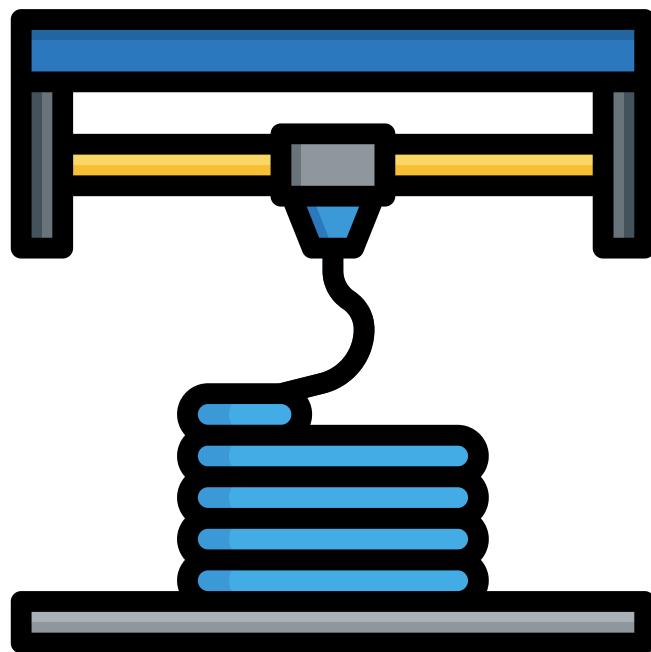


# 3D DESIGNING & PRINTING



# 3D Design and Printing

## Session 1

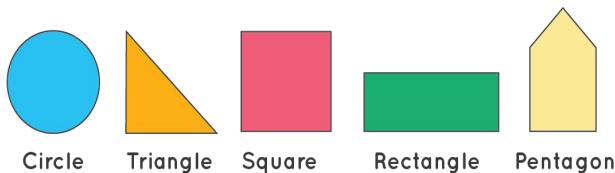
### Design and Print a 3D Keychain

## Introduction to 2D and 3D Shapes (10 mins)



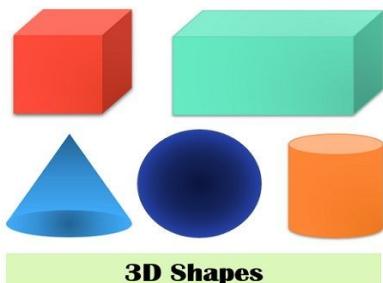
### 2D Shapes

A 2D shape has two dimensions, that is, Length and Breadth. 2D shapes are flat because they don't have any height or depth. Examples of 2D shapes include circle, rectangle, square, polygons, etc. Since 2D shapes don't have any height, they don't have any volume either. 2D shapes have only areas. 2D shapes are drawn using X-axis and Y-axis. Refer to the picture given below.

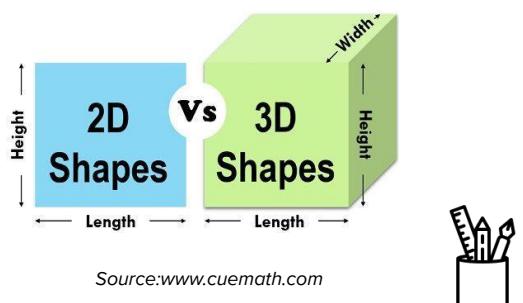


### 3D Shapes

Most of the objects that we see around us have 3D shapes, which means they have three dimensions: Length, Breadth, and Depth. Examples of 3D shapes include cubes, cylinders, spheres, cones, et



Since 3D shapes have depth, they occupy some volume. 3D shapes are drawn using X-axis, Y-axis, and Z-axis.



### Materials Required :

1. Laptop with Internet Connection
2. 3D Printer

⌚: 60 minutes

**Module:** 3D Design and Printing

**Grade:** 6th to 9th

### Importance/ Value:

3D Printing and Design allows children to think, visualize their imaginative concepts and create prototypes on their own in the ATL Lab. It also enables the children to understand the basic design concepts while differentiating between 2D and 3D images.

### Learning Goals:

1. Learners will be able to understand the basic concepts of 3D design.
2. Learners will explore and learn to use a simple 3D design software called Tinkercad.
3. Learners will design and 3D print a simple key chain exploring the possibilities of 3D Printing.

| Time   | Description                           |
|--------|---------------------------------------|
| 01 Min | Check-in-Experience (CIE)             |
| 05 Min | Icebreaker- Get-to-know               |
| 10 Min | Introduction to 3D Printing           |
| 35 Min | Activity - Design and 3D Print a cup. |
| 09 Min | Reflection and Learnings              |

## Icebreaker (5 mins): Get-to-know

Create groups of 4-5 people, and let them discover what they have in common, along with interesting characteristics that are unique to a person in the group. This icebreaker promotes unity as it gets people to realize that they have more common ground with their peers than they first might realize. As people become aware of their own unique characteristics, they can also help people feel empowered to offer the group something unique.

