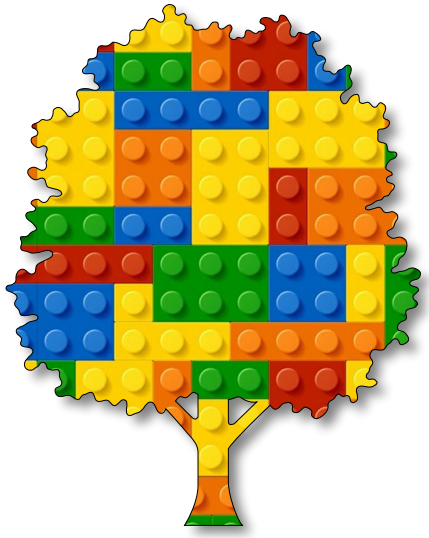
Algorithmic Art

Module C

Unit #2

orbit and smooth



Content

Module C Unit #2 orbiting and smoothing

Introduction to orbiting and smoothing

You will notice that the shapes aren't very smooth as they are drawn with a series of interconnecting triangles. This can be improved by increasing the number of triangles; it will mean that there is a lot more geometry for the code to keep track of, so don't go mad, keep them to a minimum where possible to still give a pleasing effect. In these units, we won't really need to worry as we are not making big demands on it, but it may start running slowly.

Sketch C2.1 default WEBGL sketch

❗ start a new WEBGL sketch.

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

function draw()
{
  background(220)
}
```

Sketch C2.2 default details

❗ add the usual suspects
With 3D shapes, you may notice that the shapes with curves, for instance, the sphere and the torus, are not what you call smooth. The triangles that construct the shape add a certain angular nature to them. This is because the default detail is 24 for `detailX` and 16 for `detailY`.

You can increase the amount of detail for those shapes, but you cannot then draw the lines. If you remove the lines with `noStroke()`, then you can do it, giving you a much smoother-looking shape. To do this, we add two more arguments to our `torus()` shape. The third argument is `detailX`, and the fourth is `detailY`.

```
let angle = 0

function setup()
{
  createCanvas(400, 400, WEBGL)
  angleMode(DEGREES)
}

function draw()
{
  background(220)
  rotateX(angle)
  rotateY(angle)
  rotateZ(angle)
  torus(100, 25, 24, 16)
  angle++
}
```

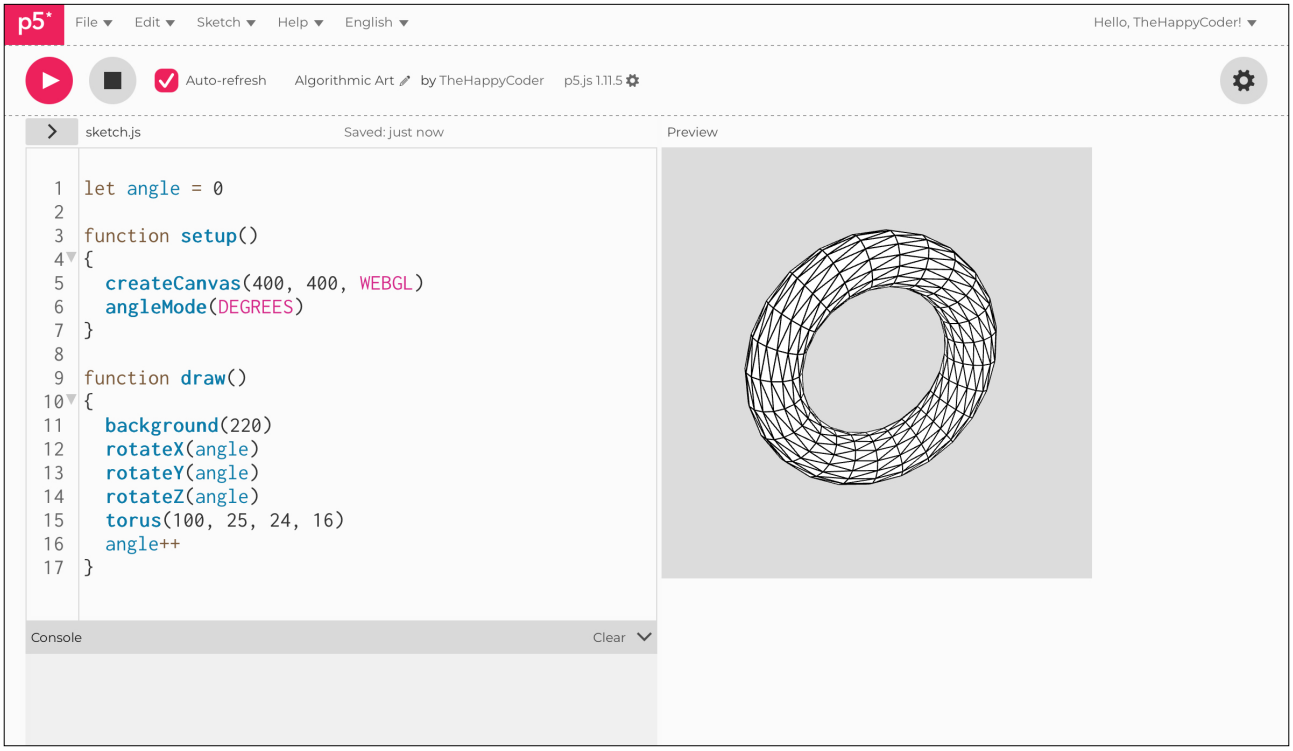
🗒️ Notes
Here we just add the default values for the `torus()`.

🌻 Challenge
What happens if you increase those values?

🛠️ Code Explanation

`torus(100, 25, 24, 16)`	Drawing a torus with a detailX of 24 and a detailY of 16

Figure C2.2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Preview
let angle = 0
function setup()
{
createCanvas(400, 400, WEBGL)
angleMode(DEGREES)
}
function draw()
{
background(220)
rotateX(angle)
rotateY(angle)
rotateZ(angle)
torus(100, 25, 24, 16)
angle++
}
Console
Clear

Sketch C2.3 smoothing the curves

We are going to remove the lines, `noStroke()`, and increase the values by a factor of `two`.

