Lesson : Functions

Introduction to functions

A ***function*** is a named group of statements. JavaScript functions are declared with the function keyword followed by the function name and parameter list in parentheses (). A ***parameter*** is a variable that supplies the function with input. The function's statements are enclosed in braces {}.

Invoking a function's name, known as a ***function call***, causes the function's statements to execute. An ***argument*** is a value provided to a function's parameter during a function call.

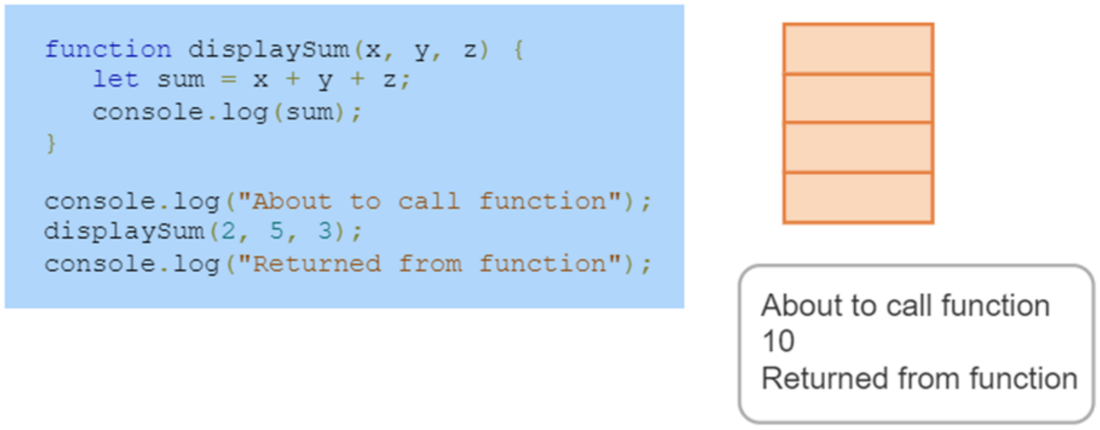
Function declaration.

function functionName(parameter1, parameter2, ...) {

// Statements to execute when function is called

}

Declaring and Calling Functions :



```
function displaySum(x, y, z) {
   let sum = x + y + z;
   console.log(sum);
}

console.log("About to call function");
displaySum(2, 5, 3);
console.log("Returned from function");
```

```
About to call function
10
Returned from function
```

Explanaiton :

1. A function named displaySum is declared with three parameters: x, y, and z.
2. displaySum() is called with arguments 2, 5, and 3, which are assigned to parameters x, y, and z.

3. The variable sum is assigned the sum of x, y, and z, which is 10.
4. sum is output to the console. No more code exist in the function, so the function is finished executing.

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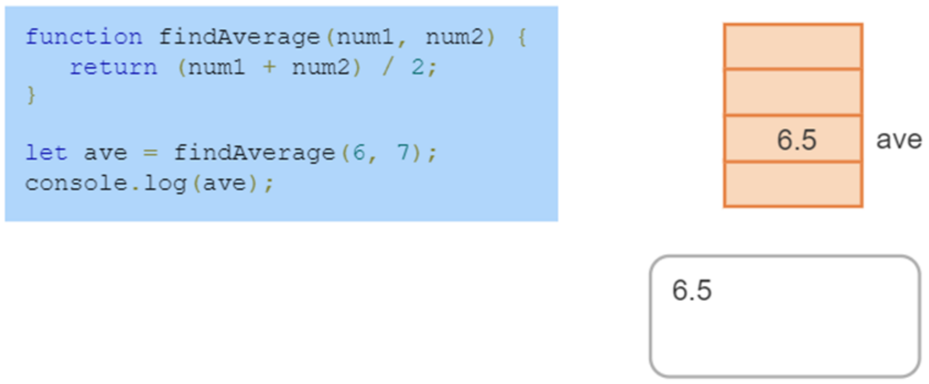
Good practice is to use function names that contain a verb and noun. Ex: display is a vague function name, but displayAverage is better because displayAverage indicates what is being displayed.

Good practice is to use camel case for JavaScript function names, where the name starts with a lowercase letter and subsequent words begin with a capital letter.

