

TWeb

Testing Javascript Applications

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☰ Overview of Today's Class

- Quiz about last week's lecture
- Correction of last week's assignment
- Javascript Arrays and Iterables
- Testing Javascript Applications
- More about Chrome DevTools
- Introduction of next week's assignment





You can answer to the following Quiz on Speakup.

<http://www.speakup.info/>

Room Number: **XXXXXX**

Once connected, answer to the first test question.

Question 1

Parmis les types suivant, lesquels sont primitifs:

- ***Number***
- Object
- Array
- ***Undefined***
- Aucune réponse correcte

Question 2

Quelle est la valeur imprimée par le programme suivant?

```
var obj = {  
  "1": 1  
}  
console.log(obj[1]);
```

- SyntaxError
- **1**
- Undefined
- TypeError
- NaN
- Aucune réponse correcte

? Question 3

Quelle est la valeur imprimée par le programme suivant?

```
var arr = [];  
arr[0] = 0;  
arr[2] = 2;  
arr[4] = 4;  
for (var val in arr) {  
    console.log(val)  
}
```

- 0 1 2 3 4
- 0 1 2 3 4 length
- **0 2 4**
- 0 null 2 null 4
- 0 undefined 2 undefined 4
- Aucune réponse correcte

Question 4

Que se passe-t-il lorsque l'on ajoute une fonction au prototype d'une classe de la librairie standard.

- Cela est interdit
- Les instances futures de la classe hériteront la fonction
- La fonction est copiée instantanément dans toutes les instances existantes de la classe
- ***Aucune réponse correcte***

Question 5

Quelle est la valeur imprimée par le programme suivant?

```
var age = 20;
var student = {
  age: 25
}
function get() {
  return this.student.age;
}
get.prototype.student = {age: 30};
console.log(get());
```

- 20
- **25**
- 30
- undefined
- aucune réponse correcte

Question 6

Quelle est la valeur imprimée par le programme suivant?

```
var age = 20;
var student = {
  age: 25,
  get: function() {
    return this.age;
  }
}
var anotherStudent = {
  age: 30,
  get: function() {
    return this.age;
  }
}
console.log(student.get.call(anotherStudent))
```

- 20
- 25
- **30**
- undefined
- aucune réponse correcte



Question 7

```
var age = 20;  
function Student(age) {  
  this.age = age  
  return {  
    age: 25  
  }  
}  
var student = new Student(30);  
console.log(student.age)
```

- 20
- **25**
- 30
- undefined
- aucune réponse correcte

Question 8

A quoi correspond la propriété `document.referrer`?

- A l'adresse du site Internet visité par l'utilisateur
- ***A l'adresse du site Internet depuis lequel l'utilisateur est arrivé sur le site***
- A l'adresse du site Internet le plus référencé par le site visité par l'utilisateur
- Au référend du site Internet, c'est à dire son propriétaire ou responsable
- Aucune réponse correcte



Correction

```
model.js
MovingObject
  ✓ should exists
  ✓ new MovingObject(...) should instantiate an object
  ✓ xAt(0) should return 0
  ✓ xAt(10) should return 0.7071067811865476
  ✓ xAt(100) should return 7.0710678118654755
  ✓ xAt(1000) should return 70.71067811865476
  ✓ xAt(10000) should return 707.1067811865476
  ✓ xAt(100000) should return 671.067811865476
  ✓ yAt(0) should return 0
  ✓ yAt(10) should return 0.7071067811865476
  ✓ yAt(100) should return 7.0710678118654755
  ✓ yAt(1000) should return 70.71067811865476
  ✓ yAt(10000) should return 707.1067811865476
  ✓ yAt(100000) should return 671.067811865476
  ✓ should raise an error when calling the draw abstract method
Rocket
  ✓ rocket.draw(ctx, 0) should call ctx.beginPath(), ctx.drawn(0, 0, ...) and ctx.stroke()
  ✓ rocket.draw(ctx, 10) should call ctx.beginPath(), ctx.drawn(0.7071067811865476, 0.7071067811865475, ...) and ctx.stroke()
  ✓ rocket.draw(ctx, 100) should call ctx.beginPath(), ctx.drawn(7.0710678118654755, 7.0710678118654755, ...) and ctx.stroke()
  ✓ rocket.draw(ctx, 1000) should call ctx.beginPath(), ctx.drawn(70.71067811865476, 70.71067811865476, ...) and ctx.stroke()
  ✓ rocket.draw(ctx, 10000) should call ctx.beginPath(), ctx.drawn(707.1067811865476, 707.1067811865476, ...) and ctx.stroke()
  ✓ rocket.draw(ctx, 100000) should call ctx.beginPath(), ctx.drawn(671.067811865476, 671.067811865476, ...) and ctx.stroke()
```

