

Topic	INTRODUCTION TO WEB VR				
Class Description	Students learn how to create a basic html layout of a 3-D page using A-Frame web framework.				
Class	C145				
Class time	45 mins				
Goal	<ul style="list-style-type: none"> • Create a 3-D scene over web using html and A-Frame lib • Add different 3D shapes and set their different attributes 				
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"> • Introduce 'A-Frame web framework' for building 3D/AR/VR web applications and how it builds on HTML and Javascript. 					
 Teacher starts slideshow from slides 1 to 15 Refer to speaker notes and follow the instructions on each slide.					

Activity details	Solution/Guidelines
<i>Hey <student's name>. How are you? It's great to see you! Are you excited to learn something new today?</i>	ESR: Hi, thanks, Yes I am excited about it!
Run the presentation from slide 1 to slide 3 Following are the WARM-UP session deliverables: <ul style="list-style-type: none"> • Greet the student. • Revision of previous class activities. • Quizzes 	Click on the slide show tab and present the slides
Q&A Session	
Question	Answer
Which component do we use to show the details of a particular movie? A. <card> B. <show> C. <view> D. <touchable opacity>	A.
Which of the following is used to show the list of movies? A. fulllist B. flatlist C. movielist D. list	B.
Continue the WARM-UP session	
Activity details	Solution/Guidelines
Run the presentation from slide 4 to slide 15 to set the problem statement.	Narrate the story by using hand gestures and voice modulation methods to bring

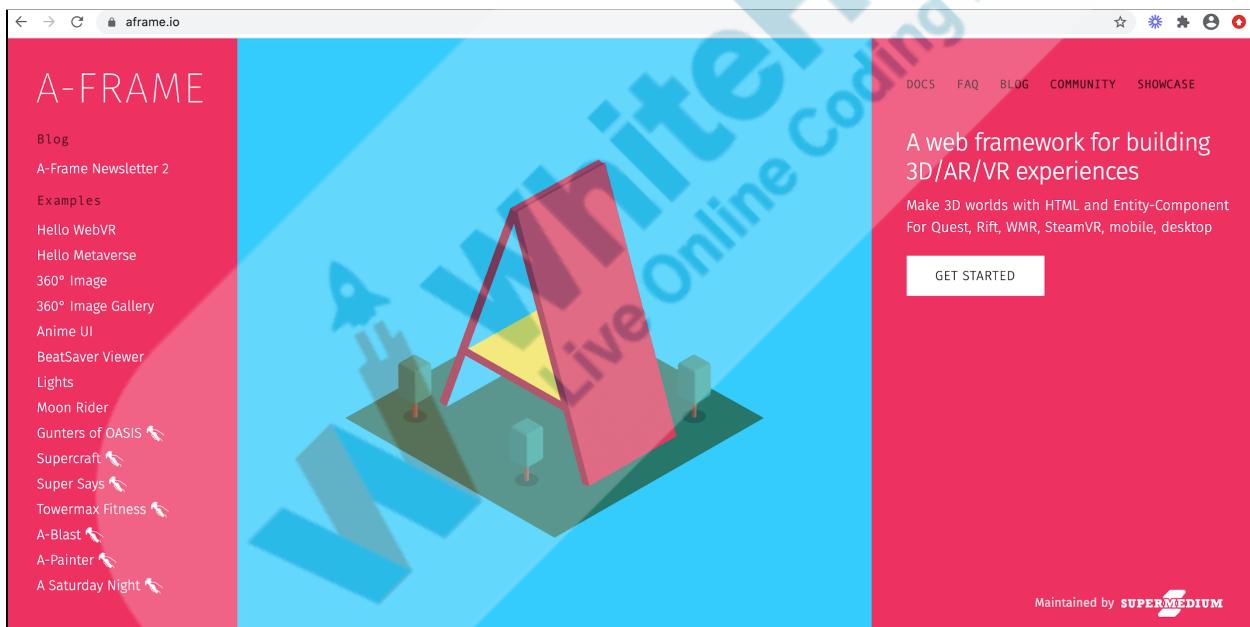
Following are the WARM-UP session deliverables: <ul style="list-style-type: none"> • Appreciate the student. • Introducing A-Frame. 	in more interest in students.	
Teacher ends slideshow 		
TEACHER-LED ACTIVITY - 15 mins		
Teacher Initiates Screen Share		
CHALLENGE <ul style="list-style-type: none"> • Create a virtual 3-D world on the web. 		
Step 2: Teacher-led Activity (10 mins)	<p>Before moving forward let's understand what is A-Frame? It is basically 3D on the web. Using A-frame you can create regular HTML websites with special 3D powers. Interesting?</p> <p>Do you remember HTML and what we used it for?</p>	<i>The student will recollect the portfolio page he/she had created earlier.</i>
	<p>Do you remember how we created a simple portfolio website using HTML where we used tags to write instructions for the computer to draw the webpage. There is a simple pattern for HTML websites which is similar to a human's head and body. Head on top and body below the head. Everything enclosed inside the html tag.</p> <pre><html> <head> <title>Page title </title></pre>	<i>Student watches.</i>

```
</head>
<body>
    (the interesting stuff comes
here)
    </body>
</html>
```

