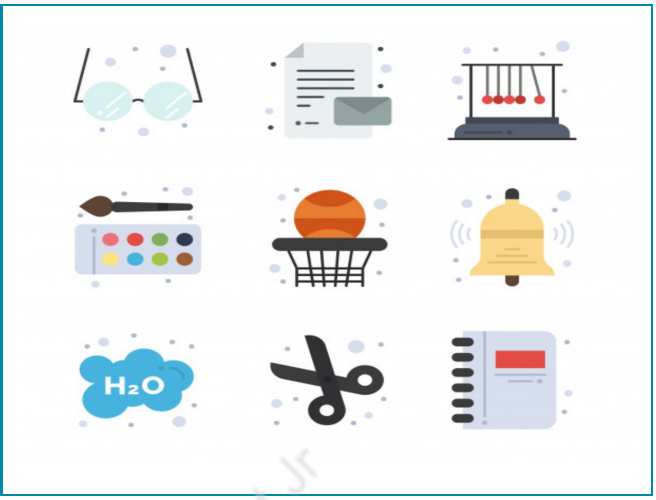
Classes and Objects



What is our GOAL for this MODULE?

The goal for this module is to extend the knowledge of class . And create objects using blueprints.

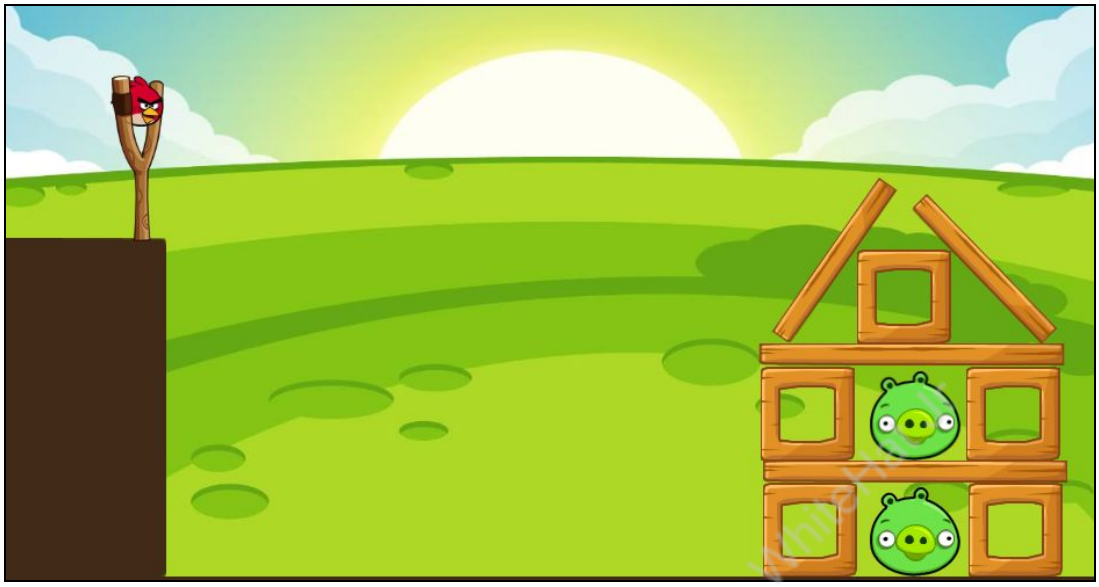
What did we ACHIEVE in the class TODAY?

- Designed different classes corresponding to the different game objects.
- Created objects using the above class blueprints
- Made the bird object move with the mouse

Which CONCEPTS/ CODING BLOCKS did we cover today?

- Creating different classes for different game objects.
- Moving the objects with the mouse movement.

How did we DO the activities?



1. Change the colour of the Ground class to brown and add a stroke of green to our box class, so that each object's boundary looks visibly separate.

```
Ground.js > Ground > display
1   class Ground {
2       constructor(x,y,width,height) {
3         var options = {
4             isStatic: true
5         }
6         this.body = Bodies.rectangle(x,y,width,height,options);
7         this.width = width;
8         this.height = height;
9         World.add(world, this.body);
10      }
11      display(){
12        var pos =this.body.position;
13        rectMode(CENTER);
14        fill("brown");
15        rect(pos.x, pos.y, this.width, this.height);
16      }
17  };
```

```
JS Box.js > Box > display
1   class Box {
2     constructor(x, y, width, height) {
3       var options = {
4           'restitution':0.8,
5           'friction':0.3,
6           'density':1.0
7       }
8       this.body = Bodies.rectangle(x, y, width, height, options);
9       this.width = width;
10      this.height = height;
11
12      World.add(world, this.body);
13    }
14    display(){
15      var pos =this.body.position;
16      var angle = this.body.angle;
17      push();
18      translate(pos.x, pos.y);
19      rotate(angle);
20      rectMode(CENTER);
21      strokeWeight(4);
22      stroke("green");
23      fill(255);
24      rect(0, 0, this.width, this.height);
25      pop();
26    }
27  };
28
```

