Introduction to JavaScript

Basic Syntax, Conditions and Loops

SoftUni Team

Technical Trainers

Software University

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Table of Contents

JavaScript Overview

Definition, Execution, IDE Setup

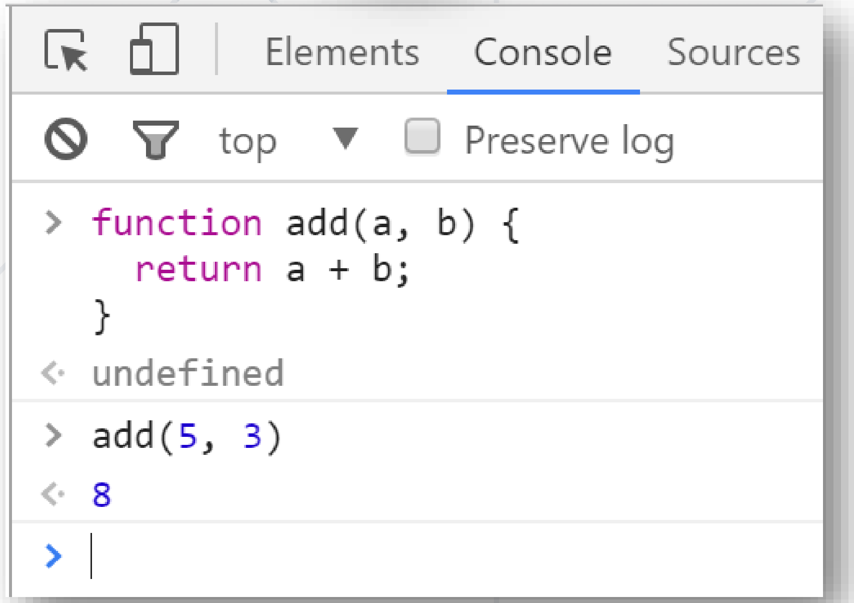
What is JavaScript?

- JavaScript (**JS**) is a **high-level** programming language
  - One of the **core technologies** of the World Wide Web
  - Enables **interactive** web pages and applications
  - Can be **executed** on the server and on the **client**
- Features:
  - C-like **syntax** (curly-brackets, identifiers, operator)
  - **Multi-paradigm** (imperative, functional, OOP)
  - Dynamic **typing**

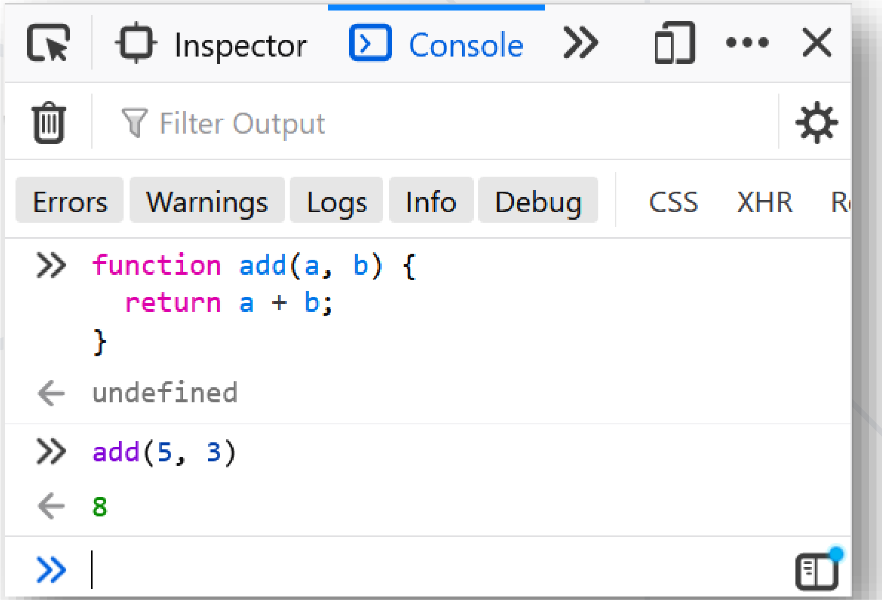
Web Browser Support

Developer Console: [F12]

