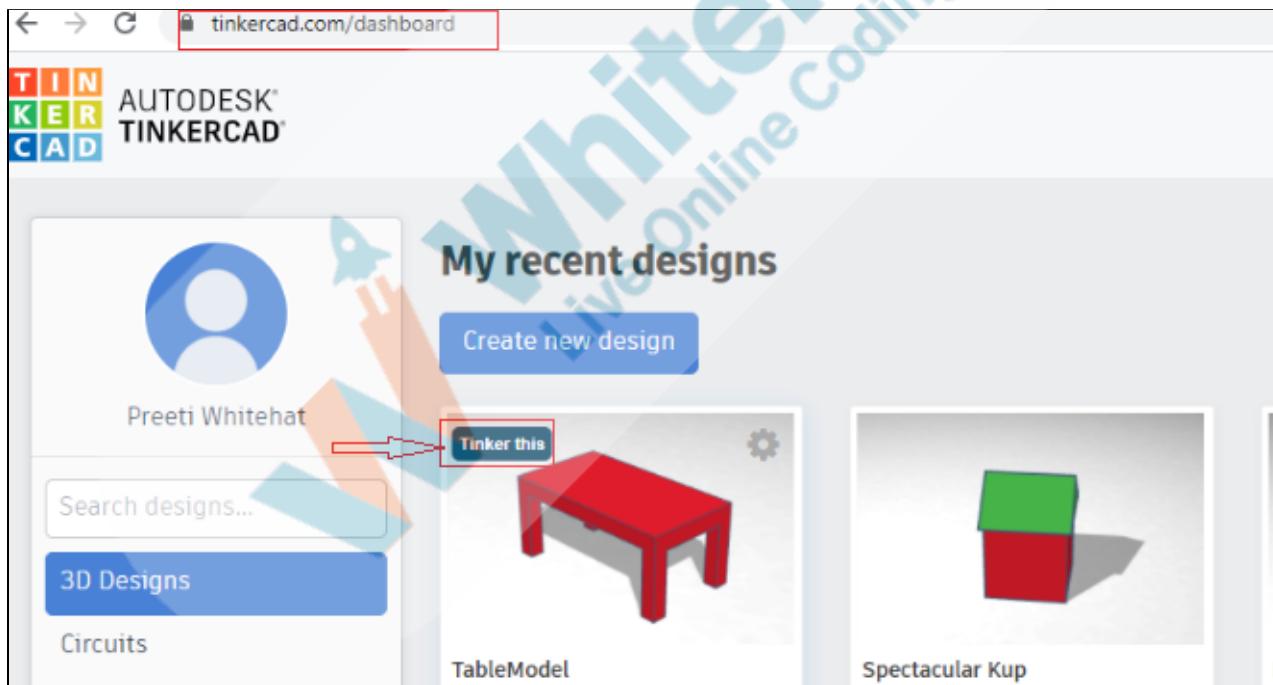


Topic	EXPORTING 3D MODELS IN A-Frame		
Class Description	Students learn how to export 3D models created on Tinkercad into A-Frame.		
Class	C150		
Class time	45 mins		
Goal	<ul style="list-style-type: none"> ● Explore the different tools on Tinkercad. ● Create a 3D model using Tinkercad. ● Learn how to export 3D models in A-Frame. 		
Resources Required	<ul style="list-style-type: none"> ● Teacher Resources <ul style="list-style-type: none"> ○ Laptop with internet connectivity ○ Earphones with mic ○ Notebook and pen ● Student Resources <ul style="list-style-type: none"> ○ Laptop with internet connectivity ○ Earphones with mic ○ Notebook and pen 		
Class structure	Warm-Up Teacher-led Activity Student-led Activity Wrap-Up		05 mins 15 mins 20 mins 05 mins
WARM-UP SESSION -05 mins			
<u>CONTEXT</u>			
<ul style="list-style-type: none"> ● Introducing how to create 3D models. 			
<div style="background-color: #c8e6c9; padding: 10px; text-align: center;"> »  » Teacher starts slideshow from slides 1 to 14 Refer to speaker notes and follow the instructions on each slide. </div>			

Activity details	Solution/Guidelines
<p><i>Hey <student's name>. How are you? It's great to see you! Are you excited to learn something new today?</i></p>	<p>ESR: Hi, thanks, Yes I am excited about it!</p>
<p>Run the presentation from slide 1 to slide 3</p> <p>Following are the WARM-UP session deliverables:</p> <ul style="list-style-type: none"> • Greet the student. • Revision of previous class activities. • Quizzes 	<p>Click on the slide show tab and present the slides</p>
Q&A Session	
Question	Answer
<p>What are 3D models called and how are they represented?</p> <p>A. Mold, hexagon B. Mesh, polygons C. Mold, polygon D. Mesh, hexagon</p>	<p>B</p>
<p>Which online platform do we use to create 3D models?</p> <p>A. Tinkerbell B. Tinker C. Tinkercad D. Tinkerlad</p>	<p>C</p>
Continue the WARM-UP session	
Activity details	Solution/Guidelines
<p>Run the presentation from slide 4 to slide 14 to set the problem statement.</p>	<p>Narrate the story by using hand gestures and voice modulation methods to bring</p>

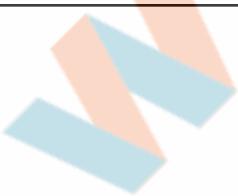
Following are the WARM-UP session deliverables: <ul style="list-style-type: none"> • Appreciate the student. • Explain A-Frame entity, animation and camera component. 		in more interest in students.
 Teacher ends slideshow		
	Now, Let's get started.	
TEACHER-LED ACTIVITY - 15 mins		
Teacher Initiates Screen Share		
<u>CHALLENGE</u>		
<ul style="list-style-type: none"> • Export 3D model from Tinkercad to A-Frame. 		
Step 2: Teacher-led Activity (10 mins)	<p>Before exporting the models in the A-Frame scene, let's explore some more tools to rotate the shapes/models for proper alignment and grouping of shapes/models to build slightly more complex objects.</p> <p>For this we will be creating some more 3D models today on tinkercad.</p> <p>3D modelling is also an art. To make complex designs you have to logically think of how the model can be built with minimum shapes and computations.</p> <p>In the previous class we created a very basic model, let's continue on that design by adding more objects</p>	

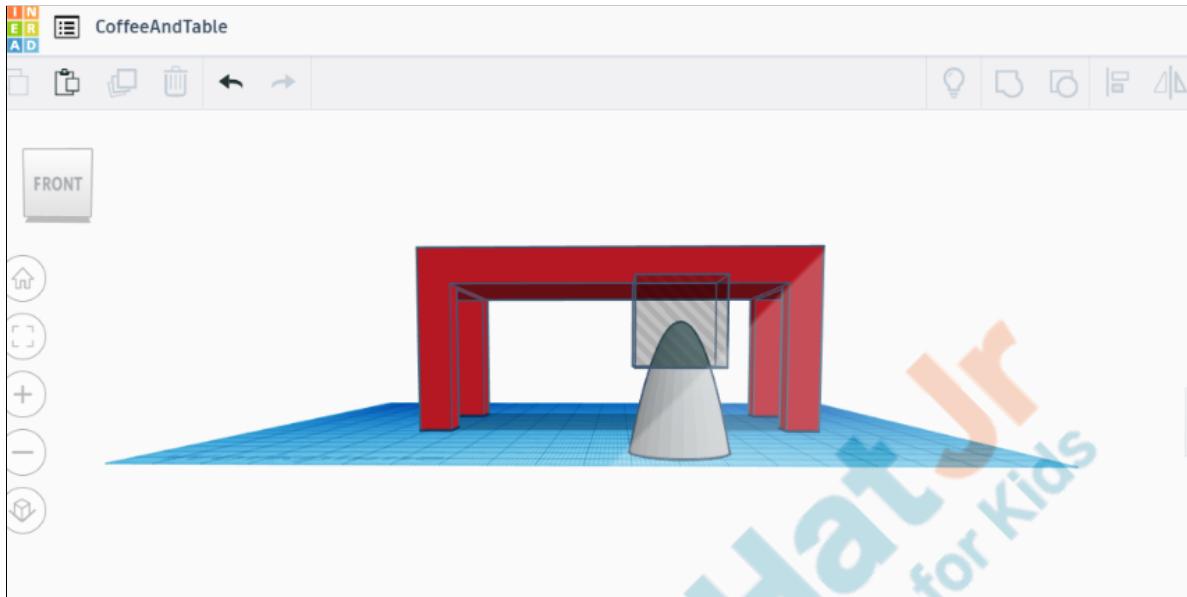
	<p>like a coffee mug and table lamp in the model design.</p> <p>Let's start by logging into the account on Tinkercad.</p> <p>[Teacher Activity 1]</p> <ol style="list-style-type: none"> 1) Go to https://www.tinkercad.com/. 2) On the dashboard under your recent designs, find the TableModel design created in the previous class and click on "Tinker this". 	<p><i>Students observe.</i></p>
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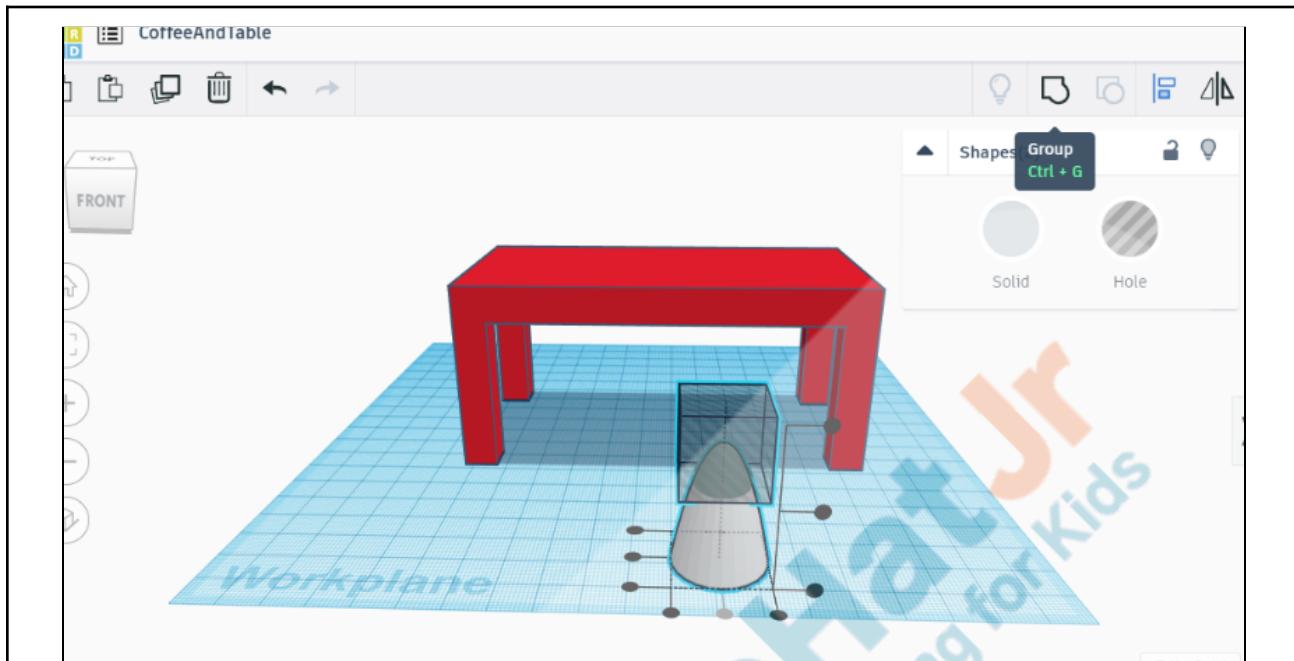
	<p>Let's start by adding a coffee mug to be placed on the table.</p>	
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	<p>What can we use from the basic shapes to design?</p> <p>Yes. Great!</p> <p>Any one among the two shapes can be used.</p> <p>Let's use Paraboloid for now.</p> <p><i>Paraboloid is a solid shape created from parabola. You will learn more about parabola in your future mathematics classes.</i></p> <p><i>Teacher follows the following steps as shown below in the illustrations to create a coffee mug.</i></p>	<p>ESR: Paraboloid or Half sphere.</p>
<p><i>Take a Paraboloid and a Hole Box shape and place the box over the paraboloid.</i></p>		