```
let angle = 0

function setup()
{
  createCanvas(400, 400, WEBGL)
  angleMode(DEGREES)
}

function draw()
{
  background(220)
  rotateX(angle)
  rotateY(angle)
  rotateZ(angle)
  noStroke()
  torus(100, 25, 48, 32)
  angle++
}
```

🗒️ Notes

This creates a much smoother-looking shape. However, because we haven't explored materials and light yet, the full benefit is not readily appreciated.

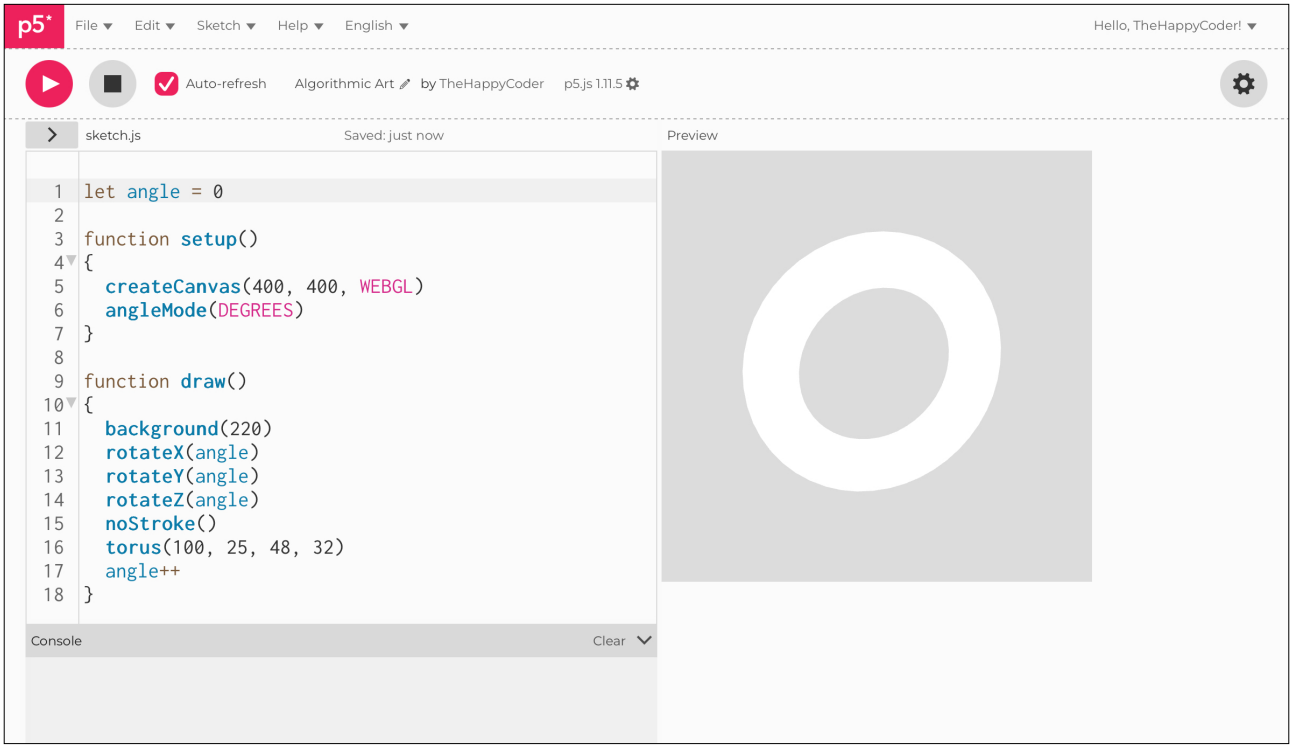
🌻 Challenges

1. See what difference it makes if you change the detail by half (12 and 8).
2. Try even smaller values to see the effect, as well as much larger values.

🛠️ Code Explanation

`torus(100, 25, 48, 32)`	Drawing a torus with a detailX of 24 and a detailY of 16

Figure C2.3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Saved: just now
Preview
let angle = 0
function setup()
{
createCanvas(400, 400, WEBGL)
angleMode(DEGREES)
}
function draw()
{
background(220)
rotateX(angle)
rotateY(angle)
rotateZ(angle)
noStroke()
torus(100, 25, 48, 32)
angle++
}
Console
Clear

Sketch C2.4 a single cube

❗ starting a new sketch

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

function draw()
{
  background(220)
  box(100)
}
```

