Topic	CREATE BASIC 3D MODELS	
Class Description	**Students learn to create 3D models using Tinkercad.**	
Class	**C149**	
Class time	**45 mins**	
Goal	• Introduction to Tinkercad. • Explore the different tools on Tinkercad. • Create a simple 3D model using Tinkercad. • Learn the concept of creating holes in 3D shapes. • Learn to align and group multiple shapes into one object.	

Resources Required	• Teacher Resources
	  ○ Laptop with internet connectivity
	  ○ Earphones with mic
	  ○ Notebook and pen
	• Student Resources
	  ○ 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

CONTEXT

- **Introducing how to create 3D models.**

Teacher starts slideshow  **from slides 1 to 16**

Refer to speaker notes and follow the instructions on each slide.	
Activity details	**Solution/Guidelines**
Hey <student's name>. How are you? It's great to see you! Are you excited to learn something new today? **Run the presentation from slide 1 to slide 3** **Following are the WARM-UP session deliverables:** • **Greet the student.** • **Revision of previous class activities.** • **Quizzes**	**ESR**: Hi, thanks, Yes I am excited about it! Click on the slide show tab and present the slides
Q&A Session	
Question	**Answer**
Which of the following instructions is used as an attribute in the light component to see the shadow? A. Shadow = true B. showShadow:true C. castShadow:true D. CastShadow:enabled	**C**
Which of the following lights in A-Frame can cast shadow of objects? A. Point light, Spot light and Directional light B. Revert light C. Point light, Spot light and Directional light D. Resume light	**C**
Continue the WARM-UP session	
Activity details	**Solution/Guidelines**

<table>
<tr><td colspan="2">Run the presentation from slide 4 to slide 16 to set the problem statement.

Following are the WARM-UP session deliverables:
● Appreciate the student.
● Explain how to create 3D models.</td><td>Narrate the story by using hand gestures and voice modulation methods to bring in more interest in students.</td></tr>
<tr><td colspan="3">Teacher ends slideshow  </td></tr>
<tr><td colspan="3">TEACHER-LED ACTIVITY - 15 mins</td></tr>
<tr><td colspan="3">Teacher Initiates Screen Share</td></tr>
<tr><td colspan="3"><u>CHALLENGE</u>
● Create a 3D model using Tinkercad.</td></tr>
<tr><td>Step 2: Teacher-led Activity (10 mins)</td><td>Today we will be creating our own 3D models and for this we will be using an online platform called Tinkercad. It is simple to use.

Let’s start by creating an account on Tinkercad.

[Teacher Activity 1]
Link1: https://www.tinkercad.com/

Steps to create an account on Tinkercad:</td><td></td></tr>
<tr><td colspan="3">1) Go to https://www.tinkercad.com/

2) Click on Start Tinkering.</td></tr>
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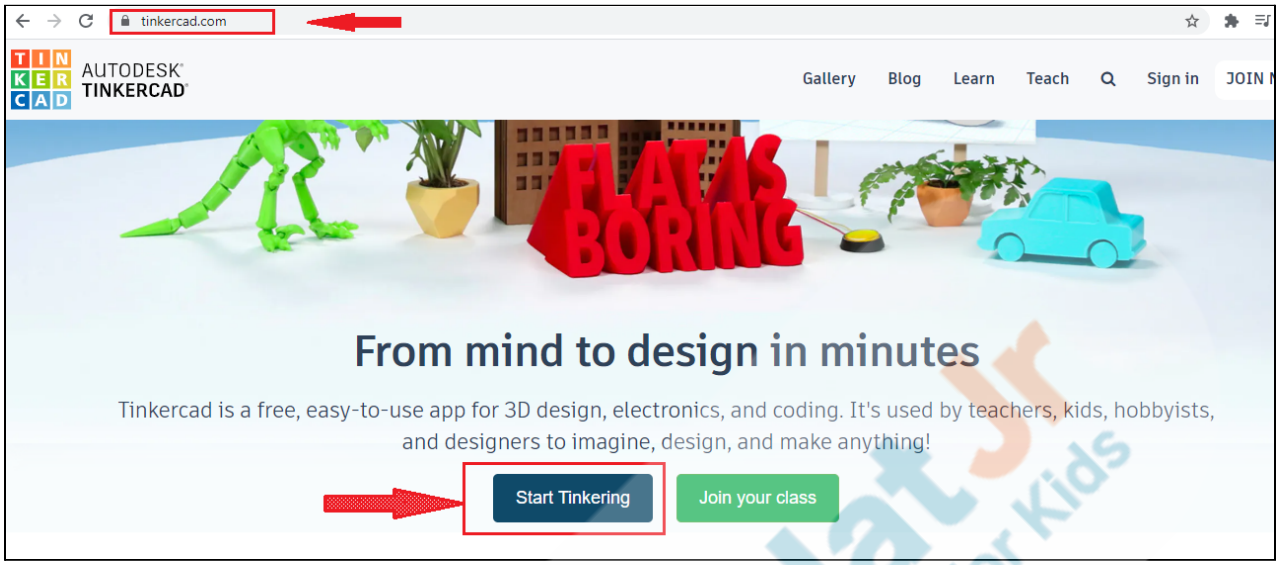
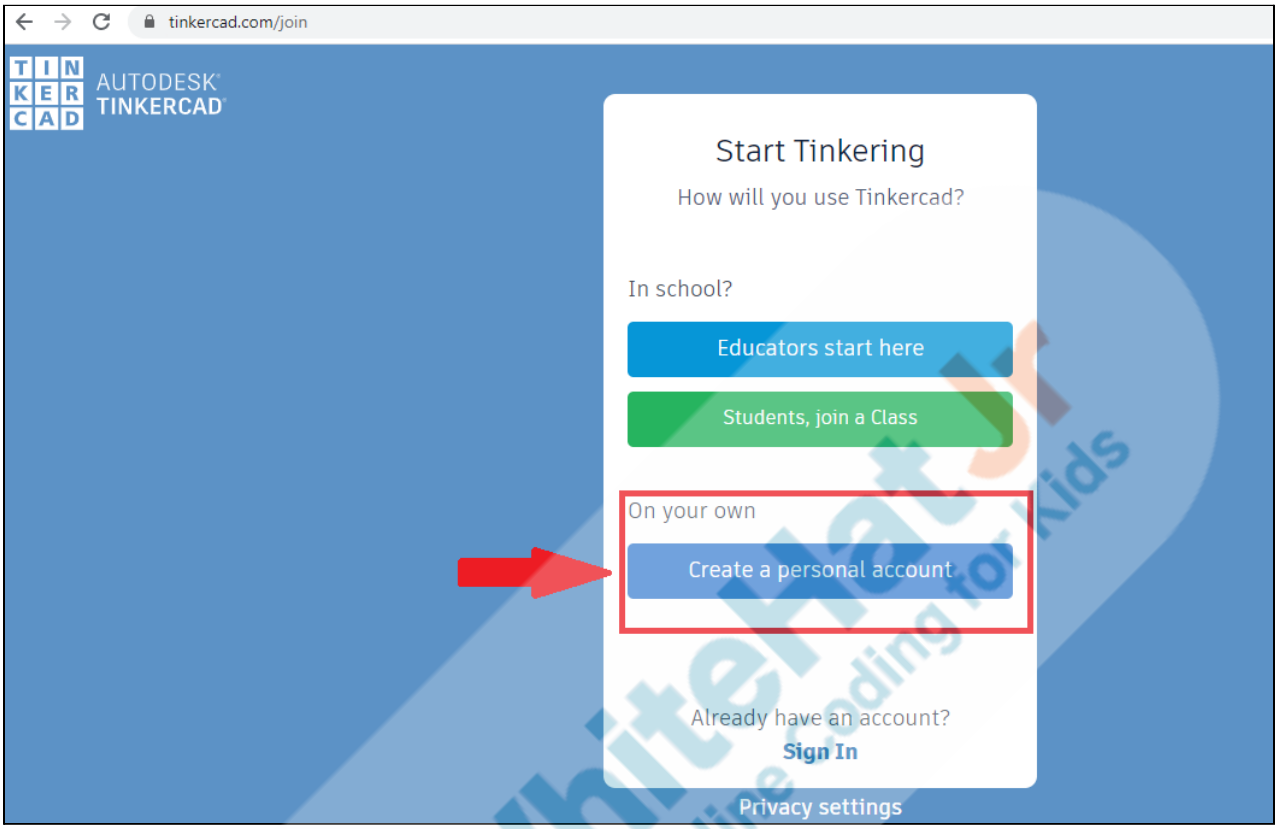
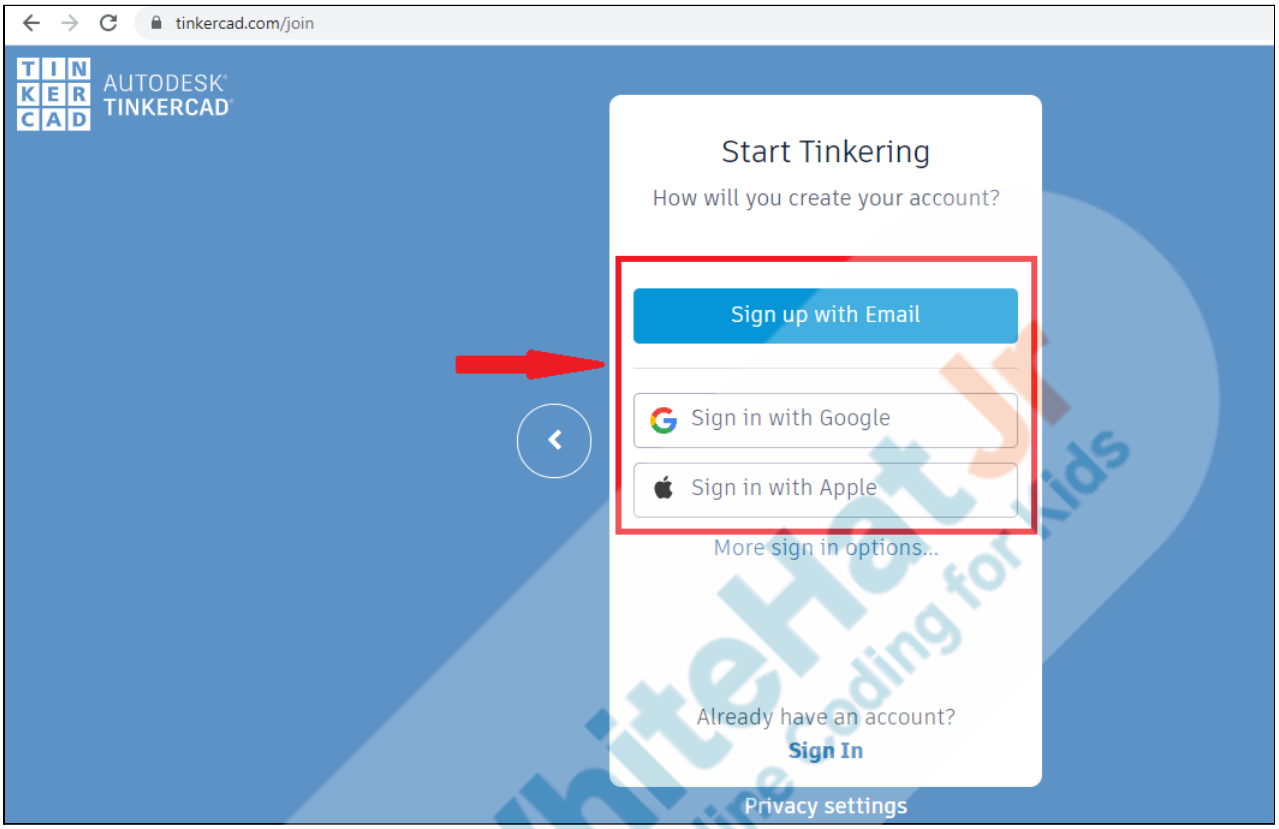