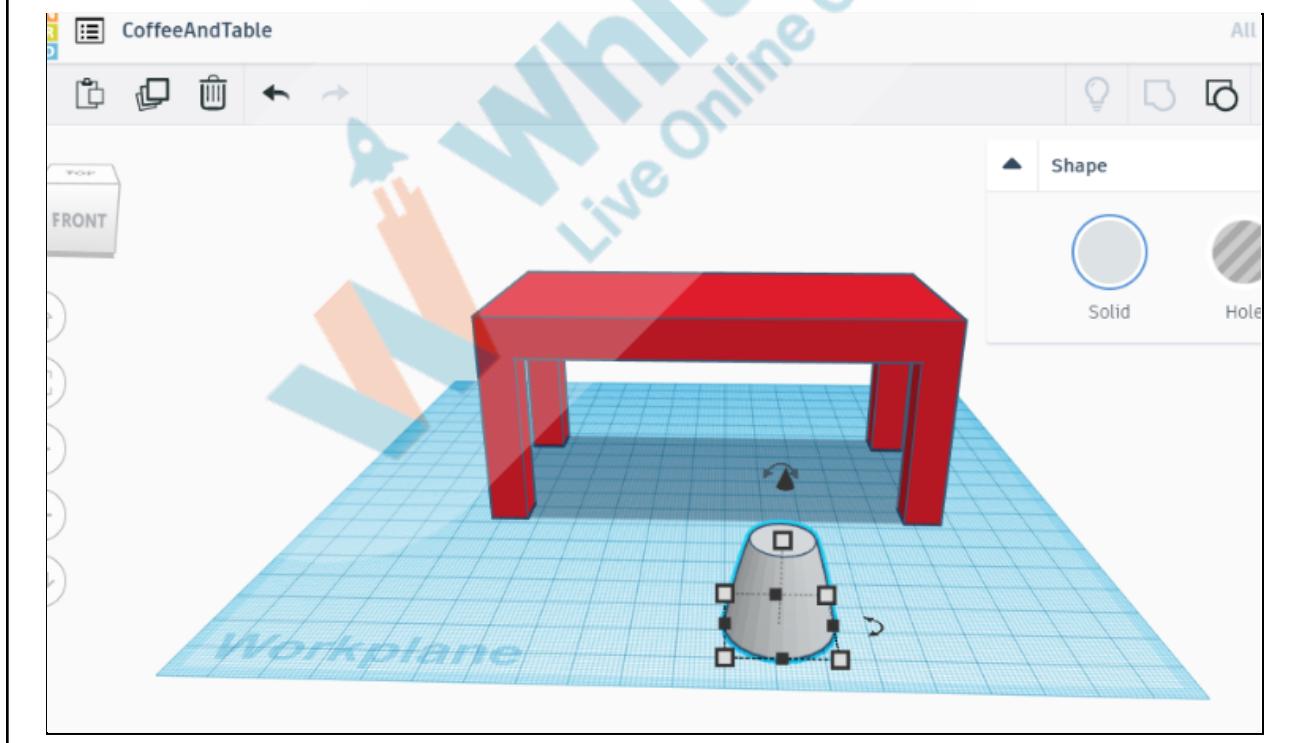




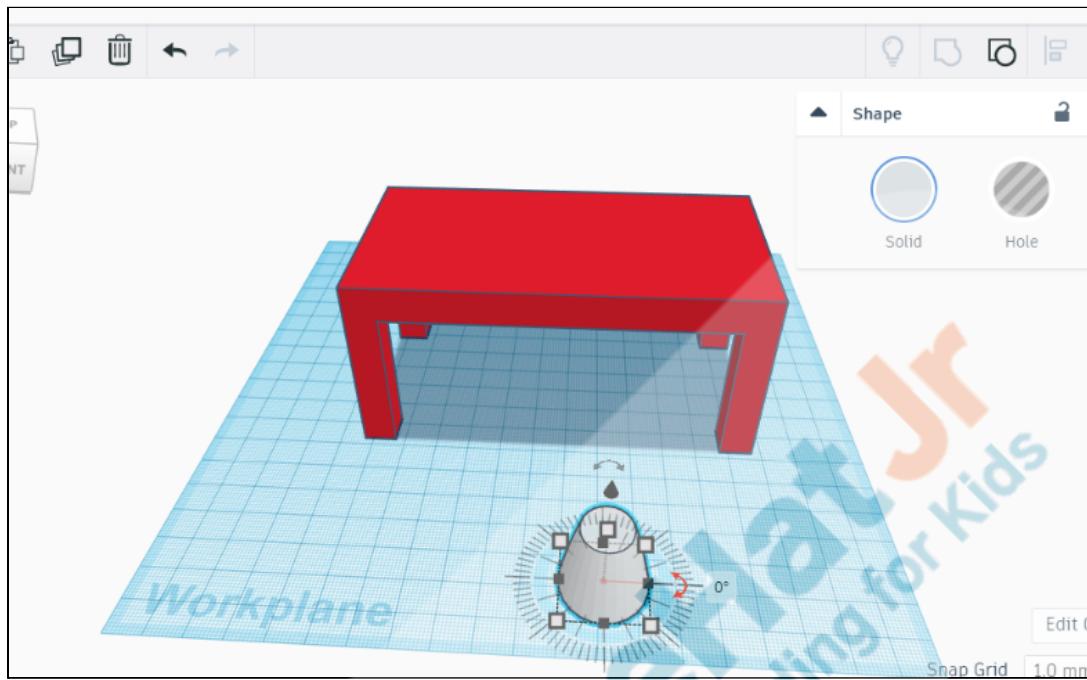
Align the paraboloid and the box properly and group them together.



Shape after grouping...



