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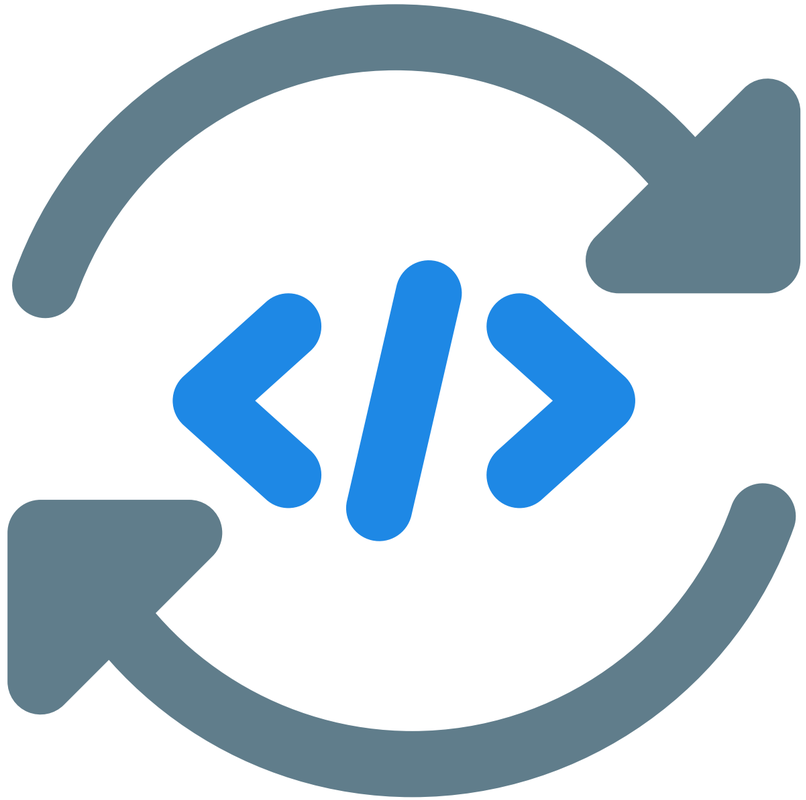
JavaScript essentials for Node-RED

Section 4

Loops



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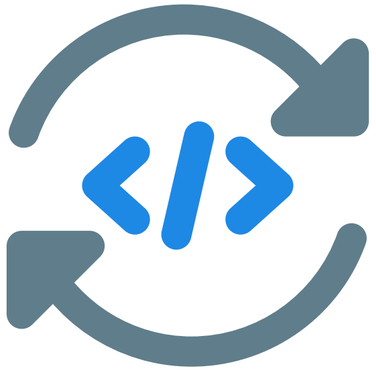
JS

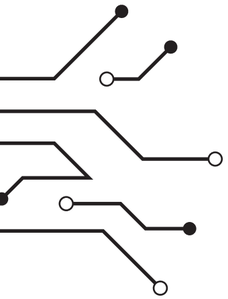
What you will learn in this section?

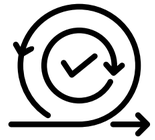


In this section, we will learn about the importance of using loops in programming specifically using the following loops:

- while loop
- do while loop
- for loop
- for in
- for of loop

Applications





Iteration over array, objects etc

Repeated tasks

User input validation

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while loop

It will execute the code as long as the **expression is True.** If the condition is False the code execution will be skipped

```
1   while(//condition)
2       {
3       //code to execute
4       }
```

do while loop

It will execute the code at least once before checking if the **expression is True.** If the condition is False the code execution will be skipped

```
1   do { //code
2   } while (true);
```

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while loop

Example 1: Printing the number from 0 ~ 10

```
1   var number = 0;
2   while(number <= 10)
3       {
4           console.log(number)
5           number += 1;
6       }
7
8   return msg;
```

```
0
1
2
3
4
5
6
7
8
9
10
```

Example 2: Filling the array with number 0 ~ 10

```
1   var number = 0;
2   var arr = [];
3
4   while(number <= 10)
5       {
6           arr.push(number);
7           number += 1;
8       }
9   console.log(arr);
10  return msg;
```

```
[
  0, 1, 2, 3, 4,
  5, 6, 7, 8, 9,
  10
]
```