## Safety Measures:

1. Put your 3D printer in an area which isn't easily accessible
2. Wear gloves when handling your 3D printer.
3. Keep a mental note in your head that your 3D printer gets very hot.
4. Only reach for your printer when you are certain it's off



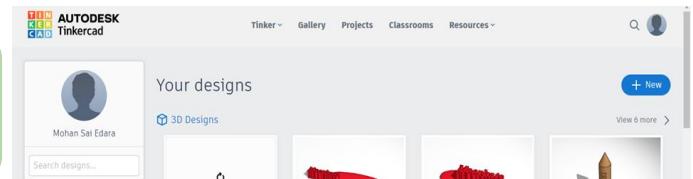
## Activity: Design & 3D Print a simple Key Chain



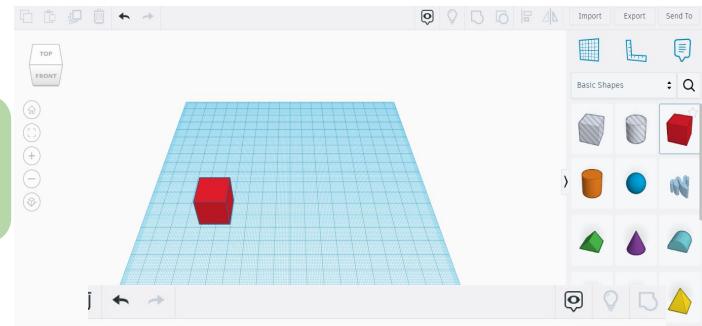
In this activity you will learn how to use a 3D design software called TinkerCad and Design a simple 3D key chain and 3D print it.

**Step 1:** Open a browser and type [tinkercad](http://tinkercad.com) in the url and press enter. Click on the first result [www.tinkercad.com](http://www.tinkercad.com) and you will be redirected to a tinkercad website. Click on sign in and use your google account or autodesk account to sign in to the tinkercad website.

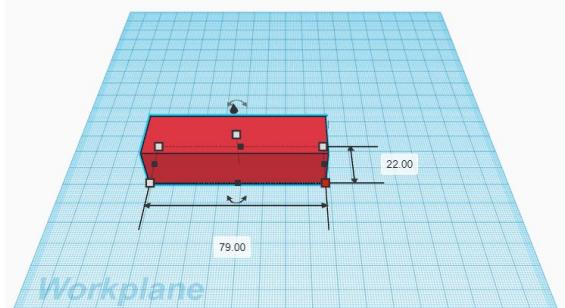
**Step 2:** After logging in, click on +new to start a new design.



**Step 3:** Drag and drop a box from the basic shapes onto the work plane.

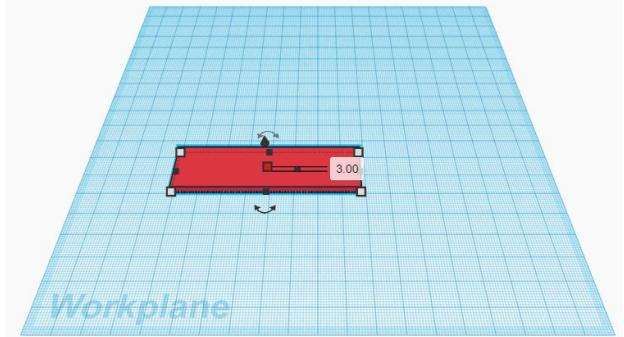


**Step 4:** Click on one of the corners of the box and adjust the length by 35 mm and width by 22 mm with the help of the mouse by holding the shift key.

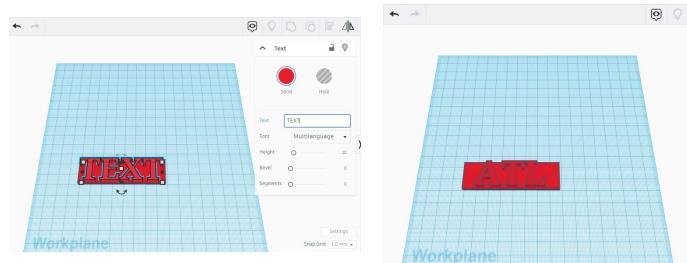


Source: [tinkercad.com](http://tinkercad.com)

