Web Storage api and JSON

IE8+

localStorage:
```
localStorage.length;
localStorage.key(index);
localStorage.getItem(key);
localStorage.setItem(key, data);
localStorage.removeItem(key);
localStorage.clear();
```

sessionStorage:
```
sessionStorage.length;
sessionStorage.key(index);
sessionStorage.getItem(key);
sessionStorage.setItem(key, data);
sessionStorage.removeItem(key);
sessionStorage.clear();
```

hasItem:
```
localStorage.getItem(key) !== null
sessionStorage.getItem(key) !== null
```

setJSON:
```
localStorage.setItem(key,
JSON.stringify(object));
sessionStorage.setItem(key,
JSON.stringify(object));
```

getJSON:
```
JSON.parse(localStorage.getItem(key));
JSON.parse(sessionStorage.getItem(key));
```

element.dataset & data-* attributes

- IE11 compatible
- element data-* attributes
- no methods and events

camelcase:
```
element.data-name
  -> element.dataset.name
element.data-first-second
  -> element.dataset.firstSecond
```

set:
```
element.dataset.name = "value";
element.dataset["name"] = "value";
element.setAttribute("data-name",
"value");
element["data-name"] = "value";
```

get:
```
element.dataset.name;
element.dataset["name"];
element.getAttribute("data-name");
element["data-name"];
```

remove:
```
element.removeAttribute("data-
name");
```

check:
```
element.hasAttribute("data-name");
```

TypedArray

IE10+11 compatible

```
new <TypedArray>(); ES2017
new <TypedArray>(length);
new <TypedArray>(typedArray);
new <TypedArray>(object);
new <TypedArray>(buffer[,byteOffset[,len]]);
```

Int8Array();
-128 to 127, 1 byte, int8_t, Shortint
Uint8Array();
0 to 255, 1 byte, uint8_t, Byte
Uint8ClampedArray();
0 to 255, 1 byte, uint8_t, Byte
Int16Array();
-32768 to 32767, 2 byte, int16_t, Smallint
Uint16Array();
0 to 65535, 2 byte, uint16_t, Word
Int32Array();
-2147483648 to 2147483647, 4 byte, int32_t
Uint32Array();
0 to 4294967295, 4 byte, uint32_t, Longword
BigInt64Array(); - not in IE10-11
-2**63 to 2**63-1, 8 byte, int64_t, Int64
BigUint64Array(); - not in IE10-11
0 to 2**64-1, 8 byte, uint64_t, Qword
Float16Array(); - not in IE10-11
-65504 to 65504, 2 byte
Float32Array();
1.2x10-38 to 3.4x1038, 4 byte, float, Real
Float64Array();
5.0x10-324 to 1.8x10308, 8 byte, Double

DOM events

```
target.addEventListener(<type>,<listener>[,useCapture]); or target.addEventListener(<type>,<listener>[,options]);
target.removeEventListener(<type>,<listener>[,useCapture]); or target.removeEventListener(<type>,<listener>[,options]);
target.dispatchEvent(<event>);
target.type(); or target["type"]();
```

element.classList

IE10+IE11 don't have support for classList on SVG or MathML elements.

element.classList.add(String[,String]);
IE10+11: yes (except the multiple arguments)

element.classList.remove(String[,String]);
IE10+11: yes (except the multiple arguments)
- Removing a class that does not exist, does NOT throw an error.

element.classList.contains(String);
IE10+11: yes

element.classList.toggle(String[,force]);
IE10+11: yes (except the second argument)
- When only one argument is present: Toggle class value; if class exists then remove it and return false, if not, then add it and return true.
- When a second argument is present: If the second argument evaluates to true, add specified class value, and if it evaluates to false, remove it.

element.classList.item(Number);
IE10+11: yes

element.classList.length;
IE10+11: yes

element.classList.replace(oldClass, newClass);
IE10+11: No and the method isn't compatible with the Safari and mobile browsers too.