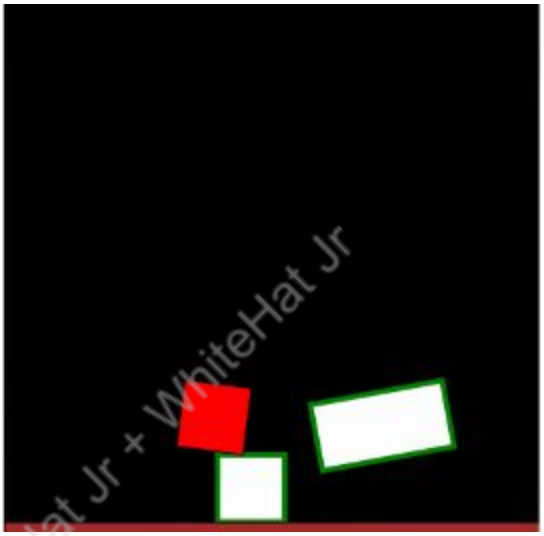
2. Create the Pig class. It will be similar to the Box class for now.

```
class Pig {
    constructor(x, y) {
      var options = {
          'restitution':0.8,
          'friction':0.3,
          'density':1.0
      }
      this.body = Bodies.rectangle(x, y, 50, 50, options);
      this.width = 50;
      this.height = 50;

      World.add(world, this.body);
    }
    display(){
      var pos =this.body.position;
      var angle = this.body.angle;
      push();
      translate(pos.x, pos.y);
      rotate(angle);
      rectMode(CENTER);

      fill("red");
      rect(0, 0, this.width, this.height);
      pop();
    }
  };
```

index.html > ...

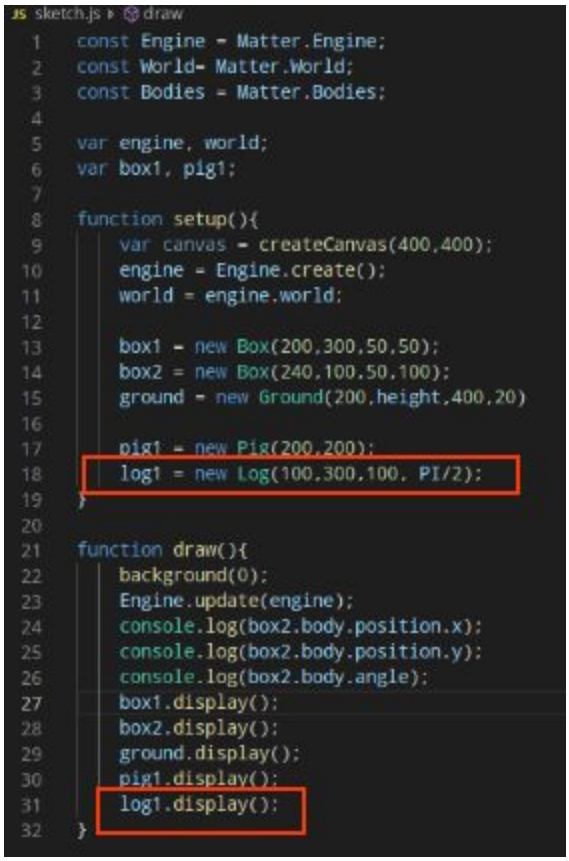
```
<!DOCTYPE html>
<html>
<head>
    <script src="p5.min.js"></script>
    <script src="p5.dom.min.js"></script>
    <script src="p5.sound.min.js"></script>
    <script src="matter.js"></script>
    <script src="Ground.js"></script>
    <script src="Box.js"></script>
    <script src="Pig.js"></script>
    <link rel="stylesheet" type="text/css" href="style.css">
    <meta charset="utf-8" />
</head>
<body>
  <script src="sketch.js"></script>
</body>
</html>
```

```
sketch.js ▸ draw
1   const Engine = Matter.Engine;
2   const World= Matter.World;
3   const Bodies = Matter.Bodies;
4
5   var engine, world;
6   var box1, pig1;
7
8   function setup(){
9       var canvas = createCanvas(400,400);
10      engine = Engine.create();
11      world = engine.world;
12
13      box1 = new Box(200,300,50,50);
14      box2 = new Box(240,100,50,100);
15      ground = new Ground(200,height,400,20)
16
17      pig1 = new Pig(200,200);
18  }
19
20  function draw(){
21      background(0);
22      Engine.update(engine);
23      console.log(box2.body.position.x);
24      console.log(box2.body.position.y);
25      console.log(box2.body.angle);
26      box1.display();
27      box2.display();
28      ground.display();
29      pig1.display();
30  }
```