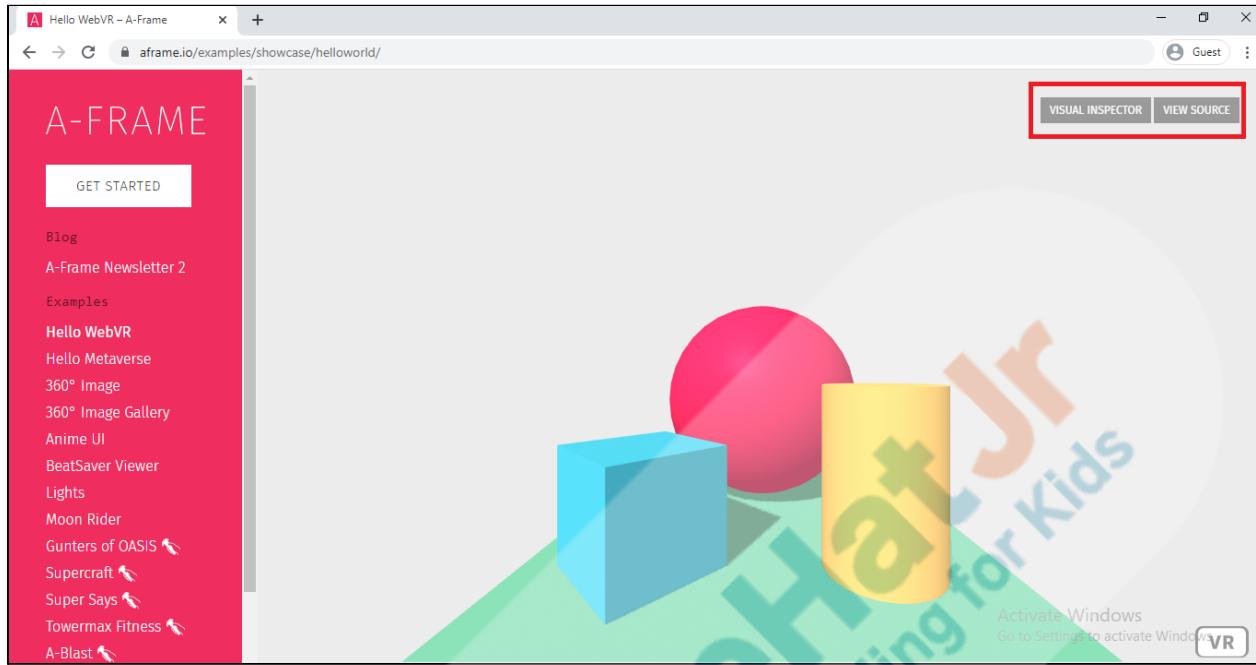
Great. We will use a similar pattern for 3-D webpage as well.

Let's try cloning an example to make our own 3D scene.

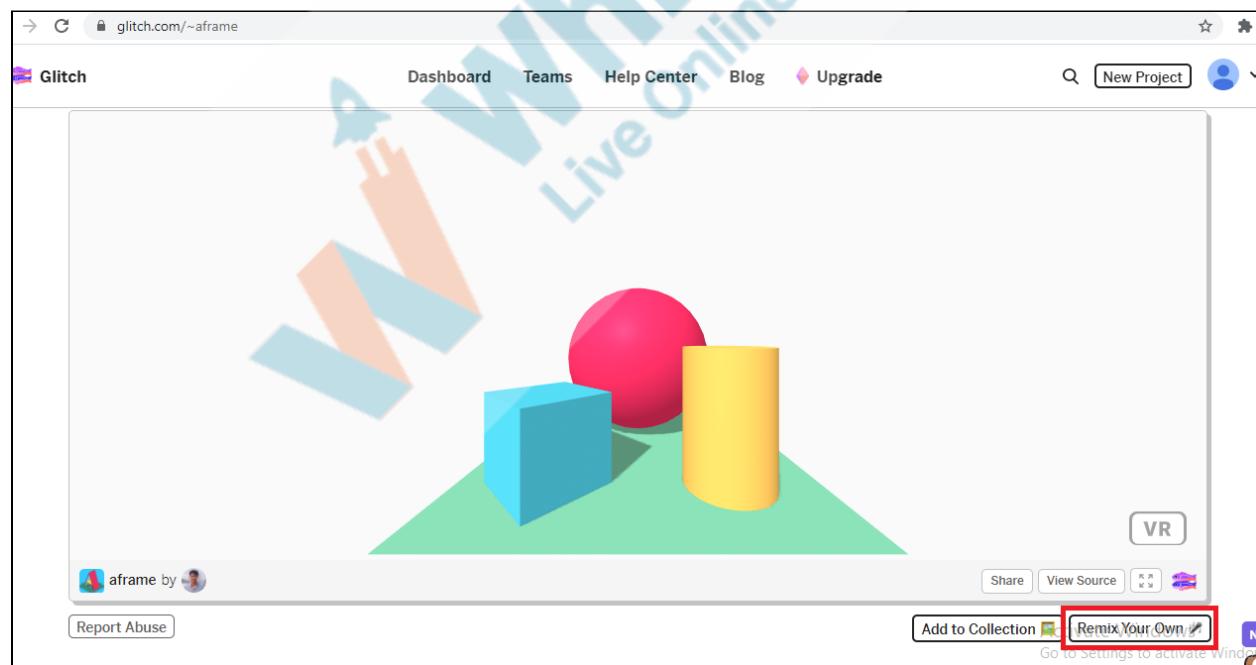
Teacher opens [aframe.io](#)