	<p>Now what should we do next?</p> <p>Yes.</p> <p>So let's see how we can do that.</p> <p>Do you remember for 3D shapes we have three axes x, y and z for rotation.</p> <p>Great!</p> <p>In Tinkercad once the shape is selected you will see three curved arrows which denote the direction of rotation and circular ruler showing the degree of rotation.</p> <p><i>Teacher shows the circular ruler and arrows to students.</i></p> <p>Once the curved arrow is clicked it turns red and the shape can be rotated in that direction as shown in the image below.</p>	<p>ESR: Rotate the shape upside down like a mug/cup.</p> <p>ESR: Yes!</p>
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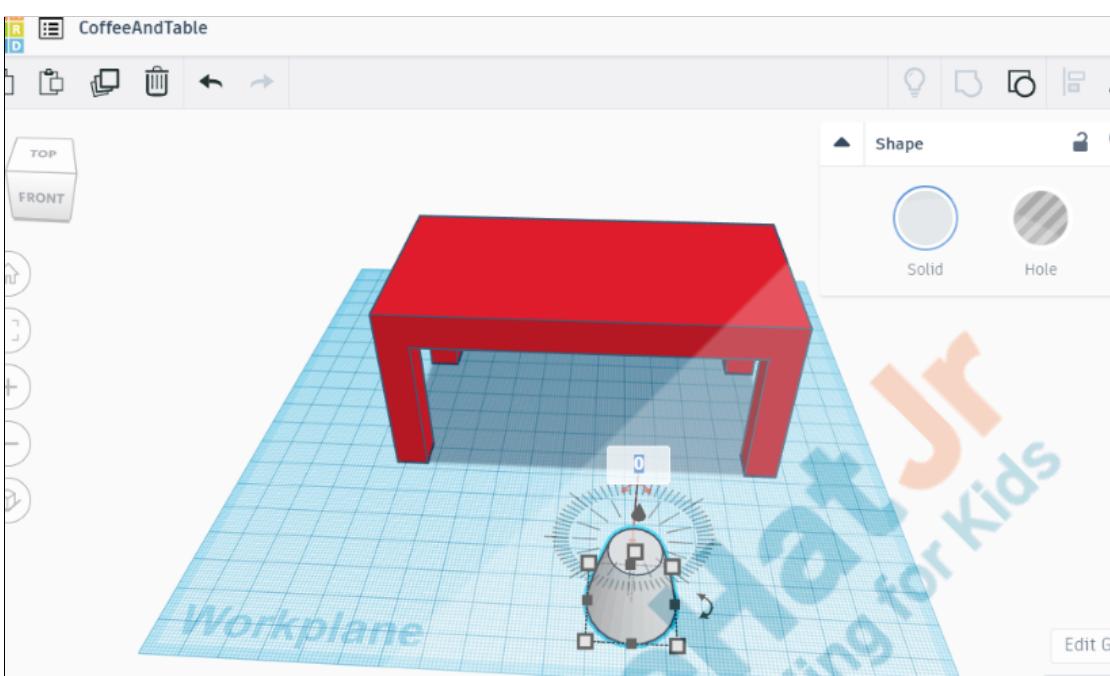


What do you think, on which axis we should rotate the shape?

Yes. The rotation will be on the y-axis (left to right is positive degree of rotation and right to left is negative degree of rotation).

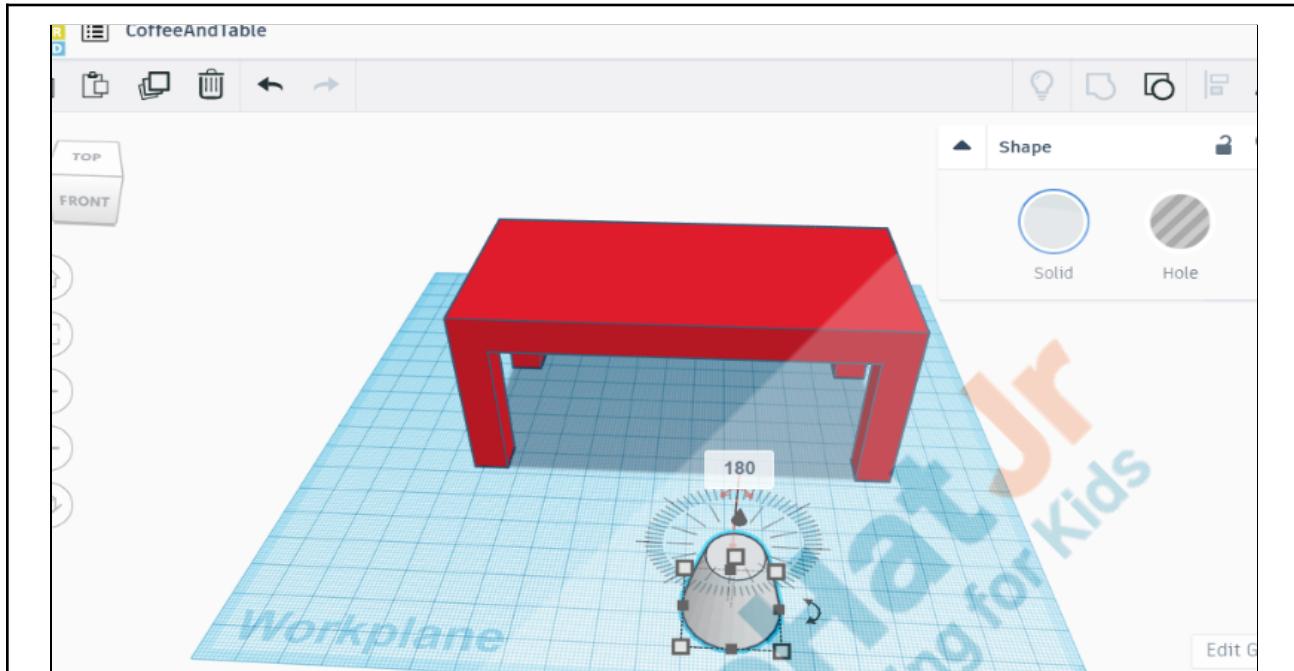
Note: To add rotation angle we can modify the text value in the textbox present above the ruler or we can hold the curved arrow and move it with the mouse.

ESR: Y-axis.



	<p>How many degrees should I rotate?</p> <p>90 degrees? 180 degrees?</p> <p><i>Teacher shows the rotation with different degrees of rotation.</i></p> <p>We can set it to 180 degrees for upside down rotation in Y direction.</p>	<p>ESR: 180 degrees</p>
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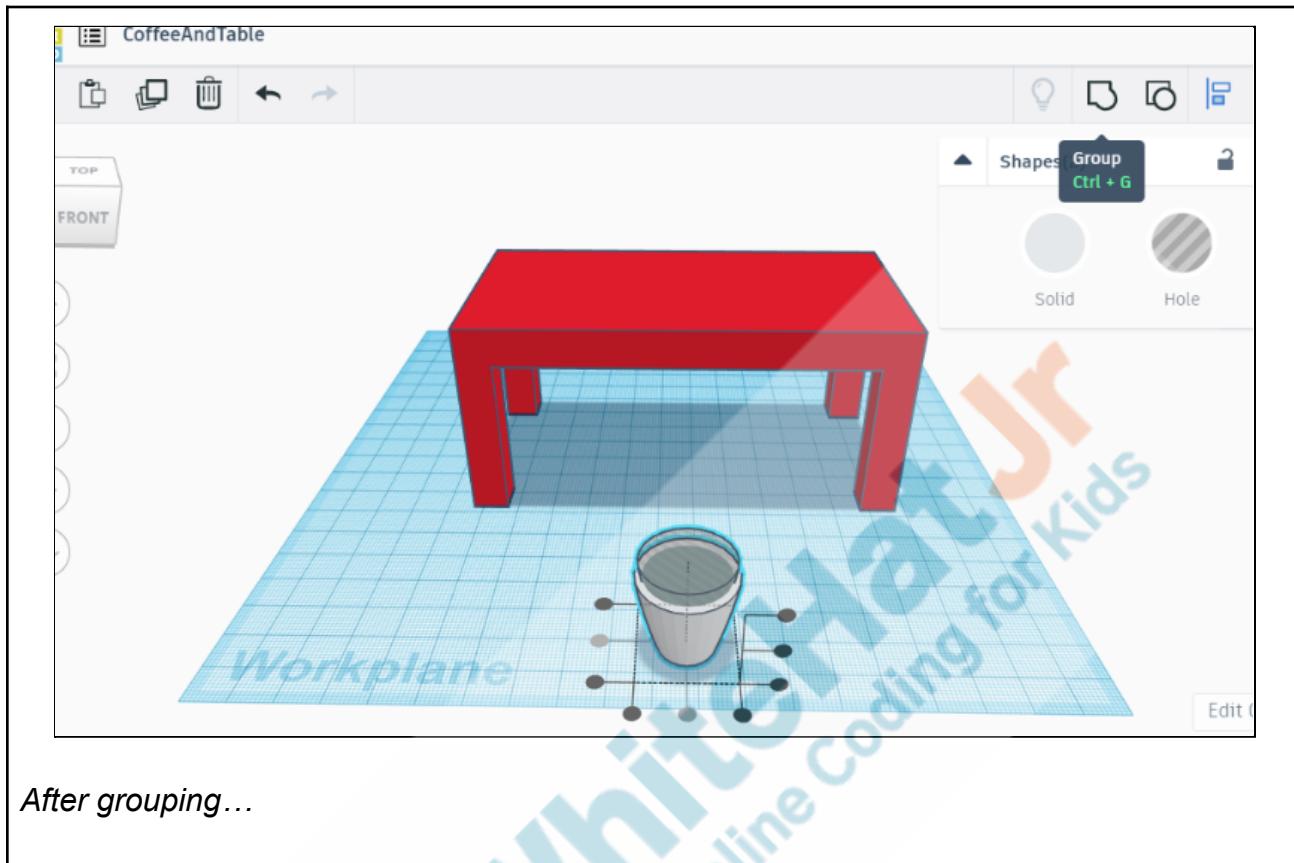
Rotation on Y-axis by 180 degrees..