The code shown in the example can be executed directly in the browser



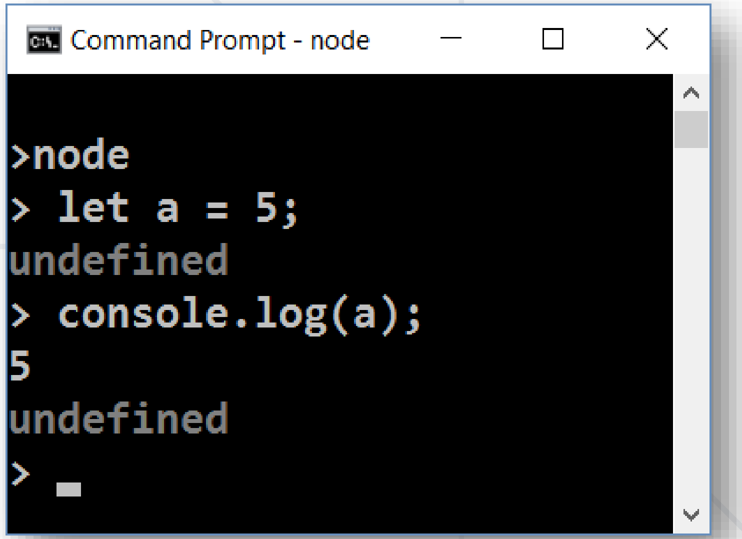
```
> function add(a, b) {
    return a + b;
  }
<· undefined
> add(5, 3)
<· 8
>
```



```
» function add(a, b) {
    return a + b;
  }
← undefined
» add(5, 3)
← 8
»
```

