+Parameters

We can pass arbitrary data to function using parameters (also called *function arguments*) .

In the example below, the function has two parameters: from and text.

```
function showMessage(from, text) { // arguments: from, text
  alert(from + ': ' + text);
}

showMessage('Ann', 'Hello!'); // Ann: Hello! (*)
showMessage('Ann', "What's up?"); // Ann: What's up? (**)
```

When the function is called in lines (*) and (**), the given values are copied to local variables from and next. Then the function uses them.

Here's one more example: we have a variable from and pass it to the function. Please note: the function changes from, but the change is not seen outside, because a function always gets a copy of the value:

```
function showMessage(from, text) {

  from = '*' + from + '*'; // make "from" look nicer

  alert( from + ': ' + text );
}

let from = "Ann";

showMessage(from, "Hello"); // *Ann*: Hello

// the value of "from" is the same, the function modified a local copy
alert( from ); // Ann
```

Default values

If a parameter is not provided, then its value becomes undefined.

For instance, the aforementioned function showMessage(from, text) can be called with a single argument:

```
showMessage("Ann");
```

That's not an error. Such call would output "Ann: undefined". There's no text, so it's assumed that text === undefined.

If we want to use a "default" text in this case, then we can specify it after =:

```
function showMessage(from, text = "no text given") {
  alert( from + ": " + text );
}

showMessage("Ann"); // Ann: no text given
```

Now if the text parameter is not passed, it will get the value "no text given"

Returning a value

A function can return a value back into the calling code as the result.

The simplest example would be a function that sums two values:

```
function sum(a, b) {
  return a + b;
}

let result = sum(1, 2);
alert( result ); // 3
```

The directive `return` can be in any place of the function. When the execution reaches it, the function stops, and the value is returned to the calling code (assigned to `result` above).

There may be many occurences of `return` in a single function. For instance:

```
function checkAge(age) {
  if (age > 18) {
    return true;
  } else {
    return confirm('Got a permission from the parents?');
  }
}

let age = prompt('How old are you?', 18);

if ( checkAge(age) ) {
  alert( 'Access granted' );
} else {
  alert( 'Access denied' );
}
```

It is possible to use `return` without a value. That causes the function to exit immediately.

For example:

```
function showMovie(age) {
  if ( !checkAge(age) ) {
    return;
  }

  alert( "Showing you the movie" ); // (*)
  // ...
}
```

In the code above, if `checkAge(age)` returns `false`, then `showMovie` won't proceed to the `alert`.

Never add a newline between `return` and the value

For a long expression in `return`, it might be tempting to put it on a separate line, like this:

```
return
 (some + long + expression + or + whatever * f(a) + f(b))
```

That doesn't work, because JavaScript assumes a semicolon after `return`. That'll work the same as:

```
       return;
 (some + long + expression + or + whatever * f(a) + f(b))
```

So, it effectively becomes an empty return. We should put the value on the same line instead.

Naming a function

Functions are actions. So their name is usually a verb. It should briefly, but as accurately as possible describe what the function does. So that a person who reads the code gets the right clue.

It is a widespread practice to start a function with a verbal prefix which vaguely describes the action. There must be an agreement within the team on the meaning of the prefixes.

For instance, functions that start with `"show"` – usually show something.

Function starting with…

- `"get…"` – return a value,
- `"calc…"` – calculate something,
- `"create…"` – create something,
- `"check…"` – check something and return a boolean, etc.

Examples of such names:

```
showMessage(..)     // shows a message
getAge(..)          // returns the age (gets it somehow)
calcSum(..)         // calculates a sum and returns the result
createForm(..)      // creates a form (and usually returns it)
checkPermission(..) // checks a permission, returns true/false
```

With prefixes at place, a glance at a function name gives an understanding what kind of work it does and what kind of value it returns.

One function – one action

A function should do exactly what is suggested by its name, no more.

Two independant actions usually deserve two functions, even if they are usually called together (in that case we can make a 3rd function that calls those two).

Few examples of breaking this rule:

- `getAge` – would be bad if it shows an `alert` with the age (should only get).
- `createForm` – would be bad if it modifies the document, adding a form to it (should only create it and return).

- `checkPermission` – would be bad if displays the `access granted/denied` message (should only perform the check and return the result).

These examples assume common meanings of prefixes. What they mean for you is determined by you and your team. Maybe it's pretty normal for your code to behave differently. But you should have a firm understanding of what a prefix means, what a prefixed function can and what it cannot do. All same-prefixed functions should obey the rules. And the team should share the knowledge.

Functions == Comments

Functions should be short and do exactly one thing. If that thing is big, maybe it's worth to split the function into few smaller functions. Sometimes following this rule may not be that easy, but it's a definitely good thing.

A separate function is not only easier to test and debug – its very existence is a great comment!

For instance, compare the two functions `showPrimes(n)` below. Each one outputs prime numbers up to `n`.