Returning a value

A function may return a single value using a ***return*** statement. A function that is missing a return statement returns undefined.



```
function findAverage(num1, num2) {
   return (num1 + num2) / 2;
}

let ave = findAverage(6, 7);
console.log(ave);
```

1. A function named findAverage is declared with two parameters: num1 and num2.
2. findAverage() is called with arguments 6 and 7, which are assigned to parameters num1 and num2.
3. The return statement returns the average of num1 and num2, which is 6.5.

Function expressions and anonymous functions

JavaScript functions may be assigned to a variable with a function expression. A ***function expression*** is identical to a function declaration, except the function name may be omitted. A function without a name is called an ***anonymous function***. Anonymous functions are often used with arrays and event handlers, discussed elsewhere in this material.

Figure Assigning a function expression to a variable.

// Function name is omitted

let displaySum = function(x, y, z) {

  console.log(x + y + z);

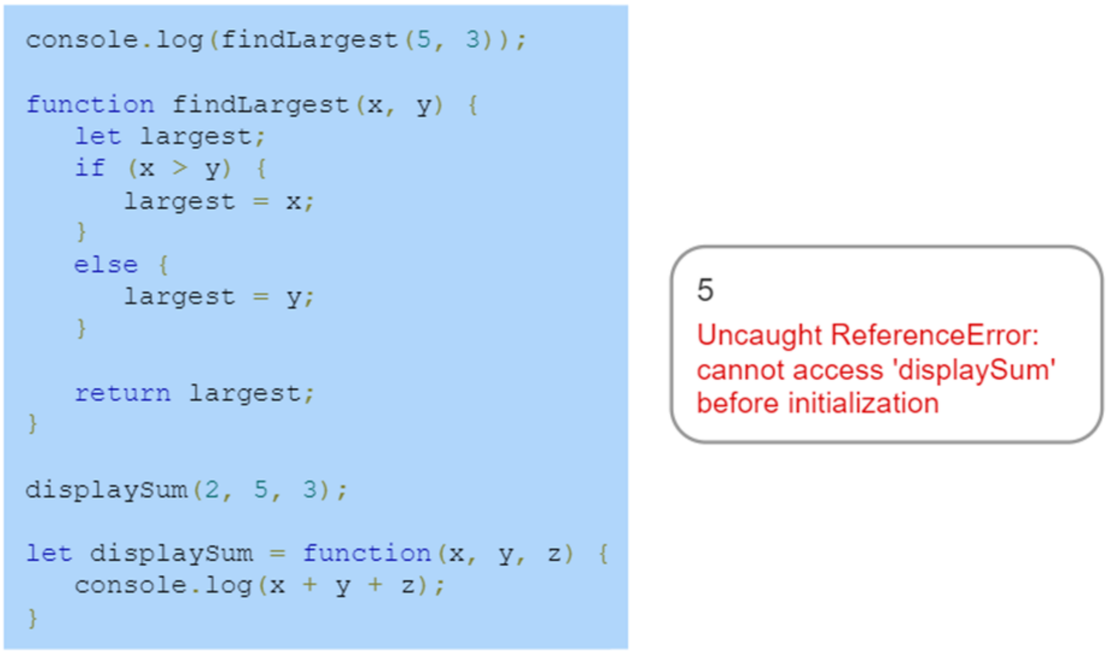
}

// Function call

displaySum(2, 5, 3);

Unlike functions declared with a function declaration, a variable assigned with a function expression cannot be used until after the variable is assigned. Using a variable before the variable is assigned with a function expression causes an exception.

Using a function expression before assignment.



```
console.log(findLargest(5, 3));

function findLargest(x, y) {
   let largest;
   if (x > y) {
      largest = x;
   }
   else {
      largest = y;
   }

   return largest;
}

displaySum(2, 5, 3);

let displaySum = function(x, y, z) {
   console.log(x + y + z);
}
```

```
5
Uncaught ReferenceError:
cannot access 'displaySum'
before initialization
```

1. findLargest() may be called before the findLargest() function declaration.
2. Since x > y, findLargest() returns 5, and 5 is output to the console.
3. Calling displaySum() before displaySum is assigned with a function expression produces an exception.

Arrow functions

An ***arrow function*** is an anonymous function that uses an arrow => to create a compact function. An arrow function's parameters are listed to the left of the arrow. The right side of the arrow may be a single expression or multiple statements in braces.