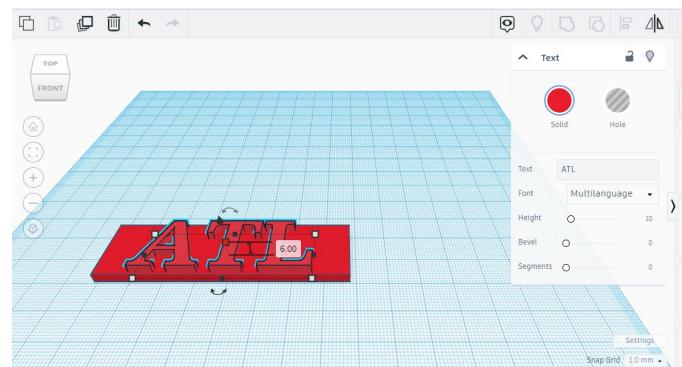
**Step 5:** Hold the middle hand and reduce the height to 3mm.



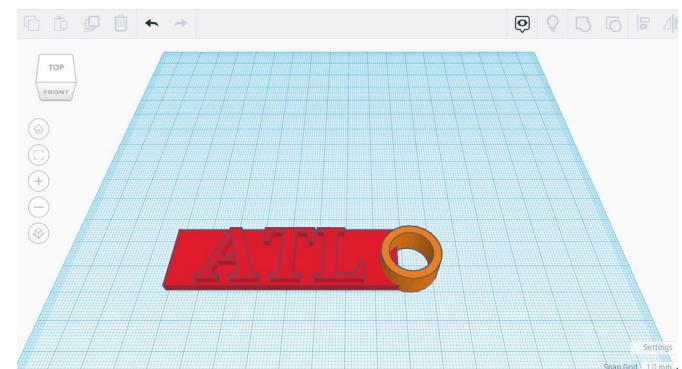
**Step 6:** Type "ATL" in the Text box.



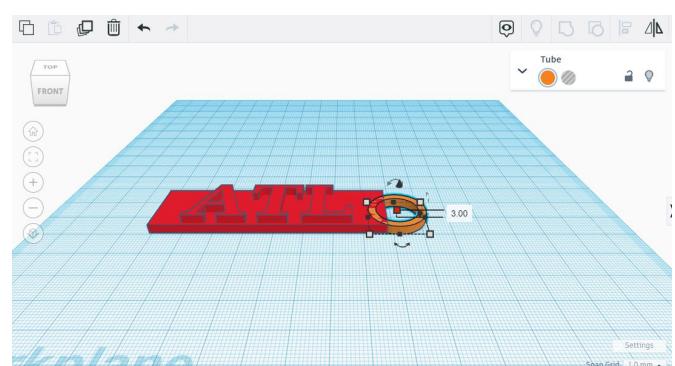
**Step 7:** Click your middle handle and decrease the thickness of your name to around 6mm.



**Step 8:** Scroll to the bottom of your Basic Shapes menu and drag a tube onto the Workplane.

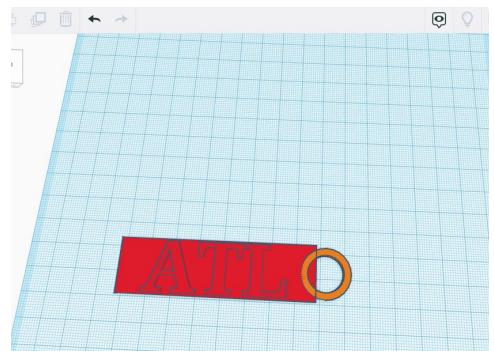


**Step 9:** Click and drag the middle handle to reduce the thickness of the tube to around 3mm.

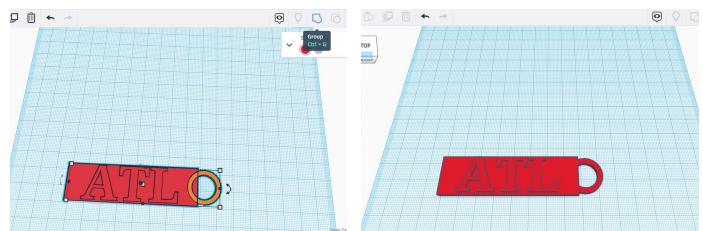


Source: [tinkercad.com](https://tinkercad.com)

**Step 10:** Drag your tube and place it so the bottom  $\frac{1}{4}$  (or so) is inside your box.



**Step 11:** Click and drag a square around your entire project. Click on the Group button, which will connect all the pieces of your project together.



Source: [tinkercad.com](https://tinkercad.com)

**AMAZING!**



**YOU HAVE SUCCESSFULLY COMPLETED THE ACTIVITY**

## Reflection and Learnings (9 mins):

1. What is the difference between 2D and 3D objects?
2. What will happen when you use the group option in Tinkercad?
3. Imagine yourself to be an eagle and draw the Top View of your house.
4. What did you or your team struggle with while doing this activity and why? How can you improve next time?
5. How did you contribute to the team and how do you think it helped? How else could you have contributed?

