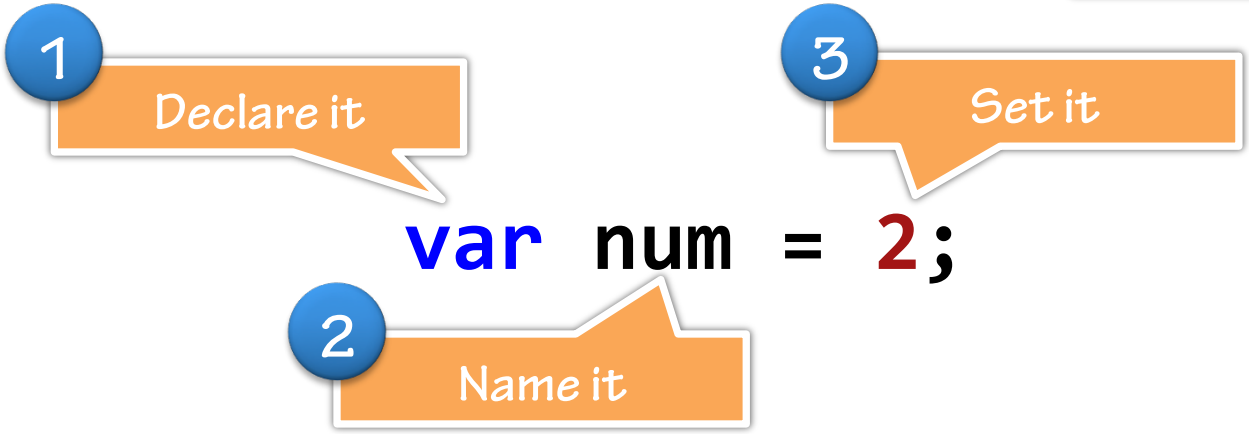
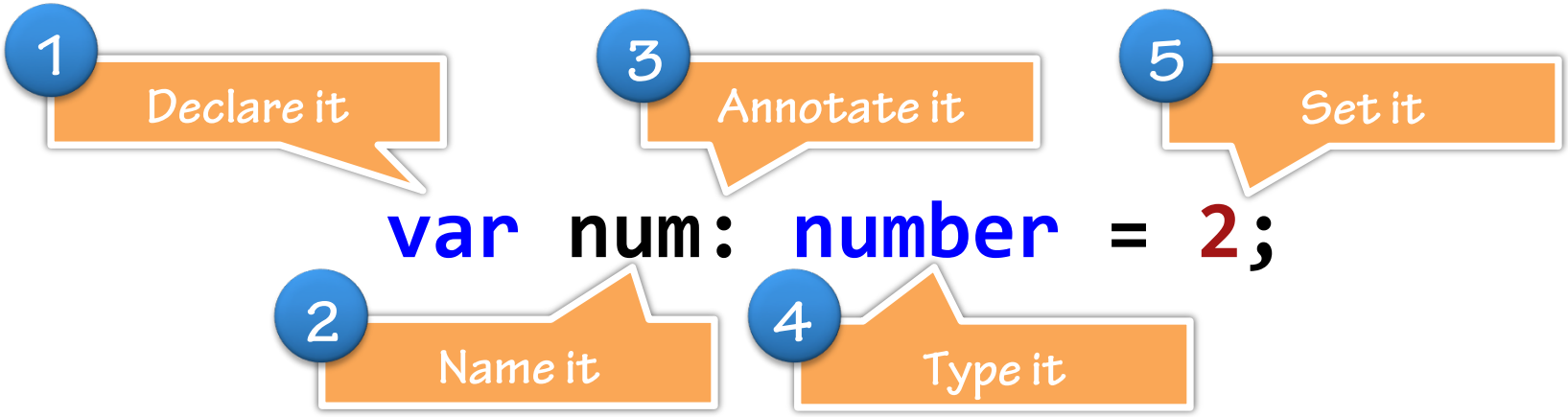
Grammar: Type Inference

This TypeScript Example is JavaScript



Grammar: Type Annotations



Annotations and Inferences

```
var any1;
```
Type could be any type (any)

```
var num1: number;
```
Type Annotation

```
var num2: number = 2;
```
Type Annotation Setting the Value

```
var num3 = 3;
```
Type Inference (number)

```
var num4 = num3 + 100;
```
Type Inference (number)

```
var str1 = num1 + 'some string';
```
Type Inference (string)

```
var nothappy : number = num1 + 'some string';
```
Error!

