**Variables**

Most of the time, a JavaScript application needs to work with information. Here are two examples:

1. An online shop – the information might include goods being sold and a shopping cart.
2. A chat application – the information might include users, messages, and much more.

Variables are used to store this information.

**[A variable](https://javascript.info/variables" \l "a-variable)**

A [variable](https://en.wikipedia.org/wiki/Variable_(computer_science)) is a “named storage” for data. We can use variables to store goodies, visitors, and other data.

To create a variable in JavaScript, use the let keyword.

The statement below creates (in other words: *declares*) a variable with the name “message”:

let message;

Now, we can put some data into it by using the assignment operator =:

let message;

message = 'Hello'; // store the string 'Hello' in the variable named message

The string is now saved into the memory area associated with the variable. We can access it using the variable name:

let message;

message = 'Hello!';

alert(message); // shows the variable content

To be concise, we can combine the variable declaration and assignment into a single line:

let message = 'Hello!'; // define the variable and assign the value

alert(message); // Hello!

We can also declare multiple variables in one line:

let user = 'John', age = 25, message = 'Hello';

That might seem shorter, but we don’t recommend it. For the sake of better readability, please use a single line per variable.

The multiline variant is a bit longer, but easier to read:

let user = 'John';

let age = 25;

let message = 'Hello';

Some people also define multiple variables in this multiline style:

let user = 'John',

age = 25,

message = 'Hello';

…Or even in the “comma-first” style:

let user = 'John'

, age = 25

, message = 'Hello';

Technically, all these variants do the same thing. So, it’s a matter of personal taste and aesthetics.

**var instead of let**

In older scripts, you may also find another keyword: var instead of let:

var message = 'Hello';

The var keyword is *almost* the same as let. It also declares a variable but in a slightly different, “old-school” way.

There are subtle differences between let and var, but they do not matter to us yet. We’ll cover them in detail in the chapter [The old "var"](https://javascript.info/var).

**[A real-life analogy](https://javascript.info/variables" \l "a-real-life-analogy)**

We can easily grasp the concept of a “variable” if we imagine it as a “box” for data, with a uniquely-named sticker on it.

For instance, the variable message can be imagined as a box labelled "message" with the value "Hello!" in it:

We can put any value in the box.

We can also change it as many times as we want:

let message;

message = 'Hello!';

message = 'World!'; // value changed

alert(message);

When the value is changed, the old data is removed from the variable:

We can also declare two variables and copy data from one into the other.

let hello = 'Hello world!';

let message;

// copy 'Hello world' from hello into message

message = hello;

// now two variables hold the same data

alert(hello); // Hello world!

alert(message); // Hello world!

**Declaring twice triggers an error**

A variable should be declared only once.

A repeated declaration of the same variable is an error:

let message = "This";

// repeated 'let' leads to an error

let message = "That"; // SyntaxError: 'message' has already been declared

So, we should declare a variable once and then refer to it without let.

**Functional languages**

It’s interesting to note that there exist so-called [pure functional](https://en.wikipedia.org/wiki/Purely_functional_programming) programming languages, such as [Haskell](https://en.wikipedia.org/wiki/Haskell), that forbid changing variable values.

In such languages, once the value is stored “in the box”, it’s there forever. If we need to store something else, the language forces us to create a new box (declare a new variable). We can’t reuse the old one.

Though it may seem a little odd at first sight, these languages are quite capable of serious development. More than that, there are areas like parallel computations where this limitation confers certain benefits.

**[Variable naming](https://javascript.info/variables" \l "variable-naming)**

There are two limitations on variable names in JavaScript:

1. The name must contain only letters, digits, or the symbols $ and \_.
2. The first character must not be a digit.

Examples of valid names:

let userName;

let test123;

When the name contains multiple words, [camelCase](https://en.wikipedia.org/wiki/CamelCase) is commonly used. That is: words go one after another, each word except first starting with a capital letter: myVeryLongName.