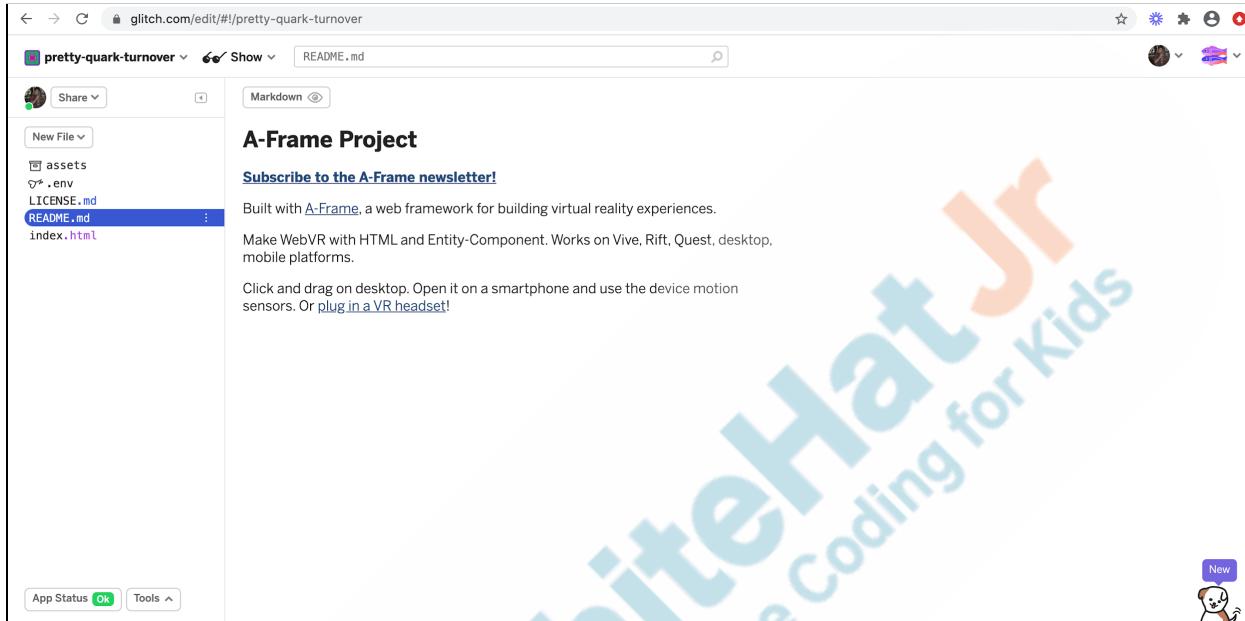
Click the “Hello WebVR” example in the left hand navigation panel.



Click on “View Source” (Top right corner)
(This should link you to the Glitch project <https://glitch.com/~aframe>.)



	<p>Scroll down and click the “Remix Your Own” button to make changes to the example page.</p>	<p><i>Student observes and asks questions.</i></p>
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The screenshot shows a Glitch project titled "pretty-quark-turnover". The README.md file is open, displaying the following content:

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A-Frame Project

Subscribe to the A-Frame newsletter!

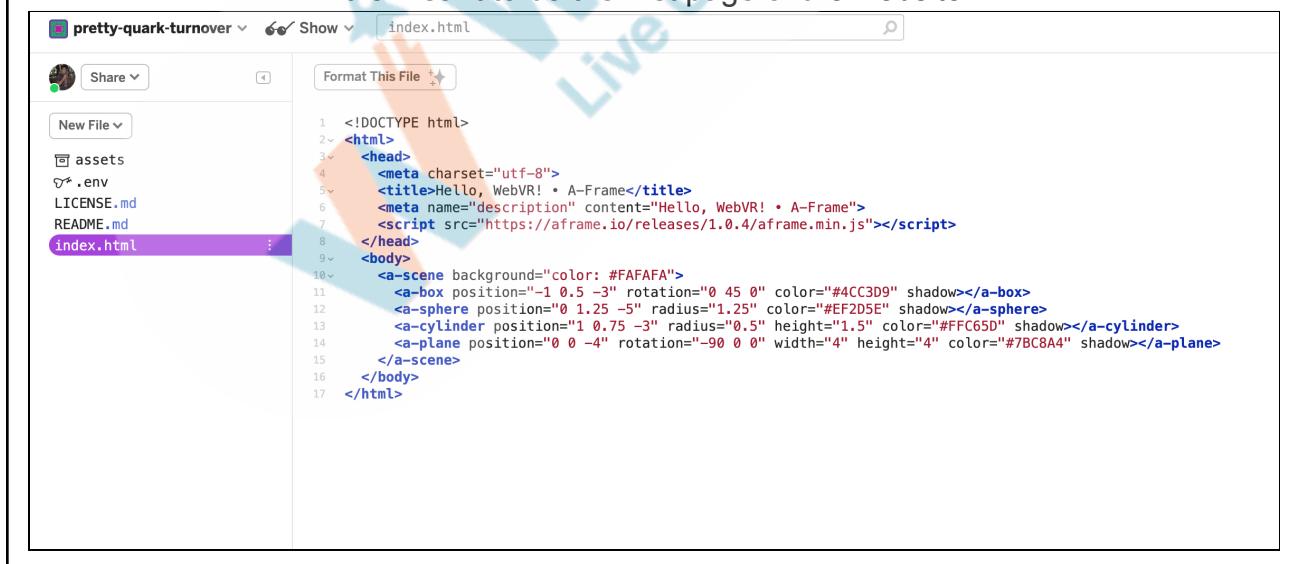
Built with A-Frame, a web framework for building virtual reality experiences.

Make WebVR with HTML and Entity-Component. Works on Vive, Rift, Quest, desktop, mobile platforms.

Click and drag on desktop. Open it on a smartphone and use the device motion sensors. Or plug in a VR headset!

```

index.html is the main file where we write the HTML Code.
It is meant to be the first page of the website.