👋 Questions?

Javascript Arrays and Iterables

JS Javascript Arrays *

Recall the array object, it comes loaded with usefull functional idioms.

`map()` creates a new array with the results of calling a provided function on every element.

```
var a = ["apple", "banana", "pear"];  
a.map(a => a.length)
```

`flatMap()` maps each element using a mapping function and flatten the result.

```
var a = ['Yverdon is', 'a', 'beautiful city'];  
a.flatMap(s => s.split(" "));
```

`reduce()` executes a reducer function on each element of the array, resulting in a single value.

```
var a = [1, 2, 3];  
a.reduce((a, b) => a + b)
```

Take some time to get familiar with these functions!

* https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Global_Objects/Array

JS Javascript Iterable *

Array like objects have been generalized in the javascript language.

Any object can now implement the iterator protocol.

```
var iterable = {  
  i: 10,  
  *[Symbol.iterator]() {  
    for (var j = 0; j < this.i; j++) {  
      yield j;  
    }  
  }  
}  
for (let k of iterable) {  
  console.log(k);  
}
```

* https://developer.mozilla.org/en-US/docs/Web/JavaScript/Guide/Iterators_and_Generators

JS Javascript Generator *

Array like objects have been generalized in the javascript language.

Generators can be used to `yield` values (or `yield*` iterables).

```
function* generator(i) {  
  for (var j = 0; j < i; j++) {  
    yield j;  
  }  
}  
for (let k of generator(10)) {  
  console.log(k);  
}
```

* https://developer.mozilla.org/en-US/docs/Web/JavaScript/Guide/Iterators_and_Generators

Usefull Built-in Iterables *

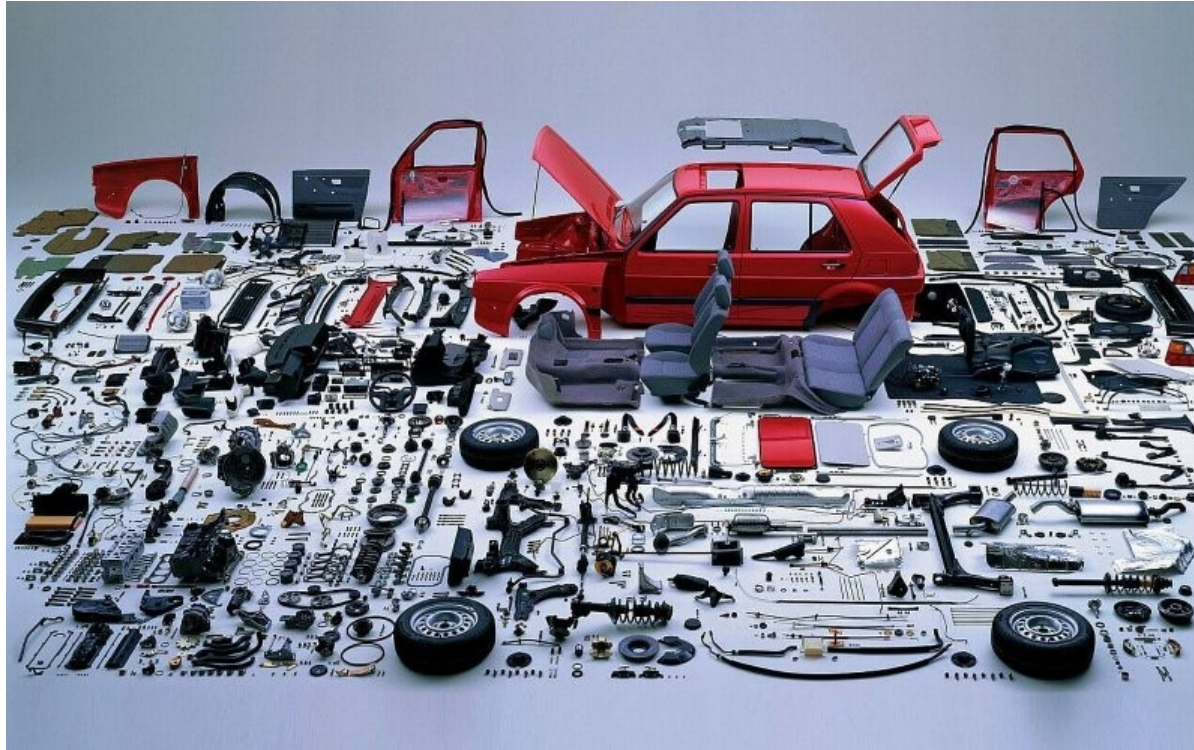
The `Map` object holds key-value pairs and remembers the original insertion order of the keys.