Remove all classes:
element.className = "";

JSON

IE8+

Valid Data Types
- string
- number
- object (containing valid JSON values)
- array
- boolean
- date
- null

Invalid Data Types
- function
- Symbol
- NaN, Infinity, undefined – *will be "null"*
- an object with method(s) (functions)
- Map, Set, WeakMap, WeakSet – *fix: convert to array*
- BigInt - *fixed in Celestra - BigInt.prototype.toJSON();*

JSON.stringify(value[,replacer[,space]]);
Convert a JavaScript object to a JSON string.

```
JSON.stringify( { a: 1, b: "2", c: true } );
// -> "{\"a\":1,\"b\":\"2\",\"c\":true}"

JSON.stringify( [1, 2, 3, 4, 5] );
// -> "[1,2,3,4,5]"
```

JSON.parse(text[,reviver]);
Parses a JSON string and returns a JavaScript object.

```
JSON.parse(JSON.stringify( {a: 1, b: "2", c: true} ));
// -> Object { a: 1, b: "2", c: true }

JSON.parse(JSON.stringify( [1, 2, 3, 4, 5] ));
// -> Array(5) [ 1, 2, 3, 4, 5 ]
```

DOMParser

IE9: XML support
IE10+IE11: XML, SVG and HTML support

```
var parser = new DOMParser();
var doc = parser.parseFromString("sourceStr", "application/xml");
```
Returns a Document, but not a SVGDocument nor a HTMLDocument.

```
var parser = new DOMParser();
var doc = parser.parseFromString(sourceStr, "image/svg+xml");
```
Returns a SVGDocument, which also is a Document.

```
var parser = new DOMParser();
var doc = parser.parseFromString(sourceStr, "text/html");
```
Returns a HTML document.

DOMParser sample function

```
function parseHTML (str) {
  return Array.from(
    (new DOMParser())
      .parseFromString(str, "text/html")
      .childNodes[0]
      .childNodes[1]
      .childNodes
  );
}

parseHTML(
  "<div>1<p>2</p><p>3</p></div>"
  + "<div>4<p>5</p><p>6</p></div>"
  + "<div>7</div>"
  + "<p>8</p>"
);
// -> Array(4) [ div, div, div, p ]
// Tested in IE11, Edge, Firefox and Chrome.
```

BigInt (Int64)

```
let theBiggestInt = 9007199254740991n;
let alsoHuge = BigInt(9007199254740991);
let hugeString = BigInt("9007199254740991");
let hugeHex = BigInt("0x1fffffffffffff");
let hugeBin =
BigInt("0b11111111111111111111111111111111111111111111111
1111111");
// all -> 9007199254740991n

typeof 1n;          // -> "bigint"
typeof BigInt("1"); // -> "bigint"
```

Operators: +, *, -, **, %, Bitwise operators (e.g.: >>>)

```
!0n      // -> true
!1n      // -> false

4n / 2n  // -> 2n
5n / 2n  // -> 2n, not 2.5n -> rounded

1n < 2   // -> true
2n > 1   // -> true
2n > 2   // -> false
2n >= 2  // -> true

let mixed = [4n, 6, -12n, 10, 4, 0, 0n];
mixed.sort();// -> [-12n, 0, 0n, 4n, 4, 6, 10]
```

Methods

```
BigInt.asIntN();
  - BigInt value to a signed integer
BigInt.asUintN();
  - BigInt value to an unsigned integer
BigInt.prototype.toLocaleString();
BigInt.prototype.toString();
BigInt.prototype.valueOf();
```