```

<!DOCTYPE html>
<html>
  <head>
    <meta charset="utf-8">
    <title>Hello, WebVR! • A-Frame</title>
    <meta name="description" content="Hello, WebVR! • A-Frame">
    <script src="https://aframe.io/releases/1.0.4/aframe.min.js"></script>
  </head>
  <body>
    <a-scene background="color: #FAFAFA">
      <a-box position="-1 0.5 -3" rotation="0 45 0" color="#4CC3D9" shadow></a-box>
      <a-sphere position="0 1.25 -5" radius="1.25" color="#EF2D5E" shadow></a-sphere>
      <a-cylinder position="1 0.75 -3" radius="0.5" height="1.5" color="#FC65D" shadow></a-cylinder>
      <a-plane position="0 0 -4" rotation="-90 0 0" width="4" height="4" color="#7BC8A4" shadow></a-plane>
    </a-scene>
  </body>
</html>

```

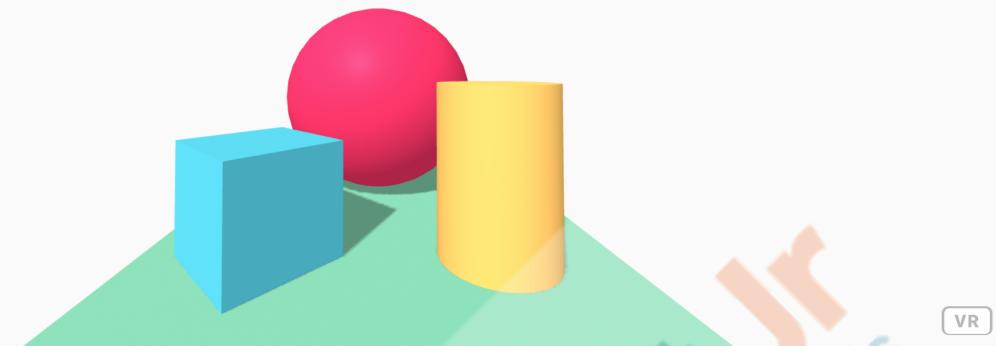
	<p>Let's quickly review the code. Do you see two parts of the HTML code?</p> <ol style="list-style-type: none">1. Head: It has a title where we define the heading for the website. Meta tag is used by search engines to describe your page. Script tag loads the aframe library which does all the cool 3D stuff. Without this script, the webpage will not be able to render 3D Objects.2. Body: This is where we write the content for our website. In this example we are creating a scene using <code><a-scene></code> tag and inside the scene we are creating basic blocks or shapes called "primitives". These are all built in primitives in A-Frame. <p>In this example, we are making a cubical box, a sphere, a cylinder and a plane.</p> <p>Each of these primitives also has "attributes" inside the opening tag like we used to have for <code><image></code> tag, <code><div></code> tag, etc. For example <code><a-box></code> has position attribute: to specify x,y,z coordinate of box in the scene, rotation attribute: to specify the angle of rotation on x,y,z axis and color attribute: to specify the color of the</p>	<p><i>Student observes and asks questions.</i></p>
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box.

On the top we write the tag <!DOCTYPE HTML> to tell the computer that this is going to be an HTML page. This informs the browser that it is going to read an HTML page. This is a must do for all HTML pages.