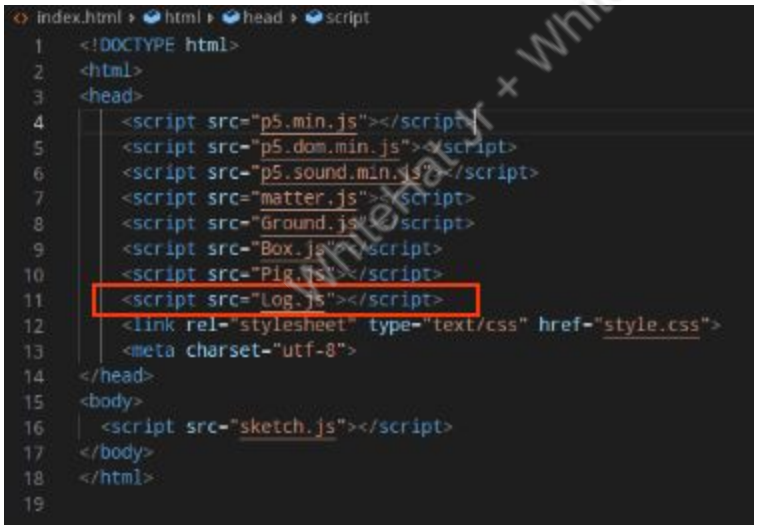


3. Write code for the log class, to pass an angle parameter while creating the log object. The logs in the object also have a fixed width.

```
1   class Log {
2       constructor(x, y, height, angle) {
3           var options = {
4               'restitution':0.8,
5               'friction':0.3,
6               'density':1.0
7           }
8           this.body = Bodies.rectangle(x, y, 20, height, options);
9           this.width = 20;
10          this.height = height;
11          Matter.Body.setAngle(this.body, angle);
12          World.add(world, this.body);
13      }
14      display(){
15          var pos =this.body.position;
16          var angle = this.body.angle;
17          push();
18          translate(pos.x, pos.y);
19          rotate(angle);
20          rectMode(CENTER);
21          strokeWeight(4);
22          stroke("green");
23          fill(255);
24          rect(0, 0, this.width, this.height);
25          pop();
26      }
27  };
```



```
sketch.js ▸ draw
1   const Engine = Matter.Engine;
2   const World= Matter.World;
3   const Bodies = Matter.Bodies;
4
5   var engine, world;
6   var box1, pig1;
7
8   function setup(){
9       var canvas = createCanvas(400,400);
10      engine = Engine.create();
11      world = engine.world;
12
13      box1 = new Box(200,300,50,50);
14      box2 = new Box(240,100,50,100);
15      ground = new Ground(200,height,400,20)
16
17      pig1 = new Pig(200,200);
18      log1 = new Log(100,300,100, PI/2);
19  }
20
21  function draw(){
22      background(0);
23      Engine.update(engine);
24      console.log(box2.body.position.x);
25      console.log(box2.body.position.y);
26      console.log(box2.body.angle);
27      box1.display();
28      box2.display();
29      ground.display();
30      pig1.display();
31      log1.display();
32  }
```



```
index.html ▸ html ▸ head ▸ script
1   <!DOCTYPE html>
2   <html>
3   <head>
4       <script src="p5.min.js"></script>
5       <script src="p5.dom.min.js"></script>
6       <script src="p5.sound.min.js"></script>
7       <script src="matter.js"></script>
8       <script src="Ground.js"></script>
9       <script src="Box.js"></script>
10      <script src="Pig.js"></script>
11      <script src="Log.js"></script>
12      <link rel="stylesheet" type="text/css" href="style.css">
13      <meta charset="utf-8">
14  </head>
15  <body>
16    <script src="sketch.js"></script>
17  </body>
18  </html>
19
```

