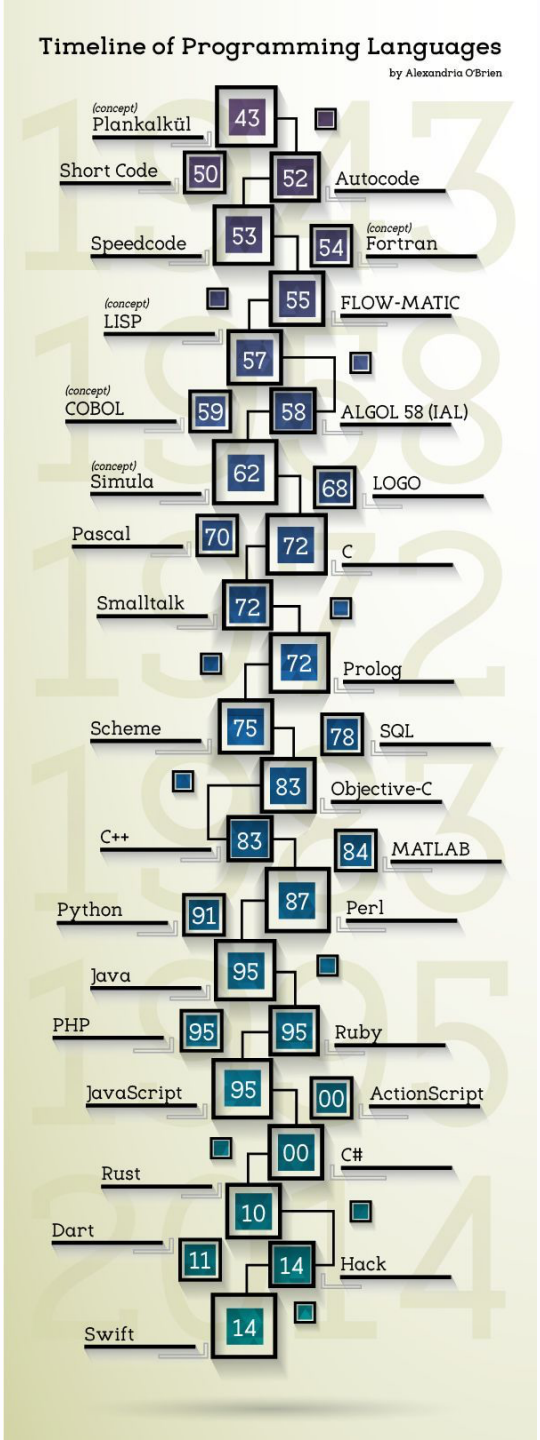
Object Oriented Programming

(OOP)

“ Abstraction of our world ▲ ”



Paradigms

- Imperative
  - **Procedural**
  - **Object Oriented**
  - Parallel Processing
- Declarative
  - Logic
  - Functional
  - Database

Procedural Programming

- Variables
- Methods / Functions
- Loops
- Arrays

```
// circles
int[] circles = new int[7];

for(int i = 0; i < circles.length; i++) {
  println("Position: " + circles[i]);
}
```

- How to add a color to each circle?

```
// circles
int[] positions = new int[7];
color[] colors = new color[7];

for(int i = 0; i < positions.length; i++) {
  int p = positions[i];
  color c = colors[i];
}
```

- How to add a size to each circle?

```
// circles
int[] positions = new int[7];
color[] colors = new color[7];
float[] sizes = new float[7];

for(int i = 0; i < positions.length; i++) {
  int p = positions[i];
  color c = colors[i];
  float s = sizes[i];
}
```

- It's getting messy & complicated 🥺

A new paradigm.

Object Oriented Programming

- Class & Object
- Abstraction*
- Inheritence*
- Polymorphism*

Bicycle 🚲

- It has...
  - Frame Color
  - Wheel Size
  - Type
- It can...
  - Accelerate
  - Brake

Object

- Attributes (Properties)
  - Variables that describe the state of the object.
- Methods
  - Things we can do with the object.