The first variant uses a label:

```
function showPrimes(n) {
  nextPrime: for (let i = 2; i < n; i++) {

    for (let j = 2; j < i; j++) {
      if (i % j == 0) continue nextPrime;
    }

    alert( i ); // a prime
  }
}
```

The second variant uses an additional function `isPrime(n)` to test for primality:

```
function showPrimes(n) {

  for (let i = 2; i < n; i++) {
    if (!isPrime(i)) continue;

    alert(i);  // a prime
  }
}
function isPrime(n) {
  for (let i = 2; i < n; i++) {
    if ( n % i == 0) return false;
  }
  return true;
}
```

The second variant is easier to understand isn't it? Instead of the code piece we see a name of the action (`isPrime`). Sometimes people refer to such code as *self-describing*.

So, functions can be created even if we don't intend to reuse them. They structure the code and make it readable.

Summary

A function declaration looks like this:

```
function name(parameters, delimited, by, comma) {
  /* code */
}
```

- Values passed to function as parameters are copied to its local variables.
- A function may access outer variables. But it works only from inside out. The code outside of the function doesn't see its local variables.
- A function can return a value. If it doesn't then its result is `undefined`.

To make the code clean and easy to understand, it's recommended to use mainly local variables and parameters in the function, not outer variables.

It is always easier to understand a function which gets parameters, works with them and returns a result than a function which gets no parameters, but modifies outer variables as a side-effect.

Function naming:

- A name should clearly describe what the function does. When we see a function call in the code, a good name instantly gives us an understanding what it does and returns.
- A function is an action, so function names are usually verbal.
- There exist many well-known function prefixes like `create…`, `show…`, `get…`, `check…` and so on. Use them to hint what a function does.

Functions are the main building blocks of scripts. Now we covered the basics, so we actually can start creating and using them. But that's only the beginning of the path. We are going to return to them many times, going more deeply in their advanced features.

Questions and Exercises

1. Write a function `min(a,b)` which returns the least of two numbers `a` and `b`.

For instance:

```
min(2, 5) == 2
min(3, -1) == -1
min(1, 1) == 1

function min(number1,number2)

{

        if(number1<number2)

        {return number1;}

        else if(number2<number1)

        {return number2;}

        else

        {return number1;}

}
```

2. Write a function `pow(x,n)` that returns `x` in power `n`. Or, in other words, multiplies `x` by itself `n` times and returns the result.

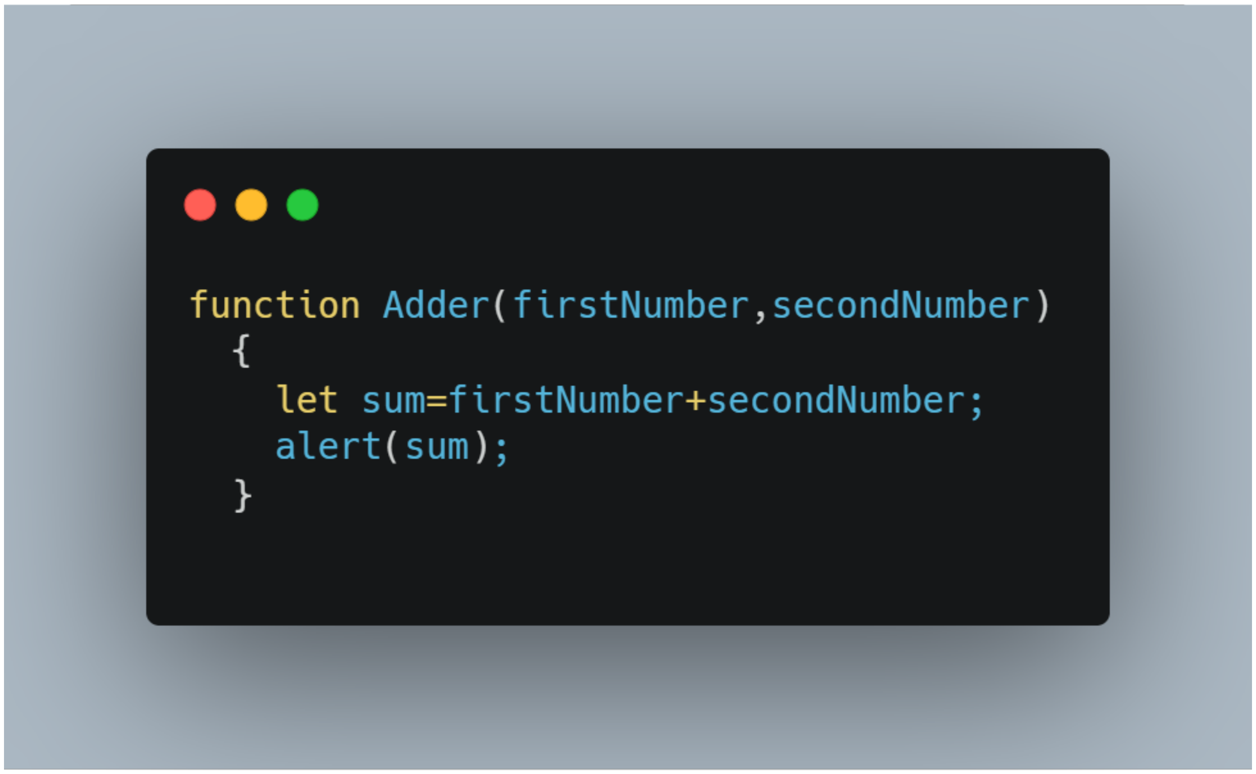
```
pow(3, 2) = 3 * 3 = 9
pow(3, 3) = 3 * 3 * 3 = 27
pow(1, 100) = 1 * 1 * ...*1 = 1
```

```
function pow(base,exponent)
{
        let answer=base**exponent;
        return answer;
}
```