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do while loop

Example 1: Printing the number from 0 ~ 10

```
1  var number = 0;
2  do {console.log(number)
3      number += 1;}
4  while (number <= 10)
```

```
0
1
2
3
4
5
6
7
8
9
10
```

Example 2: Doing the same with number initialized to 20

```
1  var number = 20;
2  do {console.log(number)
3      number += 1;}
4  while (number <= 10)
```

```
20
```

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Project 1

- Create an array with random number from 0 ~ 100.
- Print the numbers on the console which are greater than 50.

```
[
  99.9073504536627,
  41.31823726145172,
  72.04619862412707,
  75.8761176621472,
  60.095153916670554,
  67.68031076844909,
  63.641364428822115,
  7.421709472161098,
  16.326589595785034,
  49.118891663008,
  0.322453149099422
]
99.9073504536627
72.04619862412707
75.8761176621472
60.095153916670554
67.68031076844909
63.641364428822115
```

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for loops

for loops are used to repeat the execution of code for set number of intervals.
Check the expression of for loops below:

```
1   for (//initialize variable; condition; statement;)
2       {
3           //code to execute
4       }
```

The for loop below will print the number from 0 to 10 on the console

```
1   for (var number = 0; number <= 10; number++)
2       {
3           console.log(number);
4       }
```

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for loops

Example 1: Creating an array of 50 elements with only even numbers

```
1   var arr = [];
2   for (var number = 0; number <= 50; number += 2)
3       {
4           arr.push(number);
5       }
6   console.log(arr);
```

```
[
   0,  2,  4,  6,  8, 10, 12, 14,
  16, 18, 20, 22, 24, 26, 28, 30,
  32, 34, 36, 38, 40, 42, 44, 46,
  48, 50
]
```

Example 2: Can you create a pattern like the one shown in the console using for loop?

```
*
**
***
****
*****
```

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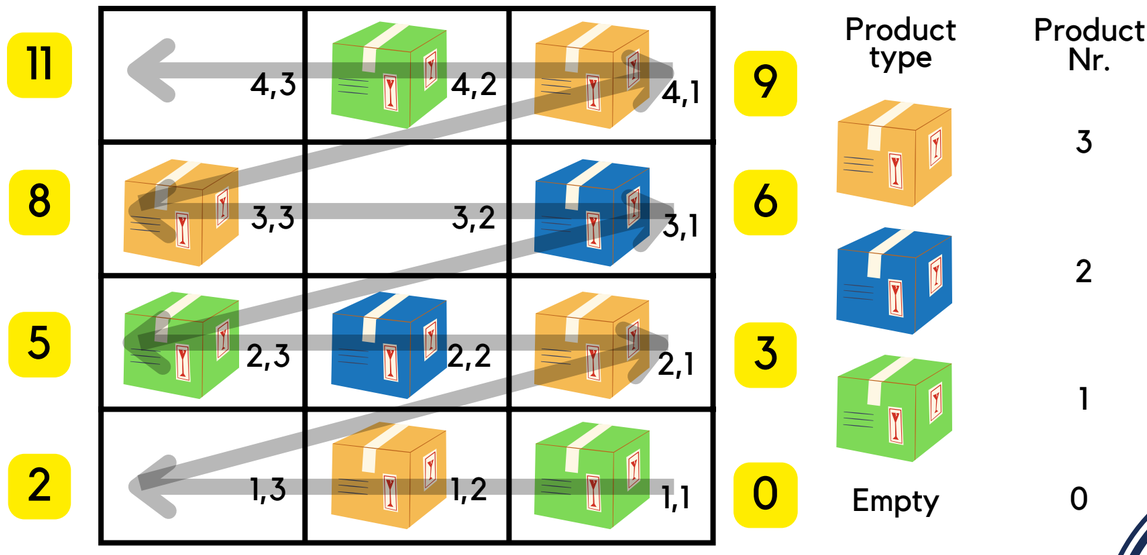
Project 2

- Initialize an array of 12 elements with a **random number** (0~3) such that every number represents the product type
- Using FOR loop, **count the each product type and empty location** in the rack

```
[
  2, 1, 0, 2, 0,
  1, 2, 0, 1, 0,
  0, 2
]
Total empty locations: 5
Total Green boxes: 3
Total blue boxes: 4
Total brown boxes: 0
```