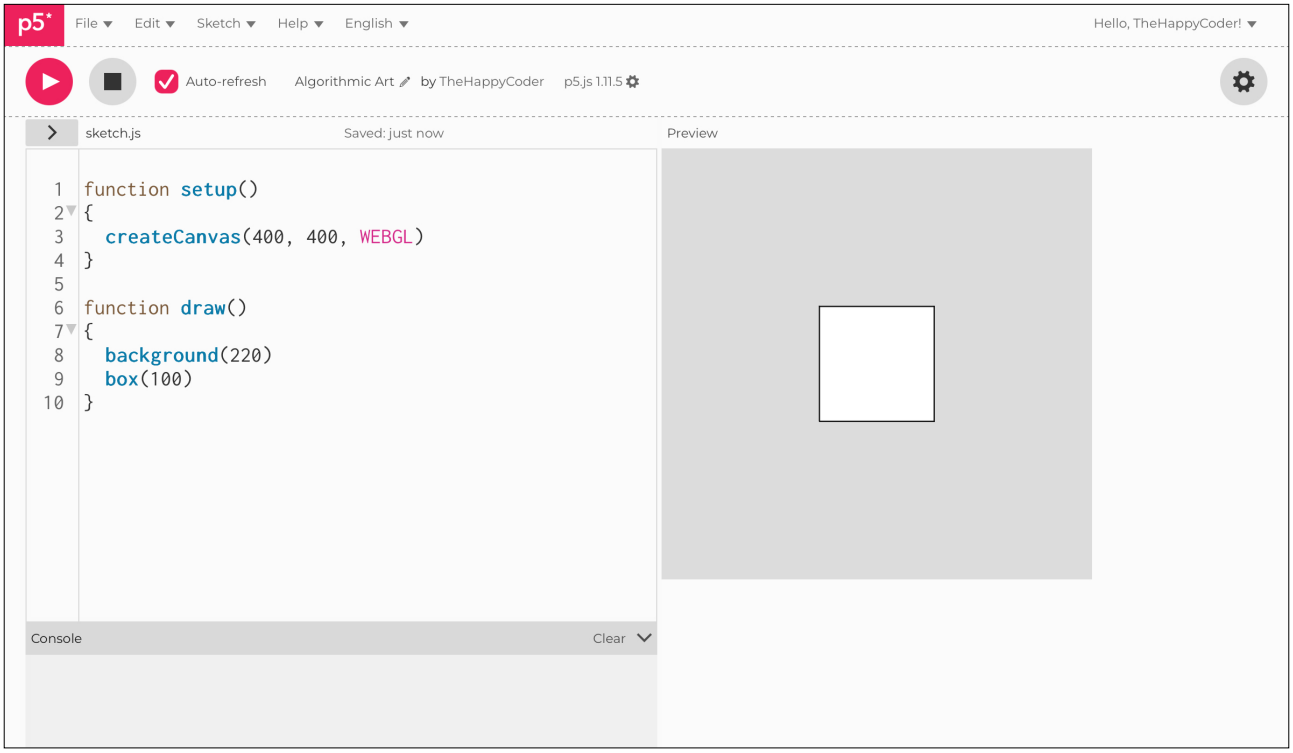
🗒️ Notes

A simple box to start with.

🌻 Challenge

Other shapes are available.

Figure C2.4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sketch.js
Saved: just now
Preview
function setup()
{
createCanvas(400, 400, WEBGL)
}
function draw()
{
background(220)
box(100)
}
Console
Clear

Sketch C2.5 many cubes

Making many cubes.

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

function draw()
{
  background(220)
  box(50)
  push()
  translate(50, 50, 0)
  box(50)
  pop()
  push()
  translate(-50, 50, 0)
  box(50)
  pop()
  push()
  translate(50, -50, 0)
  box(50)
  pop()
  push()
  translate(-50, -50, 0)
  box(50)
  pop()
}
```

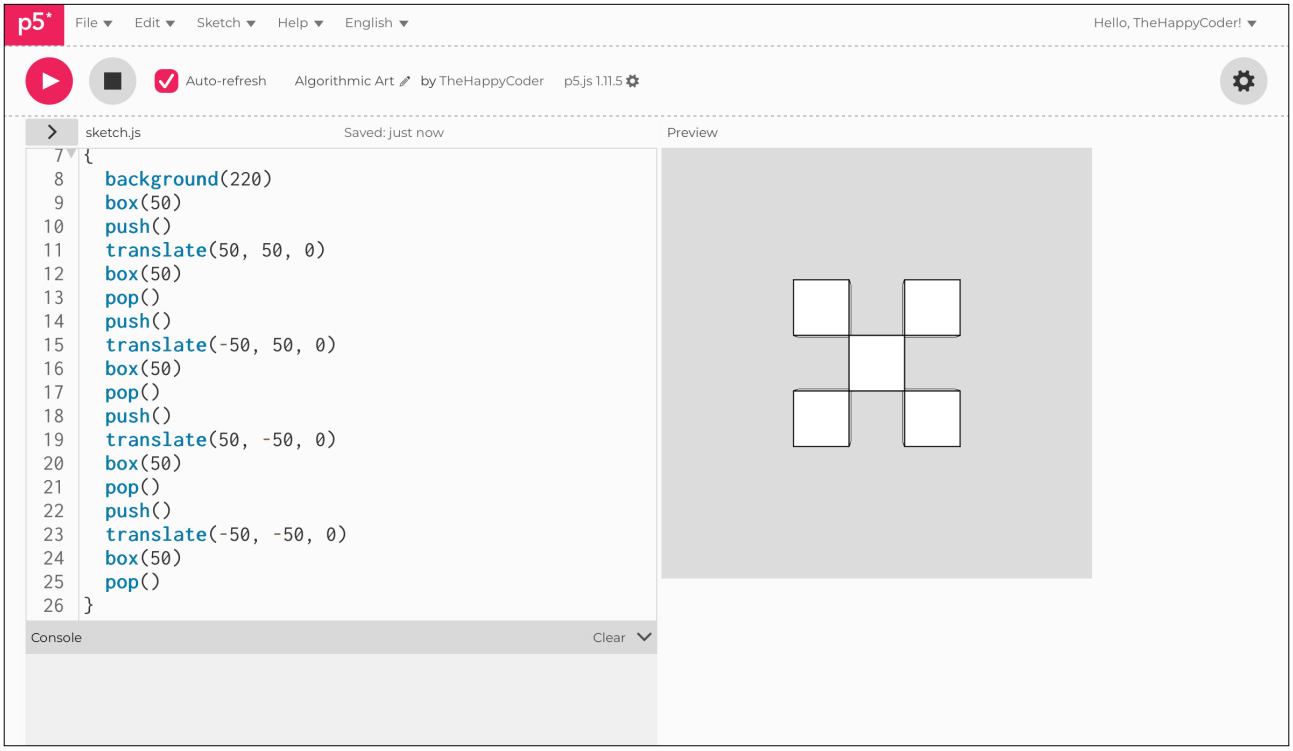
🗒️ Notes

Using `push()` and `pop()` to translate each other cube separately.

🌻 Challenge

Make each box rotate separately.

Figure C2.5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Preview
{
background(220)
box(50)
push()
translate(50, 50, 0)
box(50)
pop()
push()
translate(-50, 50, 0)
box(50)
pop()
push()
translate(50, -50, 0)
box(50)
pop()
push()
translate(-50, -50, 0)
box(50)
pop()
}
Console
Clear

Sketch C2.6 controlling the orbit

Now add the orbit control; click and drag your mouse over the canvas.

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

function draw()
{
  background(220)
  orbitControl()
  box(50)
  push()
  translate(50, 50, 0)
  box(50)
  pop()
  push()
  translate(-50, 50, 0)
  box(50)
  pop()
  push()
  translate(50, -50, 0)
  box(50)
  pop()
  push()
  translate(-50, -50, 0)
  box(50)
  pop()
}
```