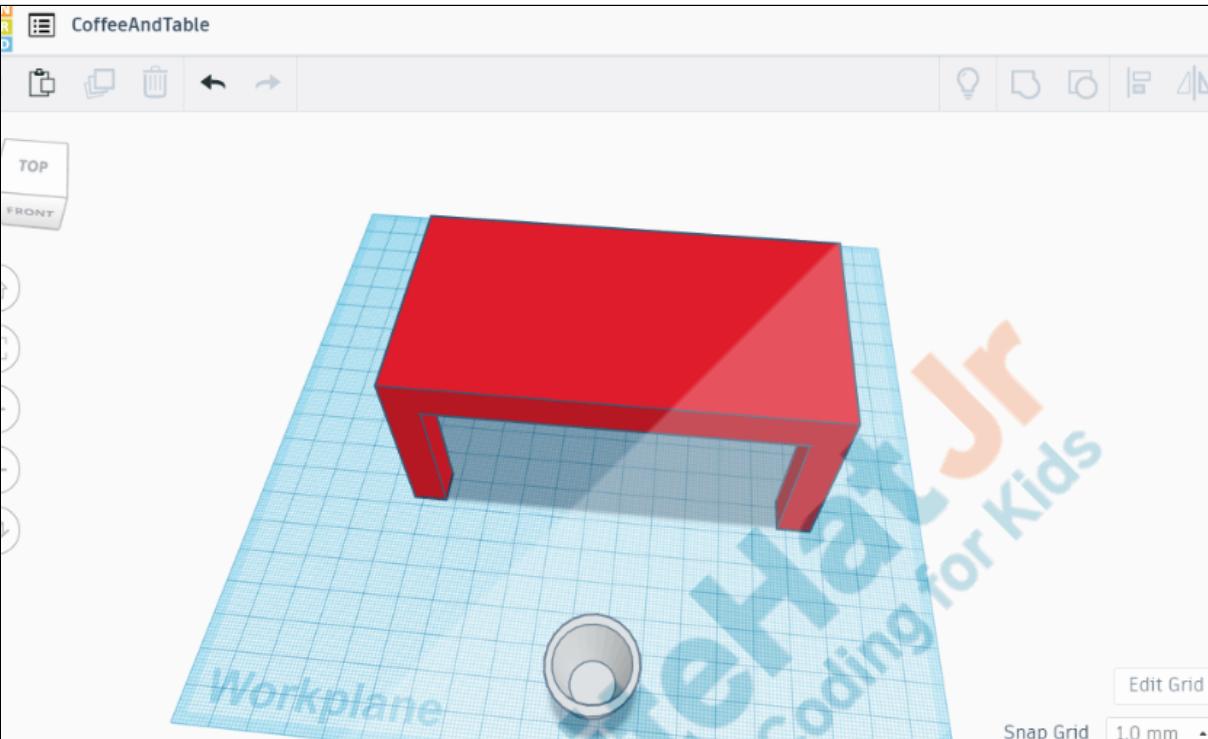


After rotation...

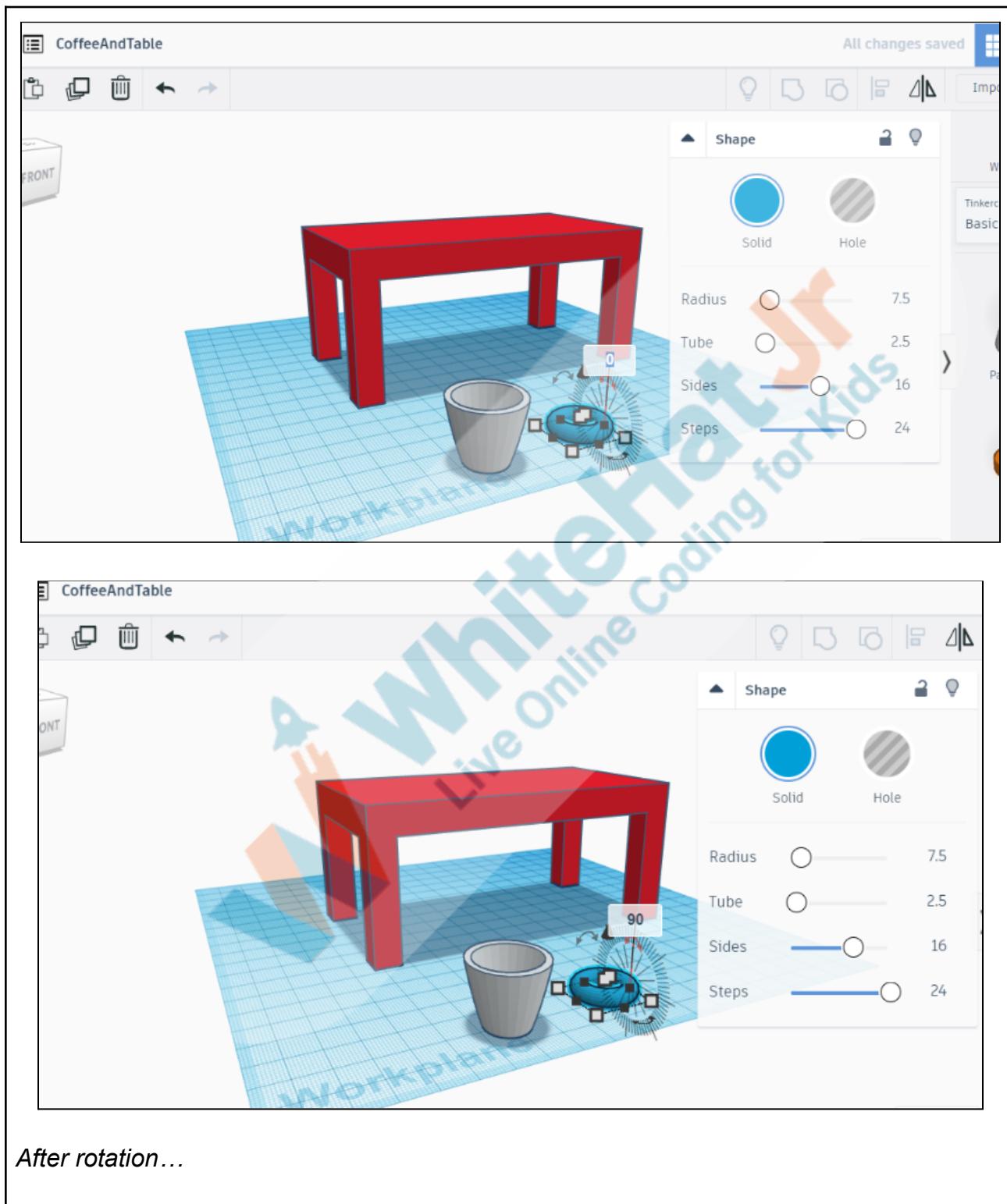


	<p>Now let's create a "Hole" of the same shape inside a cup to make it hollow.</p> <p>Note: After selecting the shape "Ctrl+C" can be used to copy the shape and "Ctrl+V" can be used to paste the same shape. The shape can be dragged out by selecting and moving it, if the second shape is not visible.</p>	
		