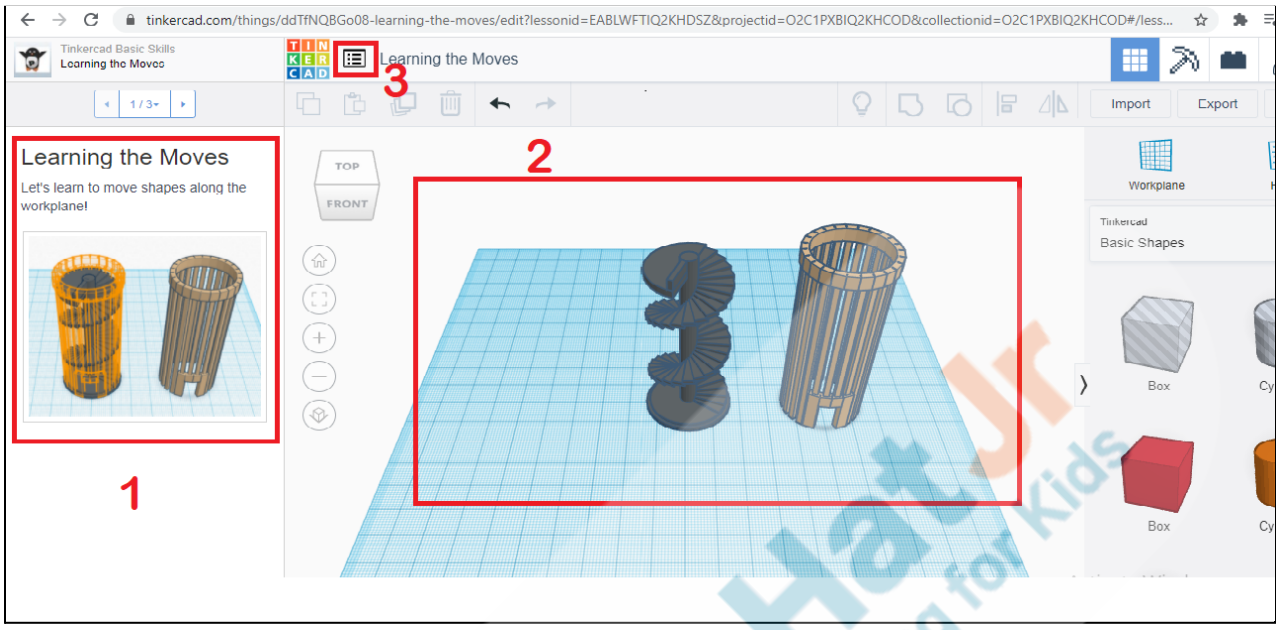
3) Click on “Create a personal account”.



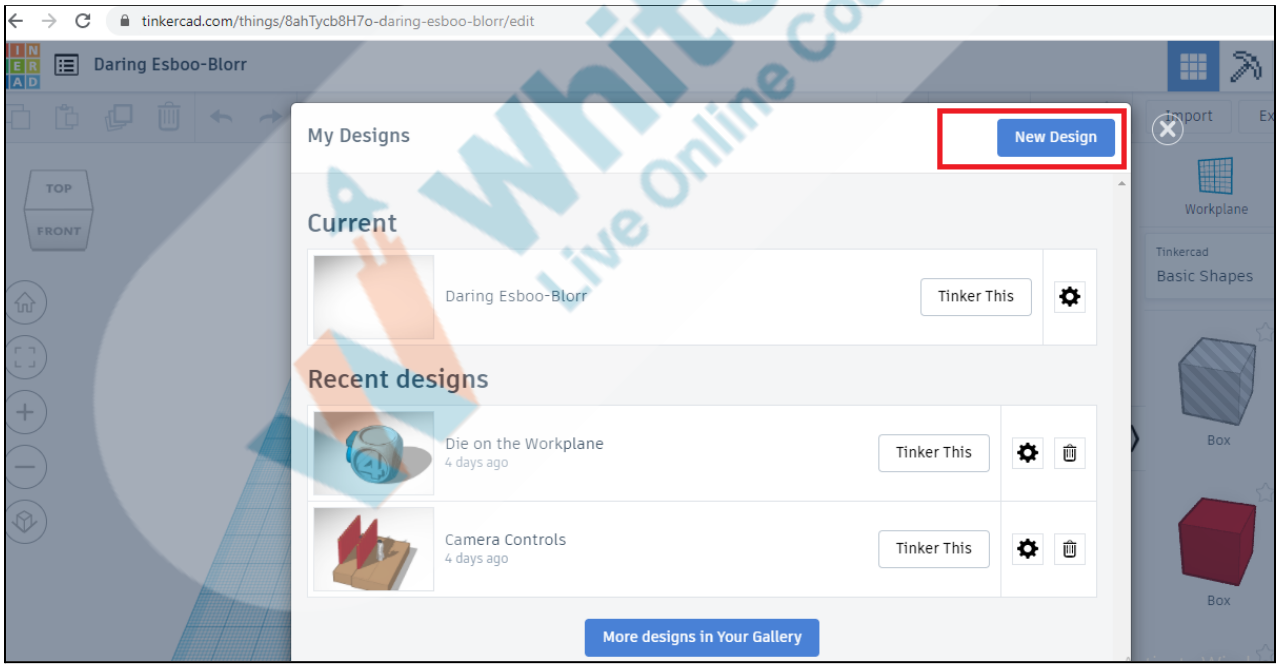
4) Sign up with Email or Sign in with an already existing Google/Apple account.

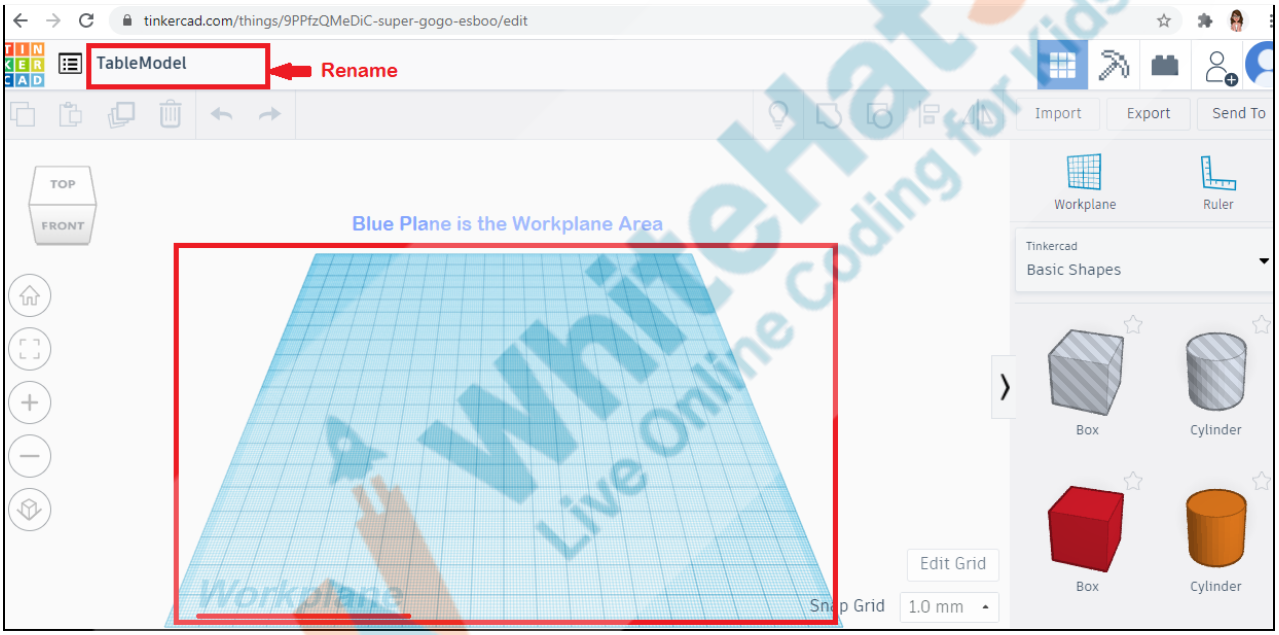


5) Once the account is created and logged in, there will be a few lessons (on the left side of the panel) to learn basics and to get acquainted with the platform.
   5.1) Instruction for lessons from the tinkercad will be on the leftmost section (**"1"** in the image below.)
   5.2) Based on the instruction, the action can be performed on the workplane of the platform. (**"2"** in the image below.)
   ***Note** :You can ask the student to try one or two things from those or you can ask them to skip for now(as those will be covered in the class) and create a new design.*
6) To **"create a new design"** of your own. (click on **"3"** as shown below in the image.)

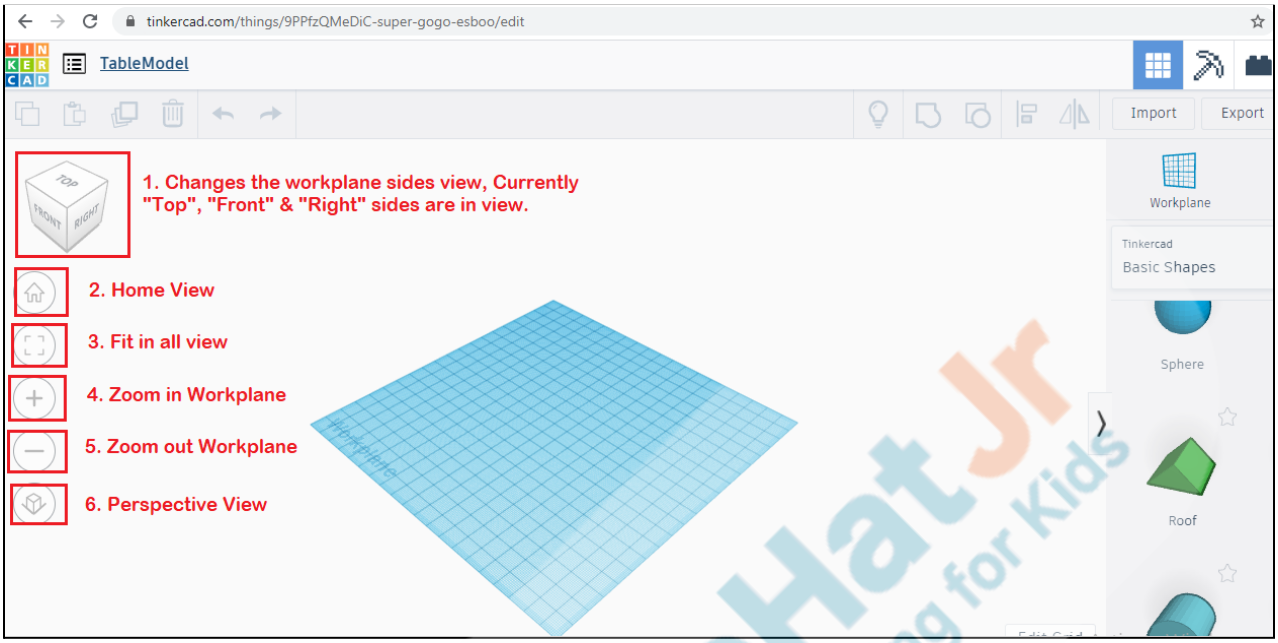


7) Click on “New Design” to start a new model design.