🗒️ Notes

The `orbitControl()` function allows you to move the canvas so that you orbit the shapes.

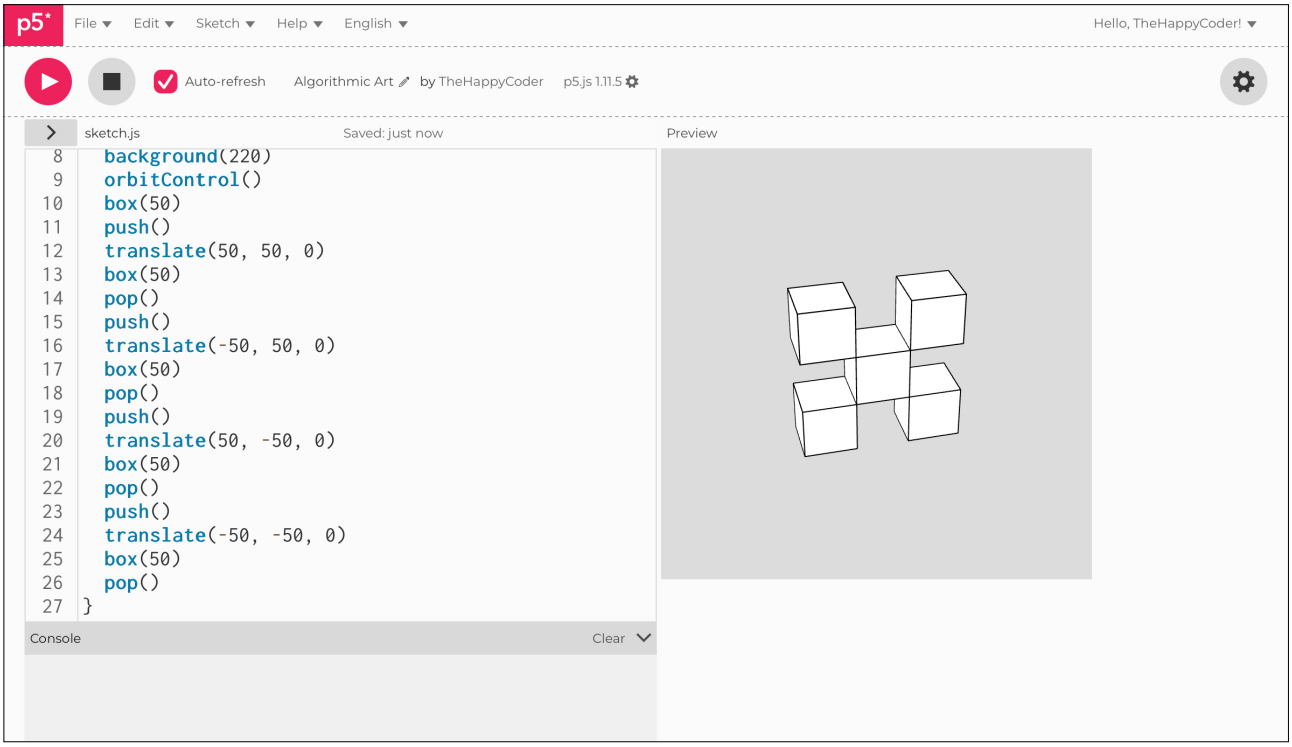
🌻 Challenge

Try other shapes.