Create a web-page that prompts for `x` and `n`, and then shows the result of `pow(x,n)`.

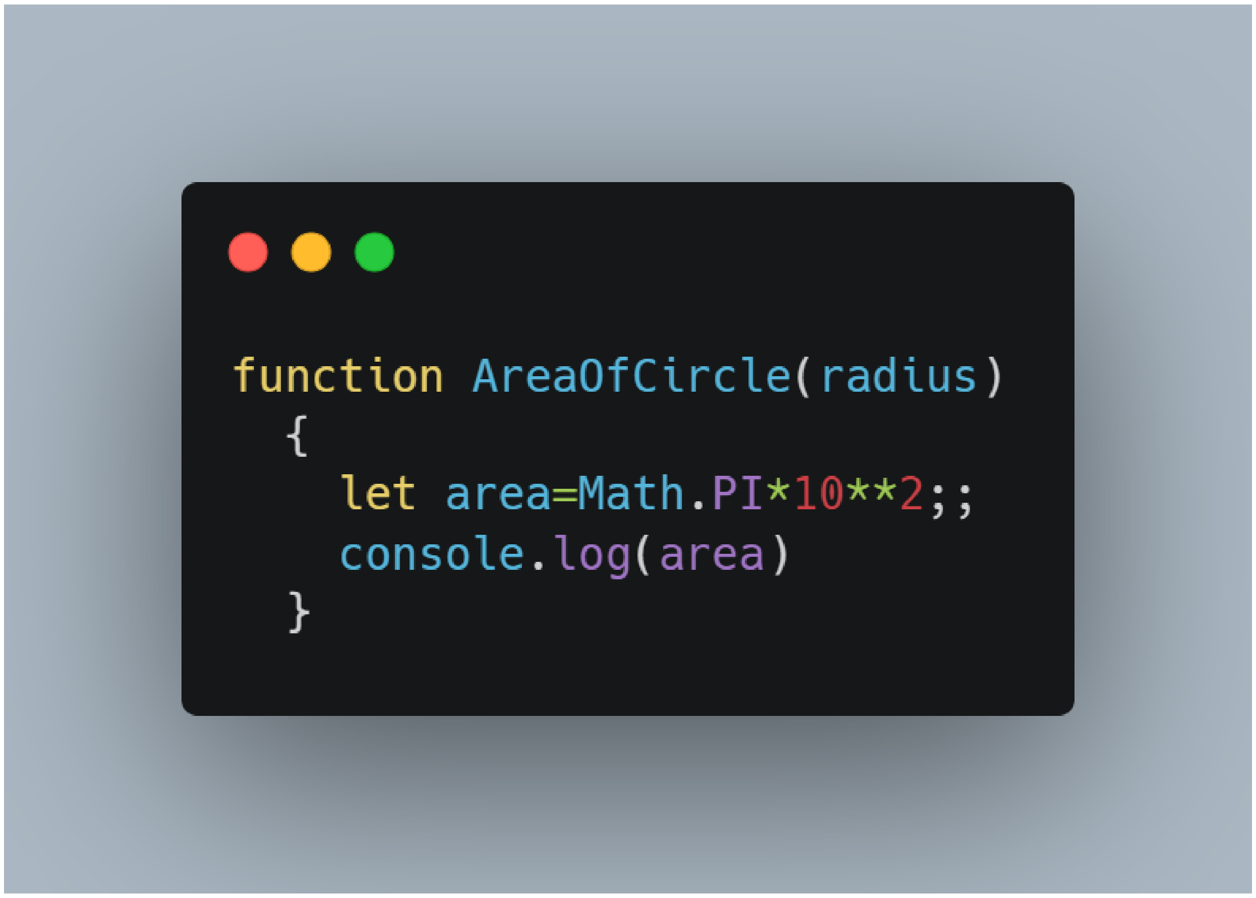
3. Create the following list of functions (make a program to test each of them out).

