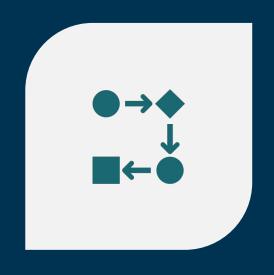
JavaScript

Functional Programming

What is Functional Programming?





PROGRAMS ARE CONSTRUCTED BY APPLYING AND COMPOSING FUNCTIONS

DECLARATIVE – PROGRAMS
TELL THE COMPUTER WHAT TO
DO, NOT HOW TO DO IT

Application and Composition

- ϕ f(x) means that a function f is applied to a value x
- f(g(x)) means that a function f is composed with a function g, applied to a value x
- At a surface level, this means functional programs are made of chains of function calls, either on plain values or the results of other function calls.

Declarative vs. Imperative





DECLARATIVE: A PROGRAM IS A TREE OF *EXPRESSIONS* THAT EACH RETURN A VALUE IMPERATIVE: A PROGRAM IS A SEQUENCE OF *STATEMENTS* THAT CHANGE THE STATE OF THE PROGRAM

Declarative vs. imperative

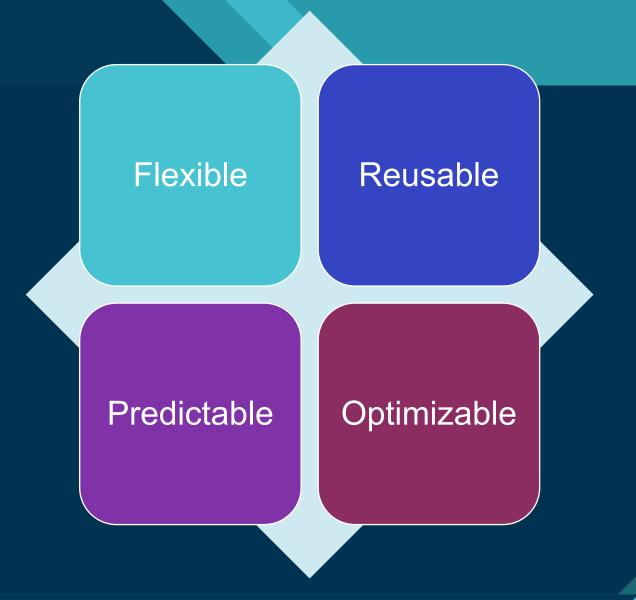
Imperative

```
let x;
if (someCondition()) {
    x = 10;
} else {
    x = 20;
}
```

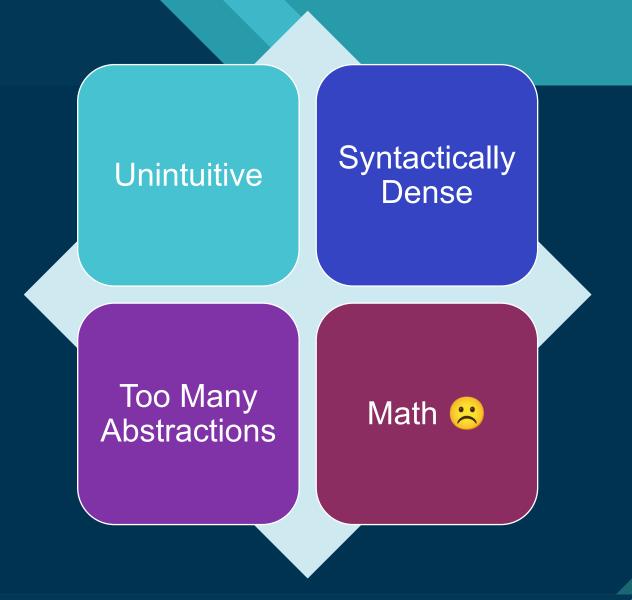
Declarative

```
const x = someCondition() ? 10 : 20;
```

Functional Benefits



Functional Detriments

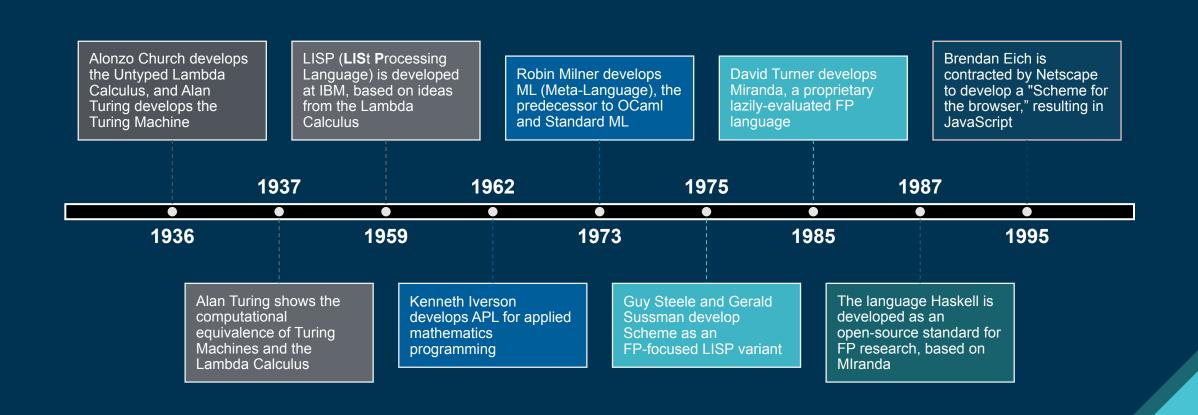


Synthesis

- FP is just one tool among many.
- Most modern languages incorporate FP alongside other paradigms, like OOP and imperative programming.
- Use FP when it makes problems easier to express and understand which is very much a subjective decision!

Functional Roots

FP: Early History



Important Early Ideas



Turing Machine / Lambda Calculus Equivalence



Programs as Data, Data as Programs



Recursion and Lazy Evaluation



Type Inference

FP in JS: Modern History

Rich Hickey develops Clojure, a LISP for the JVM, that makes major breakthroughs in immutable data structure design and emphasizes safe concurrent data manipulation through FP

Jordan Walke develops React, a declarative framework for building Web interfaces in JavaScript that draws heavily from FP principles

2012

2007 2013

Evan Czaplicki develops Elm, a purely functional language that compiles to JavaScript.

Dan Abramov develops Redux, a JavaScript library for state management, which draws heavily on Elm's architecture and FP principles

2015

Important Modern Ideas



Immutable data is concurrency-safe



Immutable data structures can be copied and compared efficiently



FP reduces concurrency confusion



FP allows for high-level abstraction of complicated ideas

The Elements of FP



Data... Data Never Changes



A name is its definition



Avoiding Side Effects



Currying and Callbacks