Lesson- loops

(Test out snippets of code below to better understand:
https://www.programiz.com/javascript/online-compiler/)

For loops:

The `for` statement creates a loop with 3 optional expressions:

```
for (_expression 1_; _expression 2_; _expression 3_) {
  // _code block to be executed_
}
```

Expression 1 is executed (one time) before the execution of the code block.
`ie.) let i = 0`
Expression 2 defines the condition for executing the code block.
`ie.) i < 10`
Expression 3 is executed (every time) after the code block has been executed.
`ie.) i++`

`example:`

```
  // let i = 0 -> means we start at index 0 of loop
  // i < 5 -> means that if i = 5, we stop the loop.
  // i++ -> means that for each loop we increase i by 1
for (let i = 0; i < 5; i++) {
  console.log("The number is " + i);
}
```

While loops:
The `while` loop loops through a block of code as long as a specified condition is true.

```
while (_condition_) {
  // code block to be executed as long as condition is true
}
```

`example:`

```
let i = 0
while (i < 10) {
  console.log("The number is " + i);
  // unlike for-loop, in while loop you have to update the condition inside the
loop
  // in this case, i increase i by 1
  i++;
}
// this will print 0 to 9.
```

Examples:

1.) create a for loop that prints 10 to 1:

```
// this loop starts at index i = 10
// i >= 1 means as long as i is greater than 0, then keep looping
// i-- means that we keep decreasing number by 1 for each loop
for(let i = 10; i > 0; i--){
        console.log(i)
}
```

2.) create a while loop that prints 10 to 1:

```
// when using while loop, initiate index/condition outside the loop
let i = 10
// this while loop will continue looping as long as i is greater than 0
while(i > 0){
        console.log(i)
        // in while loop you have to update condition inside loop.
        // in this case i is decreasing by 1 for each loop.
        i--
}
```

3.) create a function to print out each number in an array * 2:

example: if input = [1,2,3,4] ->

`expected output:`

`2`

`4`

`6`

`8`

```
// function called printNumbers
// arr is an array of numbers passed in as parameter.
```

```
// goal of this function is to print each number in arr * 2
function printNumbers(arr){
    // create a for-loop to loop through arr:
    // let i = 0 -> means we start at index 0 of loop
    // i < arr.length -> means that if i = length of arr, we stop the loop.
    // i++ -> means that for each loop we increase i by 1
        for(let i = 0; i < arr.length; i++){
                // print numbers using console.log
                console.log(arr[i] * 2)
        }
        // no return needed as it wasn't requested
}
// create an array: nums to test out the function
const nums = [1,2,3,4,5,6,7]
printNumbers(nums)
```

4.) create a function that takes in array of numbers, and return array of only the even numbers.
`example: if input =` [1,2,3,4,5,6,7,8,9,12] `-> expected output:` [2,4,6,8,12]

```
// function called evenNumbersOnly.
// The goal of function is to return an array of even numbers only
// arr is an array of numbers passed in as parameter, from which we look for even
nums
function evenNumbersOnly(arr){
        // initialize new array that will store even numbers
        let evenNums = []
    // create a for-loop to loop through arr:
    // let i = 0 -> means we start at index 0 of loop
    // i < arr.length -> means that if i = arr.length, we stop the loop.
    // i++ -> means that for each loop we increase i by 1
    for(let i = 0; i < arr.length; i++){
            // check each number of arr at index i if it's even number:
            if(arr[i] % 2 === 0){
                    // use push to store number arr[i] into evenNumbers if its even
                    evenNums.push(arr[i])
            }
    }
    // return evenNumbers as result. it should only contain even numbers
    return evenNumbers
}
// create an array: nums to test out the function
const nums = [1,2,3,4,5,6,7,8,9]
// print out the result of evenNumbersOnly by passing nums as parameter
// it should print out an array of even numbers
console.log(evenNumbersOnly(nums));
```

5.) create a function that takes an array of numbers and prints each number * 3:

```
function printNums(arr){
        for(let i = 0; i < arr.length; i++){
                console.log(arr[i] * 3)
        }
}
```

6.) create a function to calculate average of numbers in array:
`explanation: avg = sum(numbers in array) / length of array`
ex. [1,2,3,4,5] `-> expected output = (1+2+3+4+5) / 5 = 15 / 5 = 3`

```
function calculateAvg(arr){
        let sumOfNums = 0
        for(let i = 0; i < arr.length; i++){
                sumOfNums += arr[i]
        }
        let averageOfNums = sumOfNums / arr.length
        return averageOfNums
}
let nums = [1,2,3,4,5]
console.log(calculateAvg(nums))
```

exercises:

use examples above or google or ask me if you need help:

For everyone:

1.) create a function, that takes in an array of numbers as a parameter, and return a new array of each number * itself.
example: if [1,2,3,4] -> expected output: [1,4,9,16]
explanation: 1*1 = 1, 2*2 = 4, 3*3 = 9, 4*4 = 16

2.) create a function that takes in an array of numbers, and adds all values in the array and return the value:
`example: if` [1,2,3,4] `-> expected output: 10`
`explanation: 1 + 2 + 3 + 4 = 10`

3.) create a function that takes in an array of numbers, and returns the maximum value in the array:
`example: if` [9,15,2,7,-4] `-> expected output: 15`
`explanation: 15 is the largest number in the array`

4.) create a function that takes in an array of numbers, and counts the number of even numbers and odd numbers in an array. Store them both in a new array and return it.
`example: if` [1,2,3,4,5,7,9,11] `-> exepected output:` [2, 6]
`explanation: # of even numbers: 2,4 = 2, # of odd numbers: 1,3,5,7,9,11 = 6 ->so result of function is` [`#even` , `#odd`] -> [2, 6]

5.) create a function that takes in an array and reverses the array and return it:
`example:`
[1,2,3,4,5] `-> expected output =` [5,4,3,2,1];
['h','e','l','l','o'] `-> expected output =` ['o','l','l','e','h']

6.) create a function that takes in an array returns true if you find a duplicate value. if no duplicate value is found return false:
example:
[1,2,3,4,5] -> expected output = false
['a', 'b', 'c', 'a'] -> expected output = true

7.) create a function: findNumsInBoth(arr1, arr2) that takes in two arrays arr1 and arr2, and returns an array of numbers found in both arrays:
`example: arr1 =` [1,2,3,4,5] `, arr2 =` [7,3,10,9,5,17] `-> expected output =` [3, 5]
explanation: both 3 and 5 are found in arr1 and arr2

Advanced:

8.) create a function that takes in a string, and returns true if its a palindrome:
a palindrome is a word or sentence that you spell forward or backward and is the same.
`example: hannah -> expected output = true`
`explanation: hannah is spelled the same forward and reverse.`
`example: amanaplanacanalpanama -> expected output = true`
`example: banana -> expected output = false`

9.) create a function that takes in a number n, and return an array of arrays like this:
example: `if n = 5 -> expected output: [[1], [2, 2], [3, 3, 3], [4, 4, 4, 4], [5,5,5,5,5]]`

10.) create a function that takes in an array of numbers and returns an array of only the duplicate values:
`example: if` [1,2,3,4,7,3,9,2,9] `-> expected output:` [2, 3, 9]

11.) create a function to find second smallest number in array and return it.
example: if [1,2,3,4,5] -> expected output: `2`