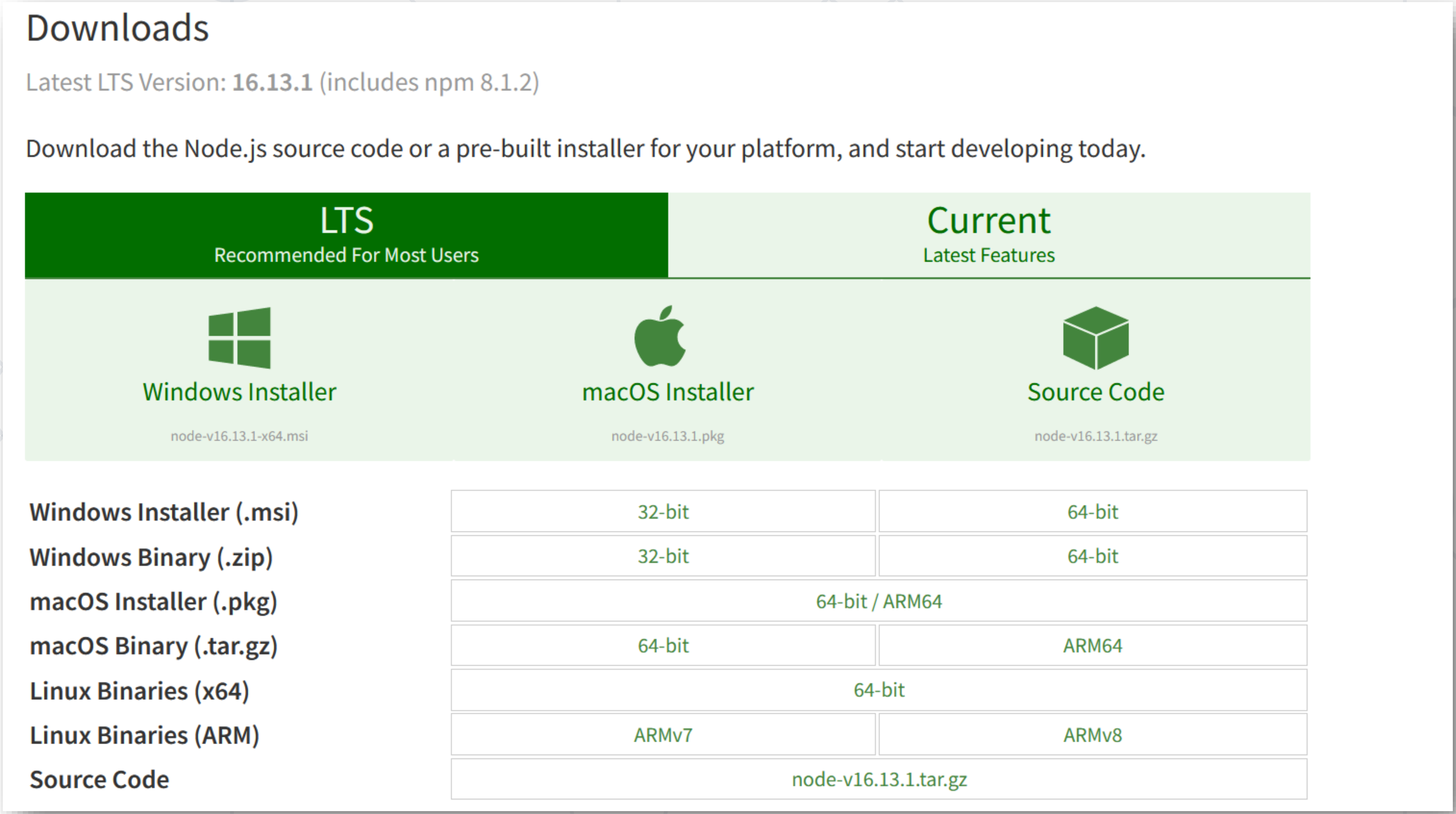
Node.js

- What is **Node.js**?
  - **Server-side** JavaScript runtime
  - Chrome V8 JavaScript engine
  - NPM **package manager**
  - Install node packages



```
>node
> let a = 5;
undefined
> console.log(a);
5
undefined
> _
```

Install the Latest Node.js



Downloads

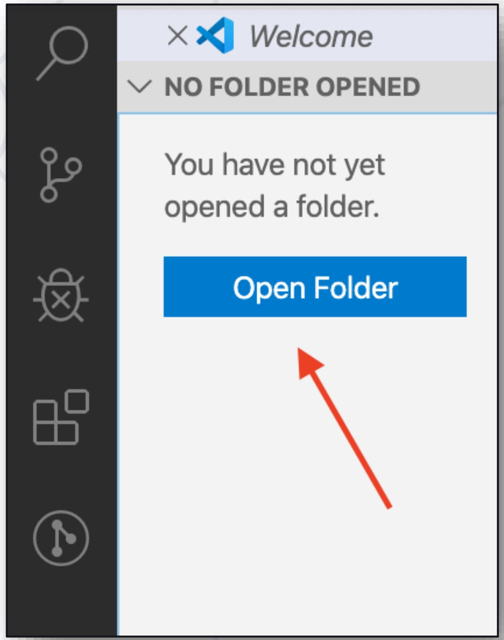
Latest LTS Version: **16.13.1** (includes npm 8.1.2)

Download the Node.js source code or a pre-built installer for your platform, and start developing today.

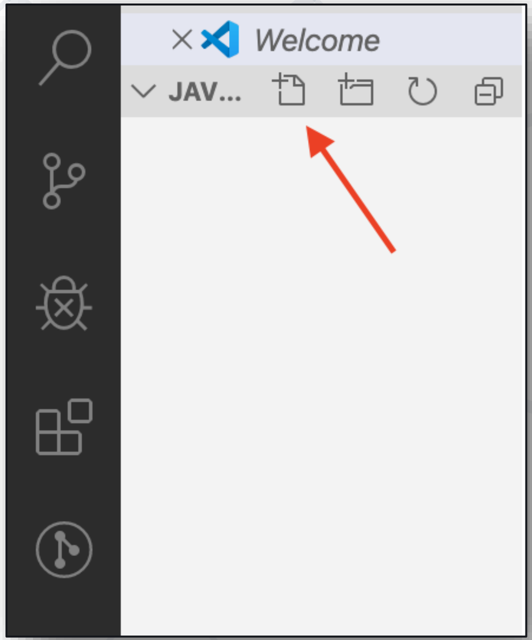
Windows Installer (.msi)	32-bit	64-bit
Windows Binary (.zip)	32-bit	64-bit
macOS Installer (.pkg)	64-bit / ARM64	
macOS Binary (.tar.gz)	64-bit	ARM64
Linux Binaries (x64)	64-bit	
Linux Binaries (ARM)	ARMv7	ARMv8
Source Code	node-v16.13.1.tar.gz	