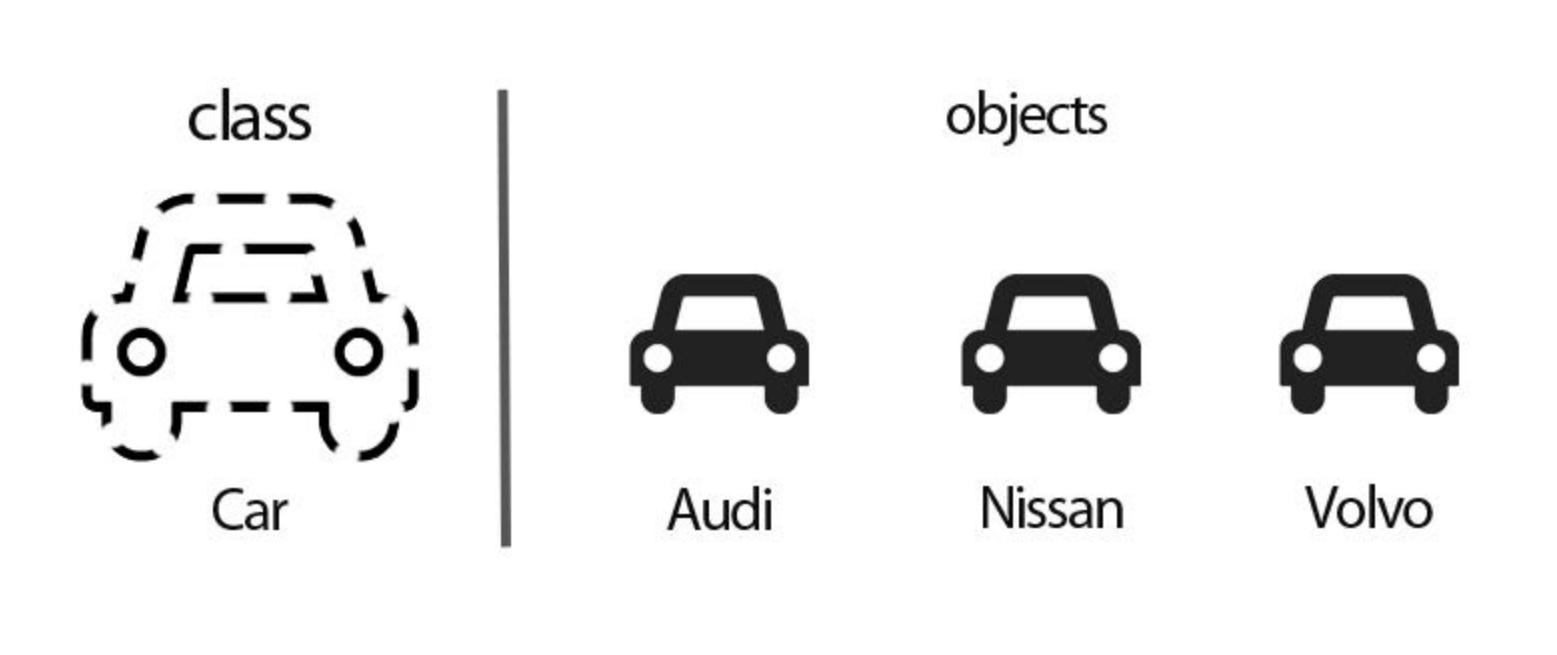
Pen

- Attributes
  - Color
  - Thickness
- Methods
  - Write
  - Refill

Circle

- Attributes
  - Position
  - Color
  - Size
- Methods
  - Draw

Class vs Object



- Very important to understand! ⚡

How to define a class?

```
class Circle {
  int position = 0;
  color c = color(255);
  float size = 30;

  void paint() {
    fill(c);
    circle(position, 0, size);
  }
}
```

- Capital Letter 🙌🏻

How to use a class?

- Create a new instance of a class

```
Circle c = new Circle();

c.size = 40;
c.position = 10;

c.paint();
```

Using Multiple Instances

```
Circle circleA = new Circle();
Circle circleB = new Circle();
Circle circleC = new Circle();

circleA.size = 40;
circleC.position = 20;

circleA.paint();
circleB.paint();
```

Task Poly Walker (30min)

Adapt the Random Walker Task to combine `position` and `velocity` values into a **Walker** class.

Give each walker a different `color` and a `paint()` method to draw it.

