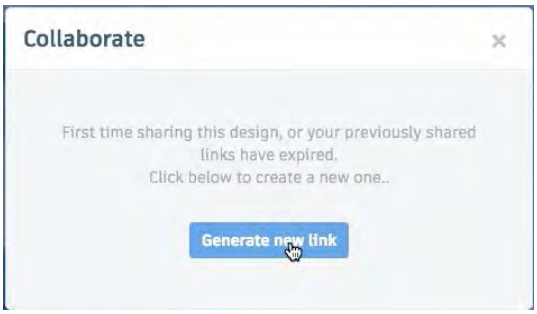
3. Click to send to Thingiverse or MyMiniFactory.



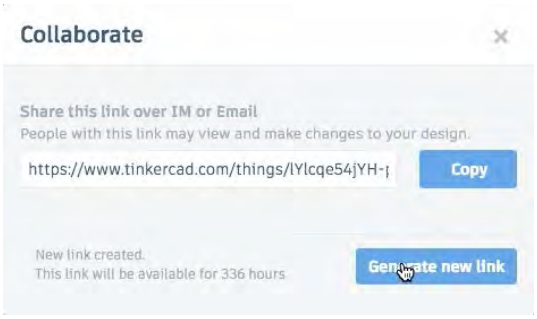
4. Click Invite People to share via IM or email.

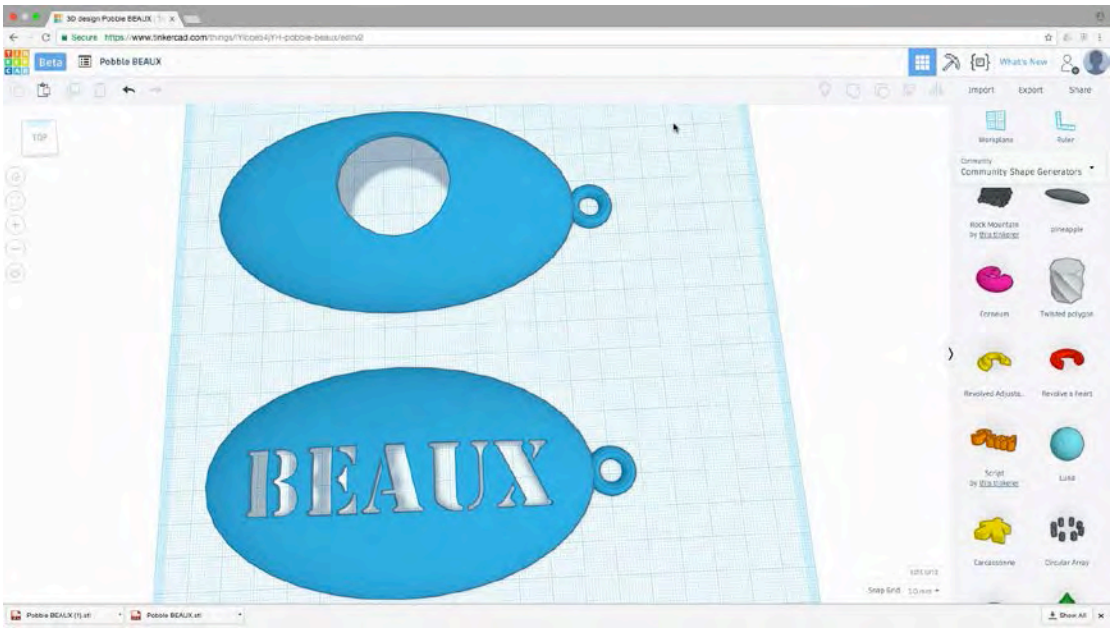


5. Click Generate New Link.



6. Click Copy and share link, or click to Generate New Link.





Next steps

Why not try the Fusion 360 Pobble BEAUX series?

The beginner-level Fusion 360 Pobble BEAUX tutorials demonstrate how to:

- Import the Tinkercad STL file into Fusion 360.
- Use parametric and freeform sculpting tools to refine the design.
- Create photorealistic renderings of the Pobble BEAUX.
- Print the Pobble BEAUX using a 3D printer.