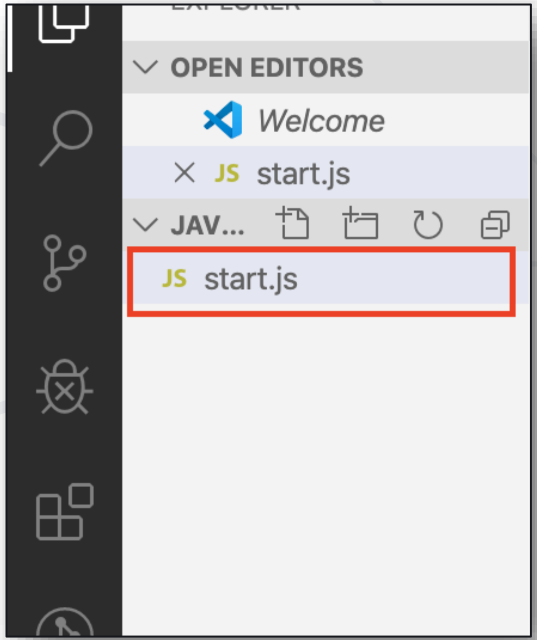
Using Visual Studio Code

- **Visual Studio Code** is powerful text editor for JavaScript and other projects
- In order to create your **first project**:



You have not yet opened a folder.





JavaScript Syntax

Functions, Operators, Input and Output

JavaScript Syntax

- C-like **syntax** (curly-brackets, identifiers, operator)
- Defining and Initializing variables:

```
let a = 5;
let b = 10;
```

Declare a variable with let

Variable name

Variable value

- Conditional statement:

```
if (b > a) {
  console.log(b);
}
```

Body of the conditional statement

Functions and Input Parameters

- In order to solve different problems, we are going to use **functions** and the **input** will come as **parameters**
- A function is similar to a **procedure**, that executes when called

declaration

parameters

```
function solve (num1, num2) {
    //some logic
}

solve(2, 3);
```

calling the function

Printing to the Console

- We use the **console.log()** method to print to console:

```
function solve (name, grade) {
  console.log('The name is: ' + name + ', grade: ' + grade);
}
solve('Peter', 3.555);
//The name is: Peter, grade: 3.555
```

- Text can be composed easier using interpolated strings:

```
console.log(`The name is: ${name}, grade: ${grade}`);
```

- To format a number, use the **toFixed()** method (converts to **string**):

Number of decimal places

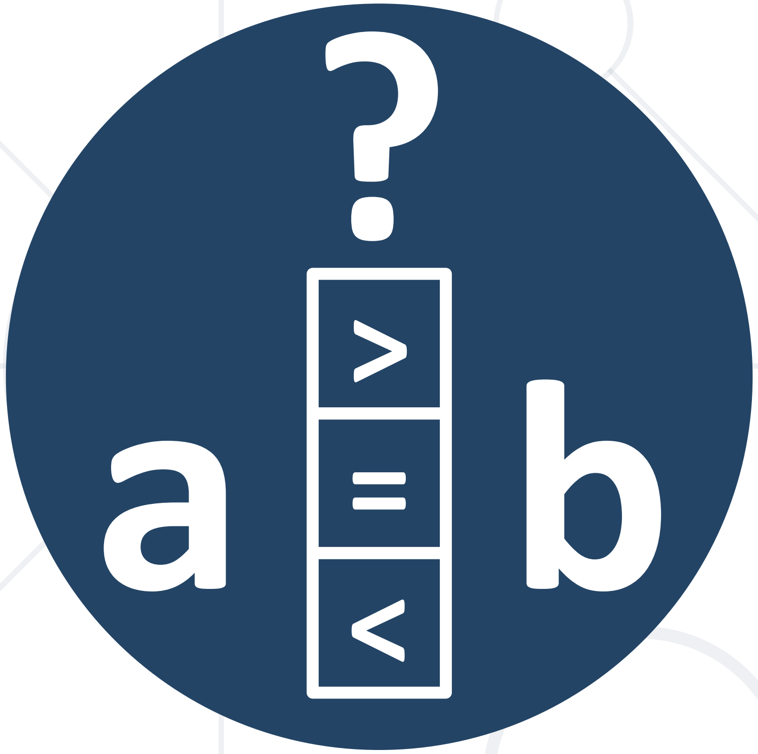
```
grade.toFixed(2);     //The name is: Petar, grade: 3.56
```