The `Set` object lets you store unique values of any type, whether primitive values or object references.

* https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Global_Objects

Testing Javascript Applications

JS A Bit of Philosophy



The whole is greater than the sum of its parts. - **Aristotle**

Testing Software

Unit Testing

Test individual units of source code in an isolated fashion to determine whether they are correct (fit for use).

Fuzz Testing

Automated software technique that monitors a program for exceptions when inputting random data.

Integration Tests

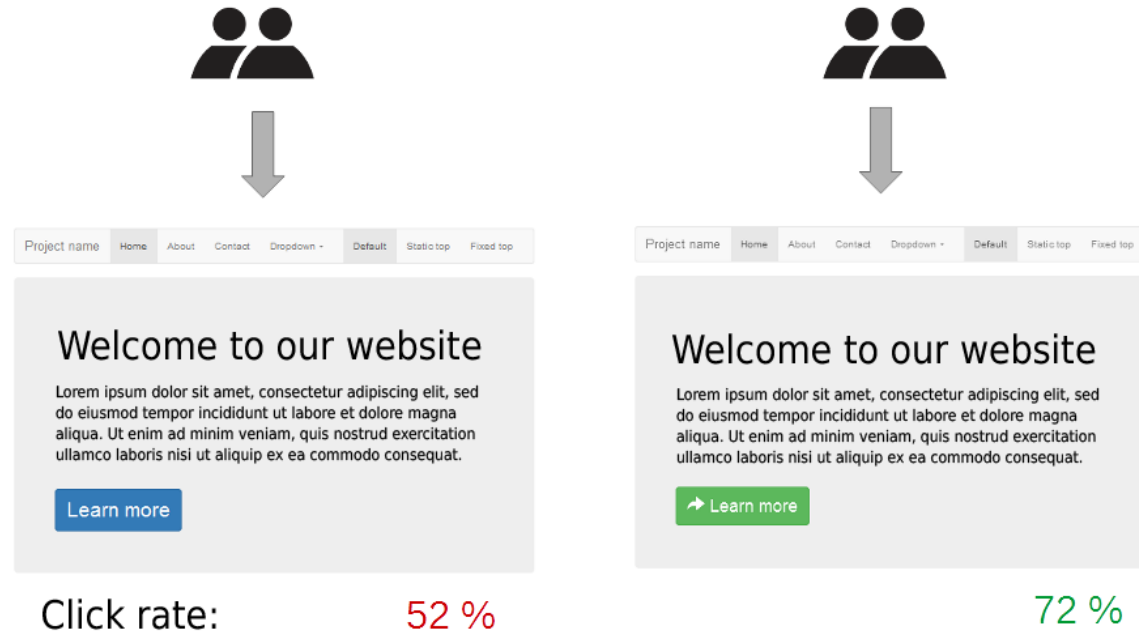
Test several units of source code combined together to determine if they work correctly as a group.