*Note: Most computer programs use the unit "radians" for degrees.
In the unit of radians:
PI = 180 degrees;
P!/2 = 90 degrees;
P!/4 = 45 degrees and so on

*Note PI stands for the mathematical pi symbol
(PI in radians = 180 degrees)

4. Increase the size of our canvas to 1200,400. The ground size will also increase.

```
const Engine = Matter.Engine;
const World= Matter.World;
const Bodies = Matter.Bodies;

var engine, world;
var box1, pig1;

function setup(){
    var canvas = createCanvas(1200,400);
    engine = Engine.create();
    world = engine.world;

    box1 = new Box(200,300,50,50);
    box2 = new Box(240,100,50,100);
    ground = new Ground(600,height,1200,20)

    pig1 = new Pig(200,200);
    log1 = new Log(100,300,100, PI/2);
}

function draw(){
    background(0);
    Engine.update(engine);
    console.log(box2.body.position.x);
    console.log(box2.body.position.y);
    console.log(box2.body.angle);
    box1.display();
    box2.display();
    ground.display();
    pig1.display();
    log1.display();
}
```

5. First position the two boxes and the pigs in between.

6. Create a log object just above these boxes. Remember we need our log at 90 degrees. In radians, 90 degrees = PI/2

```
13
14      ground = new Ground(600,height,1200,20)
15
16      box1 = new Box(700,320,70,70);
17      box2 = new Box(920,320,70,70);
18      pig1 = new Pig(810, 350);
19      log1 = new Log(810,260,300, PI/2);
20
21      box3 = new Box(700,240,70,70);
22      box4 = new Box(920,240,70,70);
23      pig3 = new Pig(810, 220);
24
25      log3 =  new Log(810,180,300, PI/2);
26
27  }
28
29  function draw(){
30      background(0);
31      Engine.update(engine);
32      console.log(box2.body.position.x);
33      console.log(box2.body.position.y);
34      console.log(box2.body.angle);
35      box1.display();
36      box2.display();
37      ground.display();
38      pig1.display();
39      log1.display();
40
41      box3.display();
42      box4.display();
43      pig3.display();
44      log3.display();
45
46  }
```

7. Create the box on the top and two sloping logs to experiment with the angles for the logs.

```
sketch.js ▸ draw
19      log1 = new Log(810,260,300, PI/2);
20
21      box3 = new Box(700,240,70,70);
22      box4 = new Box(920,240,70,70);
23      pig3 = new Pig(810, 220);
24
25      log3 =  new Log(810,180,300, PI/2);
26
27      box5 = new Box(810,160,70,70);
28      log4 = new Log(760,120,150, PI/7);
29      log5 = new Log(870,120,150, -PI/7);
30
31  }
32
33  function draw(){
34      background(0);
35      Engine.update(engine);
36      console.log(box2.body.position.x);
37      console.log(box2.body.position.y);
38      console.log(box2.body.angle);
39      box1.display();
40      box2.display();
41      ground.display();
42      pig1.display();
43      log1.display();
44
45      box3.display();
46      box4.display();
47      pig3.display();
48      log3.display();
49
50      box5.display();
51      log4.display();
52      log5.display();
```

- The logs keep sliding off to the ground.
- Increase friction to stop the sliding from happening.
- In the Log and Box class, add "friction = 1.0" in our options to prevent the sliding.

```
class Log {
    constructor(x, y, height, angle) {
      var options = {
          'restitution':0.8,
          'friction':1.0,
          'density':1.0
      }
      this.body = Bodies.rectangle(x, y, 20, height, options);
      this.width = 20;
      this.height = height;
      Matter.Body.setAngle(this.body, angle);
      World.add(world, this.body);
    }
    display(){
      var pos =this.body.position;
      var angle = this.body.angle;
      push();
      translate(pos.x, pos.y);
      rotate(angle);
      rectMode(CENTER);
      strokeWeight(4);
      stroke("green");
      fill(255);
      rect(0, 0, this.width, this.height);
      pop();
    }
  };

```

```
class Box {
  constructor(x, y, width, height) {
    var options = {
        'restitution':0.8,
        'friction':1.0,
        'density':1.0
    }
    this.body = Bodies.rectangle(x, y, width, height, options);
    this.width = width;
    this.height = height;

    World.add(world, this.body);
  }
  display(){
    var pos =this.body.position;
    var angle = this.body.angle;
    push();
    translate(pos.x, pos.y);
    rotate(angle);
    rectMode(CENTER);
    strokeWeight(4);
    stroke("green");
    fill(255);
    rect(0, 0, this.width, this.height);
    pop();
  }
};