Click on “Show” to see the output of your project. (It will ask you to choose a new window or split screen, just next to the code. New screen is preferred, you can keep it open and tab back-and-forth as you make changes, or create a split screen view that shows both code and live output by manually resizing your browser windows).

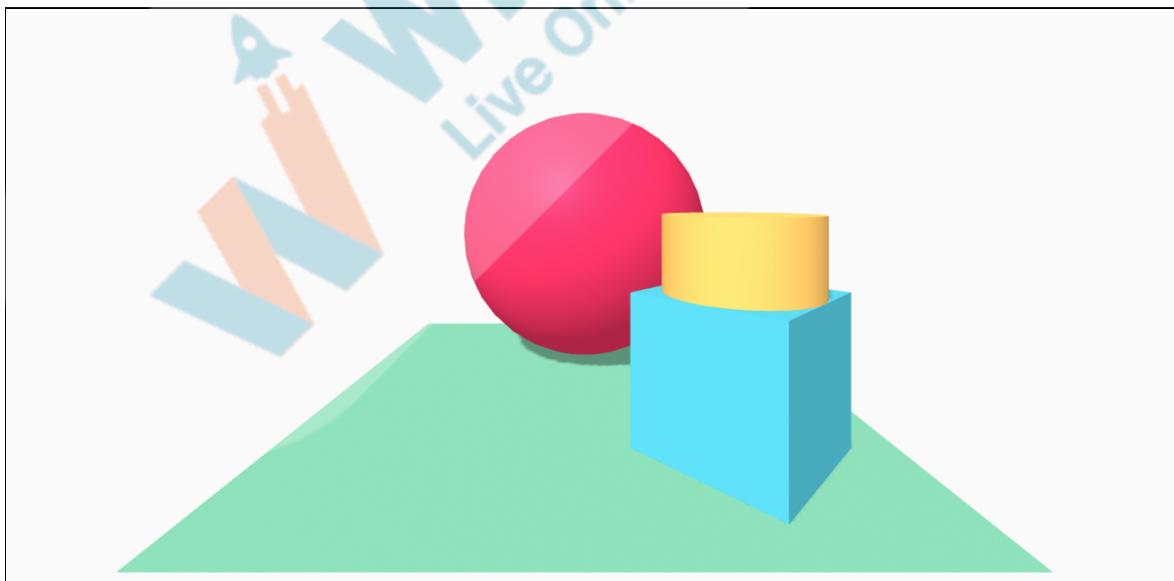




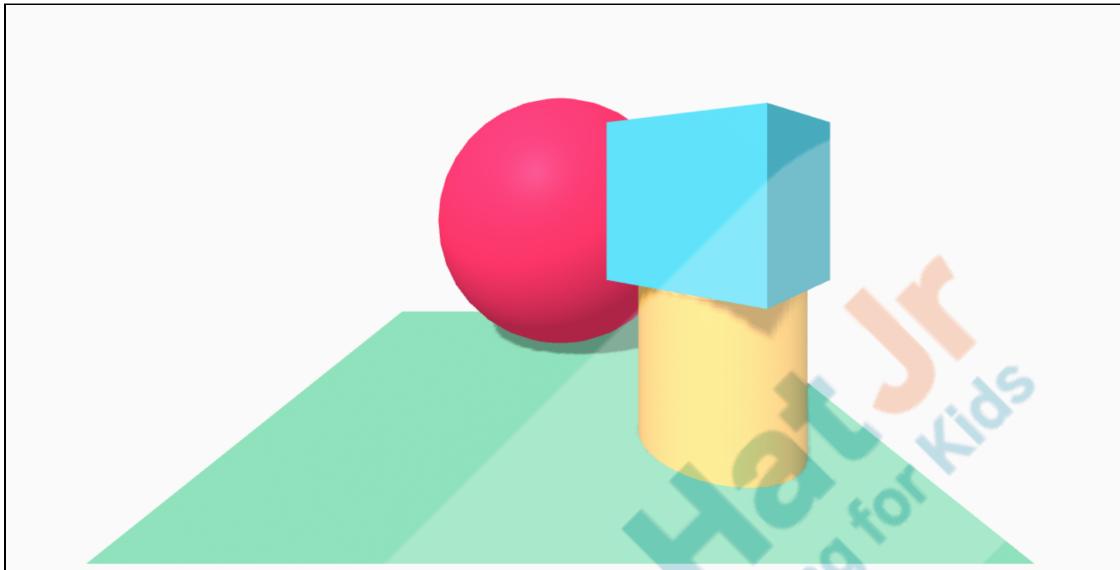
Let's start changing things! (Make sure you have clicked on the Remix button otherwise you will not be able to edit code in Glitch.)

Teacher changes few attributes and ask student to guess the change in output:

- Try changing the position attribute of the a-box to `1 0.5 -3` (by simply removing the negative symbol in front of the number one). Switch back to your output page or click on “Show (Live)” to reopen the output page. What happened? (x-position changes: box moves to right side).

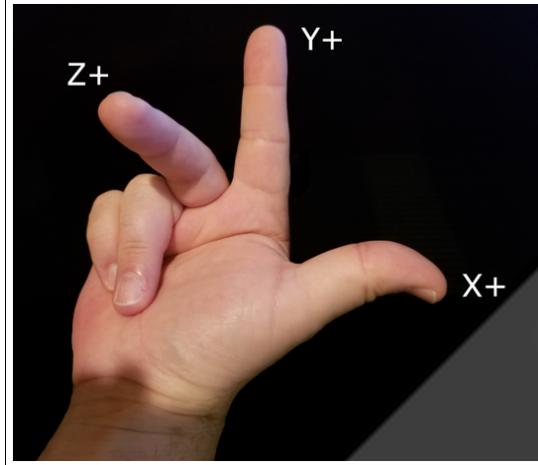


- Try changing the second value from 0.5 to 1.5. What happens now?(y position changes: box lifts up)



What do you think the first number in the position triplet represents? What about the second and third? (These represent x, y, and z coordinates on a 3D graph.)

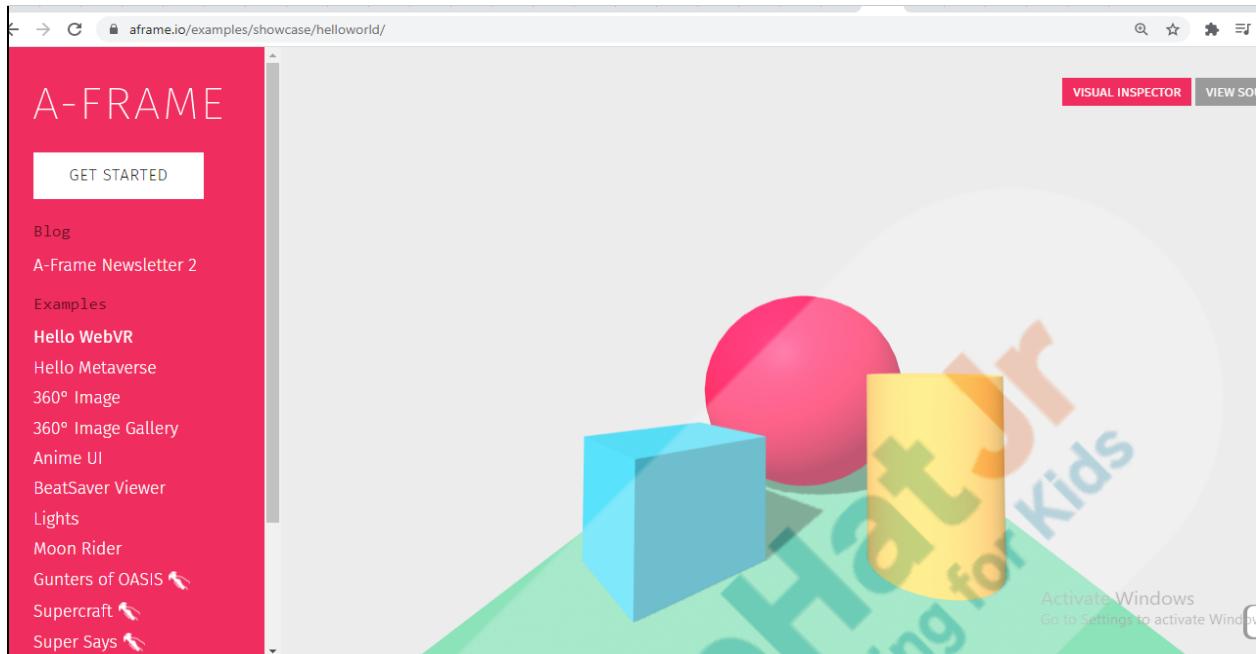
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Yes!!

You would already know about the x and y axis in 2D, but now we have 3rd Dimension i.e z-axis. Using the right hand rule you will be able to understand half of the z-axis in our case is coming out of the screen and the other half is going inside the screen. This is the reason we have kept z(3rd value of position) as negative for all blocks. If we keep it positive you will not be able to see it unless you move your camera back.(by default the camera is always at 0,0,0) We will talk more about camera and positioning in future classes.

Also, we can take the help of Visual Inspector(Top right corner) and click on any entity on the navigation panel on the left side to visualise the three dimensional axes.

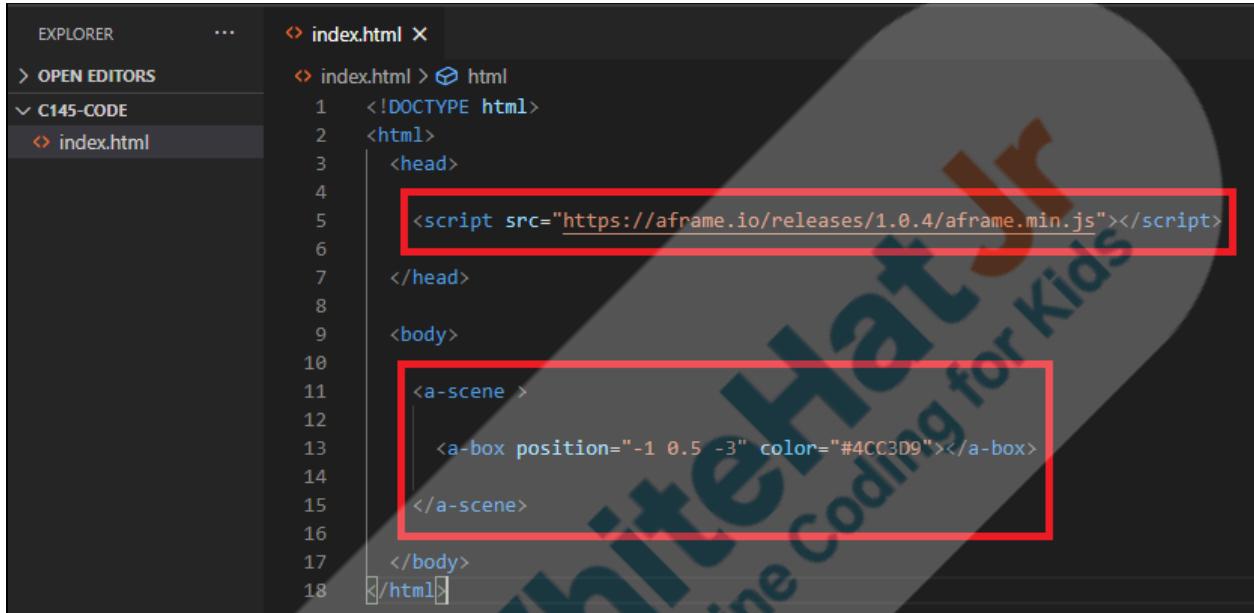


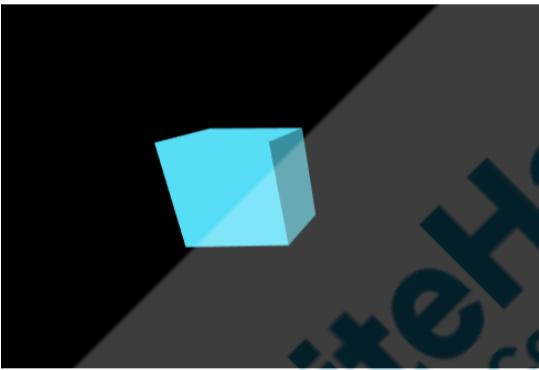