What’s interesting – the dollar sign '$' and the underscore '\_' can also be used in names. They are regular symbols, just like letters, without any special meaning.

These names are valid:

let $ = 1; // declared a variable with the name "$"

let \_ = 2; // and now a variable with the name "\_"

alert($ + \_); // 3

Examples of incorrect variable names:

let 1a; // cannot start with a digit

let my-name; // hyphens '-' aren't allowed in the name

**Case matters**

Variables named apple and APPLE are two different variables.

**Non-Latin letters are allowed, but not recommended**

It is possible to use any language, including Cyrillic letters, Chinese logograms and so on, like this:

let имя = '...';

let 我 = '...';

Technically, there is no error here. Such names are allowed, but there is an international convention to use English in variable names. Even if we’re writing a small script, it may have a long life ahead. People from other countries may need to read it sometime.

**Reserved names**

There is a [list of reserved words](https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Lexical_grammar#Keywords), which cannot be used as variable names because they are used by the language itself.

For example: let, class, return, and function are reserved.

The code below gives a syntax error:

let let = 5; // can't name a variable "let", error!

let return = 5; // also can't name it "return", error!

**An assignment without use strict**

Normally, we need to define a variable before using it. But in the old times, it was technically possible to create a variable by a mere assignment of the value without using let. This still works now if we don’t put use strict in our scripts to maintain compatibility with old scripts.

// note: no "use strict" in this example

num = 5; // the variable "num" is created if it didn't exist

alert(num); // 5

This is a bad practice and would cause an error in strict mode:

"use strict";

num = 5; // error: num is not defined

**[Constants](https://javascript.info/variables" \l "constants)**

To declare a constant (unchanging) variable, use const instead of let:

const myBirthday = '18.04.1982';

Variables declared using const are called “constants”. They cannot be reassigned. An attempt to do so would cause an error:

const myBirthday = '18.04.1982';

myBirthday = '01.01.2001'; // error, can't reassign the constant!

When a programmer is sure that a variable will never change, they can declare it with const to guarantee and communicate that fact to everyone.

**[Uppercase constants](https://javascript.info/variables" \l "uppercase-constants)**

There is a widespread practice to use constants as aliases for difficult-to-remember values that are known before execution.

Such constants are named using capital letters and underscores.

For instance, let’s make constants for colors in so-called “web” (hexadecimal) format:

const COLOR\_RED = "#F00";

const COLOR\_GREEN = "#0F0";

const COLOR\_BLUE = "#00F";

const COLOR\_ORANGE = "#FF7F00";

// ...when we need to pick a color

let color = COLOR\_ORANGE;

alert(color); // #FF7F00

Benefits:

* COLOR\_ORANGE is much easier to remember than "#FF7F00".
* It is much easier to mistype "#FF7F00" than COLOR\_ORANGE.
* When reading the code, COLOR\_ORANGE is much more meaningful than #FF7F00.

When should we use capitals for a constant and when should we name it normally? Let’s make that clear.

Being a “constant” just means that a variable’s value never changes. But some constants are known before execution (like a hexadecimal value for red) and some constants are *calculated* in run-time, during the execution, but do not change after their initial assignment.

For instance:

const pageLoadTime = /\* time taken by a webpage to load \*/;

The value of pageLoadTime is not known before the page load, so it’s named normally. But it’s still a constant because it doesn’t change after the assignment.

In other words, capital-named constants are only used as aliases for “hard-coded” values.

**[Name things right](https://javascript.info/variables" \l "name-things-right)**

Talking about variables, there’s one more extremely important thing.

A variable name should have a clean, obvious meaning, describing the data that it stores.

Variable naming is one of the most important and complex skills in programming. A glance at variable names can reveal which code was written by a beginner versus an experienced developer.

In a real project, most of the time is spent modifying and extending an existing code base rather than writing something completely separate from scratch. When we return to some code after doing something else for a while, it’s much easier to find information that is well-labelled. Or, in other words, when the variables have good names.

Please spend time thinking about the right name for a variable before declaring it. Doing so will repay you handsomely.