Hint: processing.org/tutorials/objects/

Using Multiple Instances

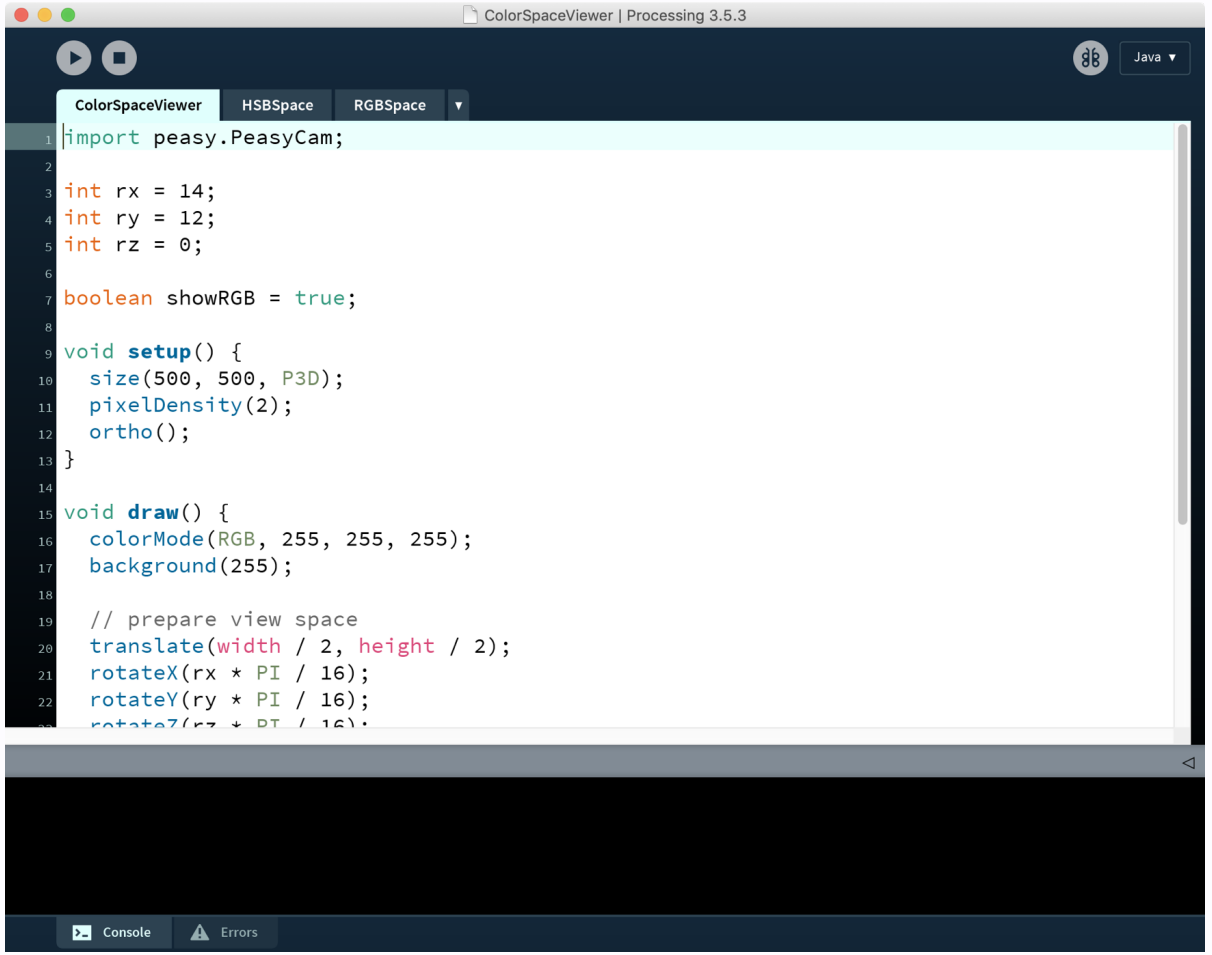
```
Circle[] circles = new Circle[10];

circles[0] = new Circle();
circles[1] = new Circle();

circles[1].size = 30;
```

- `ArrayList<Circle> circles = new ArrayList<>();`

Processing Tabs



Questions?