## Try it yourself!

Using the concepts you have learnt so far, Try creating a simple 3D quotes as shown in the image.



Use the space to draw or write your reflections and learnings

Source: vanillatech.net



# 3D Design and Printing

## Session 2

### Design and 3D Print a Cup

#### Introduction to 3D printing (10 mins):

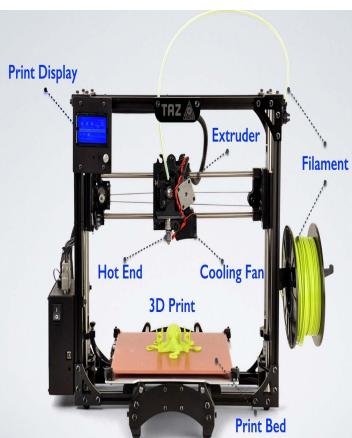
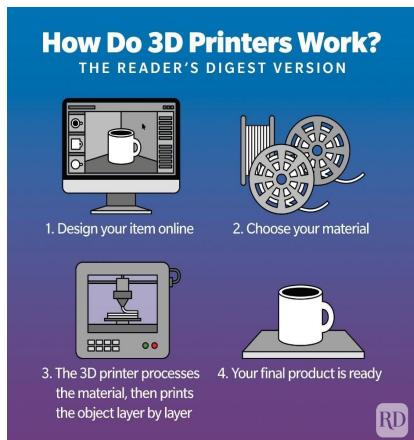
What is 3D printing and how it works?



3D printing is a process by which a digital representation of an object is created using computer aided manufacturing (CAM) technology. 3D printing is a path breaking technology and has also evolved through several different forms. The key thing to know about 3D printing is that it doesn't work like regular manufacturing methods: rather than starting with an existing object, the printer has to make one from scratch by building up layers of material in a process called additive manufacturing. In other words, it works with the same materials used in traditional manufacturing but recreates objects because it uses special materials that can be built layer by layer.

3D printing is a relatively new technology, but it's going to change the way we live. We'll be able to print out everything from toys and clothes to food and medicine in our homes. It will also help us create replacement parts for appliances and vehicles that break down on the road—and even help astronauts repair satellites. 3D printers are literally just printers. But instead of printing words on paper, they print 3D objects, layer by layer, and can make them out of everything from carbon fiber and powders to plastic and metal

#### Parts and Working of printer



Source: <https://www.rd.com>

#### Materials Required :

1. Laptop with Internet Connection
2. 3D Printer



⌚: 60 minutes

**Module:** 3D Design and Printing

**Grade:** 6th to 9th

#### Importance/ Value:

3D Printing and Design allows children to think, visualize their imaginative concepts and create prototypes on their own in the ATL Lab. It also enables the children to understand the basic design concepts while differentiating between 2D and 3D images.

#### Learning Goals:

1. Learners will be able to understand the basic concepts of 3D design
2. Learners will explore and learn to use a simple 3D design software called Tinkercad
3. Learners will design and 3D print a simple cup exploring the possibilities of 3D Printing

| Time   | Description                           |
|--------|---------------------------------------|
| 01 Min | Check-in-Experience (CIE)             |
| 05 Min | Icebreaker- I'm Awesome!              |
| 10 Min | Introduction to 3D Printing           |
| 35 Min | Activity - Design and 3D Print a cup. |
| 09 Min | Reflection and Learnings              |

#### Icebreaker (5 mins):

#I'm Awesome

Take a full size A3 chart and tape it to the wall. Once students enter the ATL Lab, hand them a marker and have them think of 2-3 hashtags that describe themselves. Allow them to write their hashtags on the wall and explain them to the rest of the class.

## Safety Measures:

1. Put your 3D printer in an area which isn't easily accessible
2. Wear gloves when handling your 3D printer.
3. Keep a mental note in your head that your 3D printer gets very hot.
4. Only reach for your printer when you are certain it's off



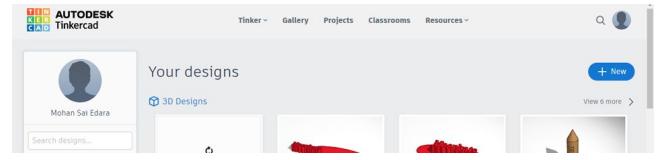
## Activity: Design & 3D Print a Cup



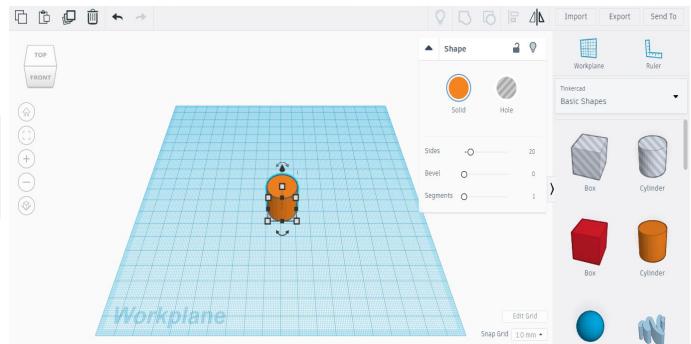
In this activity you will learn how to use a 3D design software called TinkerCad and Design a simple 3D cup and 3D print it.

