TypeScript

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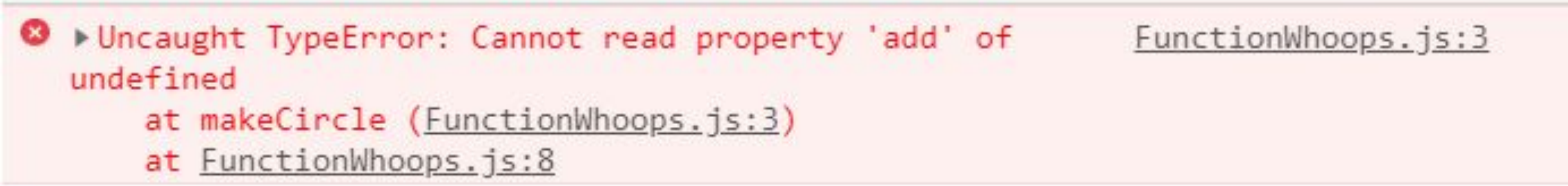
12/3/2018

Introducing TypeScript

- A **superset** of JavaScript. This means that all JavaScript code is valid TypeScript code!
- TypeScript just adds some new features that will make your life easier.
- TypeScript adds a step between “code” and “browser” that checks your code for consistency. (This is called the **compiler**.)
- TypeScript also adds additional syntax so you can tell the compiler what you’re trying to do; then, it’ll try to help you do that.
- **It’s all about making your code more consistent.**



```
▶Uncaught TypeError: Cannot read property 'add' of        FunctionWhoops.js:3
undefined
    at makeCircle (FunctionWhoops.js:3)
    at FunctionWhoops.js:8
```

```
function makeCircle(radius, x, y, gw) {
  let oval = GOval(x, y, radius * 2, radius * 2);
  gw.add(oval);
}

let gw = GWindow(400, 400);

makeCircle(50, 200, 200);
```

```
function makeCircle(radius, x, y, gw) {
  let oval = GOval(x, y, radius * 2, radius * 2);
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}

let gw = GWindow(400, 400);

makeCircle(50, 200, 200);
```

```
Creating square with color green!
The new square's color is: undefined
```

```javascript
function createSquare(config) {
  return {
     width: config.width,
     height: config.height,
     color: config.color,
     area: config.width * config.height,
     perimeter: config.width * 2 + config.height * 2
  }
}

console.log("Creating square with color green!");

let square = createSquare({width: 2, height: 2, colour: "Green"});

console.log("The new square's color is: " + square.color);
```

```
function createSquare(config) {
  return {
     width: config.width,
     height: config.height,
     color: config.color,
     area: config.width * config.height,
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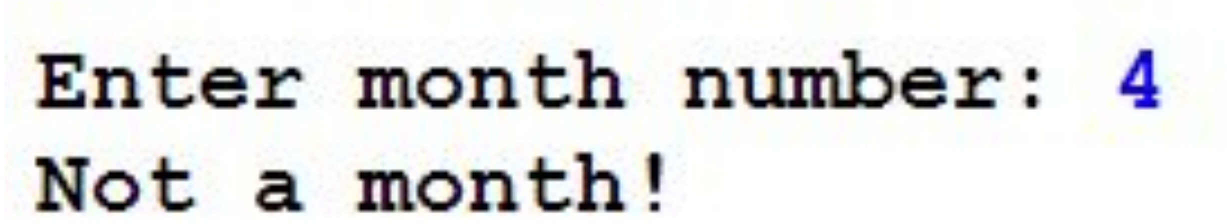

```
Enter month number: 4
Not a month!
```

Type Annotation

```
let variableName: TypeName;

const CONSTANT_NAME: TypeName;

function functionName(param1: Type1, param2: Type2): ReturnType {
```

Type Annotation

```
let age: number = 20;
const ALPHABET: string = "ABCDEFGHIJKLMNOPQRSTUVWXYZ";
function divides(divisor: number, dividend: number): boolean {
```

Type Inference

```
let foo = "Hello";

let foo: string = "Hello";
```

These statements are equivalent because of type inference.

Type Inference