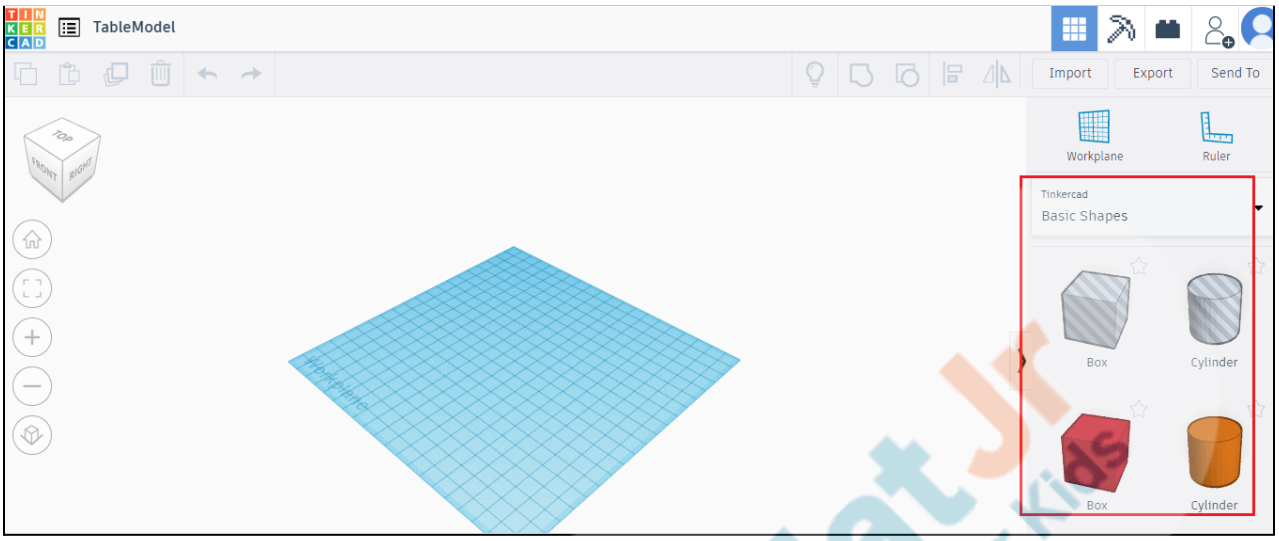


	To get started, let's rename our project to "**TableModel**" or any other name that you wish to keep. To design a model on tinkercad a "Workplane" area is provided which can act as a base to design the model.	*Students observe.*
		
	On the left side of the Workplane: 1. View Cube: This cube (#1 in the image below) can be clicked to change the orientation of the Workplane view. It has six sides TOP, BOTTOM, LEFT, RIGHT, FRONT, and BACK.	

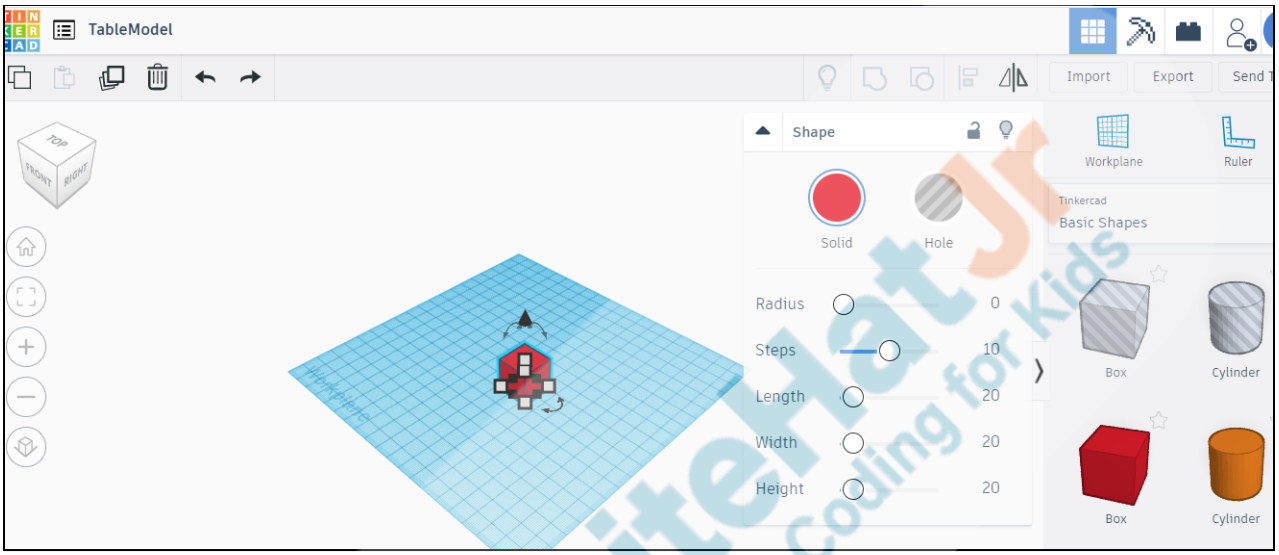
	***Note**: Show the students all the views, also while designing the model later on.* 2. The home button brings back the origin view of the Workplane. (#2 in the image below.) 3. To see all the objects/shapes on the Workplane “Fit in all” View can be clicked. (#3 in the image below.) 4. Plus sign helps to zoom in the Workplane. This can also be done by scrolling the mouse. (#4 in the image below.) 5. Minus sign helps to zoom out of the Workplane. (#5 in the image below.) 6. Creates a perspective view(#6 in the image below.)	

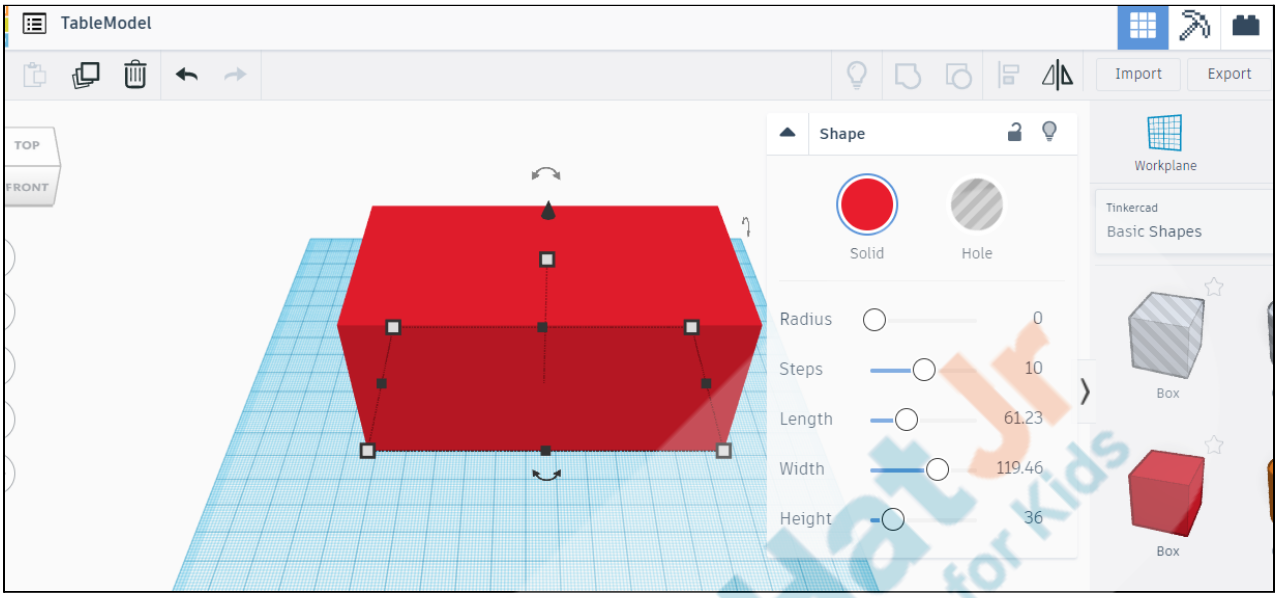


	On the right side of the Workplane there are a few basic shapes available to create 3D models. Let's start by creating a very simple model. **A table.** Can you tell me which shape can we use to create a rectangular table with four legs? Yes. Great!	**ESR**: A box



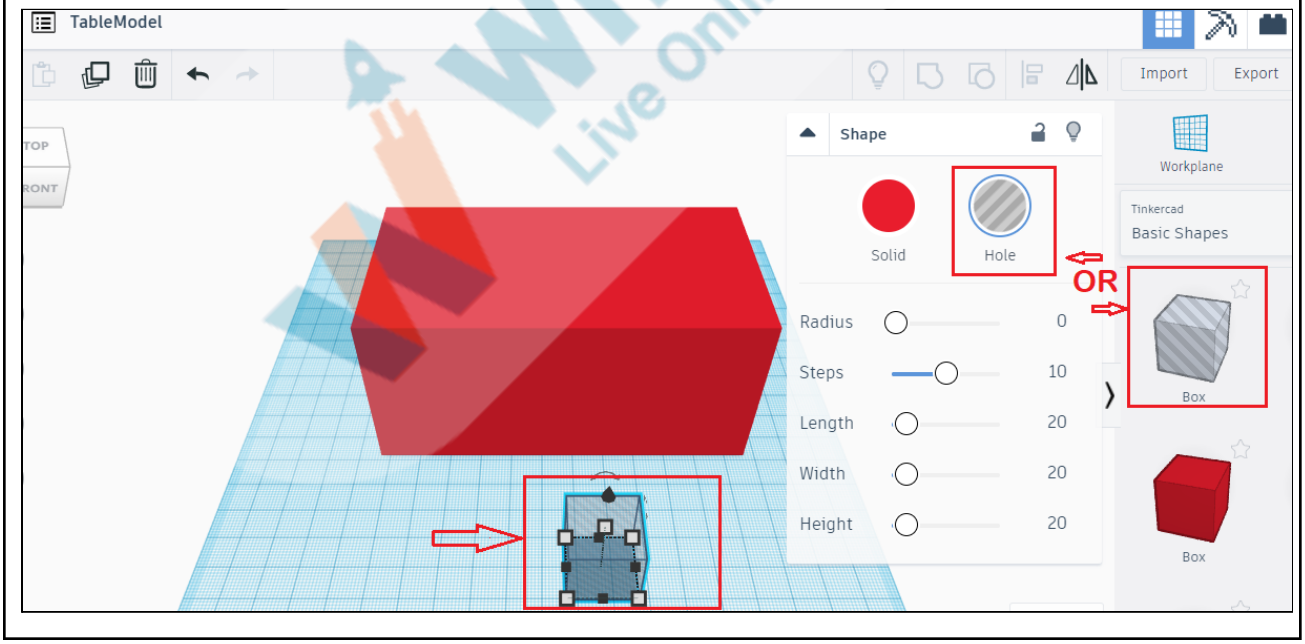
	Let's drag and drop a box on the workplane from the Basic Shapes section. ***To change the dimensions of the box:*** *Once the box is dropped on the plane, when the box is selected, a panel will appear on the right side which can be used to change the length, width, and height of the box by moving the slider present on the respective attribute of the box.* *Also when the box is selected, it is surrounded by the small squares which can also be used to change the dimensions of the box and a little cone at top which can be used to drag the box up or down on the Workplane.*	*Student watches.*

	Note:*Teacher shows the different view of the box by changing the view of the Workplane with help of the cube, zooming in and out.*	
		
	Try a different combination to get the big box approximately to the following dimensions.	