Adder(5,4)this procedure takes two *integers*, adds them together and displays the result in an alert box. Ask the user for the two numbers before using the function.



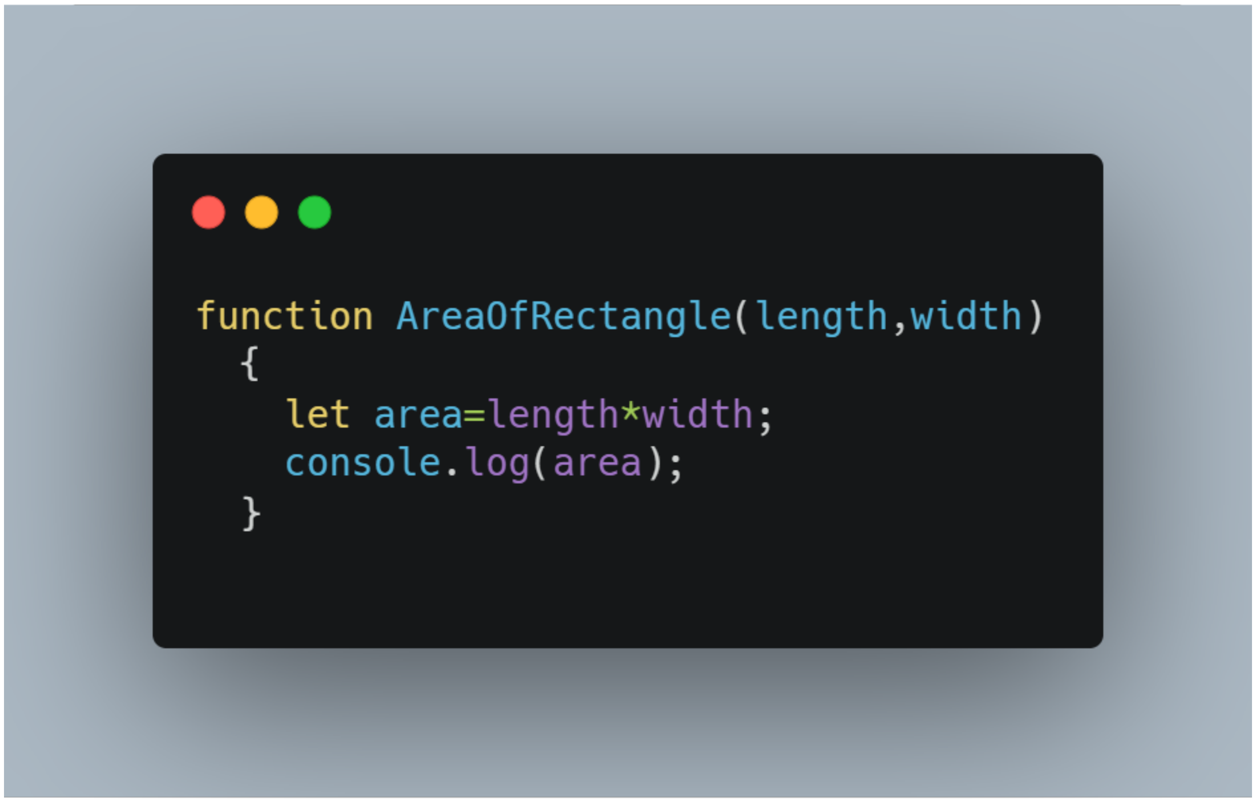
```
function Adder(firstNumber,secondNumber)
  {
    let sum=firstNumber+secondNumber;
    alert(sum);
  }
```

AreaOfCircle(10)takes one *single* number that represents the radius of a circle and displays the circle's total area in the console window. Ask the user for the radius before using the function.