The screenshot shows a web browser window displaying an A-Frame scene. On the left, there is a sidebar with a red header containing the "A-FRAME" logo and a "GET STARTED" button. Below the header, there are links to "Blog", "A-Frame Newsletter 2", and various "Examples" such as "Hello WebVR", "Hello Metaverse", "360° Image", "360° Image Gallery", "Anime UI", "BeatSaver Viewer", "Lights", "Moon Rider", "Gunters of OASIS", "Supercraft", and "Super Says". The main content area shows a 3D scene with a red sphere, a blue cube, and a yellow plane. The "Visual Inspector" tool is open on the right side of the browser, showing properties for the selected "a-plane" entity. The properties include:

ID	
class	
position	0.000 0.000 -4.000
rotation	-90.000 0.000 0.000
scale	1.000 1.000 1.000
visible	<input checked="" type="checkbox"/>
mixins	Add mixin...

Below the properties, there are sections for "COMPONENTS", "GEOMETRY", "MATERIAL", and "SHADOW".

Isn't it interesting that we can create 3D objects like we see in the real world with just writing down a few lines of codes?

	<p>Let's write our own code to create 3D shapes.</p> <p>Teacher opens VS Code Editor and creates an index.html file.</p>	
	 <pre> EXPLORER ... OPEN EDITORS < index.html x C145-CODE < index.html > html index.html 1 <!DOCTYPE html> 2 <html> 3 <head> 4 5 <script src="https://aframe.io/releases/1.0.4/aframe.min.js"></script> 6 7 </head> 8 9 <body> 10 11 <a-scene > 12 13 <a-box position="-1 0.5 -3" color="#4CC3D9"></a-box> 14 15 </a-scene> 16 17 </body> 18 </html> </pre>	

	<p>We can also set some color to it using the color attribute inside the box primitive.</p> <p>Let's check what we have got in 3D inside the web browser.</p>	
	<p>We have one 3D cube here. Isn't it amazing?</p> 	
	<p>Note: Use Arrow or WASD keys to control the camera view. Up/W : Zoom in. Down/S : Zoom out Left/A : Left view Right/S : Right view</p> <p>Now it's your turn. Please share your screen with me.</p>	
Teacher Stops Screen Share		
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

- Remix example code and play around with different attributes of primitive shapes.
- Create a new project of your own and make different 3D shapes in the scene.



Teacher starts slideshow from slides 16 to 17