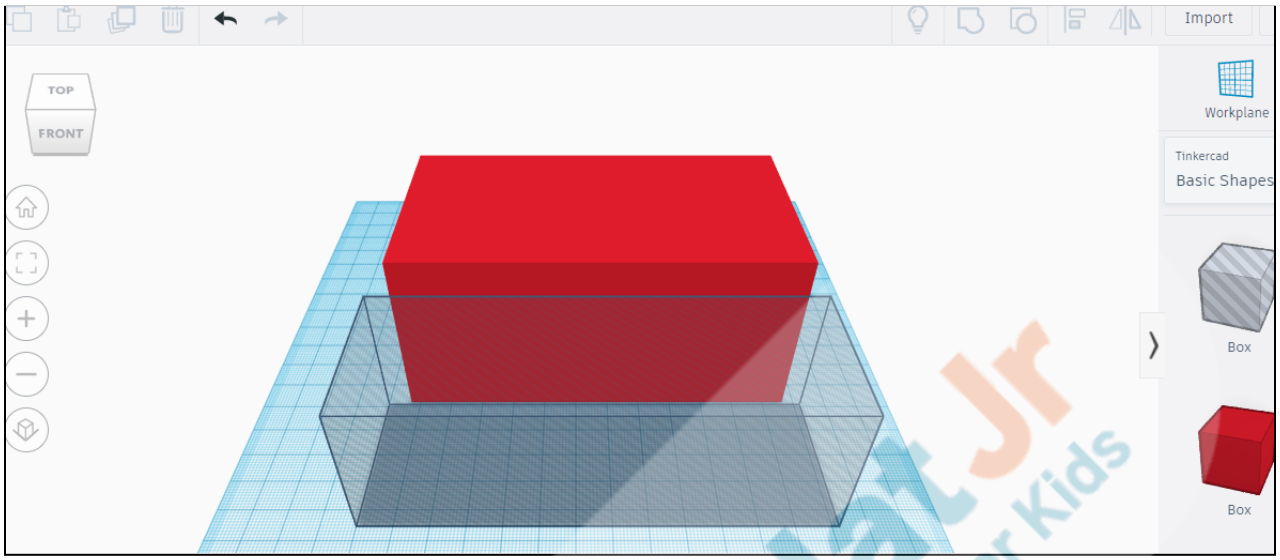


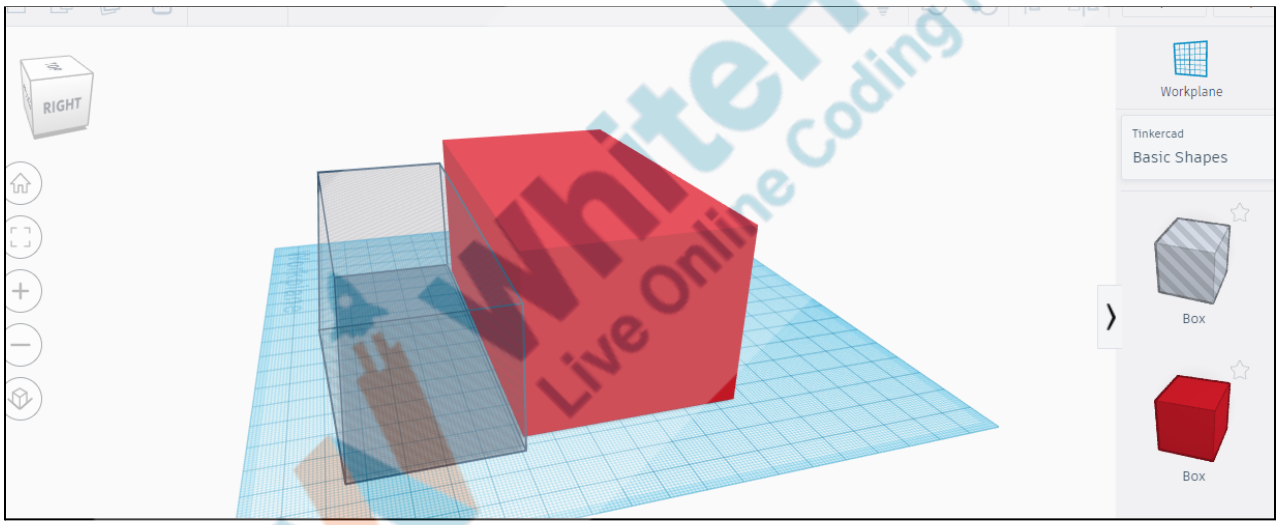
	Great! Now we have a very big box on the table. Now what do we need for the table? How can we do this? Any ideas? Great! This is one of the ways we can create four legs of our model. But there is one more interesting tool available on tinkercad which helps us create a hole inside one shape with the help of another shape. Let's try that.	**ESR**: 4 legs of the table. **ESR**: We can use 4 more boxes and attach them to this box.

	Do you see any black and white striped box or cylinder under basic shapes? So, to make a hole we can: 1) Select the black and white striped box from the basic shapes. OR 2) Drag and drop one more box and click on the “Hole”. ***You can see that the box is transparent, that means wherever this box will be used it will create hole in that space.***	**ESR:** Yes!



	The "Hole" button can be used to turn any shape into empty space of that shape. Let's see it with the help of an example. Now, since we have a box, which is a hole, let's adjust the dimension of that box in such a way that it is ***approximately longer from left to right*** side (that is the width of the box is little longer than the first box). We should keep the "Hole" shapes a little longer if we want to create a hole throughout the shape. **Note 1:** Make sure the height and length of the "Hole" box is smaller than the first box (as shown below to avoid cutting off the first box completely). **Note 2:** Make sure to view from all sides, by clicking on the "View Cube" as the dimensions might seem smaller from one view and it might be larger from the other view.	





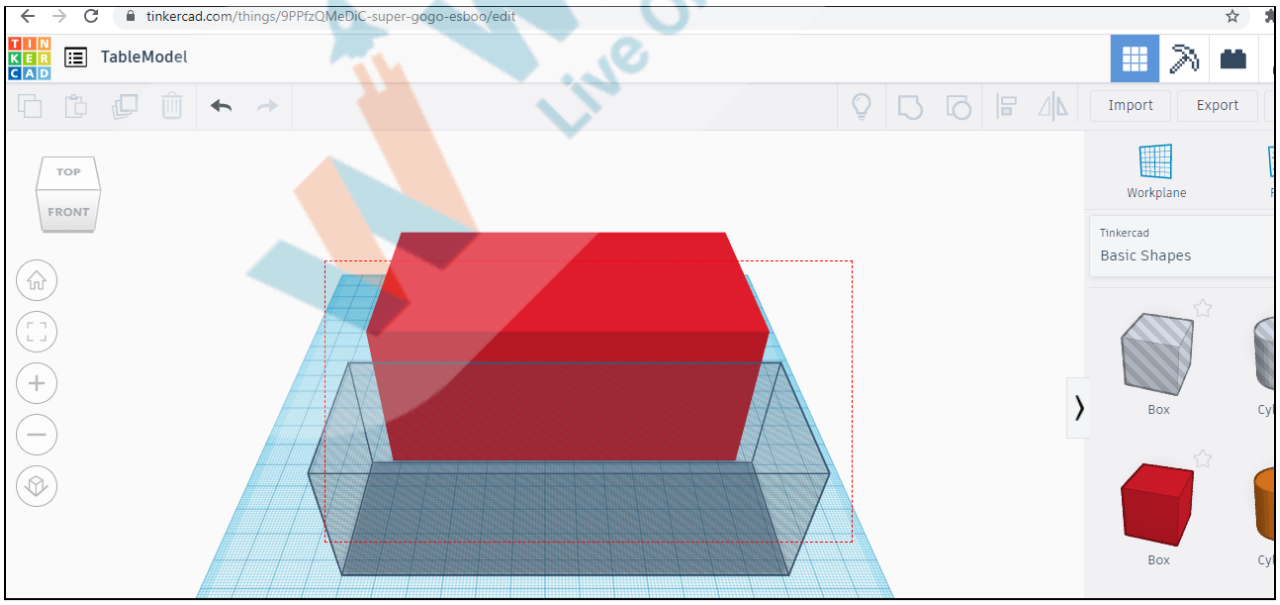
	Now we have got a transparent box which is “Hole”. What’s next? Yes. Great!	**ESR:** We need to cut a hole out of the first box.

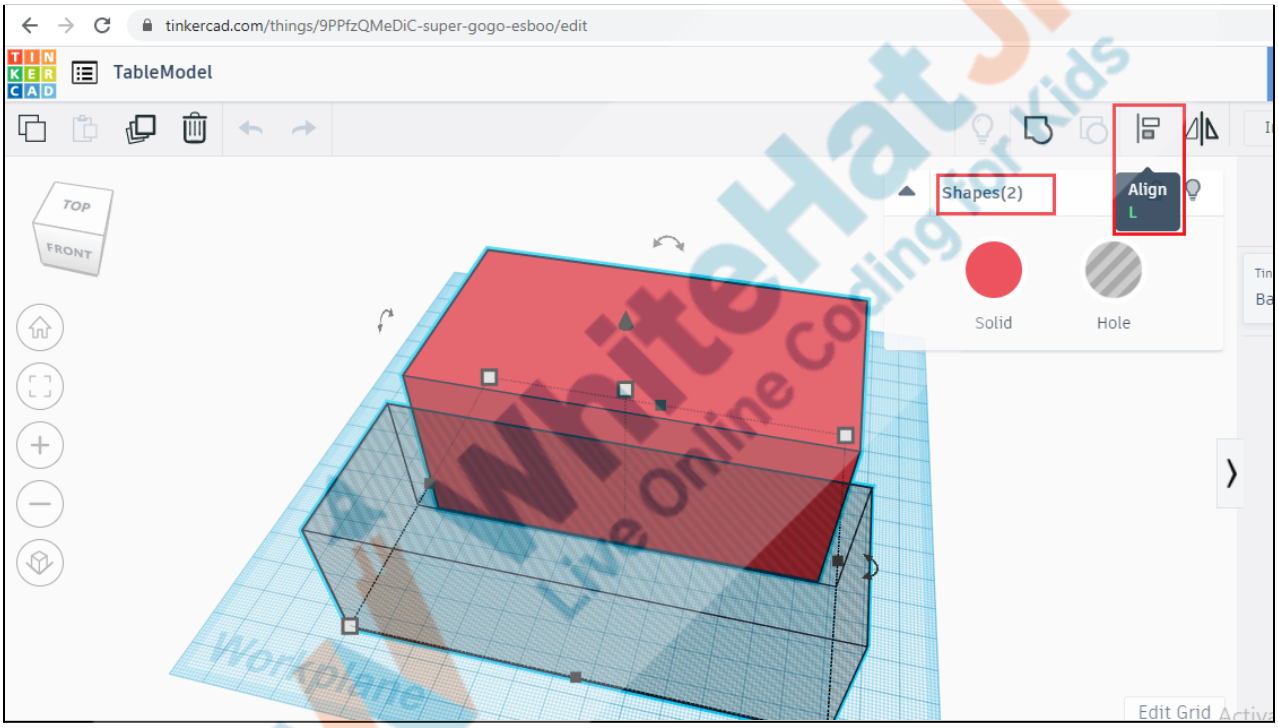
To cut the hole properly, first we need to make sure the boxes are aligned properly.