<p>Align and group...</p>		

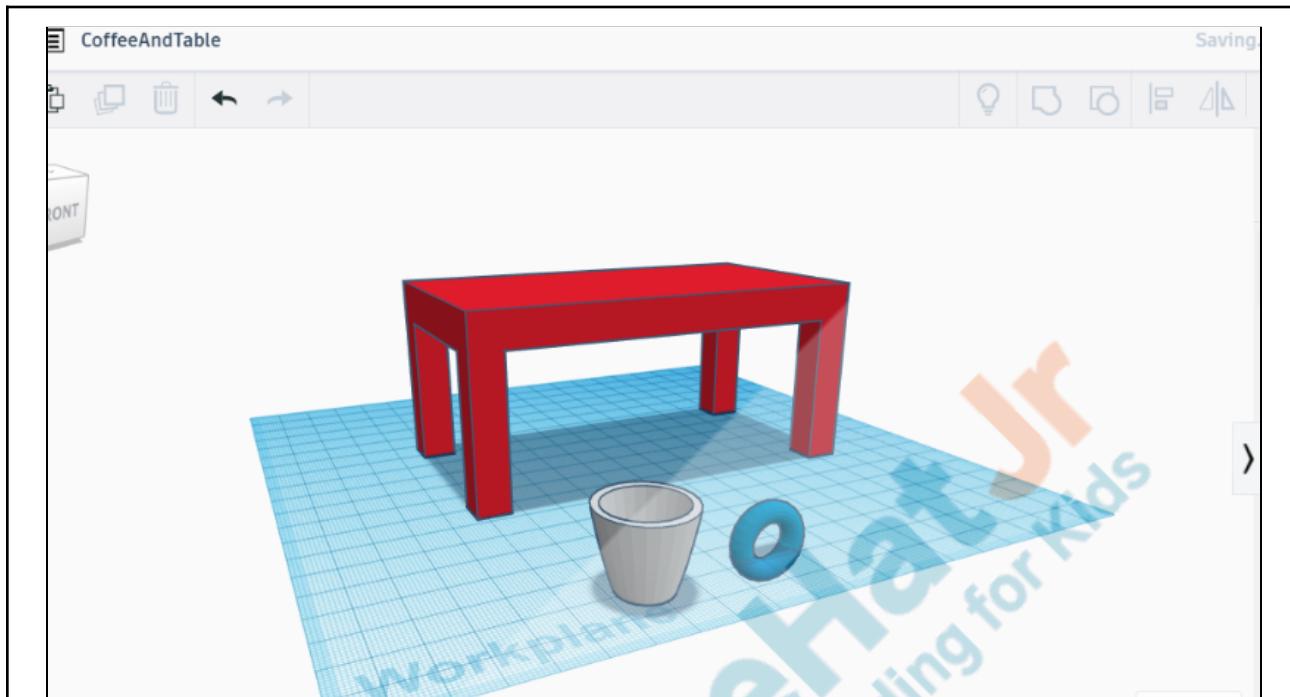




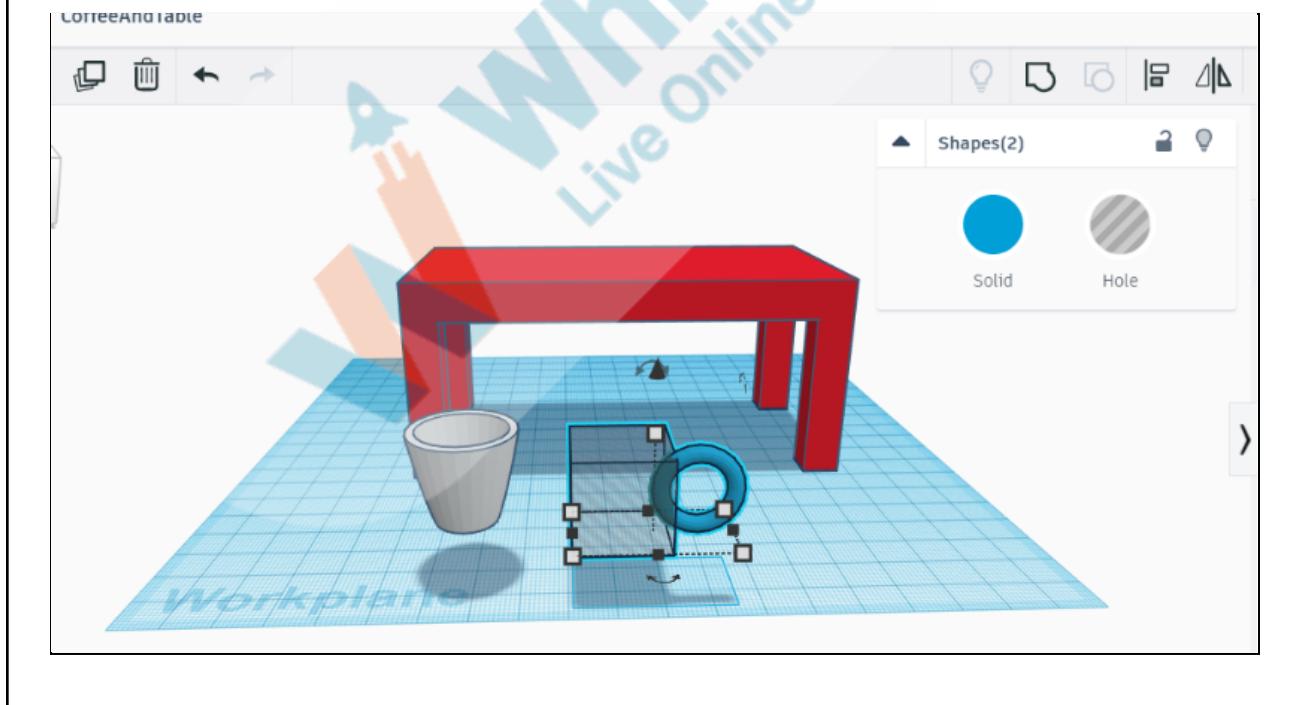
	<p>Now, what's next?</p> <p>Yes. What can be used for that?</p> <p>Great! We can use torus and cut it into half to make it a handle.</p> <p><i>Teacher shows how to rotate, cut, align and group torus with the mug.</i></p>	<p>ESR: A cup/mug handle.</p> <p>ESR: A torus</p>
<i>Rotation on z-axis by 90 degrees...</i>		



After rotation...

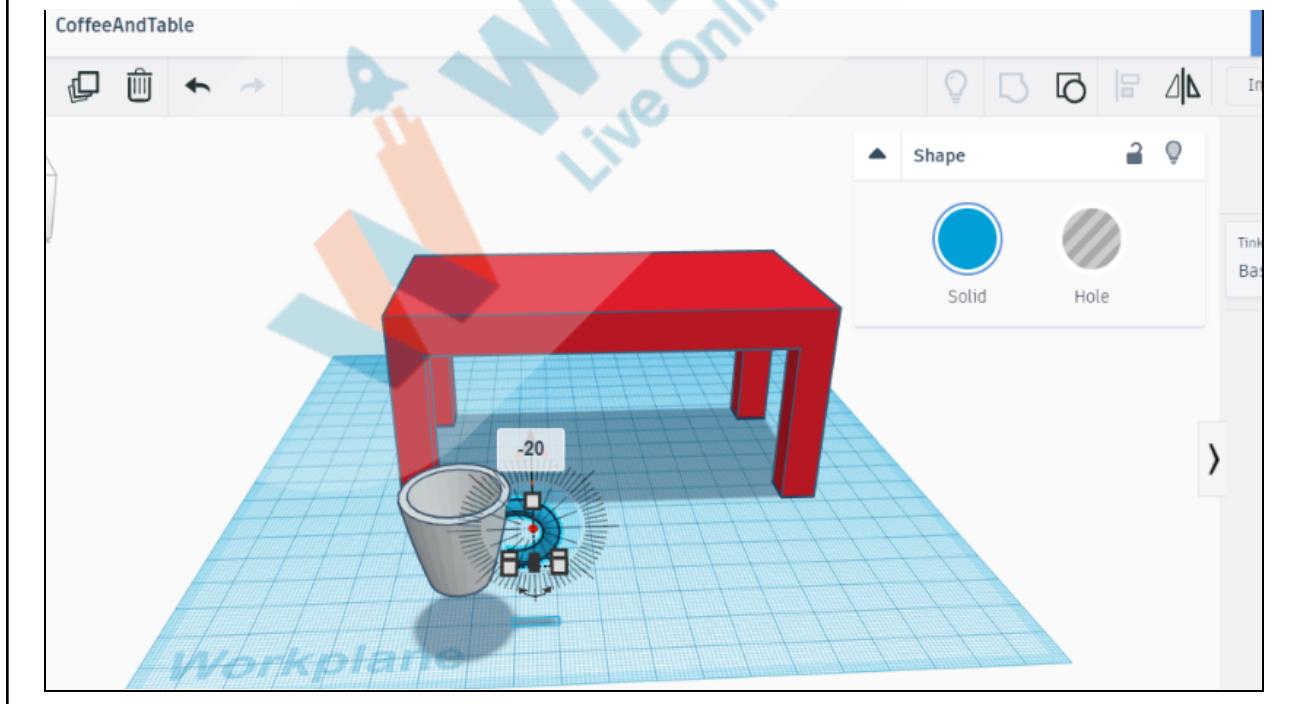


Use a box as a “Hole” to cut the torus in half...



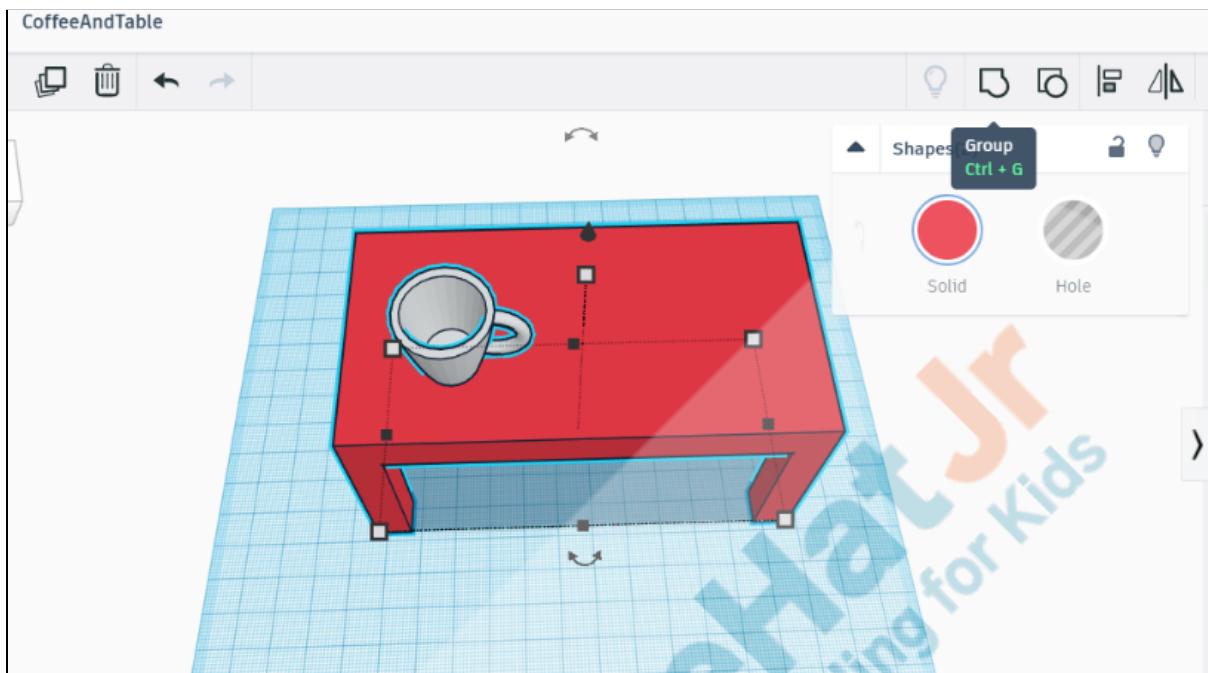


Rotate approximately 20 degrees to align with the cup...