Fetch	Fetch POST
Firefox 39, Chrome 42, Edge14, Opera29 , Safari 10.1, Samsung I. 4.0 *// Example GET method implementation with TEXT:* fetch("https://api.coindesk.com/v1/bpi/currentprice.json") .then(response => response.text()) .then(data => console.log(data)) .catch(error => console.log(error)); *// Example GET method implementation with JSON:* fetch("https://api.coindesk.com/v1/bpi/currentprice.json") .then(response => response.json()) .then(data => console.log(data.bpi.USD.rate)) .catch(error => console.log(error)); *// Example GET method implementation with TEXT and JSON:* fetch("https://api.coindesk.com/v1/bpi/currentprice.json") .then(response => response.text()) .then(text => console.log(JSON.parse(text).bpi.USD.rate+"\n"+text)) .catch(error => console.log(error)); *// Example POST method implementation with upload JSON data:* const data = { username: "example" }; fetch("https://example.com/profile", { method: "POST", // or "PUT" headers: { "Content-Type": "application/json", }, body: JSON.stringify(data), }) .then(response => response.json()) .then(data => { console.log("Success:", data); }) .catch((error) => { console.error("Error:", error); });	*// Example POST method implementation:* *// Default options are marked with ** async function postData(url = "url", data = {}) { const response = await fetch(url, { method: "POST", *// *GET, POST, PUT, DELETE, etc.* mode: "cors", *// no-cors, *cors, same-origin* cache: "no-cache", *// *default, no-cache, reload, force-cache, only-if-cached* credentials: "same-origin", *// include, *same-origin, omit* headers: {"Content-Type": "application/json"}, *// "Content-Type": "application/x-www-form-urlencoded"* redirect: "follow", *// manual, *follow, error* referrerPolicy: "no-referrer", *// no-referrer, *no-referrer-when-downgrade, origin, origin-when-cross-origin, same-origin, strict-origin, strict-origin-when-cross-origin, unsafe-url* body: JSON.stringify(data) *// body data type must match "Content-Type" header* }); return response.json(); *// parses JSON response into native JavaScript objects* } postData("https://example.com/answer", { answer: 42 }) .then(data => { console.log(data); }); *// JSON data parsed by `data.json()` call*

Nullish coalescing operator **x ?? y**	**Logical nullish assignment** **x ??= y**	**Logical AND assignment** **x &&= y**	**Logical OR assignment** **x ||= y**
FF 72, Chrome and Edge 80, Safari 13.1, Safari on iOS 13.4, Samsung Internet 13	FF 79, Chrome and Edge 85, Safari 14, Samsung Internet 14		
The nullish coalescing operator (??) is a logical operator that **returns its right-hand side operand when its left-hand side operand is null or undefined, and otherwise returns its left-hand side operand.**	The logical nullish assignment operator **only assigns if x is nullish (null or undefined).**	The logical AND assignment operator **only assigns if x is truthy.**	The logical OR assignment operator **only assigns if x is falsy.** (false, 0, -0, 0n, "", '', ``, null, undefined, NaN)
`const nullValue = null;` `const emptyText = ""; // falsy` `const someNumber = 42;` `const valA = nullValue ?? "defaultA";` `// "defaultA"` `const valB = emptyText ?? "default B";` `// "" (empty string is not null or undefined)` `const valC = someNumber ?? 0;` `// 42`	`function config (options) {` `  options.duration ??= 100;` `  options.speed ??= 25;` `  return options;` `}` `config({duration: 125});` `// {duration: 125, speed: 25}` `config({});` `// {duration: 100, speed: 25}`	`let x = 0;` `let y = 1;` `x &&= 0; // 0` `x &&= 1; // 0` `y &&= 1; // 1` `y &&= 0; // 0`	`const a = {` `  duration: 50,` `  title: ""` `};` `a.duration ||= 10;` `// 5` `a.title ||= "title is empty.";` `// "title is empty"`
`let count = 0;` `let text = "";` `let qty = count || 42; // 42` `let message = text || "hi!"; // "hi!"`	`const a = { duration: 50 };` `a.duration ??= 10; // 50` `a.speed ??= 25;  // 25`	`let a = 1;` `let b = 0;` `a &&= 2; // 2` `b &&= 2; // 0`	

		equivalent	**not equivalent**
Nullish coalescing operator (??)	**x ?? y**	`(x != null) ? x : y`	
Logical nullish assignment (??=)	**x ??= y**	`x ?? (x = y);`	`x = x ?? y;`
Logical AND assignment (&&=)	**x &&= y**	`x && (x = y);`	`x = x && y;`
Logical OR assignment (||=)	**x ||= y**	`x || (x = y);`	`x = x || y;`