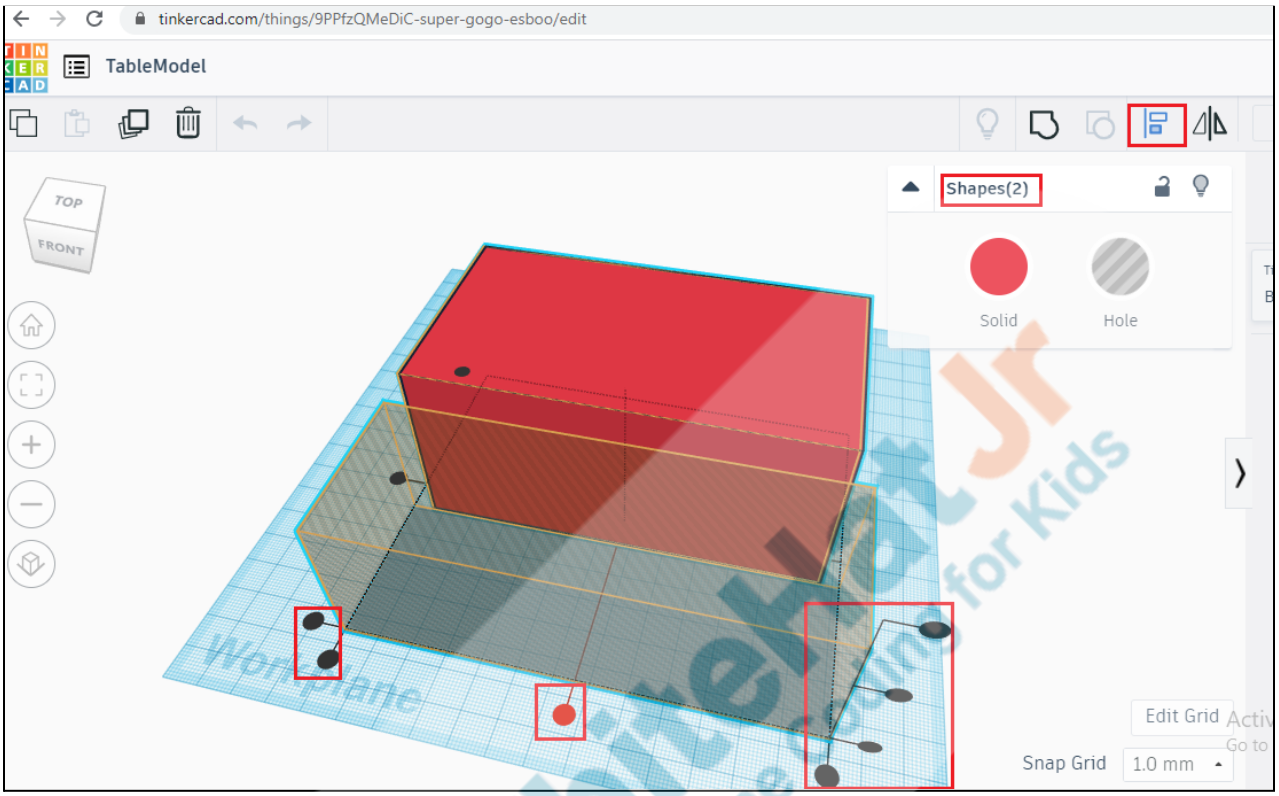
There's a tool in Tinkercad which can be used to align any two shapes. That's called an **align** tool.

Let's see how to do that.
To align any two or more shapes properly, those shapes must be selected together.

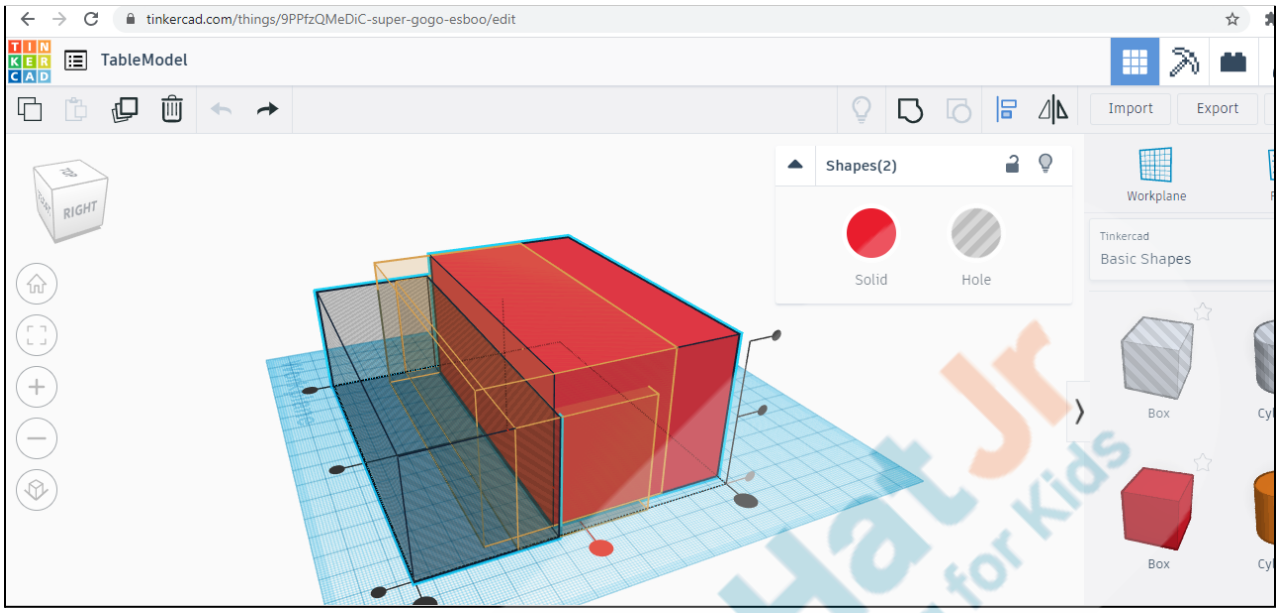
Note1: Two or more shapes can be selected by clicking and dragging the mouse over all the shapes that need to be aligned. (The red dotted line denotes shapes which will be selected every time you select multiple shapes as shown below).



	Note 2:After selecting the shapes that need to be aligned, cross verify by checking the number of shapes selected on the control panel that appear on the right side as “Shapes(2)” (as shown in the image below).	
		
	After selecting the shapes, use the black dots to align the two shapes in the left (corner dots), right (corner dots) or center (middle dots) alignment in x, y or z direction. Align from the front side and right side as shown below:	



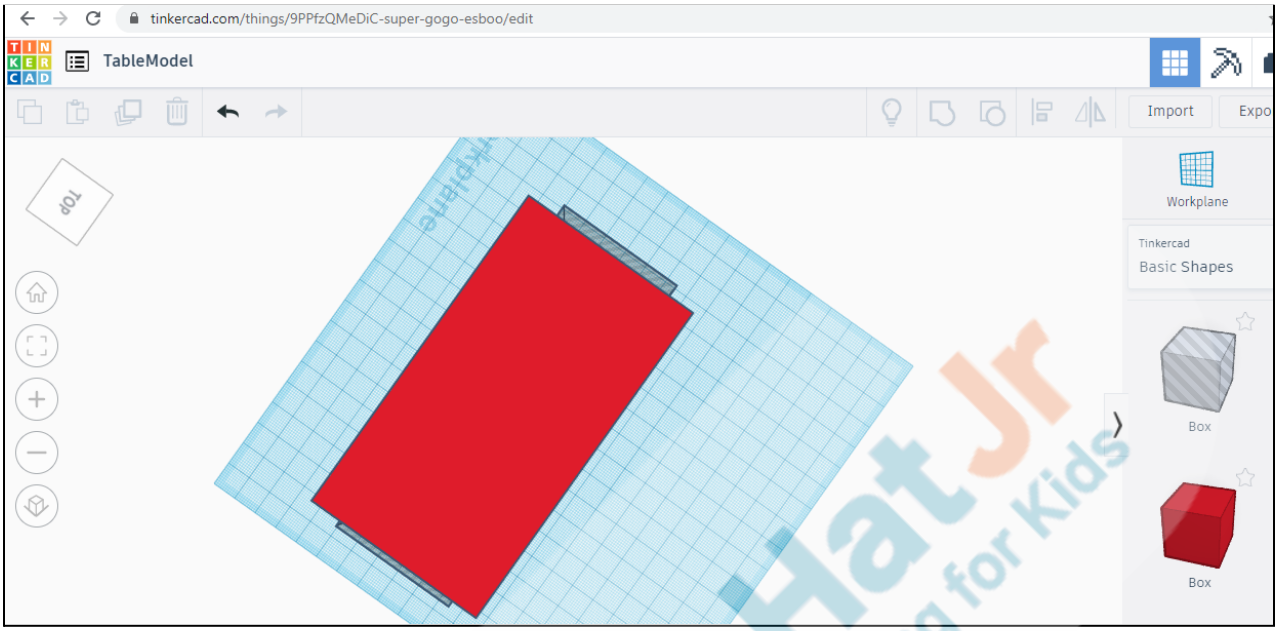
Note: While hovering over the middle dot for alignment it shows how the boxes will be aligned (Yellow colored outline will be the result once clicked).