Problem: Multiply Number by Two

- Write a function that receives a **number** and prints as a result that number **multiplied by two**

Input	Output
2	4

```
function solve (num) {
  console.log(num * 2);
}
solve(2);
```



Comparison Operators

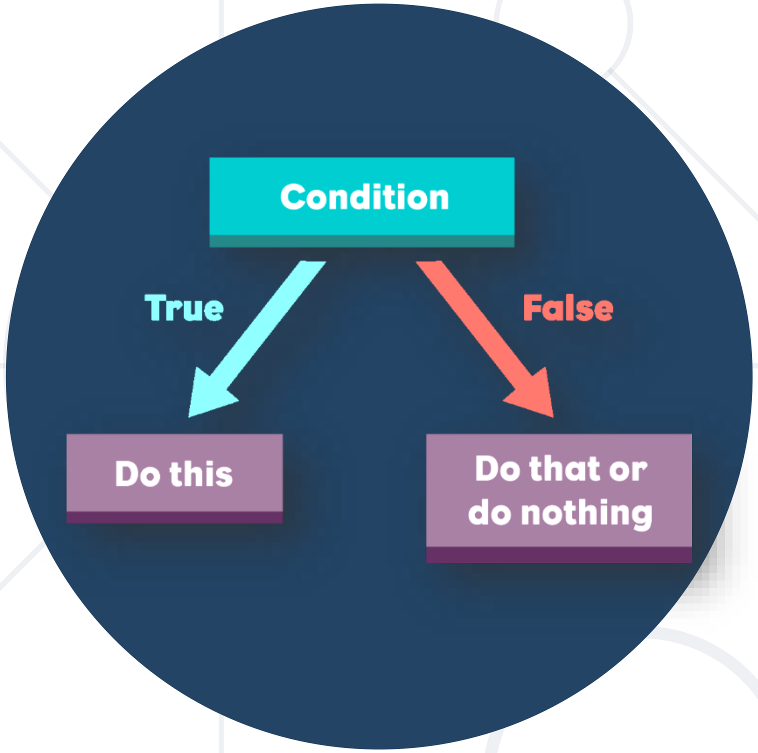
Comparison Operators

Operator	Notation in JS
Equal value	==
Equal value and type	===
Not equal value	!=
Not equal value/type	!==
Greater than	>
Greater than or Equal	>=
Less than	<
Less than or Equal	<=

Comparison Operators

- Values can be compared:

```
let a = 5;
let b = 10;
console.log(a < b);          // true
console.log(a > 0);          // true
console.log(a > 100);        // false
console.log(a < a);          // false
console.log(a <= 5);         // true
console.log(b == 2 * a);     // true
console.log("2" === 2);      // false
```



Conditional Statements

Implementing Control-Flow Logic

What is a Conditional Statement?

- The **if-else** statement:
  - Do action depending on condition

```
let a = 5;
if (a >= 5) {
  console.log(a);
}
```

If the condition **is met**, the code will execute

  - You can chain conditions

```
else {
 console.log('no');
}
```

Continue on the **next condition**, if the first is **not met**

Problem: Excellent Grade

- Write a function that receives a **single number** and checks if the grade is excellent or not
- If it is, print "**Excellent**", otherwise print "**Not excellent**"

Input	Output
5.50	Excellent
4.35	Not excellent

```
function solve(grade){
  if (grade >= 5.50) {
    //TODO
  } else {
    //TODO
  }
}
```

Chained Conditional Statements

- The **if / else - if / else**… construct is a series of checks

```
let a = 5;
if (a > 10)
  console.log("Bigger than 10");
else if (a < 10)
  console.log("Less than 10");
else
  console.log("Equal to 10");
```

Only "**Less than 10**" will be printed

- If one condition is true, it does not proceed to verify the following conditions

