Hi kids,

Today we will delve into 3d programming to animate a solar system.

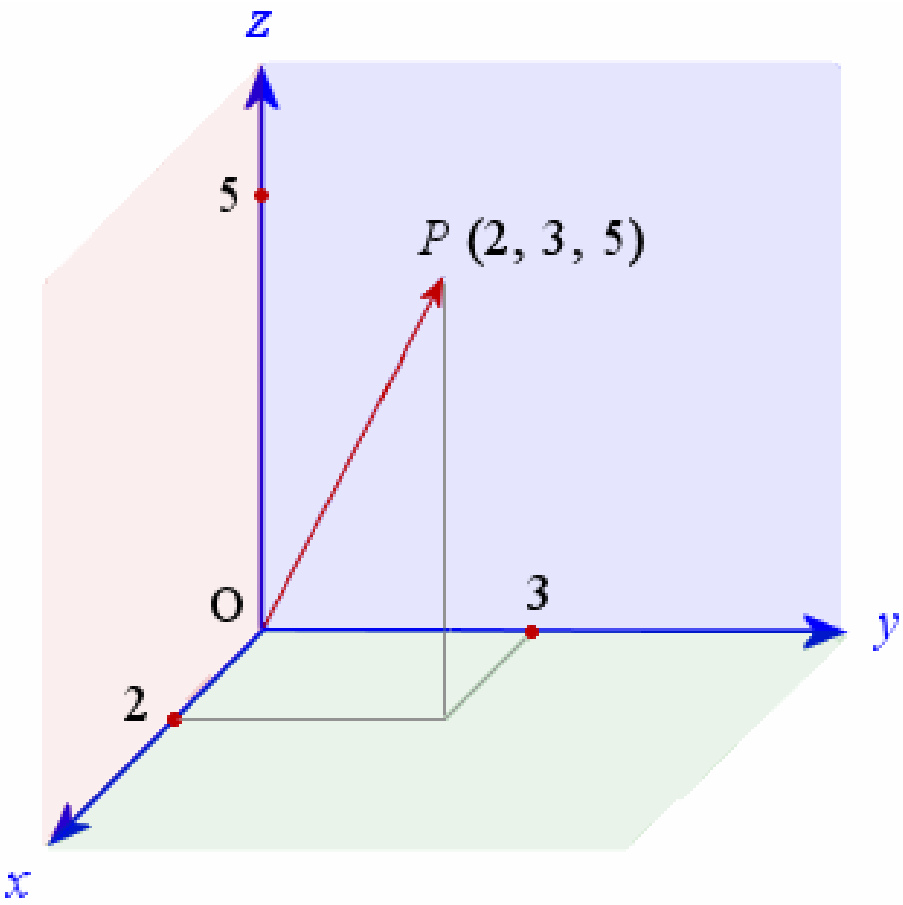
So, please create a canvas w/WEBGL, see:

```
function setup() {
  createCanvas(400, 400,WEBGL);
}
```

WEBGL enables 3d coding. Note the origin becomes the middle of the screen.

We will need to use vetors in 3-space among other things.

Below see a simple depiction of the vector with direction (2,3,5). Note this would be a vector of the line segment between the origin and (2,3,5). A vector is not a line that goes on forever.



Knowledge of exactly what a vector is is not required for this assignment. If you are thoroughly curious, see: https://www.youtube.com/watch?v=lz9v1F43skk .

First of all let's see what 3d looks like in p5.js.

Run the following snippet:

```
function setup() {
  createCanvas(400, 400,WEBGL);
}

function draw() {
  background(220);
  strokeWeight(5)
  stroke('red')
  line(0,-500,0,0,500,0)
  stroke('green')
  line(-500,0,0,500,0,0)
  stroke('purple')
  line(0,0,-500,0,0,500)
  //camera(300,300,300,0,0,0) //←try uncommenting the camera

}
```

The camera has 6 parameters, or two coordinates. The first coordinate places the camera in 3-space, the second is the center of the screen. In our case we have placed the camera at (300,300,300) and we have placed the origin at the center of the screen. Note that the z axis by default will come directly out from and straight into the screen.

Also note that I have purposely coded all 3 axes to show using different colours.

That said, imagine we wanted to rotate a planet about the y axis. We would do the following:

- Preload a vector to rotate about, therefore in this case we would do the following:

```
let v//global

function preload() {
  v = createVector(0, 1, 0);
}
```

- **Draw a sphere to be the planet**
  - **sphere(10);**
- **rotate(angle, v);**
- **translate(300, 200, 0);// ←starting location in 3 space**

Once this is done, we need to call **`push()`** and **`pop()`**.

îThe push() function saves the current drawing style settings and transformations, while pop() restores these settings. Note that these functions are always used together.ï

See: https://p5js.org/reference/#/p5/push

For cosmetic reasons, we can upload images to “wrap” 3d shapes in p5.js. To complete this, download a jpeg, and upload it to your p5.js project. I have uploaded a picture of the earth and wrapped it around one of the planets. We use texture(img) to wrap a shape.