🛠️ Code Explanation

`orbitControl()`	A function that allows you to orbit the shapes

Figure C2.6



Sketch C2.7 frame count

❗ start another new sketch

Another quick way to rotate is to use the `frameCount`. Here we can rotate a box just using the `frameCount` variable. It counts how many frames have elapsed since starting the sketch. Note it is a variable, not a function. Also, use angle mode with degrees; otherwise, it will spin out of control.

```
function setup()
{
  createCanvas(400, 400, WEBGL)
  angleMode(DEGREES)


}

function draw()
{
  background(220)
  rotateX(frameCount)
  rotateY(frameCount)
  rotateZ(frameCount)
  box(100)
}
```

🗒️ Notes

Rotates nicely enough

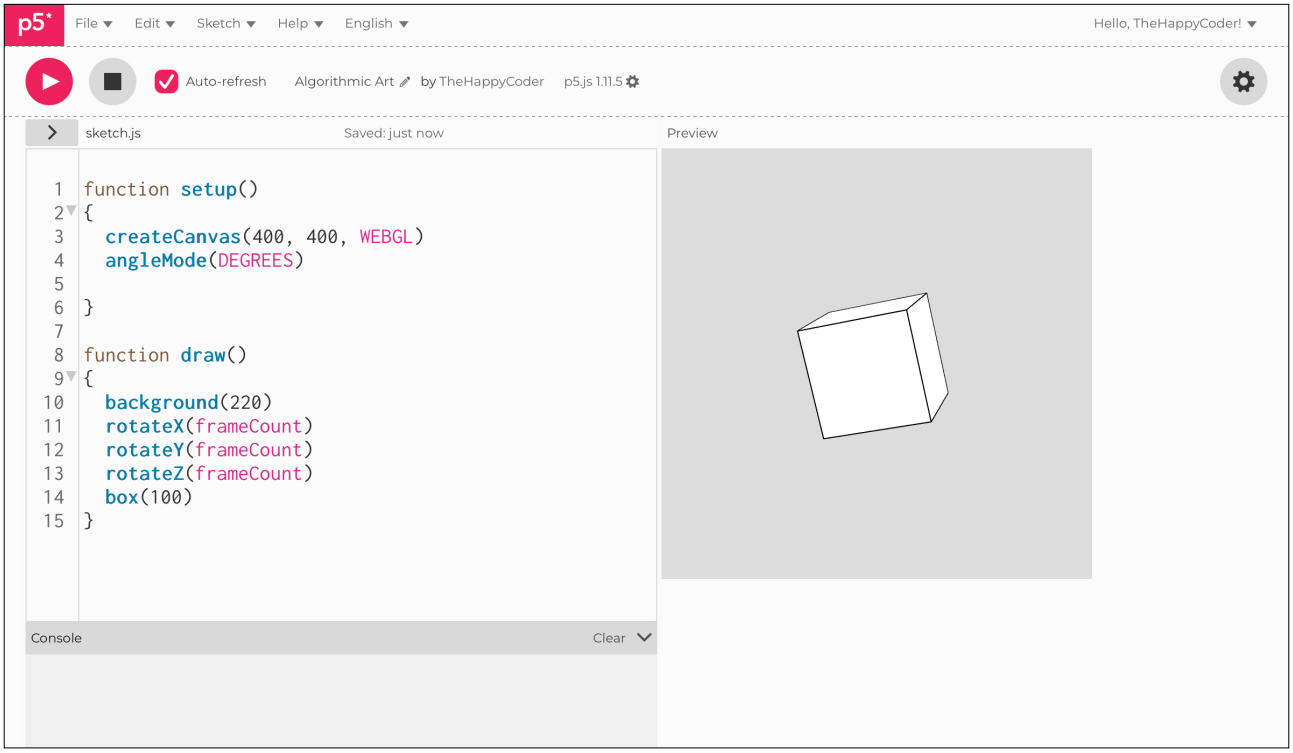
🌻 Challenge

Remove `angleMode(DEGREES)`

🛠️ Code Explanation

`rotateX(frameCount)`	Rotates every time the draw() function loops

Figure C2.7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Preview
function setup()
{
createCanvas(400, 400, WEBGL)
angleMode(DEGREES)
}
function draw()
{
background(220)
rotateX(frameCount)
rotateY(frameCount)
rotateZ(frameCount)
box(100)
}
Console
Clear