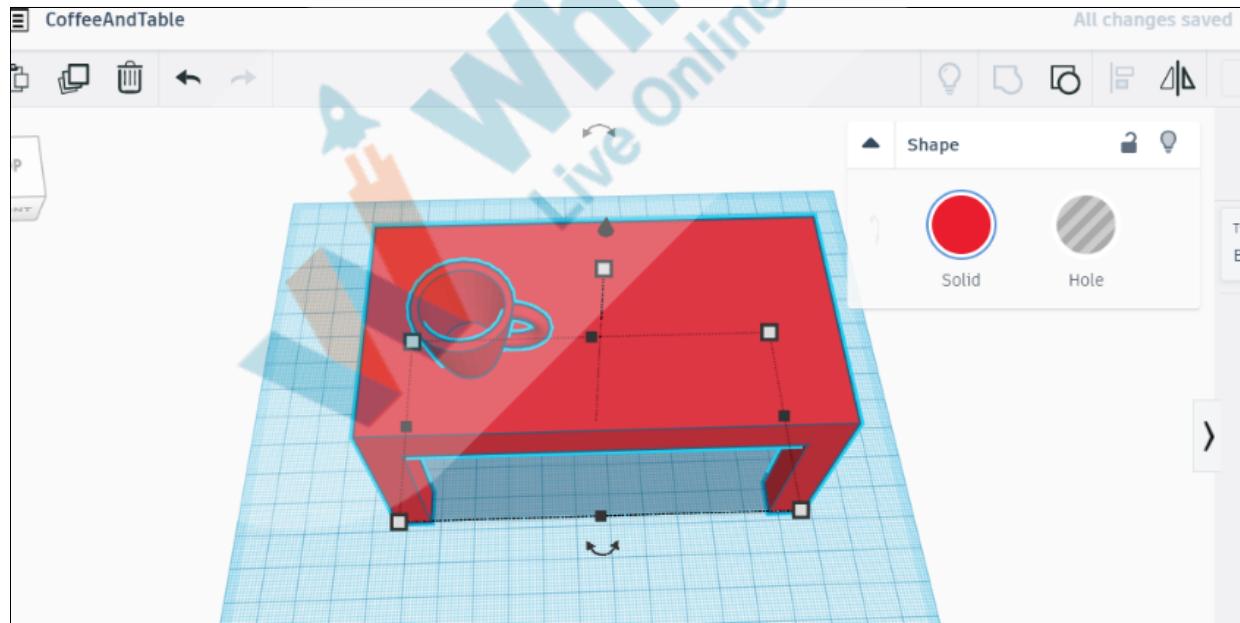




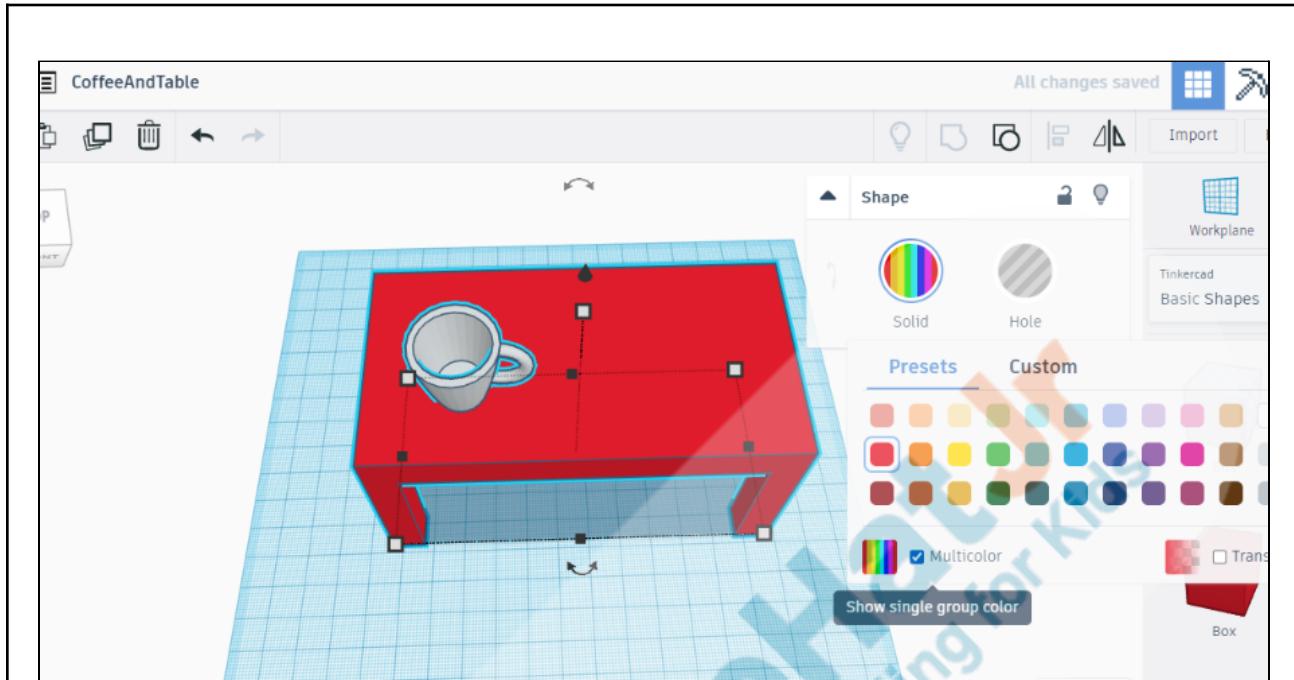




After grouping....



Note : Keep the multicolor option checked.

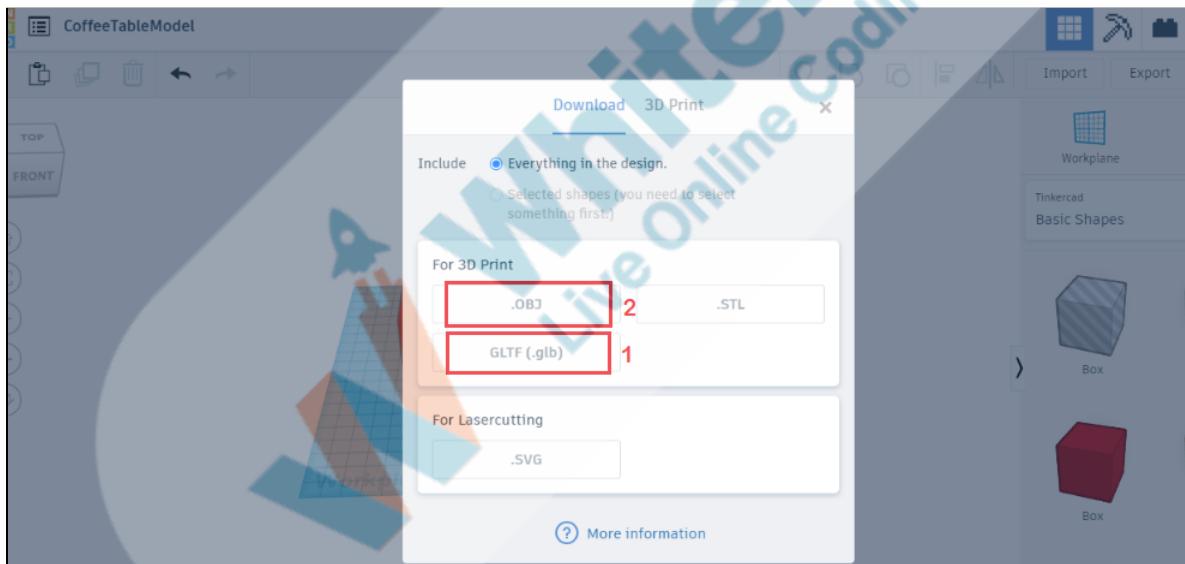
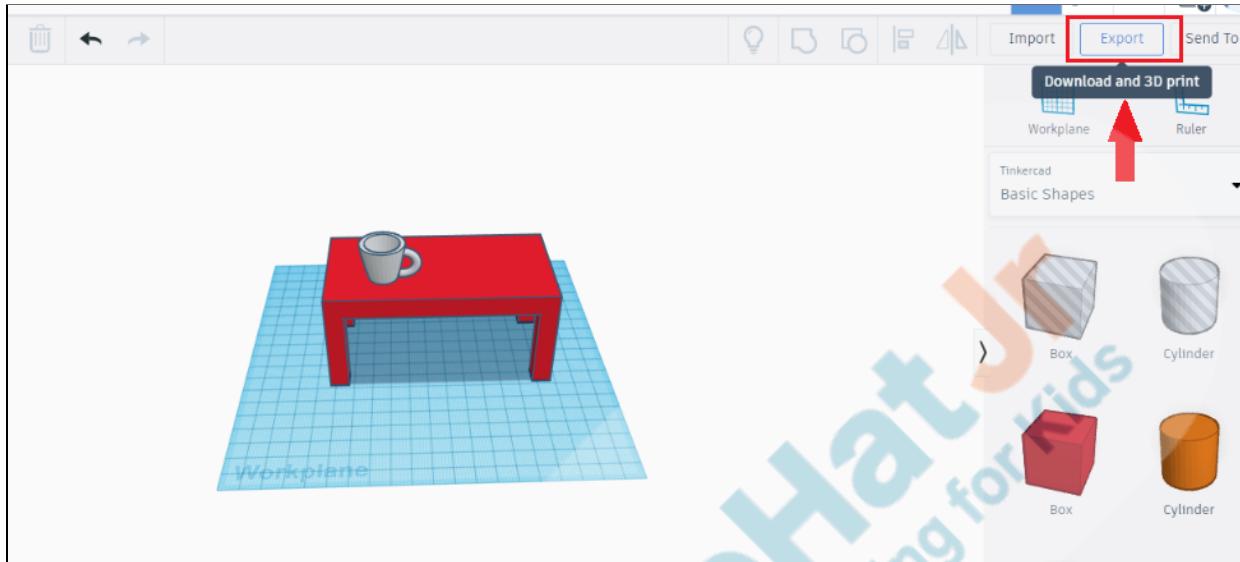


As final output we have the cup and the table model design.