Problem: Foreign Languages

- By given country print the typical spoken language:
  - English -> England, USA
  - Spanish -> Spain, Argentina, Mexico
  - other -> unknown

$$\begin{tikzcd}
\boxed{\textbf{USA}} \arrow[r] & \boxed{\textbf{English}} \\
\boxed{\textbf{Germany}} \arrow[r] & \boxed{\textbf{unknown}}
\end{tikzcd}$$

Solution: Foreign Languages

```
function solve(country){
  if (country == 'England') {
    console.log('English');
  } else if (country == 'USA') {
    console.log('English');
  } else if (country == 'Spain') {
    console.log('Spanish');
  } else if (country == 'Argentina') {
    console.log('Spanish');
  } else if (country == 'Mexico') {
    console.log('Spanish');
  } else {
    console.log('unknown')
  }
}
```

The Switch-case Statement

- Works as a series of **if / else if / else if…**

```
switch (...){
  case ...:
    // code
    break;
  case ...:
    // code
    break;
  default:
    // code
    break;
}
```

The condition in the **switch case** is a value

List of conditions (values) for the inspection

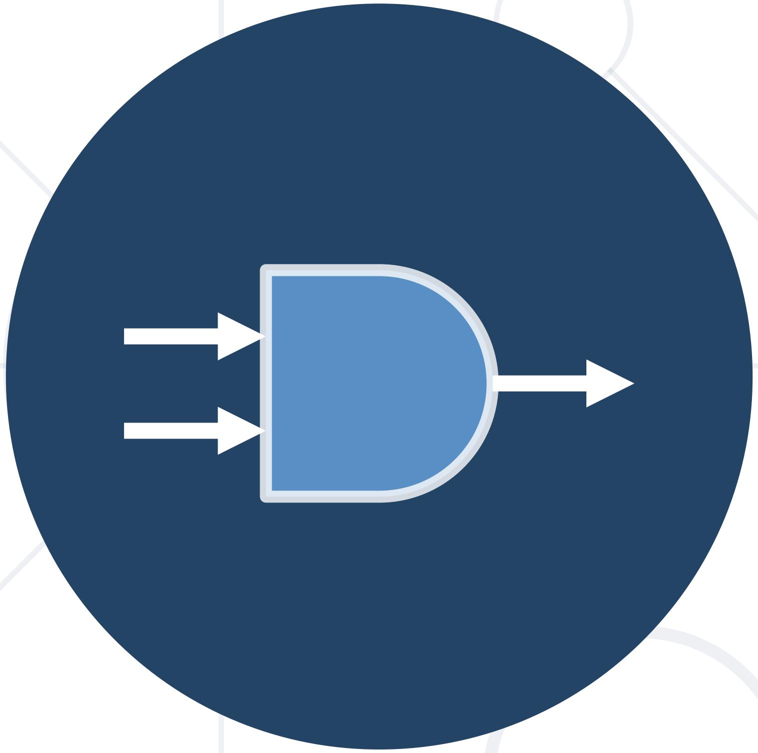
Code to be executed if there is no match with any case

Problem: Month Printer

- Write a program that takes an integer as a parameter and prints the corresponding month
- If the number **is more than 12** or **less than 1** print "**Error!**"

2	February
13	Error!

```
function solve(month) {
    switch (month) {
      case 1: console.log("January"); break;
      case 2: console.log("February"); break;
      // TODO: Add the other cases
      default: console.log("Error!"); break;
    }
}
```



Logical Operators

Writing More Complex Conditions

Logical Operators

- **Logical operators** give us the ability to write multiple conditions in one **if** statement
- They return a boolean result (**true** or **false**)

Operator	Description	Example
!	NOT	!false -> true
&&	AND	true && false -> false
||	OR	true || false -> true

Logical Operators: Examples

- Logical "**AND**"
  - Checks the fulfillment of several conditions simultaneously

```
let a = 3;
let b = -2;
console.log(a > 0 && b > 0); // expected output: false
```

- Logical "**OR**"
  - Checks that at least one of several conditions is met

```
let a = 3;
let b = -2;
console.log(a > 0 || b > 0); // expected output: true
```

Logical Operators: Examples

- Logical "**NOT**"
  - Checks if a condition is **not** met

```
let a = 3;
let b = -2;
console.log(!(a > 0 || b > 0));
// expected output: false
```