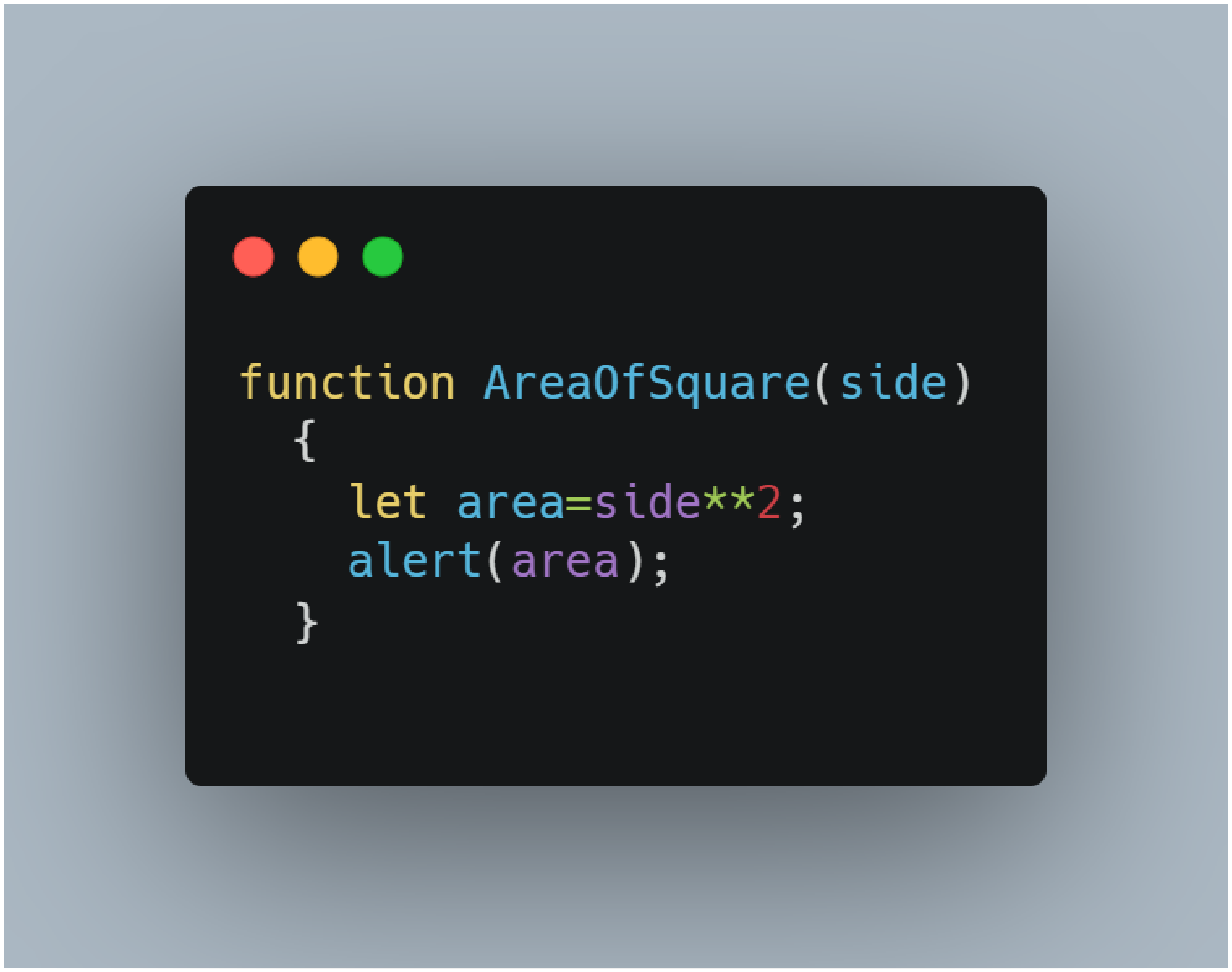
```
function AreaOfCircle(radius)
  {
    let area=Math.PI*10**2;;
    console.log(area)
  }
```

AreaOfRectangle(8,9)takes two *single* numbers that represent the length and width of a rectangle and displays its area in a console window. Ask the user for the two numbers before using the function.



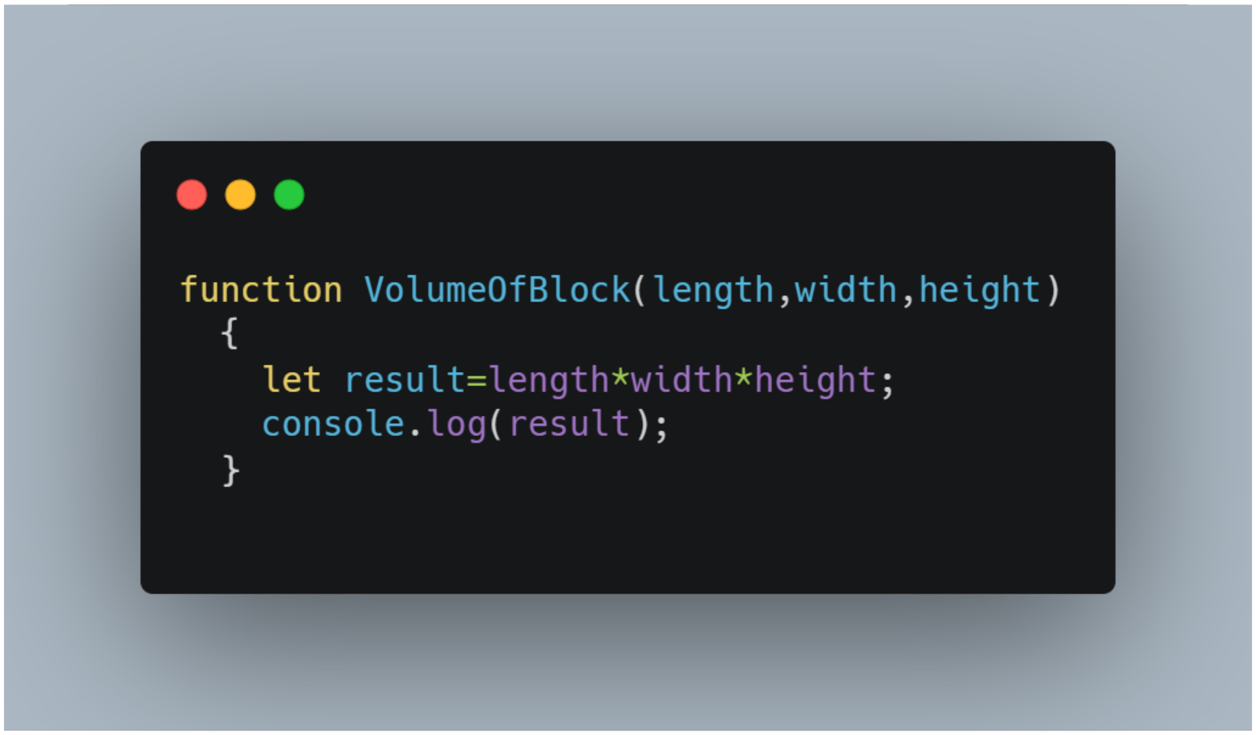
```
function AreaOfRectangle(length,width)
  {
    let area=length*width;
    console.log(area);
  }
```