Reflect object		
ES6, no IE11 support - FF 42, Chrome 49, Edge 12, Safari 10, Safari on iOS 10, Samsung Internet 5.0		
Function	**Description**	**equivalent**
Reflect.apply(target, thisArgument, argumentsList);	Calls a target function with arguments as specified by the argumentsList parameter.	Function.prototype.apply.call(target, thisArgument, argumentsList);
Reflect.construct(target,argumentsList [,newTarget]);	The new operator as a function.	new target(...argumentsList);
Reflect.defineProperty(target,propertyKey, attributes);	Similar to Object.defineProperty(). Returns a boolean that is true if the property was successfully defined.	Object.defineProperty(target, propertyKey,attributes);
Reflect.deleteProperty(target,propertyKey);	The delete operator as a function.	delete target[propertyKey];
Reflect.get(target,propertyKey[,receiver]);	Returns the value of the property of the object.	target[propertyKey];
Reflect.getOwnPropertyDescriptor(target, propertyKey);	Returns a property descriptor of the given property if it exists on the object, undefined otherwise.	Object.getOwnPropertyDescriptor(target, propertyKey);
Reflect.getPrototypeOf(target);	Object.getPrototypeOf(target);	Object.getPrototypeOf(target);
Reflect.has(target,propertyKey);	Returns a boolean whether the target has the property.	propertyKey in target;
Reflect.isExtensible(target);	Returns a boolean that is true if the target is extensible.	Object.isExtensible(target);
Reflect.ownKeys(target);	Returns an array of the target object's own (not inherited) property keys.	Object.getOwnPropertyNames(target).concat(Object.getOwnPropertySymbols(target));
Reflect.preventExtensions(target);	Prevents new properties from ever being added to an object. Similar to Object.preventExtensions().	Object.preventExtensions(target);
Reflect.set(target,propertyKey,value [,receiver]);	Assigns values to properties. Returns a boolean that is true if the update was successful.	target[propertyKey] = value;
Reflect.setPrototypeOf(target,prototype);	Sets the prototype of an object. Returns a boolean that is true if the update was successful.	Object.setPrototypeOf(target,prototype);

Map Object

```
var myMap = new Map([iterable]);

// The Map objects are iterable.
for (let [key, value] of myMap) {
  console.log(`${key} = ${value}`);
}

var cloneMap = new Map(myMap);
Map.prototype.size;
Map.prototype.get(<key>); -> value/undefines
Map.prototype.set(<key>,<value>); -> Map object
Map.prototype.has(<key>); -> boolean
Map.prototype.delete(<key>); -> boolean
Map.prototype.clear(); -> undefined

Map.prototype.forEach(function (value,key,map)); -> undefined
Map.prototype.keys(); -> iterator of keys
Map.prototype.values(); -> iterator of values
Map.prototype.entries(); -> iterator of [key, value]
```

Set Object

```
var mySet = new Set([iterable]);

// The Set objects are iterable.
for (const item of mySet) { console.log(item); }

var cloneSet = new Set(mySet);
Set.prototype.size;
Set.prototype.add(<value>); -> Set object
Set.prototype.has(<value>); -> boolean
Set.prototype.delete(<value>); -> boolean
Set.prototype.clear(); -> undefined

Set.prototype.forEach(function (value,value,set)); -> undefined
Set.prototype.keys(); -> iterator of values
Set.prototype.values(); -> iterator of values
Set.prototype.entries(); -> iterator of [value, value]
```

Set Object helper functions

```
function isSuperset(set, subset) {
  for (const elem of subset) {
    if (!set.has(elem)) { return false; }
  }
  return true;
}

function union(setA, setB) {
  const _union = new Set(setA);
  for (const elem of setB) { _union.add(elem); }
  return _union;
}
function intersection(setA, setB) {
  const _intersection = new Set();
  for (const elem of setB) {
    if (setA.has(elem)) { _intersection.add(elem); }
  }
  return _intersection;
}

function difference(setA, setB) {
  const _difference = new Set(setA);
  for (const elem of setB) { _difference.delete(elem); }
  return _difference;
}
function symmetricDifference(setA, setB) {
  const _d = new Set(setA);
  for (const e of setB) {
    if (_d.has(e)) { _d.delete(e); } else { _d.add(e); }
  }
  return _d;
}

const setA = new Set([1,2,3,4]), setB = new Set([2, 3]),
setC = new Set([3, 4, 5, 6])
isSuperset(setA, setB);          // true
union(setA, setC);               // Set {1, 2, 3, 4, 5, 6}
intersection(setA, setC);        // Set {3, 4}
difference(setA, setC);          // Set {1, 2}
symmetricDifference(setA, setC); // Set {1, 2, 5, 6}
```