Problem: Theatre Promotions

- A theatre has the following **ticket prices** according to the age of the visitor and the type of day
  - If the given **age** does not fit one of the categories, print: "**Error!**"

Day / Age	0 <= age <= 18	18 < age <= 64	64 < age <= 122
Weekday	12$	18$	12$
Weekend	15$	20$	15$
Holiday	5$	12$	10$

```
Weekday
42
```

$\Rightarrow$

```
18$
```

```
Holiday
-12
```

$\Rightarrow$

```
Error!
```

Solution: Theatre Promotions

```
function solve(day, age) {
  let price = 0;
  if (day == 'Weekday') {
    if ((age >= 0 && age <= 18) || (age > 64 && age <= 122)) {
      price = 12;
    }
    // TODO: Add else statement for the other group
  } else if (day == 'Weekend') {
    if ((age >= 0 && age <= 18) || (age > 64 && age <= 122)) {
      price = 15;
    } else if (age > 18 && age <= 64) {
      price = 20;
    }
  }
  // Continued on next slide
```

Solution: Theatre Promotions

```
else if (day == 'Holiday') {
    if (age >= 0 && age <= 18) {
      price = 5;
    }
    // TODO: Add the statements for the other cases
  }
  if (price != 0) {
    console.log(price + '$');
  } else {
    console.log('Error!');
  }
}
```

Loops

Code Block Repetition

What is a Loop?

- The **for** loop:
  - Repeats until the condition is evaluated

```
for (let i = 1; i <= 5; i++){
  console.log(i)
}
```

Incrementation in the condition

- The **while** loop:
  - Does the same, but has different structure

```
let i = 1
while (i <= 5) {
  console.log(i)
  i++
}
```

Incrementation outside the condition

Problem: Divisible by 3

- Print the numbers from 1 to 100, which are divisible by 3
- The program should not receive input

```
function solve() {
    for (let i = 3; i <= 100; i += 3){
      console.log(i);
    }
}
```

Problem: Numbers from N to 1

- Write a function that receives a number **N** and prints the all numbers from **N to 1**. Try using a **while loop**.

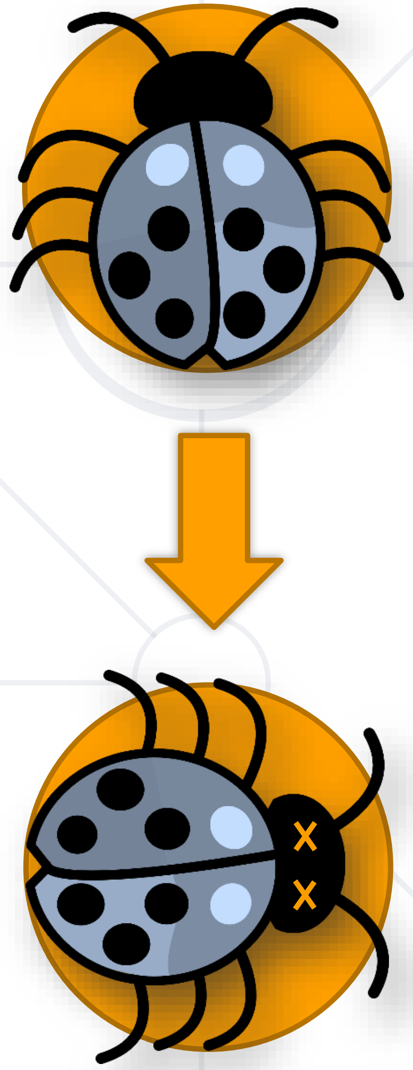
Input	Output
5	5 4 3 2 1

```
function solve(n) {
  while(/*TODO*/) {
    console.log(n);
    n--;
  }
}
solve(5);
```