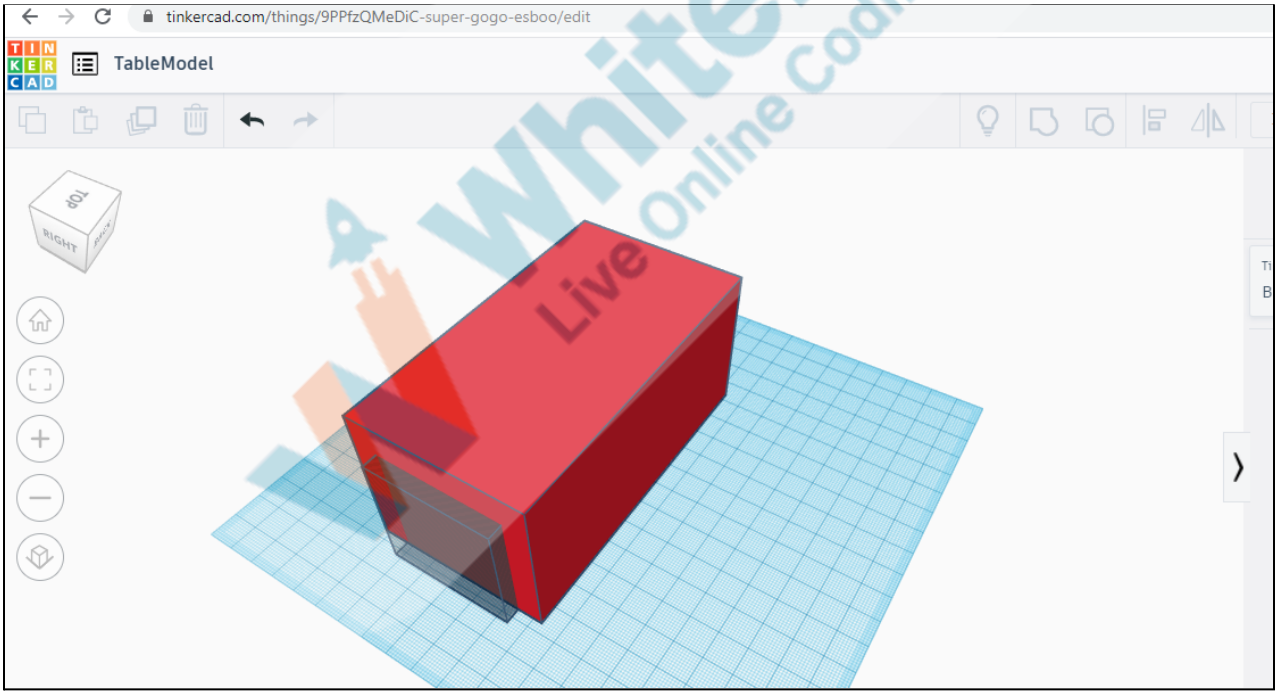
After alignment:

Below is the view from the TOP and TOP, RIGHT & BACK of the Workplane.

TOP view of the Workplane

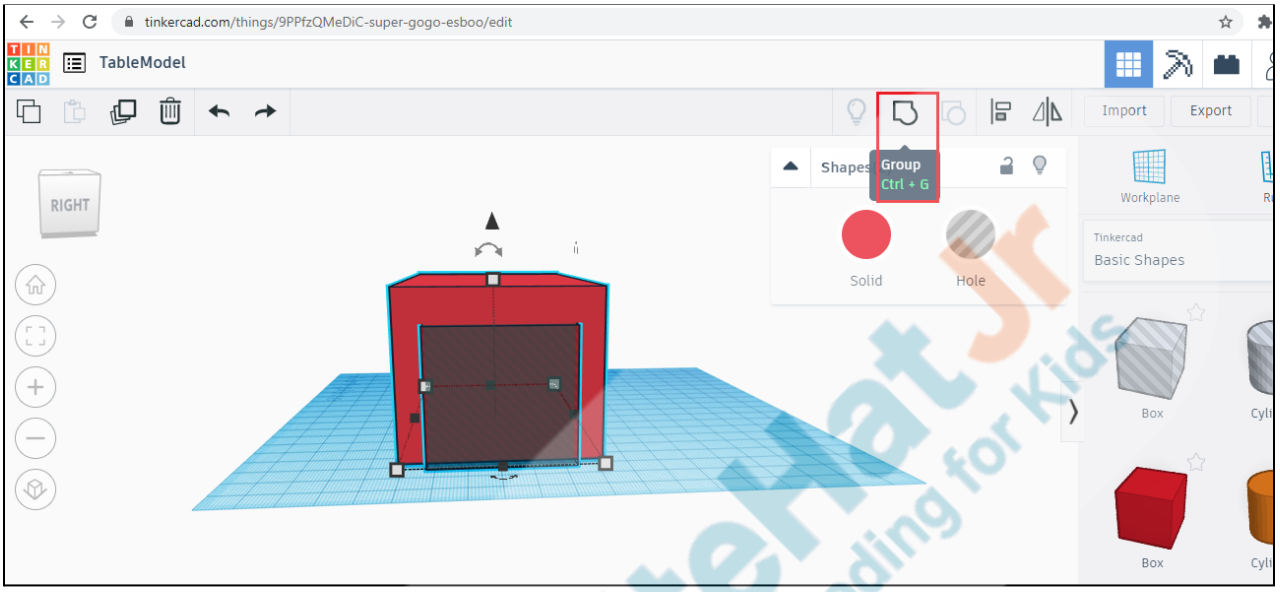
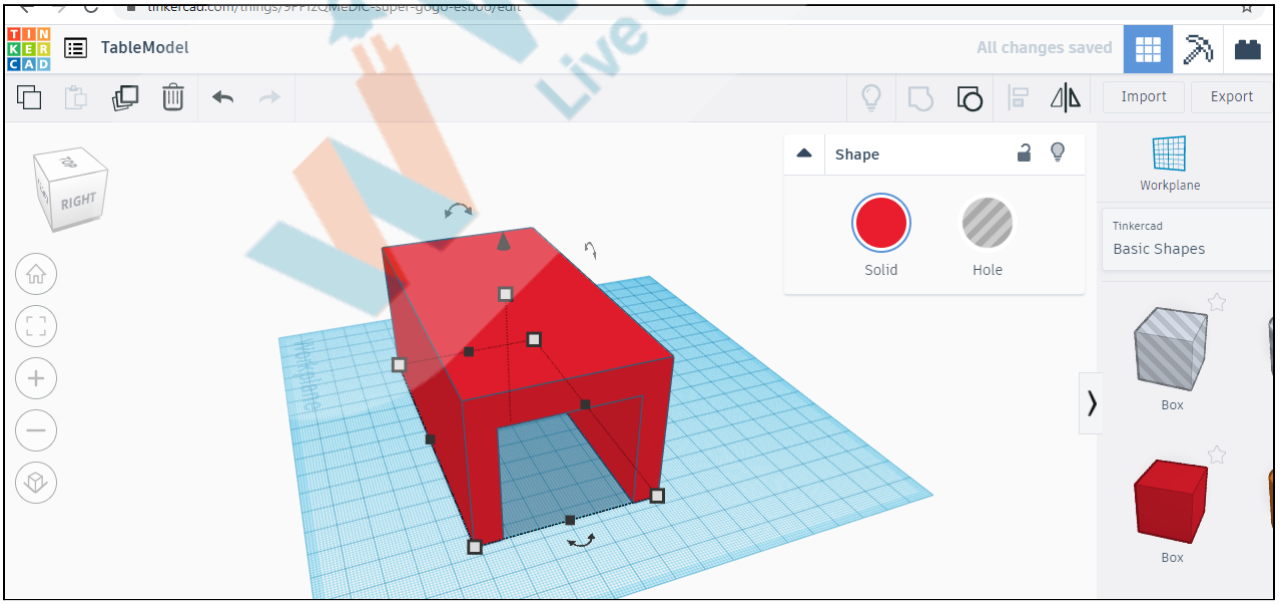


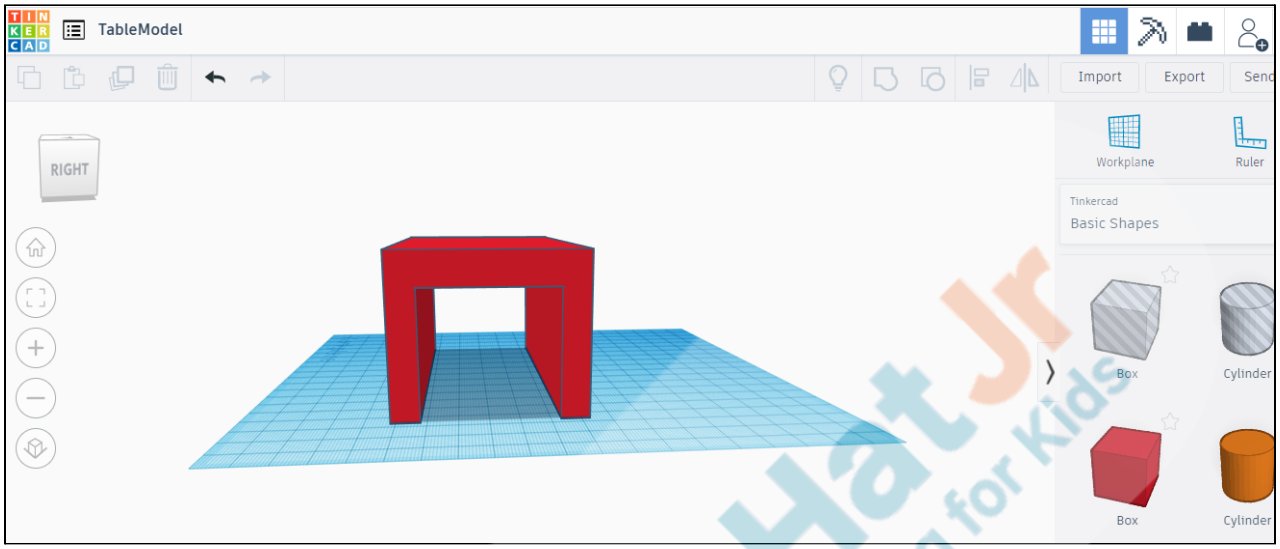
TOP, RIGHT & BACK view of the Workplane:



***Note** : Deselect by clicking somewhere on the Workplane to verify if the alignment is proper.*

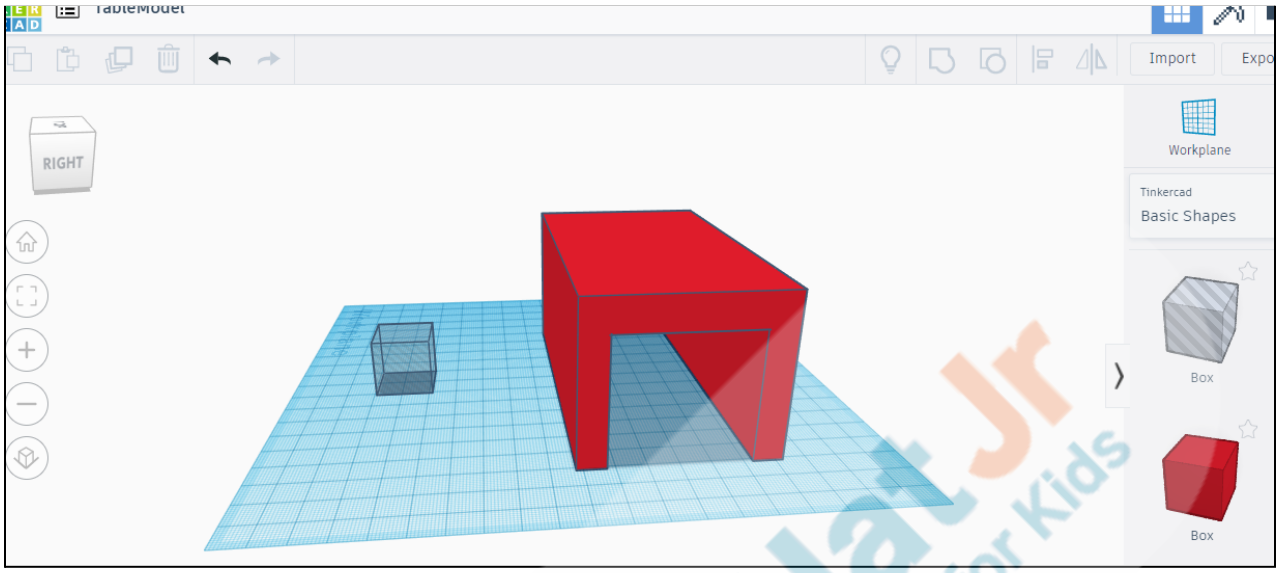
	Use the Viewcube to see all the sides' alignment. The boxes have been aligned properly. Now what should we do next? Yes. Exactly! To make an empty space inside the solid box, the transparent and solid boxes can be clubbed together as a **"Group of Shapes"**. ***The grouping of shapes is very useful in creating 3D models. By making groups of basic shapes which are present in the Tinkercad platform, we can create complex 3D models.*** Isn't that interesting? So, let's group these two shapes, the "Hole" and the "Solid" boxes together and see what happens. ***Note**: Make sure the shapes that need to be grouped are selected as explained above.*	**ESR:** The transparent box should be replaced now with empty space to make the bottom of the solid box look like legs. **ESR**: Yes.