Sketch C2.8 alternative frame count

An alternative is to remove `angleMode()` and just divide the frame count by `50` to reduce the spin rate.

```
function setup()
{
  createCanvas(400, 400, WEBGL)
  // angleMode(DEGREES)
}

function draw()
{
  background(220)
  rotateX(frameCount/50)
  rotateY(frameCount/50)
  rotateZ(frameCount/50)
  box(100)
}
```

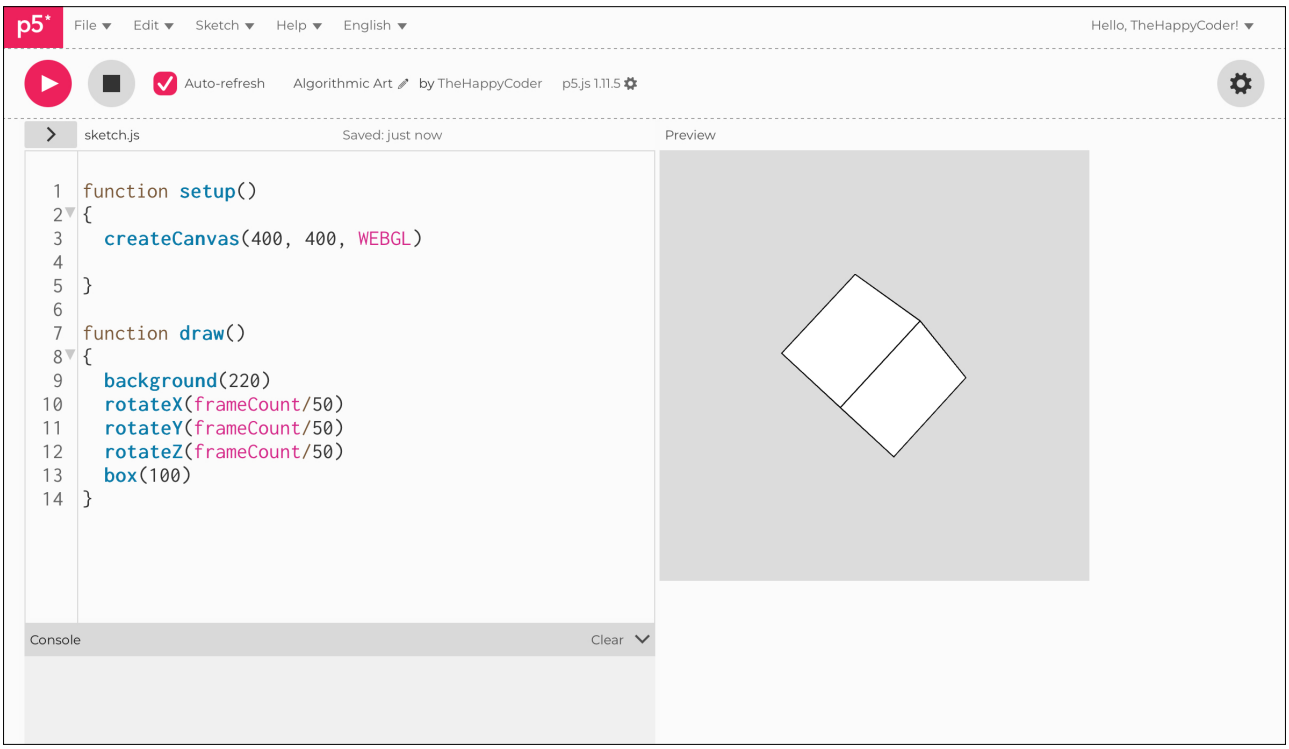
🗒️ Notes

Rotates at a more steady rate.

🌻 Challenge

Other rates are available .

Figure C2.8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{
createCanvas(400, 400, WEBGL)
}
function draw()
{
background(220)
rotateX(frameCount/50)
rotateY(frameCount/50)
rotateZ(frameCount/50)
box(100)
}
Console
Clear