**Step 1:** Open a browser and type [tinkercad](http://www.tinkercad.com) in the url and press enter. Click on the first result [www.tinkercad.com](http://www.tinkercad.com) and you will be redirected to a tinker cad website. Click on sign in and use your google account or autodesk account to sign in to the tinkercad website.

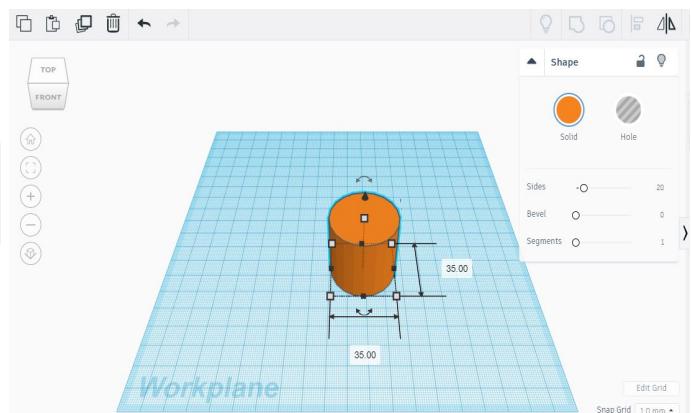
**Step 2:** After logging in, click on create a new design.



**Step 3:** Drag and drop a cylinder from the basic shapes on the work plane.

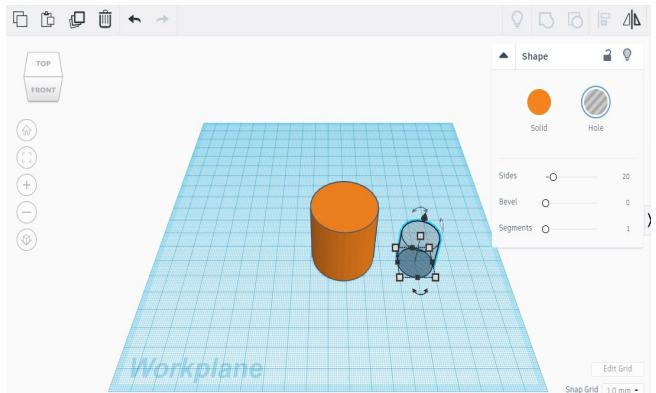


**Step 4:** Click on one of the corners of the cylinder and adjust the cylinder dimensions to 35mm with the help of the mouse by holding the shift key.

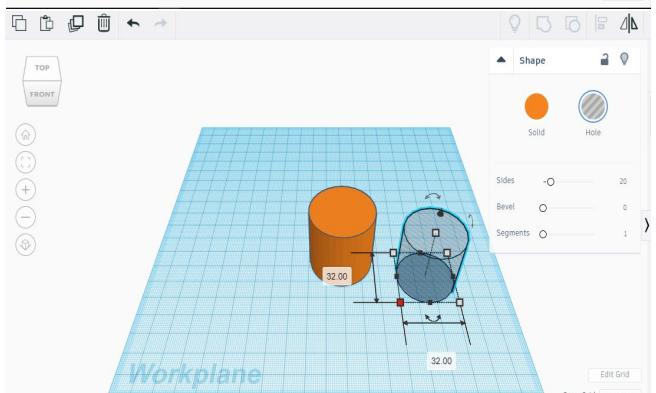


Source: [Tinkercad.com](http://Tinkercad.com)

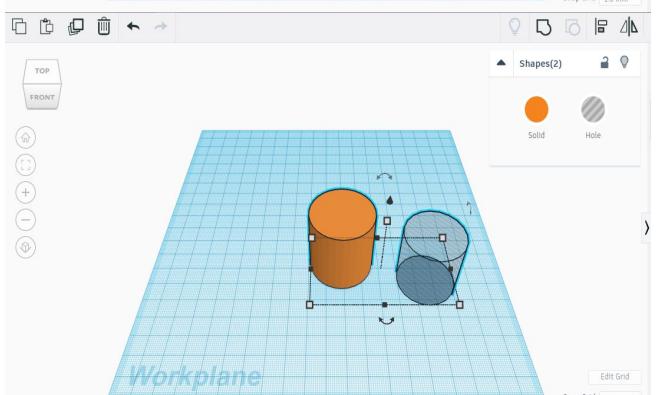
**Step 5:** Select a grayed-out cylinder from the basic shapes section and place it in the middle of the screen