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JS

Node-RED

break

break can be used to control the flow of the conditional loops

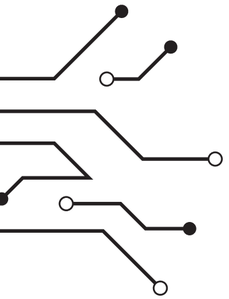
break

break will stop the loop and move to the code below the loop

Example 1: Find location of 0 in the random array of 10 elements with value from 0 ~ 3

```
[
  1, 1, 1, 1, 1, 0,
  2, 1, 1, 2, 2, 1,
  2
]
Found 0 at location: 5
```

```
1   var arr = [];
2
3   for (var i = 0; i <= 12; i++)
4       {
5           arr.push(Math.floor(Math.random()*3));
6       }
7   console.log(arr);
8
9   for (var i = 0; i <= 12; i++) {
10      if(arr[i] == 0)
11      {
12          console.log('Found 0 at location: ' + i)
13          break;
14      }
15  }
```



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continue

continue will stop the current iteration move back to the top of the loop

Example 1: Print the number from 0 to 10 but skip the number 5

```
1   for (let i = 1; i <= 10; i++) {
2       if (i === 5) {
3           // Skip printing number 5
4           continue;
5       }
6       console.log(i);
7   }
```

```
1
2
3
4
6
7
8
9
10
```

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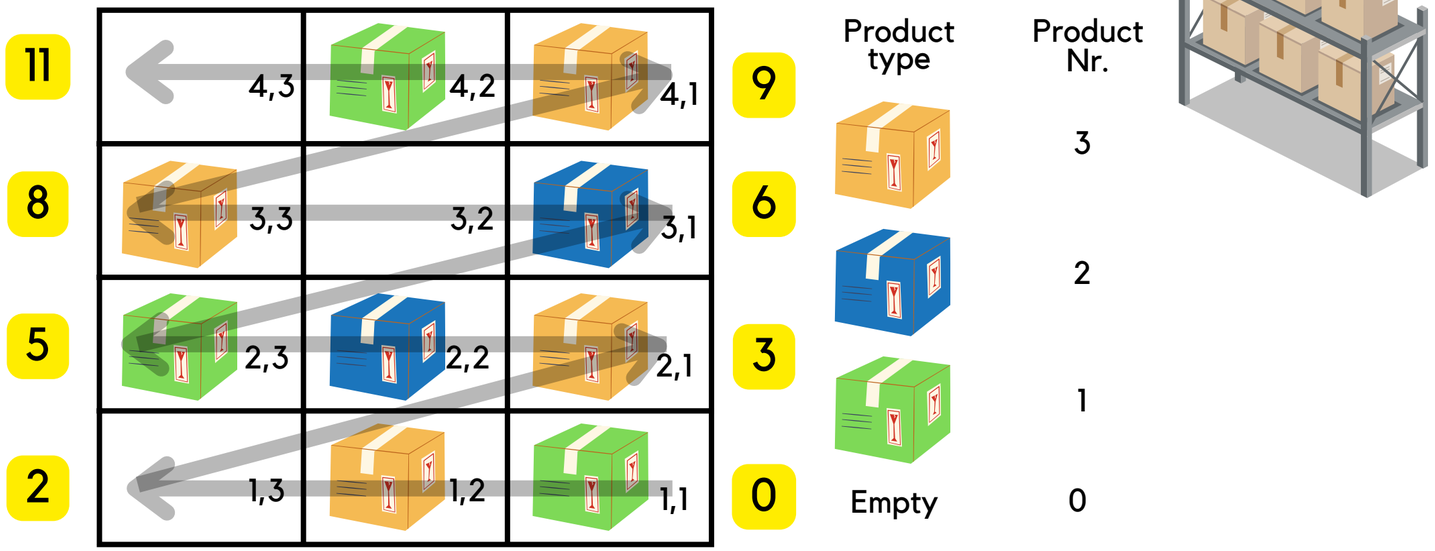
Project 3

Continue with Project 2 and use break or continue to achieve the following:

- Find the **next empty location**
- Find the nearest box location for Brown, Blue and Green

```
[
  1, 2, 2, 2, 2,
  1, 0, 2, 1, 1,
  1, 2
]
Total empty locations: 1
Total Green boxes: 5
Total blue boxes: 6
Total brown boxes: 0
Next empty location is: 6
Nearest Green box location is: 0
Nearest Blue box location is: 1
```



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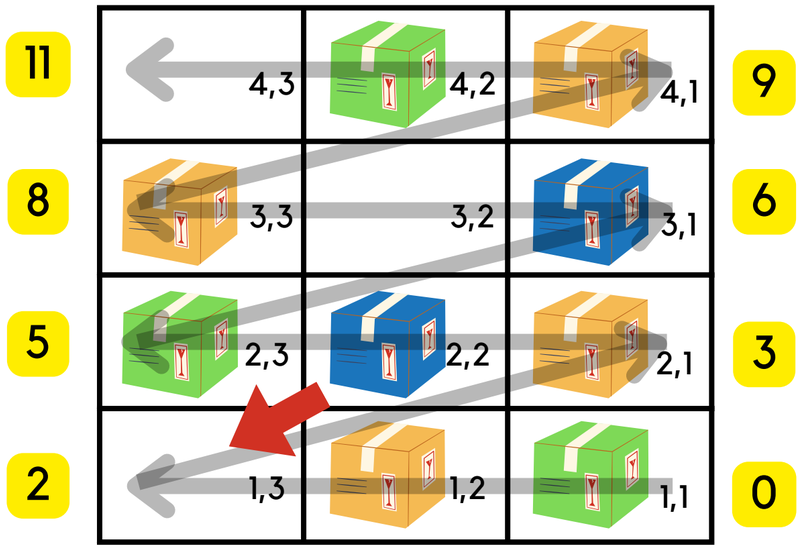
Project 4

Integrate the logic to do the following:

- Take the blue box stored at the nearest location and store in the next empty location

```
[
  0, 0, 0, 0, 0,
  0, 0, 2, 0, 1,
  0, 1
]
Next empty location is: 0
Nearest Blue box location is: 7
[
  2, 0, 0, 0, 0,
  0, 0, 0, 0, 1,
  0, 1
]
```



Product type	Product Nr.
	3
	2
	1
Empty	0

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for of loop

This loop is specially to **iterate over the elements of the array.** It cannot be used to change the value of the array element unlike for loop that we used before. We need to assign a temp variable.

The advantage of this loop is that we cannot accidently get stuck in infinite loop to skip values

Example 1: Iteration over an Array

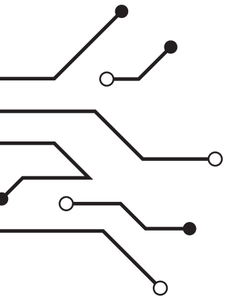
```
1   const numbers = [1, 2, 3, 4, 5];
2
3   for (const number of numbers) {
4       console.log(number);
5   }
```

```
1
2
3
4
5
```

Example 2: Iteration over a String

```
 8   const text = "Hello";
 9
10   for (const char of text) {
11       console.log(char);
12   }
```

```
H
e
l
l
o
```



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Loops and objects

Just like array we can also loop over the properties of the object. This can be down using **for in** loop similar to **for of** loop

for in loop

Example 1: Printing keys of the object

```
1   var company = {
2       name: 'Code and Compile',
3       founder: 'Rajvir Singh',
4       yearOfEstablishment: 2018
5   };
6
7   for(var temp in company)
8       {
9           console.log(temp);
10      }
```

```
name
founder
yearOfEstablishment
```

Example 2: Printing properties of the object

```
1   var company = {
2       name: 'Code and Compile',
3       founder: 'Rajvir Singh',
4       yearOfEstablishment: 2018
5   };
6
7   for(var temp in company)
8       {
9           console.log(company[temp]);
10      }
```

```
Code and Compile
Rajvir Singh
2018
```

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Practice exercises

Exercise 3: Use a for...in loop to print all its properties and their values

```
1   var company = {
2       name: 'Code and Compile',
3       founder: 'Rajvir Singh',
4       yearOfEstablishment: 2018
5   };
6
7   for (var temp in company) {
8       console.log(temp + ': ' + company[temp]);
9       //console.log(`${temp}: ${company[temp]}`);
10  }
```

```
name: Code and Compile
founder: Rajvir Singh
yearOfEstablishment: 2018
```