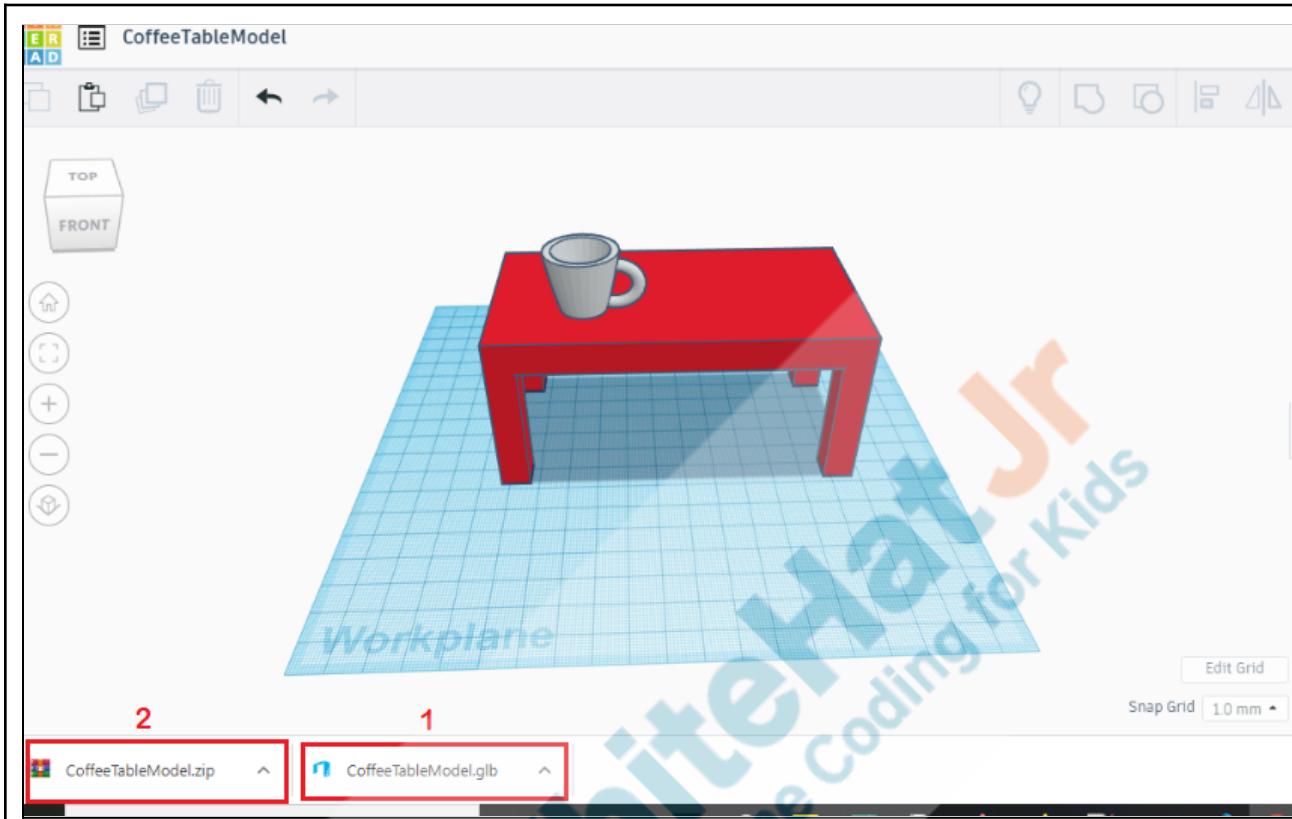


	<p>Now since our model is ready let's use the model inside the A-Frame scene.</p> <p>For this we will download our models from Tinkercad.</p> <p>Before that do you remember which file format we used in A-Frame for 3D models earlier?</p> <p>Amazing!</p> <p>In A-Frame we can also use .OBJ models.</p> <p>.OBJ is an object file similar to gLTF which keeps information of the 3D models in the form of polygon vertices.</p> <p>Let's download the .OBJ model from Tinkercad.</p> <p>To download the model from Tinkercad, click on “Export” on the top right corner and select file format to be downloaded.</p>	<p>ESR: gLTF</p>
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Note : 1 is .GLTF and 2 is .OBJ available on Tinkercad that can be used in A-Frame as shown in the image below.



Note 2: The .OBJ model from tinkercad will be downloaded in the Zip (compressed) format.



Note 3: Teacher shows how to keep all the files extracted in the working directory (folder) as discussed in earlier class.

	<p>In A-Frame, do you remember how we manage assets?</p> <p>Amazing!</p> <p>In A-Frame we can load a .OBJ model by specifying the path to an .OBJ and and .MTL files.</p> <p>MTL file is a material settings file which is used by many 3D object editing applications.</p>	
		<p>ESR: Yes. Using <a-assets> and <a-asset-item></p>

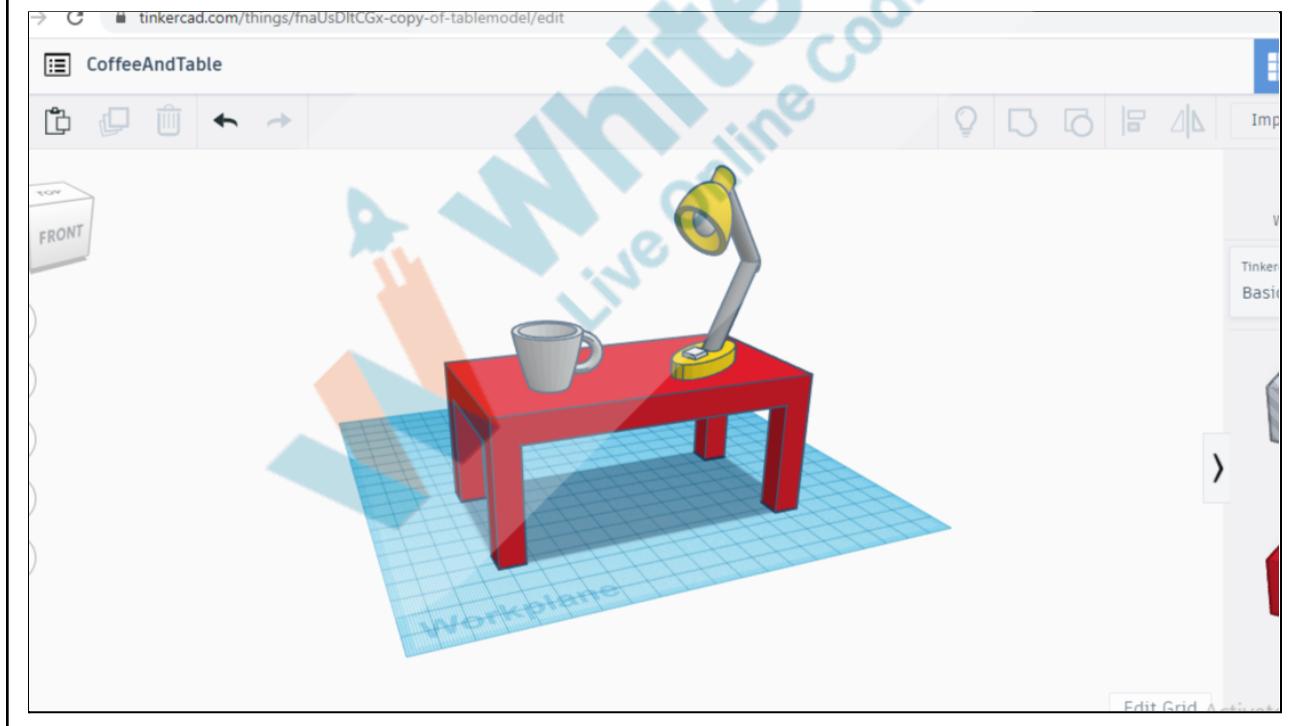
	<p>Let's add the path to the both .obj and .mtl under <a-assets> using <a-assets-item>.</p> <pre><!-------Asset Management-----> <a-assets> <a-asset-item id="table-obj" src="./models/obj/CoffeeTableModel/tinker.obj"></a-asset-item> <a-asset-item id="table-mtl" src="./models/obj/CoffeeTableModel/obj.mtl"></a-asset-item> </a-assets></pre>	
	<p>Now let's use the id of both .obj and .mtl inside <a-entity> for the "obj-model" component and set the position, rotation and scale.</p> <pre><!-------OBJ Models-----> <a-entity obj-model="obj: #table-obj; mtl: #table-mtl" position="5 0 0" rotation="-90 0 0" scale="0.1 0.1 0.1"></a-entity></pre>	

Teacher shows the output on the browser...