Dynamic and Static

TypeScript	JavaScript
Static typing (optional)	Dynamic typing
Type safety is a compile-time feature	Type safety happens at run-time debugging

JavaScript's Dynamic Types

Could be any type

```
var person;
person = 'John Papa';
person.substring(1, 4);

person = 1;
person.substring(1, 4);
```

Uncaught TypeError: Object 1 has no method 'substring'

Ambient Declarations

TypeScript

```
declare var document;

document.title = "Hello";
```

JavaScript

```
document.title = "Hello";
```

lib.d.ts is referenced by default and contains references for the DOM and JavaScript

Ambient Declarations do not appear anywhere in the JavaScript

Type Definition Files (aka Declaration Source Files)

TypeScript

```
/// <reference path="jquery.d.ts" />

declare var $;

var data = "Hello John";

$("div").text(data);
```

Helps provide types for jquery

JavaScript

```
var data = "Hello John";

$("div").text(data);
```

Ambient Declarations do not appear anywhere in the JavaScript

Any

- **Represents any JavaScript value**

```
var data: any;
var info;
```

No static type checking on “any"

Primitive Types

```
var age: number = 2;
var score: number = 98.25;
var rating = 98.25;

var hasData: boolean = true;
var isReady = true;

var firstName: string = 'John';
var lastName = 'Papa';
```

Arrays and Indexers

```
var names: string[] = ['John', 'Dan', 'Aaron', 'Fritz'];

var firstPerson: string;
firstPerson = names[0];
```

Primitive Types - Null

```
var num: number = null;
var str: string = null;
var isHappy: boolean = null;
var customer: {} = null;

var age: number;
var customer = undefined;
```

null

undefined

Null type is a subtype of all primitives
(except void and undefined)

Primitive Types - Undefined

```
var quantity: number;
var company = undefined;
```

undefined type is a subtype of all types

Object Types

- **Examples**
  - Functions, class, module, interface, and literal types

- **May contain**
  - Properties
    - public or private
    - required or optional
  - Call signatures
  - Construct signatures
  - Index signatures

Object Types

Object literals

```
var square = { h: 10, w: 20 };

var points: Object = { x: 10, y: 20 };
```

Functions

```
var multiply = function (x: number) {
    return x * x;
};

var multiplyMore: Function;
multiplyMore = function (x: number) {
    return x * x;
};
```

Functions

- **Parameter types (required and optional)**
- **Arrow function expressions**
  - Compact form of function expressions
  - Omit the function keyword
  - Have scope of “this”
- **Void**
  - Used as the return type for functions that return no value

Arrow Function Expressions

TypeScript

```
var myFunc = function (h: number, w: number) {
    return h * w;
};
```

Omit the function keyword

Compact return statement

```
var myFunc = (h: number, w: number) => h * w;
```

Emit the same JavaScript

```
var myFunc = function (h, w) {
    return h * w;
};
```

Void

Used as the return type for functions that return no value

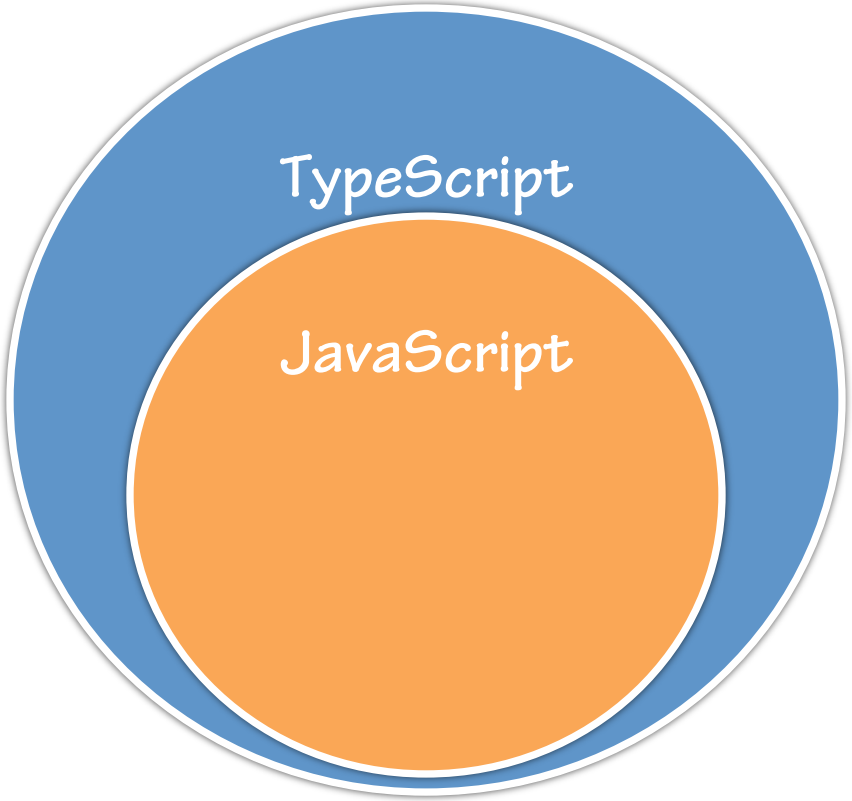
```
var greetMe : (msg: string) => void;

greetMe = function (msg) {
    console.log(msg);
}

greetMe('Hello!');
```

No return value

All JavaScript is Valid TypeScript



Typings, Variables and Functions

- **Emits JavaScript**
- **Optional static typing**
  - Various types
- **Compile time checking**
- **Ambient Declarations for external references**
  - Use with typings (*.d.ts files)
- **Objects and functions**
  - Parameter types (required and optional)
  - Arrow function expressions
- **Interfaces**