JavaScript
Lecture 3b (Some language features)

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JavaScript

Functions

function

- Block of code defined once
- Invokable many times
- May include parameters
- Observe differences Java
- Functions attached to objects referred to as *methods*
- Functions are objects
  - Assignable to variable
  - Allowable as parameter

```
function square(x) {
  return x * x;
}

console.log(square(10)); // => 100
```

```
function add() {
  let counter = 0;
  function plus() {counter += 1;}

  plus();
  return counter;
}

console.log(add()); // => 1
```

JavaScript

Function has four parts

(1) Reserved word `function`

(2) Name `square` (optional)

(3) Zero or more parameters (`x`)

(4) Statement(s) within curly braces

Reserved `return` (optional)

```
function square(x) {
  return x * x;
}

let square = function(x) {
  return x * x;
}


square(3); // => 9
```

Function

Hidden parameters

Every function has 2 hidden parameters

- **this**
  - Reference determined by which of four available function invocation patterns used.
- **arguments**
  - Array type object containing all parameters.
  - Treat as obsolete, instead use rest arguments.
  - Rest arguments a real Array, not Array-like like arguments

```
let anObject = {
  value: 0,
  increment: function () {
    this.value += 1;
  },
};

// Output: 1
anObject.increment();
```

```
function aFunction(...args) {
  return args.length;
}

// Output: 2
console.log(aFunction(3, 4));
```

Functions

Invocation Patterns

Four function invocation patterns:

- 1. Method invocation
  - **this** bound to containing object
  - function is method - a property of containing object
- 2. Function invocation
  - **this** bound to global object
  - function property of global object
- 3. Constructor invocation
  - **this** bound to containing object
  - **new** not used: this bound to global
- 4. Apply invocation
  - Outside course scope

```
let anObject = {
  value: 0,
  increment: function () {
    this.value += 1;
  },
};

// method invocation
anObject.increment();
```

```
value = 0;
function increment() {
  this.value += 1;
};

// function invocation
increment();
```

JavaScript

this binding

Note: behaviour different in strict mode

```
// Function invocation: this bound to global object
function set(x) {
  this.x = x;
  console.log(x); // => 100
};
set(100); // sets global variable x to 100
```

```
// Here, because of strict mode, this is undefined
'use strict';
function set(x) {
  this.x = x; // => TypeError
  console.log(x);
};
set(100); // fails due to TypeError
```

JavaScript

this binding

```
// Method invocation: this bound to containing object
const myObj = {
  x: 100,
  set: function (x) {
    this.x = x;
    return this;
  },
};
myObj.set(100);// sets myObj.x to 100
console.log(myObj); // Object {x: 100}
console.log(myObj.set(100)); // Object {x: 100}
```

JavaScript

this binding

strict mode causes different behaviour:

- 'use strict';
- Prevents access to global variable
- **this** undefined
- TypeError generated when code below run in strict mode

```
// Method invocation: this now bound to global object
myObj = {
  x: 0,
  set: function (x) {
    modify(x);
    function modify(val) { // nested function
      this.x = x; // this bound to global obj: undefined in strict mode
    };
  },
};
```

JavaScript

this binding

Arrow function - introduction

```
// What we're familiar with:
function add(x, y) {
  return x + y;
}

console.log(add(10, 20)); // 30
```

```
/**
 * Alternative approach: arrow function.
 * @see page 46 ES6 and Beyond (referenced)
 * @see MDN (referenced)
 */
const add2 = (x, y) => x + y;
console.log(add2(10, 20)); // 30
```

JavaScript

this binding

Pre-ES6 workaround hack

```
'use strict';
let myObj = {
  x: 0,
  set: function (x) {
    let that = this;
    modify(x);
    function modify(val) { // nested function
      that.x = x; // workaround hack
    };
  },
};

myObj.set(100); // myObj.x set to 100
```

JavaScript

this binding

Use arrow function to bind inner **this** to containing object

```
//this now bound to containing object myObj
let myObj = {
  x: 0,
  set: function (x) {
    let modify = (val) => { // nested function
      this.x = val; // this now bound to myObj
      console.log(this); // Object{x: 0}
    };

    modify(x);
  },
};

console.log(myObj); // Object{x: 0}

myObj.set(100); // myObj.x set to 100
```

JavaScript

this binding

Another JavaScript booby trap

```
// Okay: Method invocation: this bound to containing object
myObj = {
  x: 0,
  set: function (x) {
    this.x = x;
    return this;
  },
};

console.log(myObj); // Object {x: 0}
console.log(myObj.set(0)); // Object {x: 0}
```

JavaScript

this binding

Another JavaScript booby trap

```
/**
 * Not okay: Alternative approach: arrow function.
 * Method invocation: this now bound to global object
 * @see page 50 ES6 and Beyond (referenced)
 */
myObj = {
  x: 0,
  set: x => {
    this.x = x;
    return this;
  },
};

console.log(myObj); // Object {x: 0}
console.log(myObj.set(0)); // Window {...}
```

JavaScript

this binding

Constructor invocation: not recommended

```
'use strict';
function Person(name) {
  this.name = name; // this bound to Person object
}

let x = new Person('Jane');
console.log(x); // Object { name: "Jane" }
```

```
// Omitting 'use strict'
// If strict mode & new omitted then this undefined
function Person(name) {
  this.name = name; // this bound to global object
}

let x = Person('Jane'); // Oops! Forgot new keyword
console.log(x); // undefined
```

JavaScript

Passing function as function argument

```
// Passing a named function as an argument
function myFn(fn) {
  const result = fn();
  console.log(result);
};

function myOtherFn() {
  return 'hello world';
};

// logs 'hello world'
myFn(myOtherFn);
```

Functions

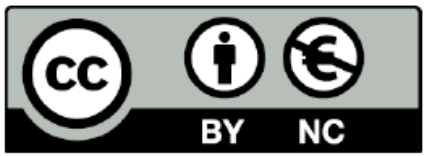
Which to use? Function expression or function statement

```
// Function statements: Airbnb recommendation (ES6)
function outer1() {
  hoisted(); // => foo
  function hoisted() {
    console.log('foo');
  }
}
```

```
// Function expressions: Crockford recommendation (ES5)
let outer2 = function outer2() {
  notHoisted(); // => TypeError: notHoisted is not a function
  let notHoisted = function() {
     console.log('bar');
  };
};
```

Summary

- Functions
  - First class objects
  - May be assigned to variable
  - Passed as parameters
  - Values in objects
  - Contain other functions
  - The arrow function (ES6)



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