```
let foo = 1;

let foo: string = 1;
```

These statements are **not** equivalent because of type inference.
(*The second statement throws an error; 1 is not a string*!)

What types are there?

- Here are types you’ve worked with!
    - number
    - string
    - boolean
    - null
    - undefined
    - object
    - function
    - any

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Primitive Types:
"simple" types –
You build all other types out of primitive types.

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Everything else.

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any:
A special type that can represent anything!

What types are there?

- Here are types you've worked with!
  - number
  - string
  - boolean
  - null
  - undefined
  - object
  - function
  - any
- And some types you haven't.
  - symbol
  - never

← ask me about these after class!

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    - number
    - string
    - boolean
    - null
    - undefined
    - **object** ← Seems like this describes an awful lot...
    - function
    - any

```javascript
let dog = {
   type: 'mammal',
   name: 'dog',
   sounds: ['woof', 'bark', 'yip',
'ruff']
};
let cat = {
   type: 'mammal',
   name: 'cat',
   sounds: ['meow', 'purr', 'hiss']
};
```

```javascript
let enigma = {
   rotors: [],
   lamps: [],
   keys: []
};

let key = {};
key.letter = "A";
key.mouseDownAction = function () {

};
```

```javascript
let jonathan = {
   favoriteColor: "Green",
   name: "Jonathan Kula",
   status: "Active",
   classes: [
       {
           name: "CS106AJ",
           role: "SL",
           grade: -1
       },
       {
           name: "CS103",
           role: "Student",
           grade: 87.5
       }
   ]
};
```

```javascript
let profile = {
   name: "Jonathan Kula",
   imageUrl: "http://image.url/img.png",
   language: "English"
};
```

Interfaces

- Interfaces describe *the structure of objects*.

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- Interfaces are not objects.
- Interfaces have no functionality – they only describe other objects.

```
interface InterfaceName {
    property1: Type1
    property2: Type2
}
```

Interfaces

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- Interfaces are not objects.
- Interfaces have no functionality – they only describe other objects.

```
interface Point {
   x: number
   y: number
}
```

Function Annotations

- What if we wanted to make an interface for an Enigma key?

Function Annotations

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```
interface WithFunction {
    func: (param1: Type1, param2: Type2) => ReturnType
}
```

Function Annotations

- What if we wanted to make an interface for an Enigma key?

```
interface Key {
    letter: string
    onMouseDown: () => void
}
```

- `void` is a special type meaning “doesn’t return anything”

Map Annotations

- What about using objects as maps?

Map Annotations

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```
interface Phonebook {
    [name: KeyType]: ValueType
}
```

- The `KeyType` can be either `string` or `number`.

Map Annotations

- What about using objects as maps?

```
interface Phonebook {
    [name: string]: string
}
```

- The `KeyType` can be either `string` or `number`.

Classes in TypeScript

- Think of them like “Interfaces *with functionality*”
- You use “class-like factory functions” in Teaching Machine, Adventure, and when coding using object-oriented ideas.
- Classes are types too, much like interfaces!

Classes in TypeScript

- Make an object of a class by using the `new` keyword.
- Refer to *properties of the class* using the `this` keyword.
- `this` inside a class refers to "the current object."

```
let jonathan = new Profile("Jonathan Kula", "http://image.url/", "English");
let ryan = new Profile("Ryan Eberhardt", "http://image.url/", "English");

jonathan.getName();  // "this" now refers to jonathan – returns "Jonathan Kula"
ryan.getName();  // "this" now refers to ryan – returns "Ryan Eberhardt"
```

Acquiring Typescript

- Download **nodejs LTS** from https://nodejs.org/en/
- Open a **Powershell** (Windows) or **Terminal** (macOS or Linux)
- Type `npm install -g typescript`

Setting Up Typescript

- Download TypeScript configuration file from the course website.
    - I can break it down after class if you’re interested!
- Put that file in your project folder.

Using TypeScript

Manually:

- Open Powershell/Terminal, go to your project directory using `cd`, then type `tsc` to build all .ts files into .js files!

Better:

- Get an IDE that supports TypeScript!
- I use both WebStorm and Visual Studio Code.
    - I prefer WebStorm, but it's only free while you're a student. Visual Studio Code is also quite good, and free. I have a slide deck about how to acquire WebStorm here.