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Practice exercises

Exercise 4: Create an object with numeric properties. Calculate the sum of all the values using a for...in loop.

```
1   var courses = {
2       nodered: 49,
3       opcua: 39,
4       mysql: 49,
5       mqtt: 49,
6   };
7
8   var sum = 0;
9   for (var key in courses) {
10      sum += courses[key];
11  }
12
13  console.log('Total of all courses value: ' + sum + '€');
```

```
Total of all courses value: 186€
```

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Practice exercises

Exercise 5: Create an object and use a for...in loop to filter out properties with only 'number' values.

```
1   var company = {
2       name: 'Code and Compile',
3       founder: 'Rajvir Singh',
4       yearOfEstablishment: '2018',
5       nodered: 49,
6       opcua: 39,
7       mysql: 49,
8       mqtt: 49,
9   };
10
11  var sum = 0;
12  for (var key in company)
13   {
14      if (typeof company[key] === 'number') {
15          console.log(key + ': ' + company[key]);
16          sum += company[key];
17      }
18  }
19  console.log('Total of all courses value: ' + sum + '€');
```

```
nodered: 49
opcua: 39
mysql: 49
mqtt: 49
Total of all courses value: 186€
```

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Converting Objects to Arrays

We can loop on objects, as soon we convert that to array. This can be done in the following ways:

Converting keys of the object to an array

```
1   var company = {
2       name: 'Code and Compile',
3       founder: 'Rajvir Singh',
4       yearOfEstablishment: '2018',
5       nodered: 49,
6       opcua: 39,
7       mysql: 49,
8       mqtt: 49,
9   };
10  var arr = Object.keys(company);
11  console.log(arr);
```

```
[
  'name',
  'founder',
  'yearOfEstablishment',
  'nodered',
  'opcua',
  'mysql',
  'mqtt'
]
```

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Converting Objects to Arrays

Converting **the value** of the object to **an array**

```
1   var company = {
2       name: 'Code and Compile',
3       founder: 'Rajvir Singh',
4       yearOfEstablishment: '2018',
5       nodered: 49,
6       opcua: 39,
7       mysql: 49,
8       mqtt: 49,
9   };
10  var arr = Object.values(company);
11  console.log(arr);
```

```
[ 'Code and Compile', 'Rajvir Singh', '2018', 49, 39, 49, 49 ]
```

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Converting Objects to Arrays

Converting key-value entries to an array (with two elements - keys and values)

```
1   var company = {
2       name: 'Code and Compile',
3       founder: 'Rajvir Singh',
4       yearOfEstablishment: '2018',
5       nodered: 49,
6       opcua: 39,
7       mysql: 49,
8       mqtt: 49,
9   };
10  var arr = Object.entries(company);
11  console.log(arr);
12  for (var [key, value] of arr)
13  {
14      console.log(key + ': ' + value)
15  }
```

```
[
  [ 'name', 'Code and Compile' ],
  [ 'founder', 'Rajvir Singh' ],
  [ 'yearOfEstablishment', '2018' ],
  [ 'nodered', 49 ],
  [ 'opcua', 39 ],
  [ 'mysql', 49 ],
  [ 'mqtt', 49 ]
]
```

```
name: Code and Compile
founder: Rajvir Singh
yearOfEstablishment: 2018
nodered: 49
opcua: 39
mysql: 49
mqtt: 49
```

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Nested loop

Nested loops in programming refer to the situation where **you use one loop inside another loop**. This means that **for each iteration of the outer loop, the inner loop will complete all its iterations.**

Nested loops are often used when dealing with **multidimensional data structures** like **matrices or nested arrays.**

```
[
  [ 'name', 'Code and Compile' ],
  [ 'founder', 'Rajvir Singh' ],
  [ 'yearOfEstablishment', '2018' ],
  [ 'nodered', 49 ],
  [ 'opcua', 39 ],
  [ 'mysql', 49 ],
  [ 'mqtt', 49 ]
]
```