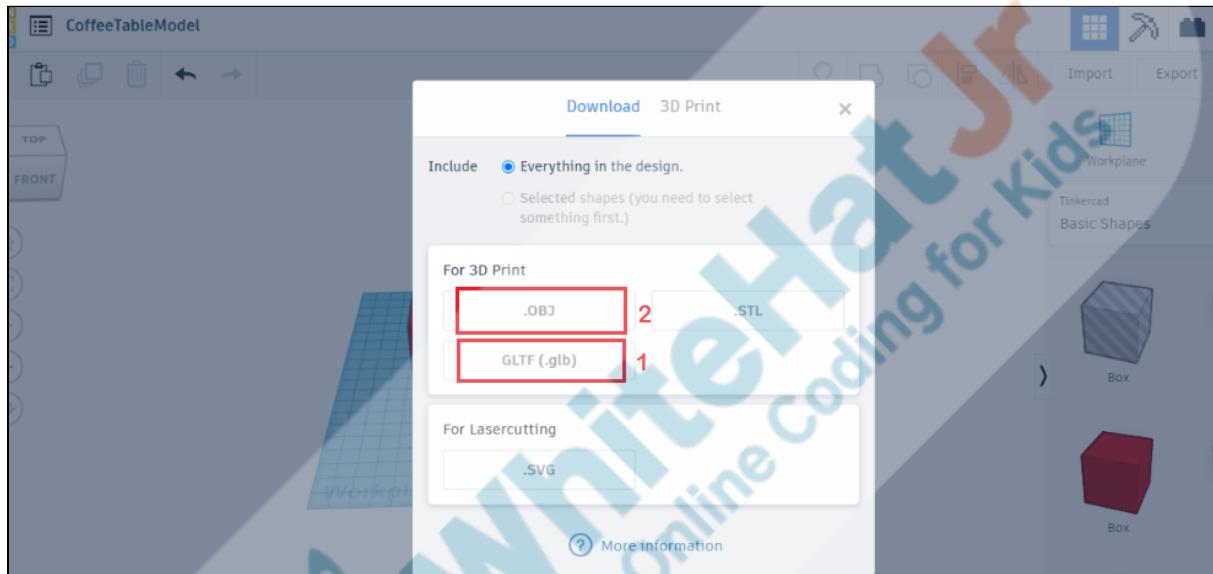


	<p>Now that we have learned how to create models with little more complexity you will create a model of lamp on the table and use it in the A-Frame scene, it's your turn.</p> <p>Please share your screen with me.</p>	
	<p>Now it's your turn. Please share your screen with me.</p>	
STUDENT-LED ACTIVITY - 20 mins		
<ul style="list-style-type: none"> • Ask Student to press ESC key to come back to panel • Guide Student to start Screen Share • Teacher gets into Fullscreen 		
ACTIVITY		
<ul style="list-style-type: none"> • Explore the platform, Tinkercad, to create 3D models • Learn about various tools used in Tinkercad like views and shapes. • Learn how to rotate shapes. 		
<p> Teacher starts slideshow from slides 15 to 17</p> <p>Refer to speaker notes and follow the instructions on each slide.</p>		
Step 3: Student-Led Activity (20 mins)	<p>Note 1: <u>Students will create only a lamp model to be placed on the table with the teacher's guidance.</u></p> <p>Note 2: <u>Teachers can use the illustrations given in Teacher Activity 2 to guide the student to make a lamp.</u></p>	

	<p><i>Encourage the student to try the different tools on Tinkercad.</i></p> <p><i>C1: Guide the student to open the previous table model design created account on Tinkercad.</i></p> <p><i>C2: Guide the student to create a lamp model and place it on the table.</i></p> <p><u>[Teachers can refer to Activity 2 to help the student to design the lamp].</u></p>	
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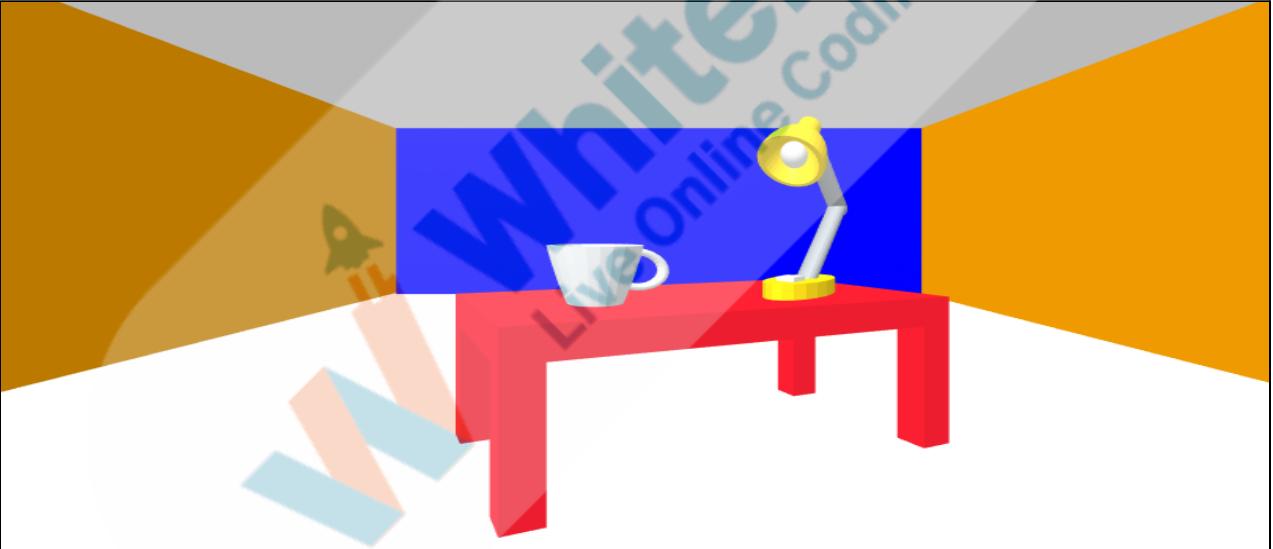
C3: Guide the student to download the model in their system/computer locally and extract all the files in the working folder.



C4: Guide the student to add the model in the A-Frame scene using assets management.

In the code the student will create two(for .obj and .mtl) <a-asset-item> under <a-assets> and will use those under <a-entity> for the “obj-model” component.

The student adds the model in the A-Frame scene.

	<p><i>Set the position, rotation and scale attribute to adjust the orientation of the model in the scene.</i></p>	
	<pre><!-------Asset Management--> <a-assets> <a-asset-item id="lamp-obj" src="./models/obj/CoffeeLampTable/tinker.obj"></a-asset-item> <a-asset-item id="lamp-mtl" src="./models/obj/CoffeeLampTable/obj.mtl"></a-asset-item> </a-assets> <!-------OBJ Models--> <a-entity obj-model="obj: #lamp-obj; mtl: #lamp-mtl" position="0 0 0" rotation="-90 25 0" scale="0.1 0.1 0.1 "></a-entity></pre> 	

	<p>You have created an amazing model and exported it to A-Frame.</p> <p>Good Job!</p> <p>Note: Students' output might look different.</p>	
Teacher Guides Student to Stop Screen Share		
WRAP-UP SESSION - 05 Mins		
<u>FEEDBACK</u>		
	<ul style="list-style-type: none"> • Complement the student for her/his effort in the class. • Encourage the student to move in the scene using WASD/arrow keys and mouse. 	
<p>Teacher starts slideshow  from slide 18 to slide 27</p>		
Activity details	Solution/Guidelines	
Run the presentation from slide 17 to slide 28		
<p>Following are the wrap-up session deliverables:</p> <ul style="list-style-type: none"> • Explain the facts and trivias • Next class challenge • Project for the day • Additional Activity 	Guide the student to develop the project and share with us.	

Quiz Time - Click on In-Class Quiz		
Question	Answer	
Which of the following are used to manage assets in A-Frame? A. <assets> B. <asset-item> C. <a-asset-item> D. <a-item>	C	
Which of the following options is used to download models from Tinkercad? A. download B. export C. share D. save	B	
To design a coffee mug, what can we use from the basic shapes? A. ellipsoid B. square C. triangle D. view	A	
• End the quiz panel		
<u>FEEDBACK</u>		
<ul style="list-style-type: none"> • Complement the student for her/his effort in the class. • Encourage the student to explore the platform and try their own models. 		
	<p>You get a “hats off”.</p> <p>Alright. I will look forward to seeing how you create your own model and use it in the program.</p>	<p>Make sure you have given at least 2 Hats Off during the class for:</p>

		<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <div style="background-color: #0070C0; color: white; padding: 5px; border-radius: 5px; text-align: center;"> Creatively Solved Activities  +10 </div> <div style="background-color: #0070C0; color: white; padding: 5px; border-radius: 5px; text-align: center;"> Great Question  +10 </div> <div style="background-color: #0070C0; color: white; padding: 5px; border-radius: 5px; text-align: center;"> Strong Concentration  +10 </div> </div> </div>
Project Overview	<p>TRAIN IN THE DESSERT</p> <p>Goal of the Project:</p> <p>In this project you will be creating a 3D train model on Tinkercad and exporting it to the A-Frame scene.</p> <p>Story:</p> <p>3D models created by 3D artists, which are also used in various game applications.</p> <p>Jacob is really fascinated by games like “Subway surfers”. In this game a character keeps running either on the track or on the train to collect coins. He is planning to design a 3D model of a train for his game.</p> <p>Create a 3D model of the train and export it to the A-Frame scene.</p> <p>I am very excited to see how you will create your own 3D models and use it in the program.</p>	

	Bye!	
 Teacher ends slideshow		
Teacher Clicks		✖ End Class
Additional Activities	<i>Guide the student to download the model a gLTF and use it in A-Frame as a 3D model.</i>	
<pre><a-asset-item id="table-gltf" src="./models/gltf/CoffeeTableModel.glb"> </a-asset-item></pre>		
<pre><a-entity gltf-model="#table-gltf" position="0 0 5" rotation="0 0 0" scale="0.1 0.1 0.1 "></a-entity></pre>		

Activity	Activity Name	Links
Teacher Activity 1	Activity 1	https://www.tinkercad.com/
Teacher Activity 2	Create Table Lamp Steps	https://curriculum.whitehatjr.com/PRO+Asset/3D+Table-Lamp+Modelling.pdf
Teacher Activity 3	Teacher Reference Code	https://github.com/whitehatjr/PRO-C1_50-Activity-Reference
Teacher Activity 4	Model Output	https://curriculum.whitehatjr.com/PRO+Asset/f0e806e2175347038e6955c784d9b5f1.mp4
Student Activity 1	Activity 1	https://www.tinkercad.com/
Student Activity 2	Blank Activity	https://github.com/whitehatjr/PRO-C1

		<u>50-Student-Activity</u>
Project Solution Link	Train In The Dessert	<u>https://github.com/whitehatjr/Project-Solution-PRO-C150/</u>
Teacher Ref. Visual Aid Link	Visual aid link	<u>https://curriculum.whitehatjr.com/Visual+Project+Asset/PRO_VD/PRO_C150_withcues.html</u>
Teacher Ref. In-class Quiz	In-class quiz	<u>https://s3-whjr-curriculum-uploads.whjr.online/b6032562-1c7a-4052-896c-c4d87c176ce7.pdf</u>