Debugging the Code

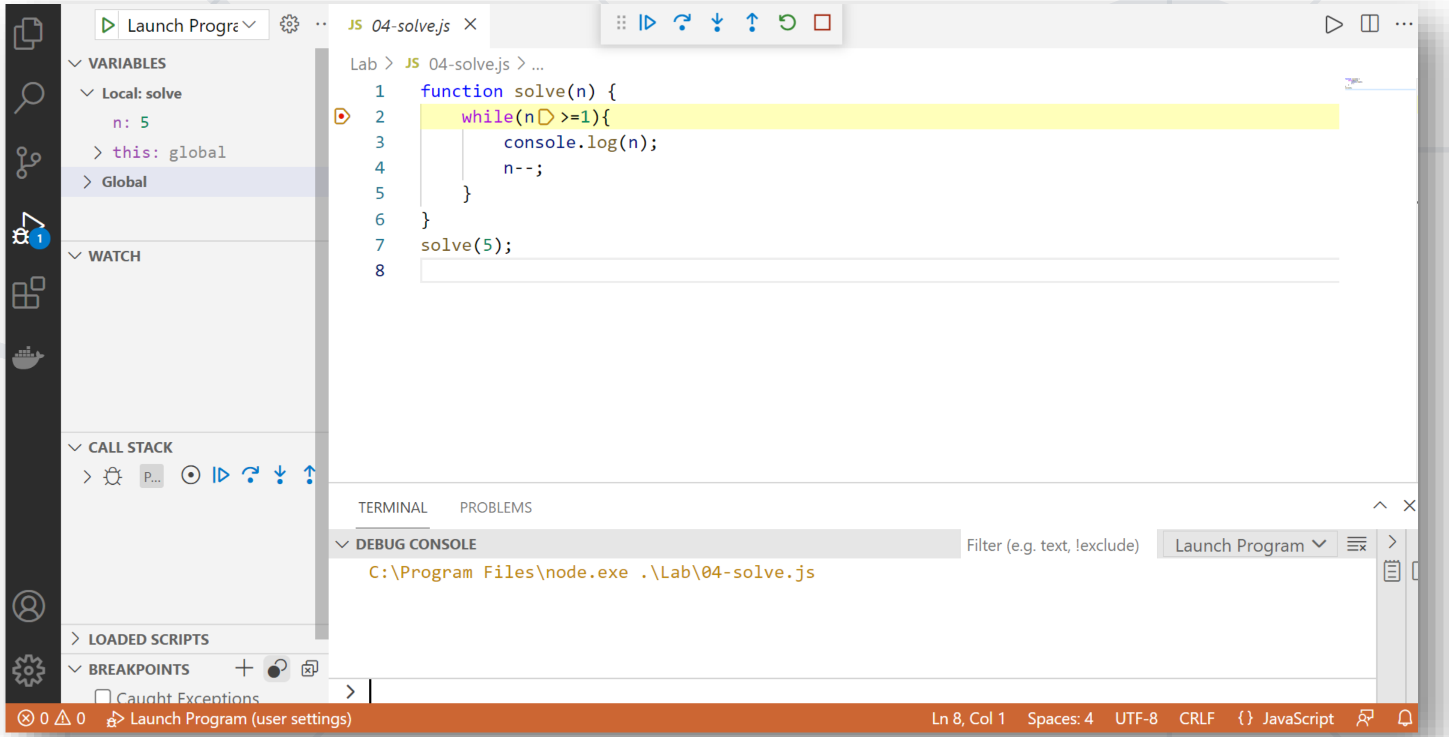
Debugging the Code

- The process of **debugging application** includes:
  - Spotting an error
  - Finding the lines of code that cause the error
  - Fixing the error in the code
  - Testing to check if the error is gone and no new errors are introduced
- Iterative and continuous process



Debugging in Visual Studio Code

- Visual Studio Code has a built-in **debugger**
- It provides:
  - **Breakpoints**
  - Ability to **trace** the code execution
  - Ability to **inspect** variables at runtime



```
function solve(n) {
    while(n>=1){
        console.log(n);
        n--;
    }
}
solve(5);
```

```
C:\Program Files\node.exe .\Lab\04-solve.js
```

Using the Debugger in Visual Studio Code

- Start without Debugger: [Ctrl+F5]
- Start with Debugger: [F5]
- Toggle a breakpoint: [F9]
- Trace step by step: [F10]
- Force step into: [F11]

Summary

- Declare variables with 'let'
- Use if-else statements to check for conditions
- Use loops to avoid repeating code
- Use the debugger to check for mistakes in the code

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