Functional Tests

Test the software without making assumptions about its internal workings (as a black box).

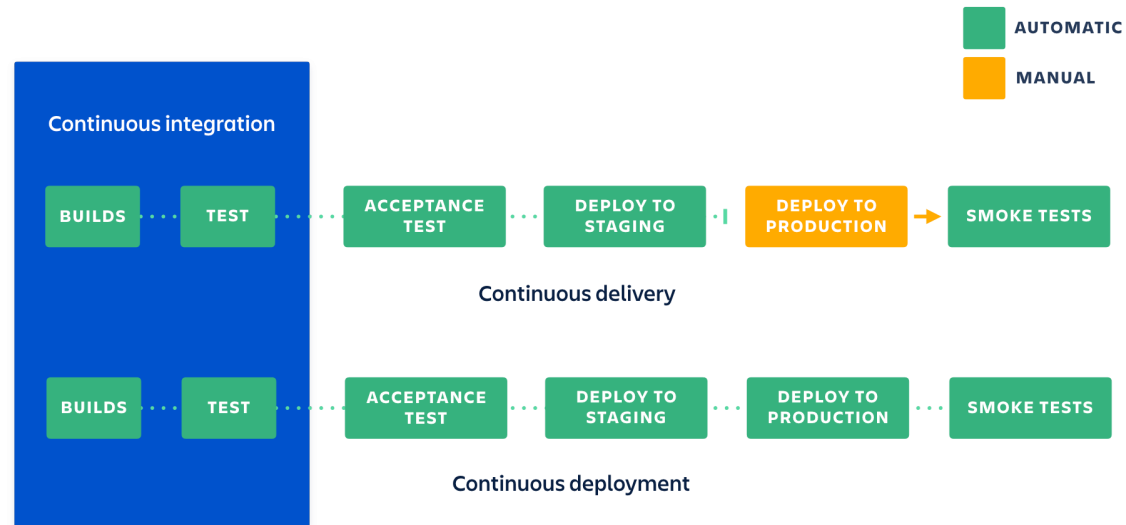
✓ Usability Testing

A/B testing, split testing and multivariate testing evaluate a software by testing one or more hypothesis on its users.



* <https://marketingplatform.google.com/about/optimize/>

✓ Continuous Integration, Delivery, Deployment *



* <https://www.atlassian.com/continuous-delivery/principles/continuous-integration-vs-delivery-vs-deployment>

✓ Chaos Engineering *

Chaos Engineering is the discipline of experimenting on a system in order to build confidence in the system's capability to withstand turbulent conditions in production.

Netflix's ChaosMonkey

Chaos Monkey is responsible for randomly terminating instances in production to ensure that engineers implement their services to be resilient to instance failures.

* <http://principlesofchaos.org/>

✓ Site Reliability Engineering (SRE) *

Site Reliability Engineering (SRE) is a discipline that incorporates aspects of software engineering and applies them to infrastructure and operations problems.

The main goals are to create scalable and highly reliable software systems.

SRE is what happens when you ask a software engineer to design an operations team. - **Ben Treynor**

* <https://landing.google.com/sre/sre-book/chapters/introduction/>

Testing Javascript Applications *

Libraries

- **Mocha** is a feature-rich JavaScript test framework running on Node.js and in the browser, making asynchronous testing simple and fun.
- **Chai** is an assertion library for node and the browser that can be delightfully paired with any javascript testing framework.
- **Selenium** automates web applications for testing purposes.
- **Selenium WebDriver** is a nodejs programming interface for web browsers.

Hands on!

Let's play with a simple **example**!