AreaOfSquare(10)takes a single *integer* number that represents the length of one side of a square and calculates its area and displays the result in an alert box. Ask the user for the numbers before using the function.



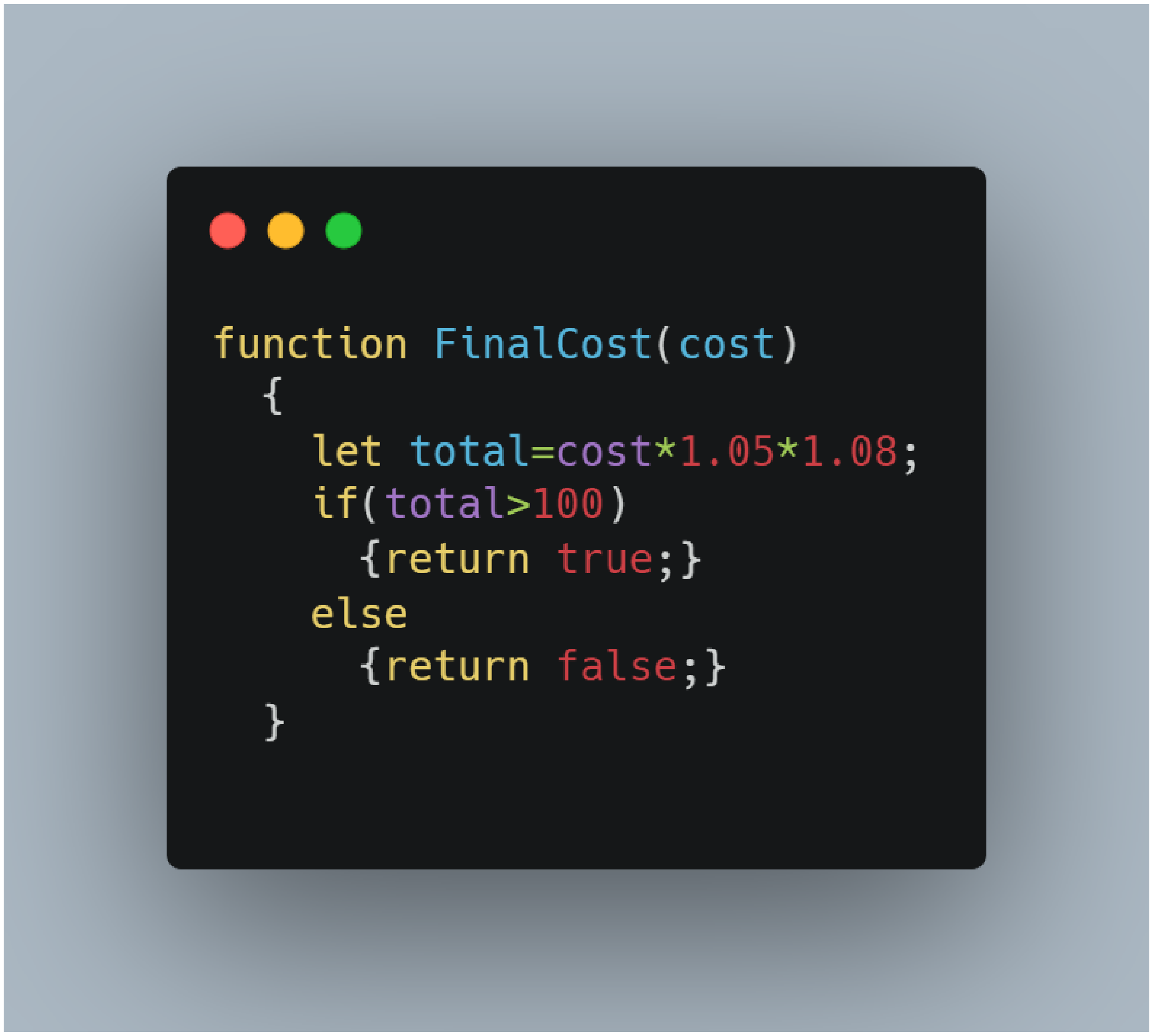
```
function AreaOfSquare(side)
  {
    let area=side**2;
    alert(area);
  }
```