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)**

Guide the student to open [aframe.io](#) and remix the example project “Hello WebVR”.

Guide the student to edit the code inside the index.html file.

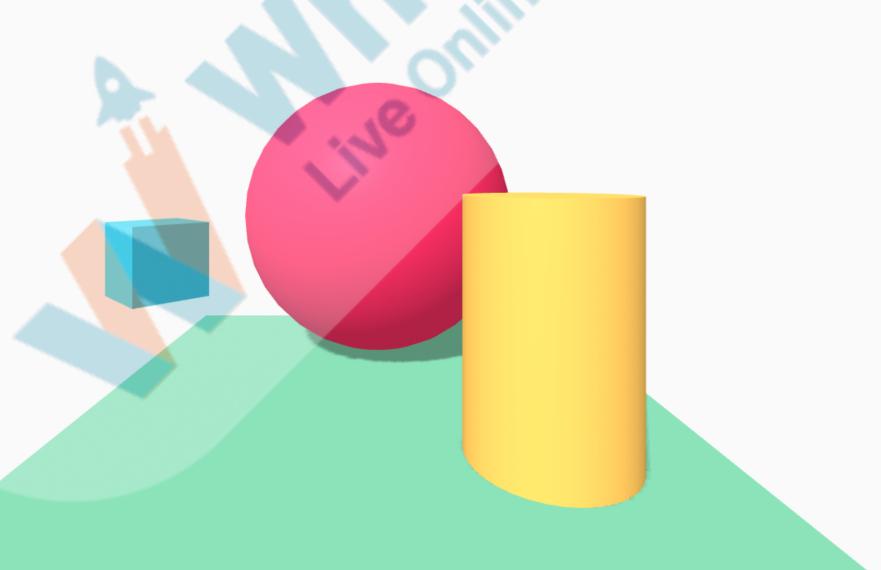
Student opens the link in a web browser and remixes the first example.

Encourage the student to edit code and see change in outputs by asking questions and giving challenges.

C1: Exchange the position of two shapes. Bring the sphere in front and place the box behind.

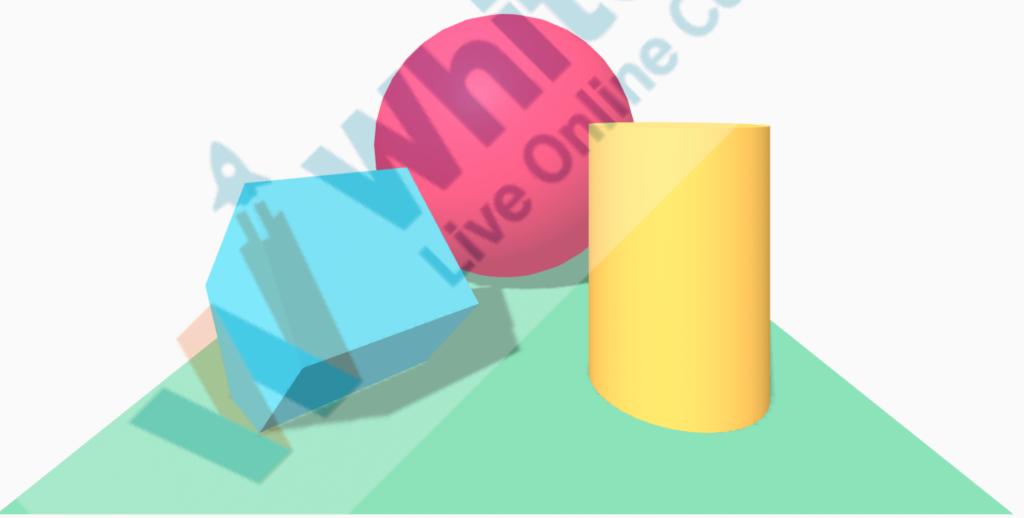
The student edits the code and tests the output on the adjacent tab.

Students also experiment with different attributes and values to understand the 3-Dimensions.

	<p>C2: What happens when you change the scale of the cylinder?</p> <p>C3: What happens when you change rotation values of some of the other primitives like box or cylinder? What do the triplets of numbers represent for rotation and scale?</p> <p>C4: What happens when you try rotating the sphere or box by 90°? Why don't you see anything change?</p> <p><i>Let the child explore and play with the example.</i></p> <p>How do you find this framework? Cool right?</p>	
 <p>Change Position (Box)</p>		



Change Scale (Cylinder)



Change Rotation(Box)

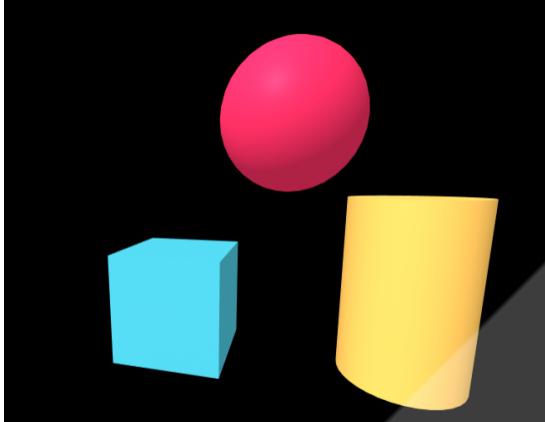
	<p>Let's now write our own code to create these shapes.</p> <p><i>Guide the student to open VS Code Editor to make some shapes and set the positions.</i></p>	<p><i>The student opens the VS code editor and writes the code with help of the teacher.</i></p>
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```

index.html
④ index.html > html
1   <!DOCTYPE html>
2   <html>
3     <head>
4
5       <script src="https://aframe.io/releases/1.0.4/aframe.min.js"></script>
6
7     </head>
8     <body>
9       <a-scene background="color: #000000">
10         <a-box position="-1 0.5 -3" color="#4CC3D9" ></a-box>
11         <a-sphere position="0 2.5 -5" radius="1.25" color="#EF2D5E" ></a-sphere>
12         <a-cylinder position="1 0.75 -3" radius="0.5" height="1.5" color="#FFC65D" ></a-cylinder>
13       </a-scene>
14     </body>
15   </html>