This can all be seen in the following program:
Or here: https://replit.com/@andrewJJimenez/KeyGoodCryptocurrency#script.js

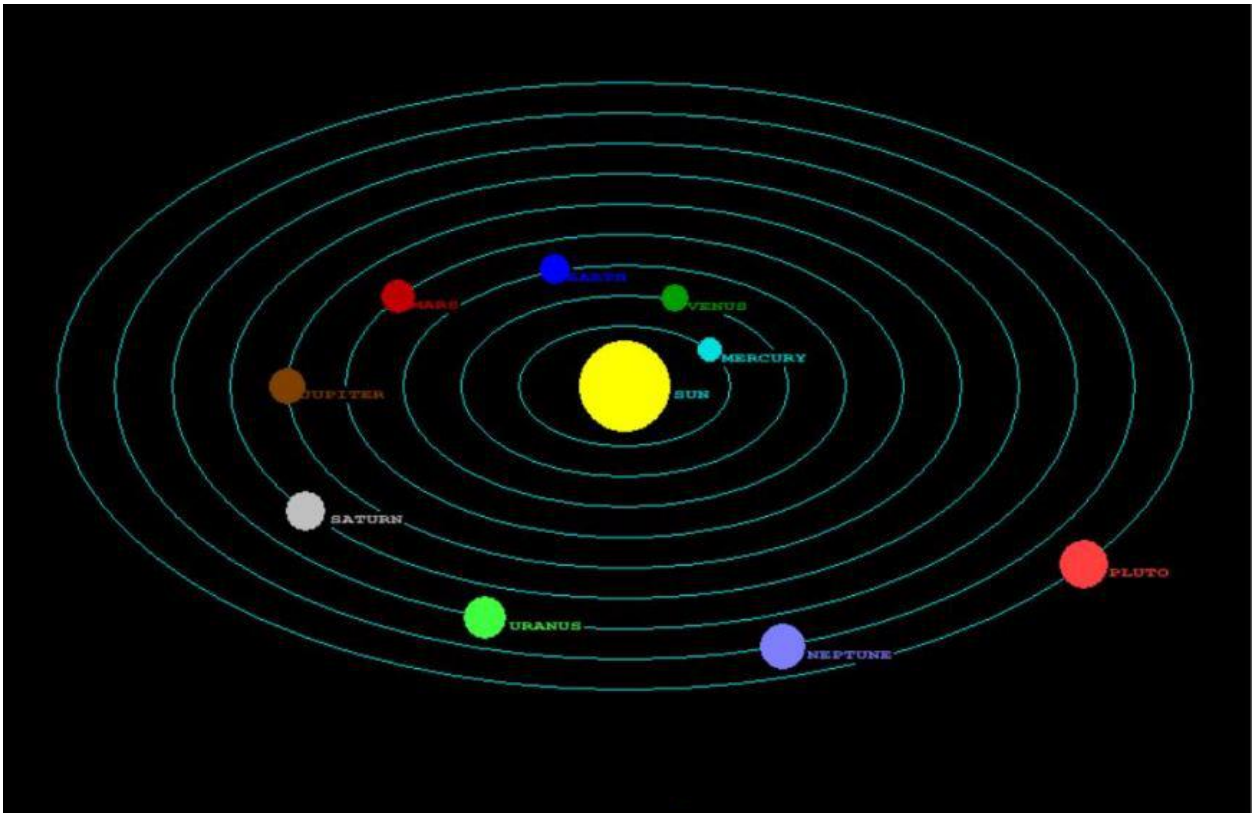
```
let a = 0;
let b = 1;
let c = 0;
let angle1 = 0;
let angle2 = 0;
let v;
function preload() {
  v = createVector(a, b, c);
  img = loadImage("world.jpg");//←you will need to upload this
}
function setup() {
  createCanvas(600, 600, WEBGL);
  background("grey");
}
function draw() {
  background("grey");
  angle1 += 0.07;
  angle2 += 0.035;
  //draw y axis
  line(0, -500, 0, 0, 500, 0);

  push();
  noStroke()
  rotate(angle1, v);
  translate(200, 0, 0);
  texture(img)
  sphere(30);
  pop();

  push();
  rotate(angle2, v);
  translate(200, 200, 0);
  stroke("yellow");
  sphere(10);
  pop();
  camera(100, 0, 600, 0, 0, 0);
}
```

Do your best to code an animated solar system of 7 planets (8 if you include Pluto). on p5.js

See:



One must make an attempt to “mimic” the periods of the planets. They needn’t be exact, however, Netptune should be the slowest and Mercury the fastest. You may use the chart below:

Planet Data Table

Planet	Diameter (km)	Rotation Period (in Earth Days)	Revolution Period (in Earth days)	Average temperature (°C)	Surface Composition	Rings & Moons	Travel Time from Earth
Mercury	4,879	58.66	88	179°C	rocky	0	5 months
Venus	12,104	243	224	482°C	rocky	0	3 months
Earth	12,756	1	365.25	15°C	rocky	1 moon	-
Mars	6,756	1.03	687	-63°C	rocky	2 moons	8 months
Jupiter	142,984	0.42	4,332	-121°C	gaseous	60 moons + rings	5 years
Saturn	120,536	0.45	10,775	-125°C	gaseous	31 moons + rings	7 years
Uranus	51,118	0.71	30,681	-193°C	gaseous	27 moons + rings	10 years
Neptune	49,528	0.67	60,193	-173°C	gaseous	13 moons + rings	12 years

Grading Scheme:

- Stationary Sun: 5 marks
- Relative size of planets
    - Earth should be smaller than Saturn and larger than Mercury etc… 5 marks
- Periods (speed of rotation)
    - Earth should be faster than Mars and slower than Venus etc… 5 marks
- Colour and creativity 5 marks

Will offer bonus marks for

- a moon around Earth 1 mark
- rings around Saturn 1 mark

Due Monday, November 27th, 11:59 PM