```

8. Create a Bird Class.
    - Bird Class will be similar to Box Class but we will give it a fixed size (width and height).
    - Make the Bird Class move with the Mouse.
    - Bird's position will be the same as mouseX and mouseY. Make the Bird red to make it look angry.

```
class Bird {
    constructor(x, y) {
      var options = {
        'density':1.5,
        'friction': 1.0,
        'restitution':0.5
      };
      this.body = Bodies.rectangle(x, y, 50, 50, options);
      this.width = 50;
      this.height = 50;
      World.add(world, this.body);
    };
    display(){
      var pos = this.body.position;
      pos.x = mouseX;
      pos.y = mouseY;
      var angle = this.body.angle;

      push();
      translate(pos.x, pos.y);
      rotate(angle);
      strokeWeight(3);
      stroke('blue')
      fill('green')
      rectMode(CENTER)
      rect(0, 0, this.width, this.height);
      pop();
    };
  };

```

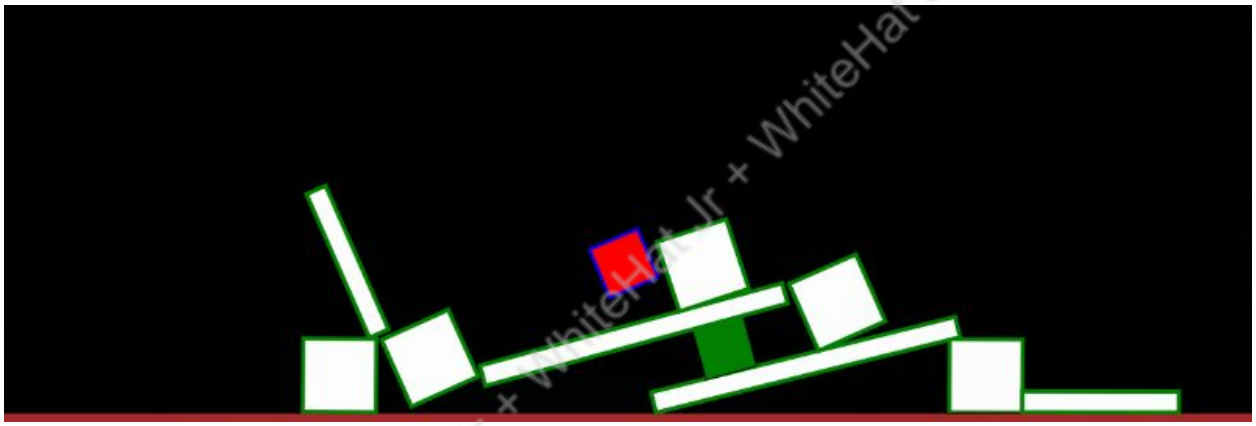
sketch.js › draw

```
    box5 = new Box(810,160,70,70);
    log4 = new Log(760,120,150, PI/7);
    log5 = new Log(870,120,150, -PI/7);

    bird = new Bird(100,100);

}

function draw(){
    background(0);
    Engine.update(engine);
    console.log(box2.body.position.x);
    console.log(box2.body.position.y);
    console.log(box2.body.angle);
    box1.display();
    box2.display();
    ground.display();
    pig1.display();
    log1.display();

    box3.display();
    box4.display();
    pig3.display();
    log3.display();

    box5.display();
    log4.display();
    log5.display();

    bird.display();
}
```

index.html › html

```
<!DOCTYPE html>
<html>
<head>
    <script src="p5.min.js"></script>
    <script src="p5.dom.min.js"></script>
    <script src="p5.sound.min.js"></script>
    <script src="matter.js"></script>
    <script src="Ground.js"></script>
    <script src="Box.js"></script>
    <script src="Pig.js"></script>
    <script src="Log.js"></script>
    <script src="Bird.js"></script>
    <link rel="stylesheet" type="text/css" href="style.css">
    <meta charset="utf-8">
</head>
<body>
  <script src="sketch.js"></script>
</body>
</html>
```

9. Beat the pigs by moving your mouse.



What's next?

We will add images to our angry Birds game!

Extend your knowledge:

- See the following link to learn more about classes:
  https://www.w3schools.com/js/js_object_classes.asp

- See the following link to learn about javascript objects:
  https://www.w3schools.com/js/js_object_definition.asp