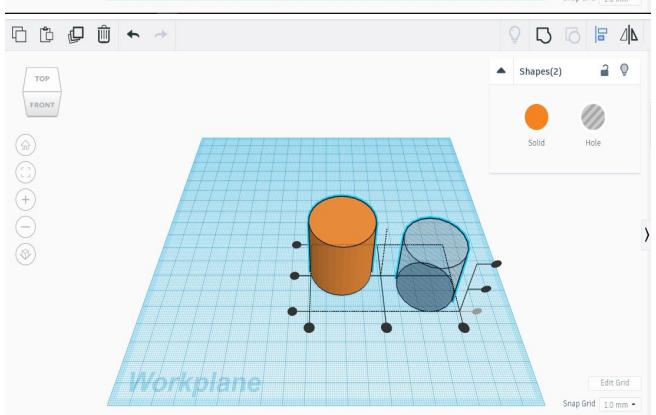
**Step 6:** Click on the corner and adjust the dimensions of the grayed-out cylinder to 32 mm, like previously done.



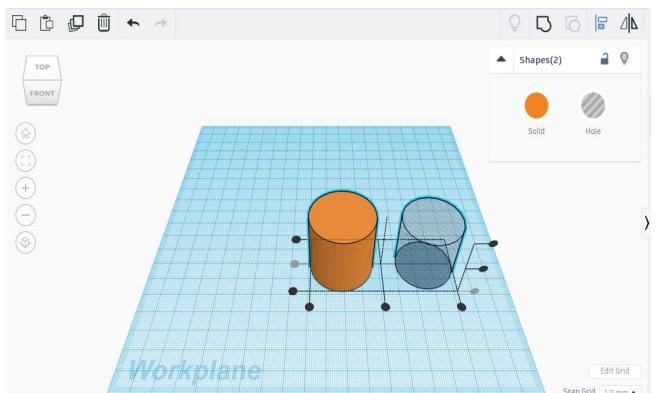
**Step 7:** Select both the shapes by dragging the cursor on the shapes.



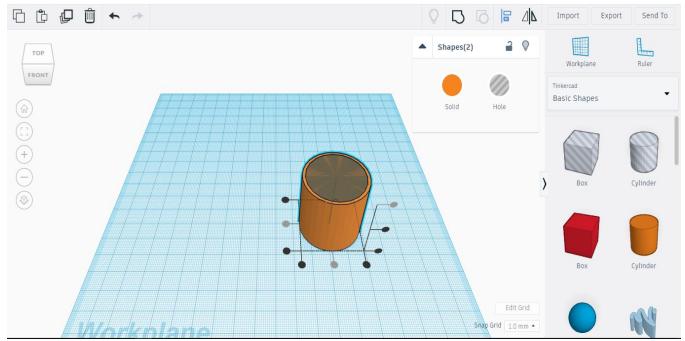
**Step 8:** Now let's align the shapes by centering the small grayed-out cylinder inside the solid cylinder.  
Click on the align icon or press letter L



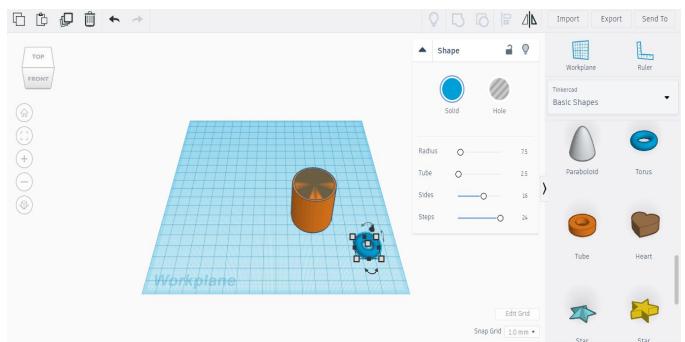
**Step 9:** Align the cylinder hole into the cylinder solid shape by clicking on the left middle dot and the front middle dot as shown in the images given below.



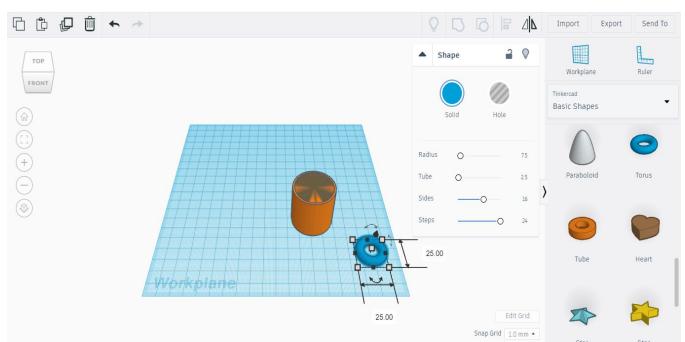
**Step 10:** Click on the top dot of the vertical 3 dots.