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Practice exercises

Exercise 1: Print the keys of this multi-dimensional array

```
[
  [ 'name', 'Code and Compile' ],
  [ 'founder', 'Rajvir Singh' ],
  [ 'yearOfEstablishment', '2018' ],
  [ 'nodered', 49 ],
  [ 'opcua', 39 ],
  [ 'mysql', 49 ],
  [ 'mqtt', 49 ]
]
```

```
var company = {
    name: 'Code and Compile',
    founder: 'Rajvir Singh',
    yearOfEstablishment: '2018',
    nodered: 49,
    opcua: 39,
    mysql: 49,
    mqtt: 49,
};
//multidimentional array
var arr = Object.entries(company);
for (var i = 0; i < arr.length; i++)
    {
        for (var j = 0; j < arr[i].length - 1; j++)
        {
            console.log(arr[i][j]);
        }
    }
```

```
name
founder
yearOfEstablishment
nodered
opcua
mysql
mqtt
```

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Practice exercises

Exercise 2: Print the value of this multi-dimensional array

```
[
  [ 'name', 'Code and Compile' ],
  [ 'founder', 'Rajvir Singh' ],
  [ 'yearOfEstablishment', '2018' ],
  [ 'nodered', 49 ],
  [ 'opcua', 39 ],
  [ 'mysql', 49 ],
  [ 'mqtt', 49 ]
]
```

```
1   var company = {
2       name: 'Code and Compile',
3       founder: 'Rajvir Singh',
4       yearOfEstablishment: '2018',
5       nodered: 49,
6       opcua: 39,
7       mysql: 49,
8       mqtt: 49,
9   };
10  //multidimentional array
11  var arr = Object.entries(company);
12  for (var i = 0; i < arr.length; i++)
13      {
14          for (var j = 1; j < arr[i].length; j++)
15          {
16              console.log(arr[i][j]);
17          }
18      }
```

```
Code and Compile
Rajvir Singh
2018
49
39
49
49
```

Code </> Compile
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Practice exercises

Exercise 3: Find the course which costs 39€

```
[
  [ 'name', 'Code and Compile' ],
  [ 'founder', 'Rajvir Singh' ],
  [ 'yearOfEstablishment', '2018' ],
  [ 'nodered', 49 ],
  [ 'opcua', 39 ],
  [ 'mysql', 49 ],
  [ 'mqtt', 49 ]
]
```

```
1  var company = {
2      name: 'Code and Compile',
3      founder: 'Rajvir Singh',
4      yearOfEstablishment: '2018',
5      nodered: 49,
6      opcua: 39,
7      mysql: 49,
8      mqtt: 49,
9  };
10 //multidimentional array
11 var arr = Object.entries(company);
12 for (var i = 0; i < arr.length; i++)
13     {
14         for (var j = 1; j < arr[i].length; j++)
15         {
16             if (arr[i][j] === 39)
17             {
18                 console.log('The course ' + arr[i][j-1] + ' cost 39€')
19                 break;
20             }
21         }
22     }
```

```
The course opcua cost 39€
```

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Practice exercises

Exercise 4: Find the courses which cost 49€

```
[
  [ 'name', 'Code and Compile' ],
  [ 'founder', 'Rajvir Singh' ],
  [ 'yearOfEstablishment', '2018' ],
  [ 'nodered', 49 ],
  [ 'opcua', 39 ],
  [ 'mysql', 49 ],
  [ 'mqtt', 49 ]
]
```

```
1  var company = {
2      name: 'Code and Compile',
3      founder: 'Rajvir Singh',
4      yearOfEstablishment: '2018',
5      nodered: 49,
6      opcua: 39,
7      mysql: 49,
8      mqtt: 49,
9  };
10 //multidimentional array
11 var arr = Object.entries(company);
12 var arr2 = [];
13 for (var i = 0; i < arr.length; i++)
14     {
15         for (var j = 1; j < arr[i].length; j++)
16         {
17             if (arr[i][j] === 49)
18             {
19                 arr2.push(arr[i][j-1]);
20             }
21         }
22     }
23 console.log('The course that cost 49€ are ' + arr2);
```

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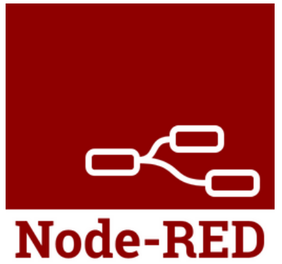

Thank you!

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