Array.fromAsync();

```
Array.fromAsync(<object>[,mapFn[,thisArg]])
  .then((resultArray) => /* todo with resultArray */);
```

Object types: async iterable, iterable (Array, Map, Set, NodeList, etc.), array-like

mapfn parameters: element, index

```
async function* asyncIterable () {
  for (let i = 0; i < 5; i++) { await new
Promise((resolve)=> setTimeout(resolve,50*i)); yield i; }
}

Array.fromAsync(asyncIterable())
  .then((res) => console.log("asyncIterable1: "+res));
// asyncIterable1: 0,1,2,3,4
Array.fromAsync(asyncIterable(), (x) => x*2)
  .then((res) => console.log("asyncIterable2: "+res));
// asyncIterable2: 0,2,4,6,8

Array.fromAsync([4,5,6,7,8])
  .then((res) => console.log("[4,5,6,7,8]: "+res));
// [4,5,6,7,8]: 4,5,6,7,8
Array.fromAsync([4,5,6,7,8], (x) => x*2)
  .then((res) => console.log("[4,5,6,7,8] + fn: "+res));
// [4,5,6,7,8] + fn: 8,10,12,14,16

Array.fromAsync(new Set([4,5,6,6,10]))
  .then((res) => console.log("Set: "+res));
// Set: 4,5,6,10

Array.fromAsync(new Set([4,5,6,6,10]), (x) => x*2)
  .then((res) => console.log("Set + fn: "+res));
// Set + fn: 8,10,12,20

Array.fromAsync({"0": 3, "1": 4, "2": 5, length: 3})
  .then((res) => console.log("arraylike: "+res));
// arraylike: 3,4,5

Array.fromAsync({"0": 3, "1": 4, "2": 5, length: 3}, (x) =>
x*2).then((res) => console.log("arraylike + fn: "+res));
// arraylike + fn: 6,8,10
```

Set methods

```
Chrome, Chrome Android, Edge, WebView Android v122
Firefox, Firefox for Android v127
Safari, Safari on iOS, WebView on iOS v17
Opera v108, Opera Android v81
Samsung Internet v26.0
Deno 1.42, Node.js 22.0.0

Set.prototype.intersection(other): Set
Set.prototype.union(other): Set
Set.prototype.difference(other): Set
Set.prototype.symmetricDifference(other): Set
Set.prototype.isSubsetOf(other): Boolean
Set.prototype.isSupersetOf(other): Boolean
Set.prototype.isDisjointFrom(other): Boolean

var setA = new Set([1]);
var setB = new Set([1,2]);
var setC = new Set([2,3]);

console.log( setB.intersection(setC) );
// Set [ 2 ]
console.log( setB.union(setC) );
// Set(3) [ 1, 2, 3 ]
console.log( setB.difference(setC) );
// Set [ 1 ]
console.log( setB.symmetricDifference(setC) );
// Set [ 1, 3 ]

console.log( setB.isSupersetOf(setA) );
// true
console.log( setA.isSupersetOf(setC) );
// false
console.log( setA.isSubsetOf(setB) );
// true
console.log( setA.isSubsetOf(setC) );
// false

console.log( setA.isDisjointFrom(setC) );
// true - there are no common elements
console.log( setA.isDisjointFrom(setB) );
// false - there are common elements
```