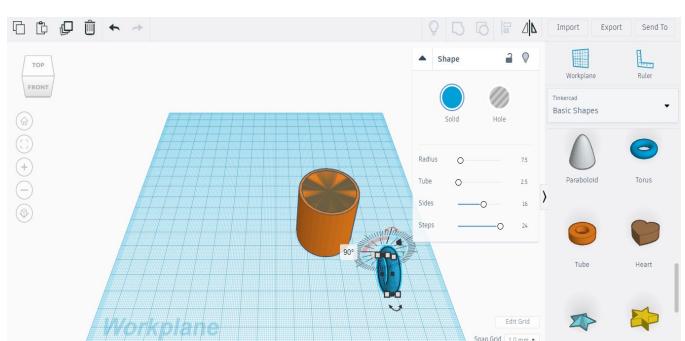
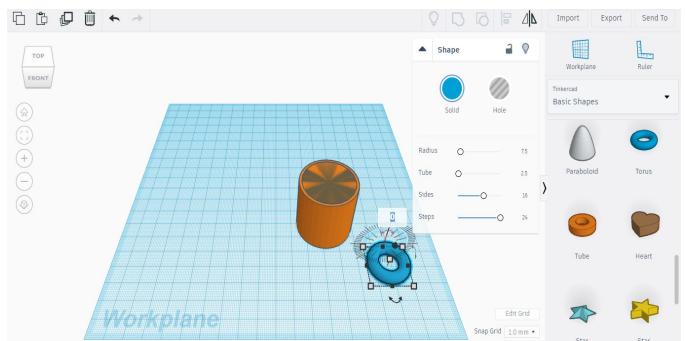
**Step 11:** Drag and drop a torus from the basic shapes and place it on the work plane beside the cylinder.



**Step 12:** Select the shape, click on a corner and adjust the dimensions to 25mm.

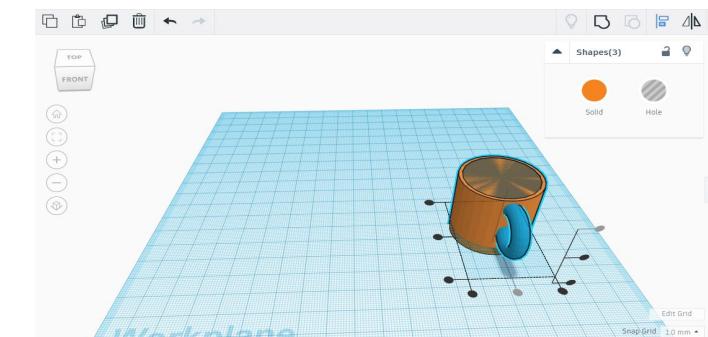
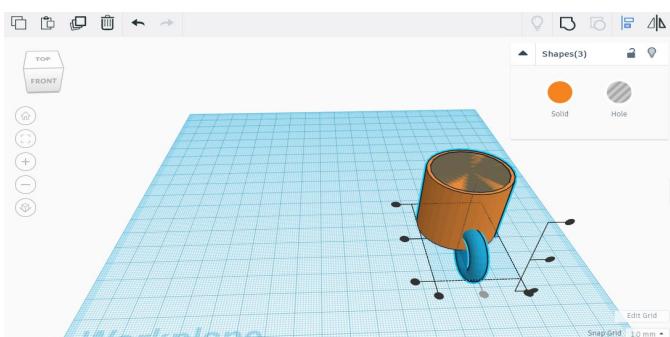
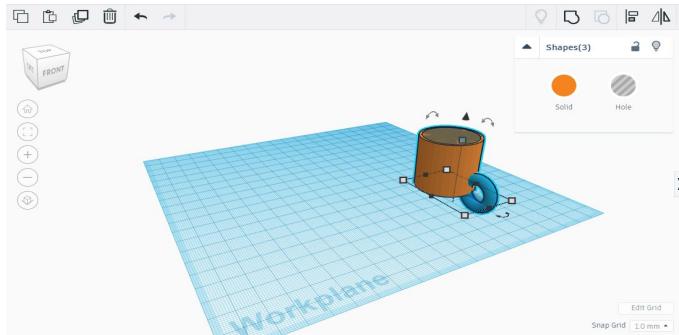
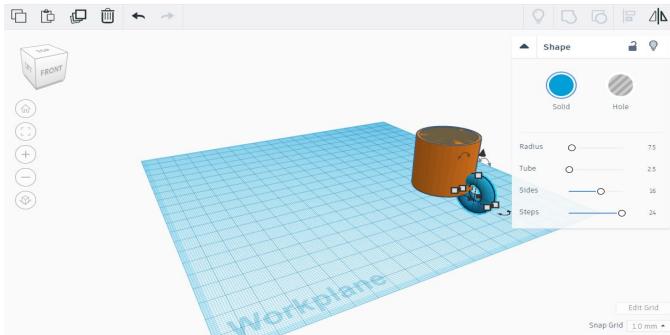