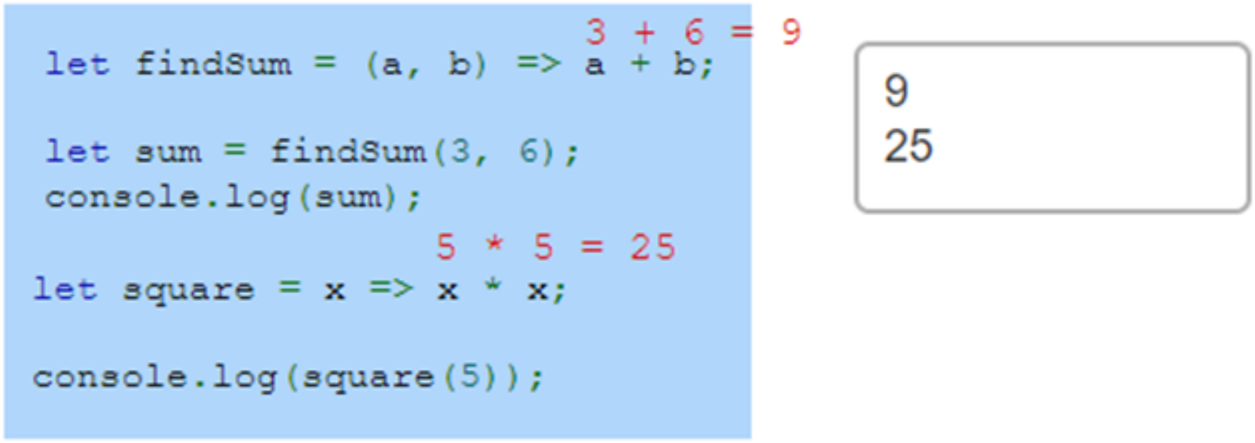
Arrow function declaration that returns a single expression.

(parameter1, parameter2, ...) => expression

Arrow function with multiple statements.

(parameter1, parameter2, ...) => { statements; }

Arrow functions that sum two numbers and square a number.



```
let findSum = (a, b) => a + b;

let sum = findSum(3, 6);
console.log(sum);

let square = x => x * x;

console.log(square(5));
```

```
9
25
```

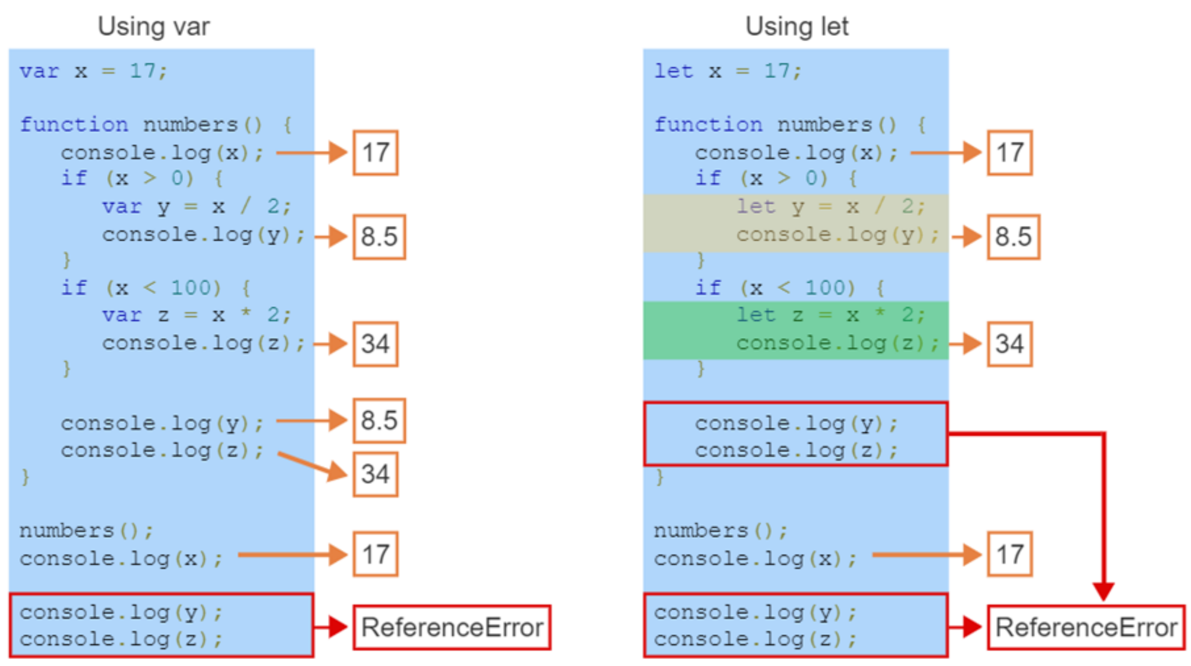
1. An arrow function may be assigned to a variable, just like a function expression.
2. The function parameters are listed in parenthesis to the left of the arrow =>.
3. An expression listed by itself is the value returned by the arrow function.
4. An arrow function is called the same as any other function. The arguments 3 and 6 are