	To group the shapes together, after selecting, click on the group icon.	
		
	After the shapes are grouped together, verify the output from all dimensions.	
		

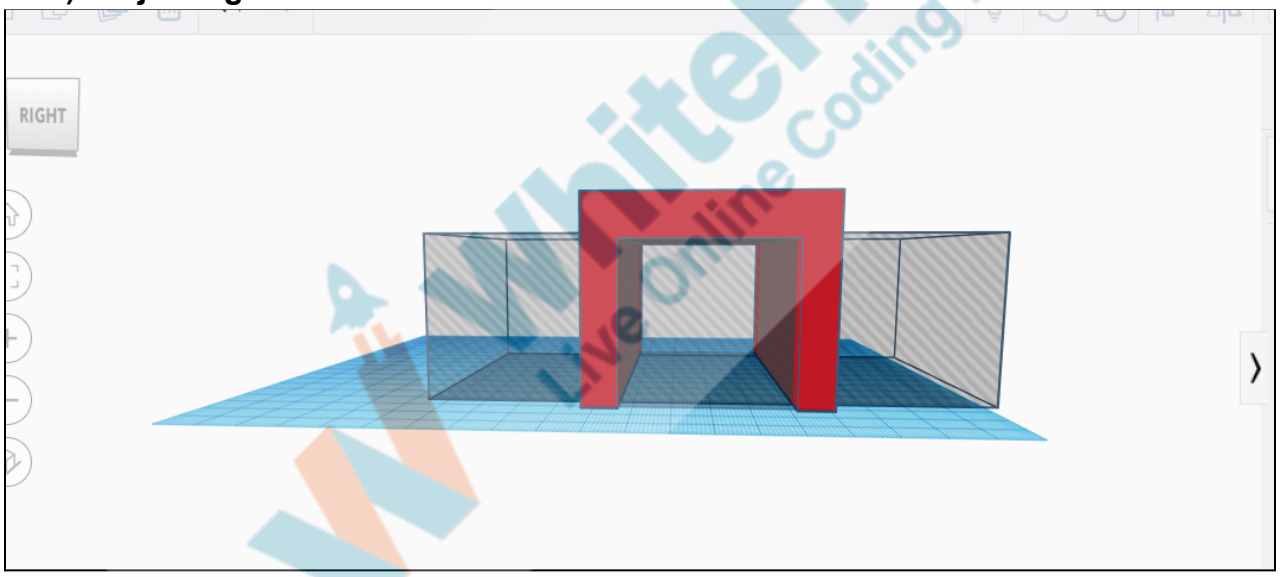


	Repeat** the steps to create a "Hole" from **front to back side of the solid box** to complete the **formation of the legs.	
	1) Take the **"Hole"** box. 2) Increase it's length a little more than the solid box. 3) Make sure this time the height and width of the transparent("Hole") box are smaller than the solid box. 4) **Align** the two boxes properly. 5) **Group** the boxes together to get a complete table.	

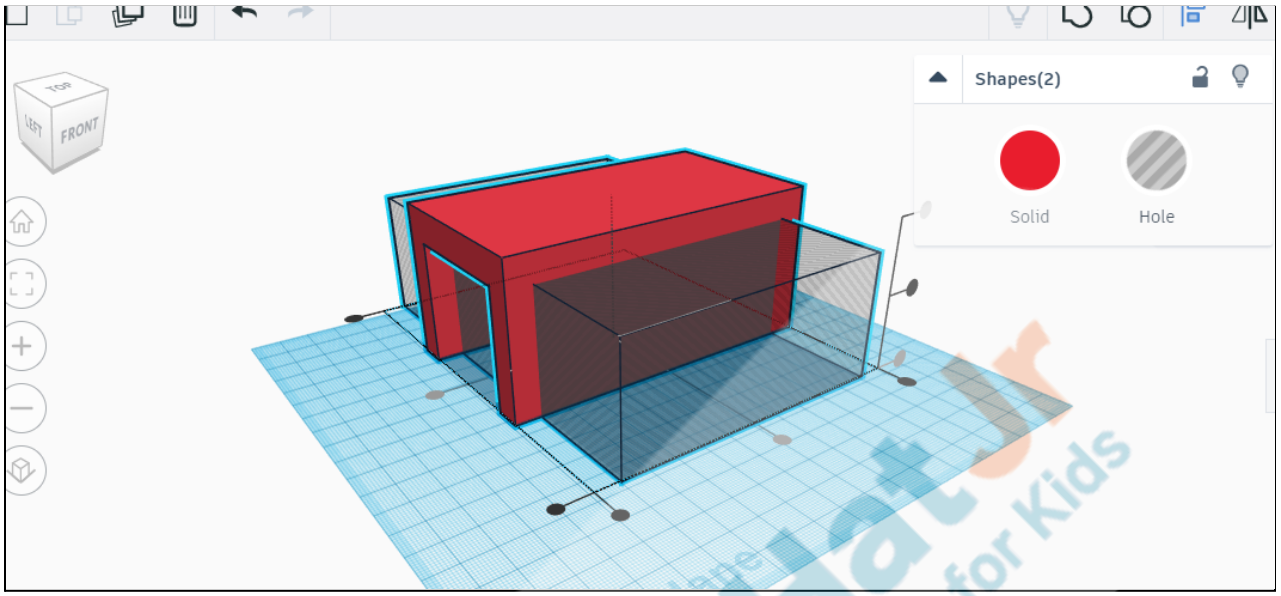
1) Hole Box



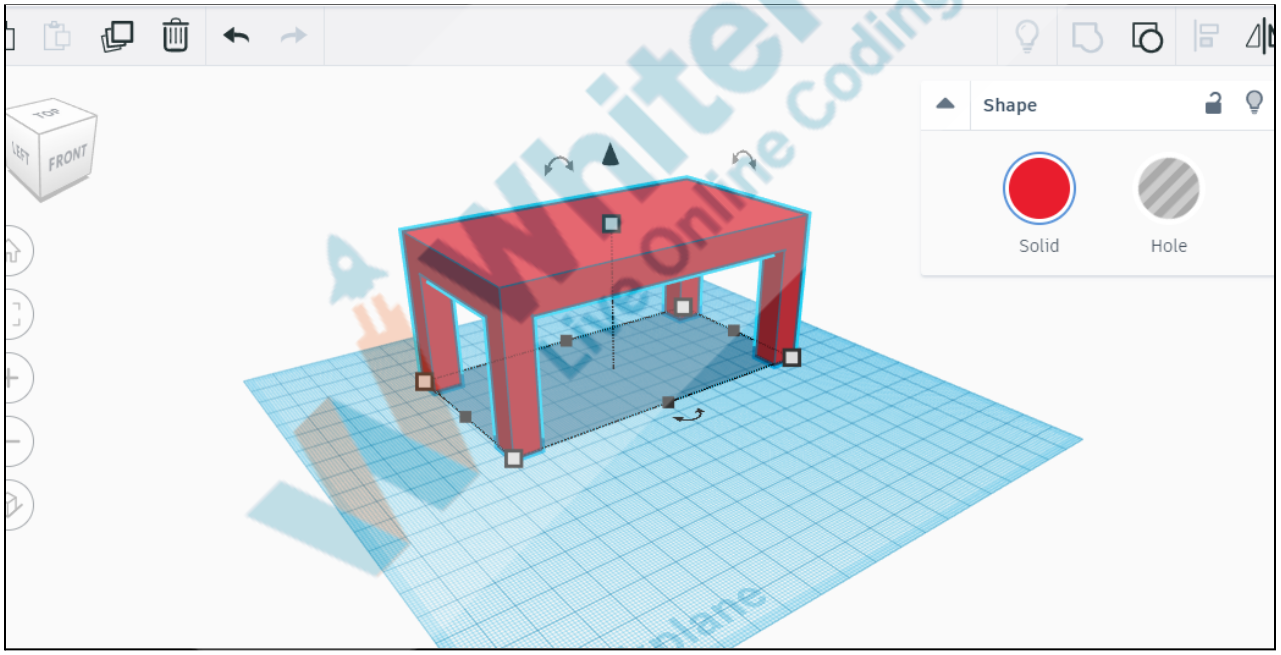
2) **Adjusting dimensions FRONT to BACK.**



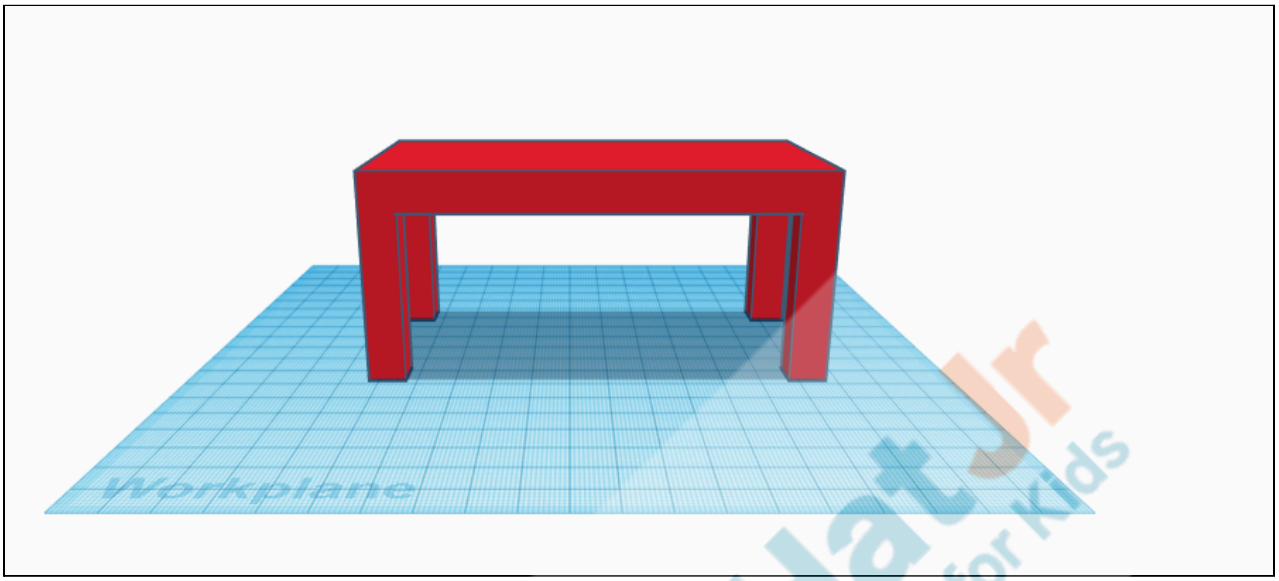
3) **Aligning.**



4) Grouping.