**Step 13:** Now let's rotate the shape to 90 degrees. To do so, Click on the curve shaped arrow and edit the 0 degrees and change it to 90 degrees as shown in the images given below.

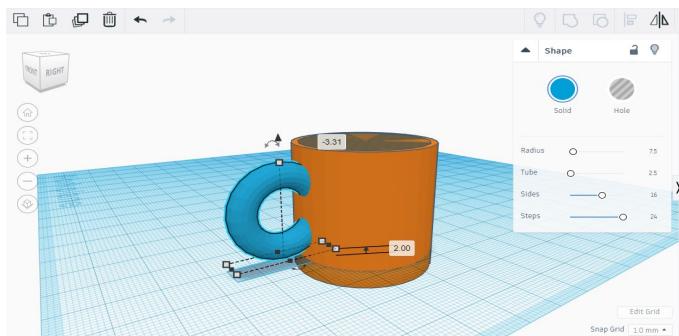
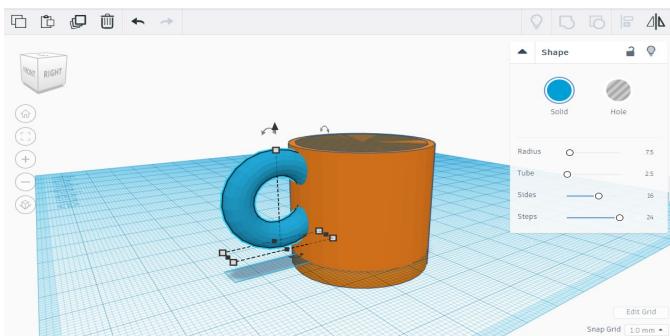


Source: [Tinkercad.com](https://www.tinkercad.com)

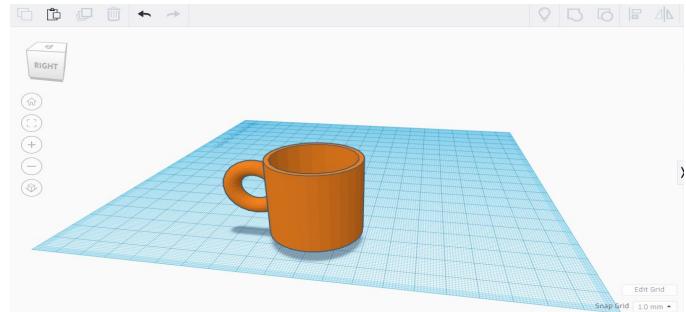
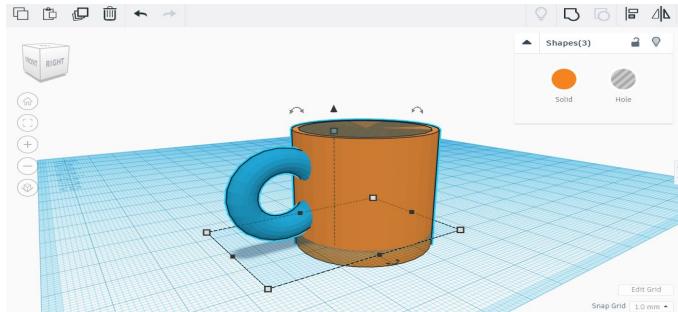
**Step 14:** Select the torus and move it onto the surface of the cup. Then center align the shape as shown in the images given below.



**Step 15:** Turn the shape to the right side and move the handle to the center of the cup.



**Step 16:** Click and select both the shapes. Then click on the combine shapes icon and combine them.



## Reflection and Learnings (9 mins):

1. How do you think you can use 3D Printing in a real-world scenario?
2. What are the benefits of 3D Printing an object?
3. Imagine and draw the Top View and front view of the cup.
4. What did you or your team struggle with while doing this activity and why? How can you improve next time?
5. How did you contribute to the team and how do you think it helped? How else could you have contributed?

### Try it yourself!

Using the concepts you have learnt so far, Try creating a simple 3D Trophy as shown in the image.

Use the space to draw or write your reflections and learnings



*Source: tinkercad.com*

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