Some good-to-follow rules are:

* Use human-readable names like userName or shoppingCart.
* Stay away from abbreviations or short names like a, b, and c, unless you know what you’re doing.
* Make names maximally descriptive and concise. Examples of bad names are data and value. Such names say nothing. It’s only okay to use them if the context of the code makes it exceptionally obvious which data or value the variable is referencing.
* Agree on terms within your team and in your mind. If a site visitor is called a “user” then we should name related variables currentUser or newUser instead of currentVisitor or newManInTown.

Sounds simple? Indeed it is, but creating descriptive and concise variable names in practice is not. Go for it.

**Reuse or create?**

And the last note. There are some lazy programmers who, instead of declaring new variables, tend to reuse existing ones.

As a result, their variables are like boxes into which people throw different things without changing their stickers. What’s inside the box now? Who knows? We need to come closer and check.

Such programmers save a little bit on variable declaration but lose ten times more on debugging.

An extra variable is good, not evil.

Modern JavaScript minifiers and browsers optimize code well enough, so it won’t create performance issues. Using different variables for different values can even help the engine optimize your code.

**[Summary](https://javascript.info/variables" \l "summary)**

We can declare variables to store data by using the var, let, or const keywords.

* let – is a modern variable declaration.
* var – is an old-school variable declaration. Normally we don’t use it at all, but we’ll cover subtle differences from let in the chapter [The old "var"](https://javascript.info/var), just in case you need them.
* const – is like let, but the value of the variable can’t be changed.

Variables should be named in a way that allows us to easily understand what’s inside them.

[**Tasks**](https://javascript.info/variables#tasks)

**[Working with variables](https://javascript.info/variables" \l "working-with-variables)**

**importance: 2**

1. Declare two variables: admin and name.
2. Assign the value "John" to name.
3. Copy the value from name to admin.
4. Show the value of admin using alert (must output “John”).

**solution**

In the code below, each line corresponds to the item in the task list.

let admin, name; // can declare two variables at once

name = "John";

admin = name;

alert( admin ); // "John"

**[Giving the right name](https://javascript.info/variables" \l "giving-the-right-name)**

**importance: 3**

1. Create a variable with the name of our planet. How would you name such a variable?
2. Create a variable to store the name of a current visitor to a website. How would you name that variable?

**solution**

#### **The variable for our planet**

That’s simple:

let ourPlanetName = "Earth";

Note, we could use a shorter name planet, but it might not be obvious what planet it refers to. It’s nice to be more verbose. At least until the variable isNotTooLong.

#### **The name of the current visitor**

let currentUserName = "John";

Again, we could shorten that to userName if we know for sure that the user is current.

Modern editors and autocomplete make long variable names easy to write. Don’t save on them. A name with 3 words in it is fine.

And if your editor does not have proper autocompletion, get [a new one](https://javascript.info/code-editors).

**[Uppercase const?](https://javascript.info/variables" \l "uppercase-const)**

**importance: 4**

Examine the following code:

const birthday = '18.04.1982';

const age = someCode(birthday);

Here we have a constant birthday for the date, and also the age constant.

The age is calculated from birthday using someCode(), which means a function call that we didn’t explain yet (we will soon!), but the details don’t matter here, the point is that age is calculated somehow based on the birthday.

Would it be right to use upper case for birthday? For age? Or even for both?

const BIRTHDAY = '18.04.1982'; // make birthday uppercase?

const AGE = someCode(BIRTHDAY); // make age uppercase?

**solution**

We generally use upper case for constants that are “hard-coded”. Or, in other words, when the value is known prior to execution and directly written into the code.

In this code, birthday is exactly like that. So we could use the upper case for it.

In contrast, age is evaluated in run-time. Today we have one age, a year after we’ll have another one. It is constant in a sense that it does not change through the code execution. But it is a bit “less of a constant” than birthday: it is calculated, so we should keep the lower case for it.

**[Comments](https://javascript.info/variables" \l "comments)**

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