Iterator methods	Iterator methods samples
Firefox, Firefox for Android 131 Chrome, Edge, Webview Android 122 Opera 108 Safari, Safari in iOS, Webview on iOS 18.4 (?) Samsung Internet 26.0 Deno 1.42, Node.js (?) Iterator.from(object); Iterator.prototype.drop(limit); Iterator.prototype.every(callbackFn(Element, index)); Iterator.prototype.filter(callbackFn(Element, index)); Iterator.prototype.find(callbackFn(Element, index)); Iterator.prototype.flatMap(callbackFn(Element, index)); Iterator.prototype.forEach(callbackFn(Element, index)); Iterator.prototype.map(callbackFn(Element, index)); Iterator.prototype.reduce(callbackFn(accumulator, currentValue, currentIndex), initialValue: Optional); Iterator.prototype.some(callbackFn(Element, index)); Iterator.prototype.take(limit); Iterator.prototype.toArray(); Equivalent to Array.from(iterator) and [...iterator] Iterator.prototype[Symbol.iterator]();	var A1 = [1, 2, 3, 4, 5, 6]; console.log(Iterator.from(A1)); // Iterator { 1, 2, 3, 4, 5, 6 } console.log(A1.values().drop(3)); // Iterator { 4, 5, 6 } console.log(A1.values().every((x) => x > 0)); // true console.log(A1.values().every((x) => x > 3)); // false console.log(A1.values().filter((x) => x > 3)); // Iterator { 4, 5, 6 } console.log(A1.values().find((x) => x > 3)); // 4 var M1 = new Map([["a", 1], ["b", 2], ["c", 3]]); var M2 = new Map([["d", 4], ["e", 5], ["f", 6]]); console.log(new Map([M1, M2].values().flatMap((x) => x))); // Map(6) { a → 1, b → 2, c → 3, d → 4, e → 5, f → 6 } console.log(A1.values().take(2).forEach((el, i) => console.log(i+": "+el))); // "0 : 1", "1 : 2" console.log(A1.values().map((x) => x * 2)); // Iterator { 2, 4, 6, 8, 10, 12 } console.log(A1.values().reduce((ac, it) => (ac + it), 0)); // 21 console.log(A1.values().some((x) => x > 3)); // true console.log(A1.values().some((x) => x > 6)); // false console.log(A1.values().take(3)); // Iterator { 1, 2, 3 } console.log(A1.values().toArray()); // Array(6) [1, 2, 3, 4, 5, 6]

Javascript Equality comparisons and sameness					
X	Y	loose equality	strict equality	Same-value	Same-value-zero
		X == Y	X === Y	Object.is(X, Y)	[X].includes(Y)
					X === Y || (X !== X && Y !== Y)
undefined	undefined	✅ true	✅ true	✅ true	✅ true
null	null	✅ true	✅ true	✅ true	✅ true
true	true	✅ true	✅ true	✅ true	✅ true
false	false	✅ true	✅ true	✅ true	✅ true
"foo"	"foo"	✅ true	✅ true	✅ true	✅ true
0	0	✅ true	✅ true	✅ true	✅ true
+0	-0	✅ true	✅ true	❌ false	✅ true
+0	0	✅ true	✅ true	✅ true	✅ true
-0	0	✅ true	✅ true	❌ false	✅ true
0n	-0n	✅ true	✅ true	✅ true	✅ true
0	false	✅ true	❌ false	❌ false	❌ false
""	false	✅ true	❌ false	❌ false	❌ false
""	0	✅ true	❌ false	❌ false	❌ false
"0"	0	✅ true	❌ false	❌ false	❌ false
"17"	17	✅ true	❌ false	❌ false	❌ false
[1, 2]	"1,2"	✅ true	❌ false	❌ false	❌ false
new String("foo")	"foo"	✅ true	❌ false	❌ false	❌ false
null	undefined	✅ true	❌ false	❌ false	❌ false
null	false	❌ false	❌ false	❌ false	❌ false
undefined	false	❌ false	❌ false	❌ false	❌ false
{foo: "bar"}	{foo: "bar"}	❌ false	❌ false	❌ false	❌ false
new String("foo")	new String("foo")	❌ false	❌ false	❌ false	❌ false
0	null	❌ false	❌ false	❌ false	❌ false
0	NaN	❌ false	❌ false	❌ false	❌ false
"foo"	NaN	❌ false	❌ false	❌ false	❌ false
NaN	NaN	❌ false	❌ false	✅ true	✅ true