VolumeOfBlock(4,5,7)takes three *single* numbers that represents the length, width and height of a 3D block and returns its volume. Use the returned value to display the volume in the console window. Ask the user for the three numbers before using the function.



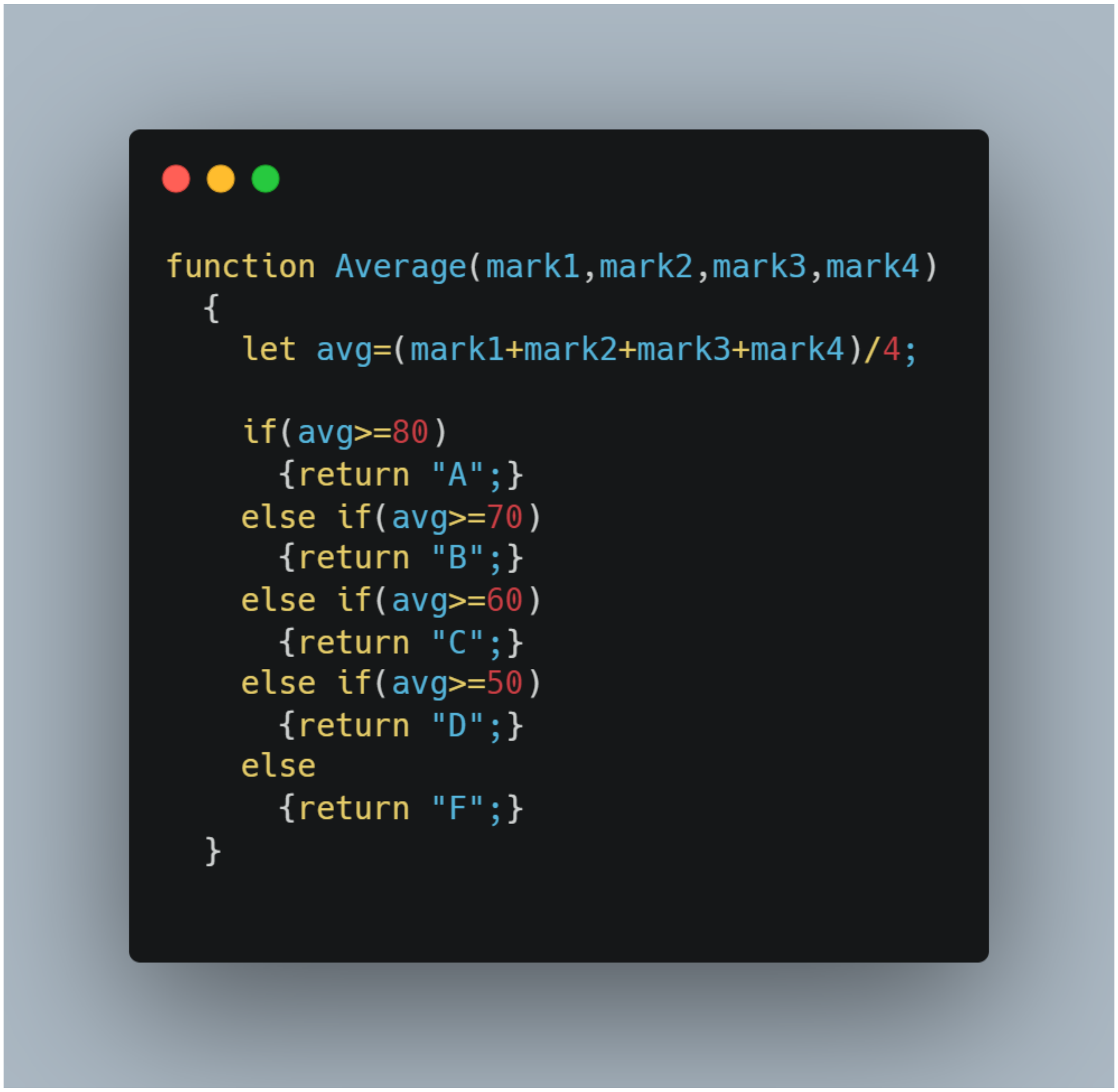
```
function VolumeOfBlock(length,width,height)
  {
    let result=length*width*height;
    console.log(result);
  }
```