```

	<p><i>Guide the student to set the positions of the shapes or try out different different combinations like placing all shapes one over the other.</i></p>	<p><i>Students' output can vary based on the positions they choose.</i></p>
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	<p>Awesome!</p> <p>It was really fun to see 3D objects inside the web. In the next class we will create our Solar System.</p> <p>Can you tell what we have in our solar system?</p>	<p>ESR: Our solar system consists of stars, the Sun, and everything bound to it by gravity – the planets Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune.</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. 		

 Teacher starts slideshow from slide 18 to slide 28	
Activity details	Solution/Guidelines
Run the presentation from slide 18 to slide 28 Following are the wrap-up session deliverables: <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
What are the two parts of a HTML code? A. Script and image B. Src and div tags C. Head and Body D. Image and src	C
Which of the following enables us to create 3D objects like the real world? A. V-frame B. A-frame C. VR-frame D. AR-frame	B
Which of these is the default element of A-frame? A. <a-scene> B. <a-tag> C. <a> D. <a-view>	A

<ul style="list-style-type: none"> ● End the quiz panel 		
	<p>You get a “hats off”.</p> <p>As an assignment, do you think you can create some more shapes in the hello world example like a tetrahedron, torus?</p> <p>Alright. I will look forward to seeing how you create your content.</p> <p>We will be adding planets and animation in the next class.</p>	<p>Make sure you have given at least 2 Hats Off during the class for:</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>Creatively Solved Activities +10</p> </div> <div style="text-align: center;">  <p>Great Question +10</p> </div> <div style="text-align: center;">  <p>Strong Concentration +10</p> </div> </div>
Project Overview	<p>BASIC 3D SHAPES</p> <p>Goal of the Project:</p> <p>Today, you have learned to add different 3-D shapes in your scene.</p> <p>In this project, you will have to use some new shapes and place them in your scene.</p> <p>Story: Shreyas has been learning about three dimensional shapes in his school but it is very difficult for him to visualize the 3D shapes on paper or textbook. Help him to design 3D shapes on the web so that he sees them in 3 dimensions i.e., on x , y and z-axis.</p>	

	<p>Discuss the project with students before completing the class and give them hints on how to start with the project.</p> <p>Bye!</p>	
 Teacher ends slideshow		
Additional Activities	<p>Encourage the student to write the sample project entirely by himself/herself in a new project including the <head> tag and <script> tag.</p>	<p>Students will build a 3D shaped world with their own ideas.</p>

Activity	Activity Name	Links
Teacher Activity 1	AFrame Introduction	https://aframe.io/
Teacher Activity 2	Glitch Project	https://glitch.com/~aframe
Teacher Activity 3	Basics 3D shapes	https://github.com/whitehatjr/PRO-C145-Activity-Reference
Student Activity 1	A-Frame Introduction	https://aframe.io/
Student Activity 2	Glitch Project	https://glitch.com/~aframe
Student Activity 3	Basic 3D shapes	https://github.com/whitehatjr/PRO-C145-Activity-Reference

		<u>Activity-Reference</u>
Project Solution Link	Basic 3D Shapes	https://github.com/whitehatjr/VR-PRO-C145
Teacher Ref. Visual Aid Link	Visual Aid link	https://curriculum.whitehatjr.com/Visual+Project+Asset/PRO_VD/PRO_C145_withcues.html
Teacher Ref. In-Class Quiz	In-Class Quiz	https://s3-whjr-curriculum-uploads.whjr.online/c2127598-c5a9-470c-8f88-d4a9d41a31e0.pdf