5) The table!



That's really cool to see our own 3D model.

Now that we have learned the basics of creating 3D models, it's your turn. Please share your screen with me.

STUDENT-LED ACTIVITY - 20 mins

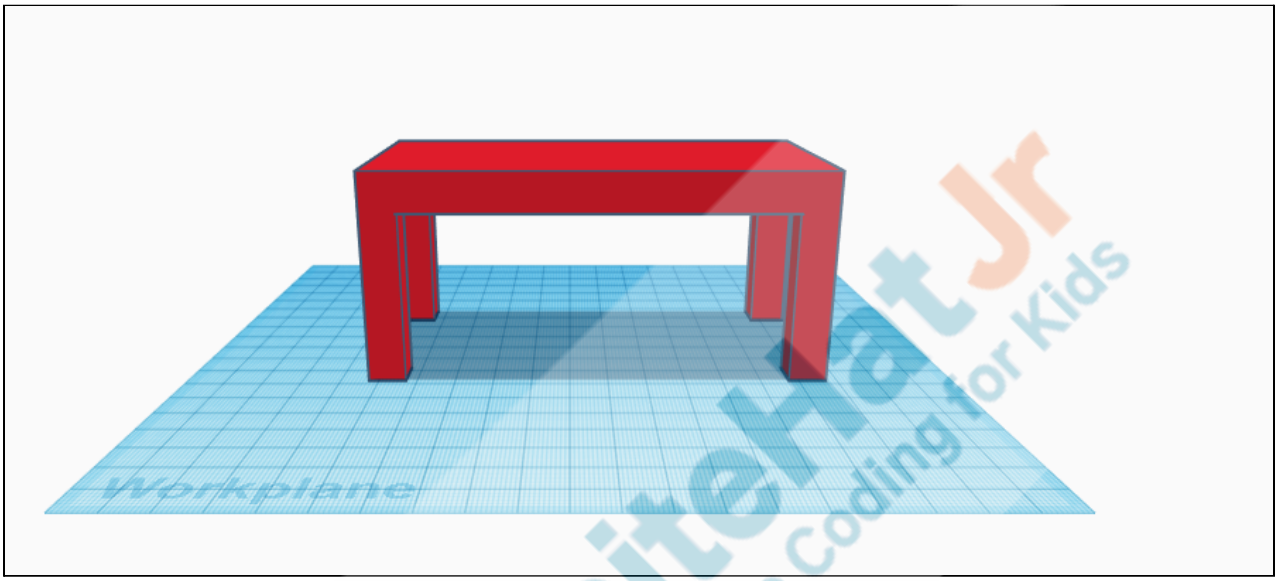
- **Ask Student to press ESC key to come back to panel**
- **Guide Student to start Screen Share**
- **Teacher gets into Fullscreen**

ACTIVITY

- **Explore the platform, Tinkercad, to create 3D models**
- **Learn about various tools used in Tinkercad like views and shapes.**
- **Create a new project create a simple real world objects with basic 3D shape**
- **Learn how to align and group shapes.**

Teacher starts slideshow **from slides 17 to 18**
Refer to speaker notes and follow the instructions on each slide.

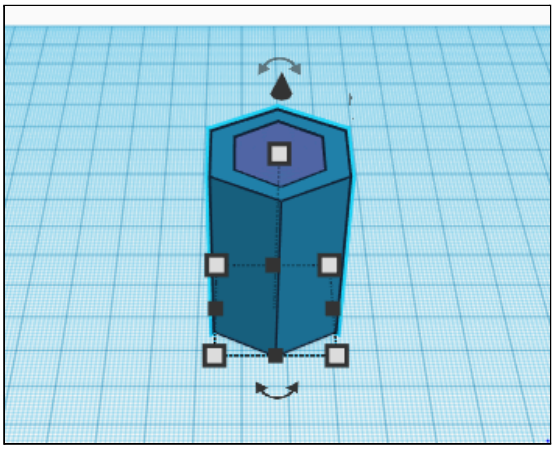
	Now it's your turn. Please share your screen with me.	
Teacher ends slideshow 		
Step 3: Student-Led Activity (20 mins)	***Note 1***: *Students will be repeating the process of creating an account on Tinkercad and a 3D Table model from scratch.* ***Note 2:*** *Use all the illustrations shown as teacher activities to help the students make their own Table model.*	
	Encourage the student to try the different tools on Tinkercad. *C1: Guide the student to create an account on Tinkercad.* *C2: Guide the student to try some instructions from the lessons for sometime.*	*Students add different models in the scene.*
	C3: Guide the student to add a box on the Workplane. *C4: Help the student to adjust the dimensions of the box and to see the box from different sides.*	

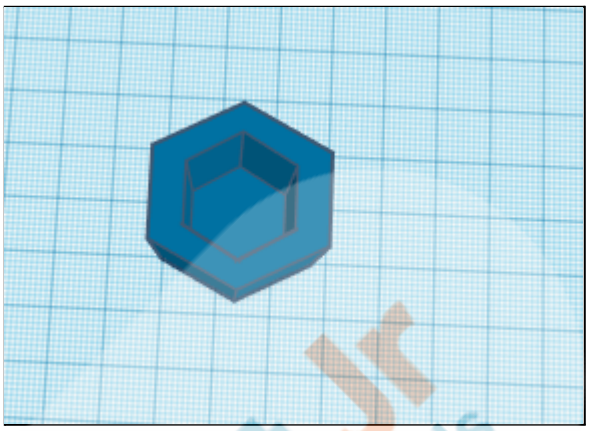
	C5: Guide the student through the process of aligning and grouping a "Hole" and a "Solid" box.	
		
	You have created an amazing model. Good Job! ***Note**: Students can create a different output with different shapes.*	
Teacher Guides Student to Stop Screen Share		
WRAP-UP SESSION - 05 Mins		
FEEDBACK • **Complement the student for her/his effort in the class.** • **Encourage the student to explore the platform and try their own models.**		

Teacher starts slideshow  from slide 19 to slide 30	
Activity details	**Solution/Guidelines**
Run the presentation from slide 19 to slide 30 **Following are the wrap-up session deliverables:** • **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**
Where are 3D models used? A. Games B. Schools C. Playground D. Library	**A**
On which online platform did we create our 3D models? A. Tinkercard B. Tinkercad C. Thunkable D. Tinkerbell	**B**
Why do we use Groups in the program? A. to group all sprites together B. to group conditions C. to group variables D. to group arrays	**A**

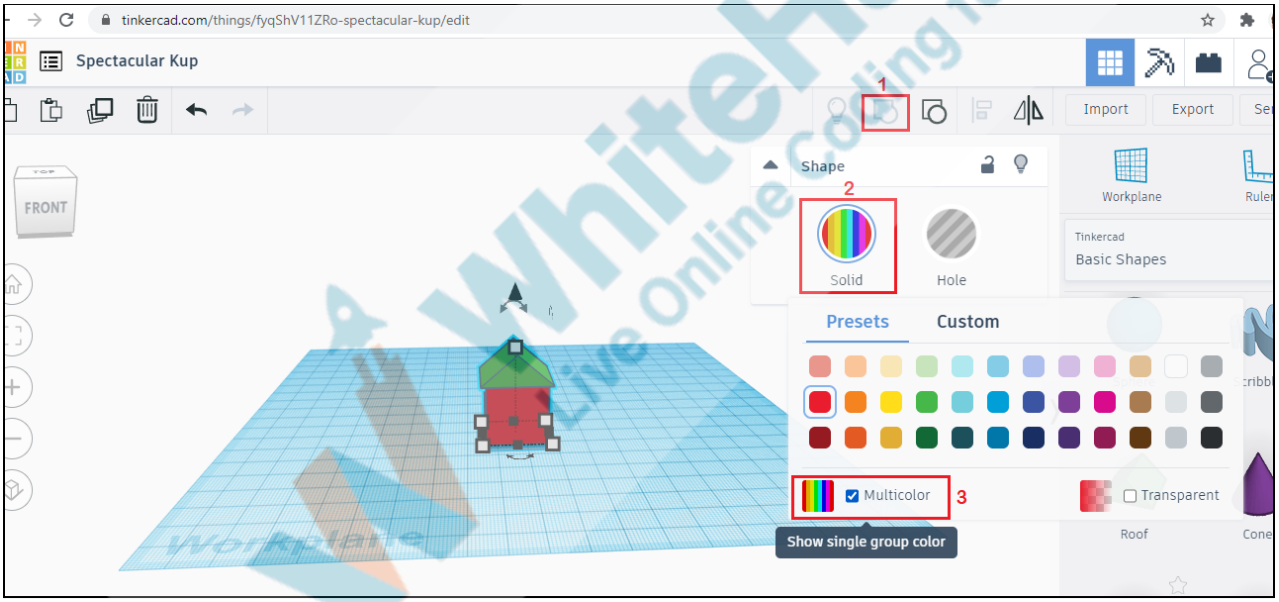
	• **End the quiz panel**	
	You get a “hats off”. Alright. I will look forward to seeing how you create your own model.	Make sure you have given at least 2 Hats Off during the class for: 
Project Overview	**SIDE TABLE MODEL** **Goal of the Project:** In this project you will create a 3D model of a nightstand for a room on Tinkercad. **Story:** 3D models created by 3D artists are providing better visualizations of real world objects. Room design that you created for Divya, with 3D textures and paintings, was really appreciated by her. Now she is looking to add some more furniture in her room. She is looking	

	for a nightstand to organize her work files and books in her office. Create a 3D model of a nightstand using Tinkercad. I am very excited to see how you will create your own 3D models. Bye!	
Teacher ends slideshow 		
Teacher Clicks 		
Additional Activities	*Guide the student to try other shapes on Tinkercad to create their own objects.* *Students can try to create a hollow pen-stand for the table by grouping two polygon shapes (one solid and one hole).*	





Note: *To keep the original colors of the shapes after grouping them together, check the Multicolor option.*



Activity	Activity Name	Links
Teacher Activity 1	Activity 1	https://www.tinkercad.com/
Student Activity 1	Activity 1	https://www.tinkercad.com/

Project Solution Link	Side Table	https://whitehatjrcontent.s3.ap-south-1.amazonaws.com/curriculum/PRO+Asset/d72724df485946cba779b8a692178888.mp4
Teacher Ref. Visual Aid Link	Visual Aid Link	https://curriculum.whitehatjr.com/Visual+Project+Asset/PRO_VD/PRO_C149_withcues.html
Teacher Ref. In-Class Quiz	In-Class quiz	https://s3-whjr-curriculum-uploads.whjr.online/245d88da-633c-43e0-a717-30788f07ebf1.pdf