assigned to parameters a and b.
5. The arrow function returns the sum of a and b, which is 9.
6. An arrow function with only one parameter does not require parentheses around the one parameter.

Scope and the global object

The var keyword and scope

1. In addition to declaring variables with let, a variable can be declared with the ***var*** Ex: var x = 6;declares the variable x with an initial value of 6. When JavaScript was first created, var was the only way to declare a variable. The let keyword was added to JavaScript in 2015.
2. Both letand var declare variables but with differing scope. A JavaScript variable's ***scope*** is the context in which the variable can be accessed.
3. A variable declared inside a function has ***local scope***, so only the function that defines the variable has access to the ***local variable***. A variable declared outside a function has ***global scope***, and all functions have access to a ***global variable***.
4. A variable declared inside a function with varhas ***function scope***: the variable is accessible anywhere within the function, but not outside. A variable declared inside a function with let has ***block scope***: the variable is accessible only within the enclosing pair of braces.
5. A variable declared using varor let that is not inside a function creates a global variable that is accessible from anywhere in the code.



```
var x = 17;

function numbers() {
   console.log(x);
   if (x > 0) {
      var y = x / 2;
      console.log(y);
   }
   if (x < 100) {
      var z = x * 2;
      console.log(z);
   }

   console.log(y);
   console.log(z);
}

numbers();
console.log(x);
console.log(y);
console.log(z);
```

```
let x = 17;

function numbers() {
   console.log(x);
   if (x > 0) {
      let y = x / 2;
      console.log(y);
   }
   if (x < 100) {
      let z = x * 2;
      console.log(z);
   }

   console.log(y);
   console.log(z);
}

numbers();
console.log(x);
console.log(y);
console.log(z);
```

1. var x = 17; declares x with global scope. x is accessible everywhere, so each console.log(x) statement logs x as 17.
2. The var y declaration exists inside the numbers() function. So both console.log(y) statements inside the function log y as 8.5.
3. Similarly, the var z statement is inside the function, so both console.log(z) statements inside the function log z as 34.
4. y and z are not accessible outside the numbers() function. The console.log() statements that exist outside the function throw a ReferenceError when executed.
5. Code that uses let instead of var has similar behavior for the global variable x.
6. The first log statement for y is in y's scope (yellow), and the first log statement for z is in z's scope (green). So, 8.5 and 34 are logged.
7. All remaining calls to log y or z are out of scope and throw a ReferenceError.

Global variables and the global object

Before developer code is run, JavaScript implementations create ***the global object***: an object that stores certain global variables, functions, and other properties. When running JavaScript code in a web browser, global variables are usually assigned as properties to the global window object. Therefore, a global variable called test is accessible as window.test.

Developers must be careful when assigning global variables, because a global variable could replace an existing window property. Ex: window.location contains the URL the browser is displaying. Assigning location = "Texas" causes the web browser to attempt to load a web page with the URL "Texas", which likely does not exist.

Three cases exist when assigning to a global variable X:

- X has been declared with var, in which case a property named "X" is added to the global object.
- X has been declared with let, in which case a property named "X" is not added to the global object, but X is still accessible from anywhere in the code.
- X has not been declared with var or let, in which case the variable becomes a property of the global object, even if assigned to inside a function.

- Example with accidental global variable.
- function calculateTax(total) {
- *// Missing "var" so tax becomes a global variable!*
- tax = total * 06;
- return tax;
- }
-
- var totalTax = calculateTax(10);
-
- *// tax is accessible because tax is global*
- console.log(tax);
-
- 6

Good practice is to always declare variables used in functions with var or let, so the variables do not become global.