FinalCost(4.59)takes the cost of an item as a *single* number, adds the GST and PST to it and then returns true if the final cost is over or under a $100.00. Use the returned value to tell a customer if they've spent over $100.00. Ask the user for the initial cost before using the function.



```
function FinalCost(cost)
  {
    let total=cost*1.05*1.08;
    if(total>100)
      {return true;}
    else
      {return false;}
  }
```

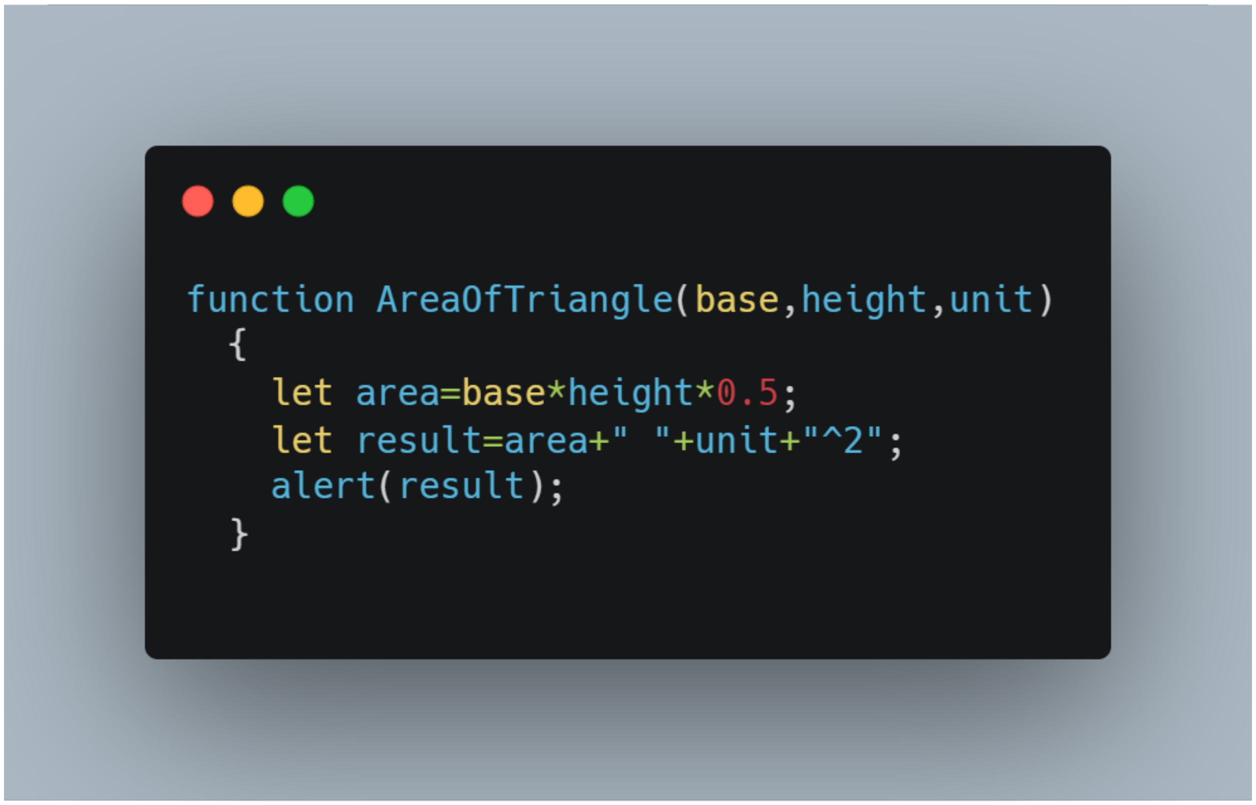
Average(55,99,76,98)takes 4 *integers* that represent the marks of four different classes, averages them and returns the corresponding letter mark. Ask the user for the 4 marks before using the function.



```
function Average(mark1,mark2,mark3,mark4)
  {
    let avg=(mark1+mark2+mark3+mark4)/4;

    if(avg>=80)
      {return "A";}
    else if(avg>=70)
      {return "B";}
    else if(avg>=60)
      {return "C";}
    else if(avg>=50)
      {return "D";}
    else
      {return "F";}
  }
```

AreaOfTriangle(4.5,8,”cm”)takes two *single* numbers representing the base and height of a triangle, calculates it area and displays the final answer along with the correct unit in an alert box (the last parameter, a string, is used to identify the unit of measurement). Ask the user for the two numbers and unit before using the function.



```
function AreaOfTriangle(base,height,unit)
  {
    let area=base*height*0.5;
    let result=area+" "+unit+"^2";
    alert(result);
  }
```