

Introduction to JavaScript and Math

What is JavaScript?

JavaScript is a programming language primarily used in webpages to add interactivity. It first appeared in 1994. You can read more about it here (<http://en.wikipedia.org/wiki/JavaScript>).

Math and JavaScript

See below for a list of the Math Object Properties (constant values) and Math Object Methods (functions).

Syntax

```
var x = Math.PI; // Returns PI
var y = Math.sqrt(16); // Returns the square root of 16
```

For a tutorial about the Math object, read our [JavaScript Math Object tutorial](#).

Math Object Properties

Property	Description
E	Returns Euler's number (approx. 2.718)
LN2	Returns the natural logarithm of 2 (approx. 0.693)
LN10	Returns the natural logarithm of 10 (approx. 2.302)
LOG2E	Returns the base-2 logarithm of E (approx. 1.442)
LOG10E	Returns the base-10 logarithm of E (approx. 0.434)
PI	Returns PI (approx. 3.14)
SQRT1_2	Returns the square root of 1/2 (approx. 0.707)
SQRT2	Returns the square root of 2 (approx. 1.414)

Math Object Methods

Method	Description
abs(x)	Returns the absolute value of x
acos(x)	Returns the arccosine of x, in radians
asin(x)	Returns the arcsine of x, in radians
atan(x)	Returns the arctangent of x as a numeric value between -PI/2 and PI/2 radians
atan2(y,x)	Returns the arctangent of the quotient of its arguments
ceil(x)	Returns x, rounded upwards to the nearest integer
cos(x)	Returns the cosine of x (x is in radians)
exp(x)	Returns the value of E ^x
floor(x)	Returns x, rounded downwards to the nearest integer
log(x)	Returns the natural logarithm (base E) of x
max(x,y,z,...,n)	Returns the number with the highest value
min(x,y,z,...,n)	Returns the number with the lowest value
pow(x,y)	Returns the value of x to the power of y
random()	Returns a random number between 0 and 1
round(x)	Rounds x to the nearest integer
sin(x)	Returns the sine of x (x is in radians)
sqrt(x)	Returns the square root of x
tan(x)	Returns the tangent of an angle

JavaScript and Webpages

As mentioned, JavaScript is used to provide interactivity in webpages. Webpages contain elements that can be interacted with through JavaScript. These elements have properties that can be read and changed.

A Word about HTML

HTML is the language of the web. HTML stands for Hypertext Markup Language. HTML is what we use to create the content of a webpage, and JavaScript is what we use to make the webpage do something.

For this lesson, the HTML has been created for you. The most important parts are below:

This code

```
<hr width="25%" align="left">
<b>Choose a function:</b><br>
<input type="radio" id="function_choice" name="function_choice" value="f(x)">f(x)</br>
<input type="radio" id="function_choice" name="function_choice" value="2f(x)">2f(x)</br>
<input type="radio" id="function_choice" name="function_choice" value="f(x-2)">f(x-2)</br>
<hr align="left" width="25%">
<input type="radio" id="function_choice" name="function_choice" value="f(-x)">f(-x)</br>
<input type="radio" id="function_choice" name="function_choice" value="f(2x)">f(2x)</br>
<input type="radio" id="function_choice" name="function_choice" value="f(x)-2">f(x)-2</br>
<input type="radio" id="function_choice" name="function_choice" value="-f(x)">-f(x)</br>
```

results in this:

Choose a function:

f(x)

2f(x)

f(x-2)

f(-x)

f(2x)

f(x)-2

-f(x)

and this code

```
<b>Input (x):</b><input type="text" id="text_input_x" name="text_input_x"><br>
<b>User f(x)=</b><input type="text" id="text_user_function" name="text_user_function"><br><br>
<input type="button" value="Calculate" onClick="calculate();"><br><br>
<b>Output (y):</b><input type="text" id="text_output" name="text_output"><br><br>
```

results in this:

Input (x):

User f(x)=

Output (y):

X Input Element ID

Y Output Element ID

Must be written in JavaScript!

Note: For this lesson the key thing to keep in mind is the id of the element we wish to read and change.

Interacting with Elements with JavaScript

All elements reside on a document (the webpage itself). As an analogy, take your classroom. All elements (students, desks, etc.) are in the classroom. All elements need an id, which is a unique name.

So, using this concept, we might write the following code to find someone's height.

```
h = classroom.getElementById("mrthompson").value;
```

will give the result:

```
h = 175;
```

Similarly, we can change the value as well.

```
classroom.getElementById("mrthompson").value=150;
```

Note: Lines of code in JavaScript end with a semicolon.

So, if we wanted to read the value of the X Input Box, we would use the following code:

```
//Get the value from the input text box  
x=document.getElementById("text_input_x").value;
```

And at the end of our calculations, we want to update the value in our Y input Box.

```
//This shows the output – do not make any changes  
document.getElementById("text_output").value="y = " + y;
```

Note: JavaScript is "case sensitive" which means that CAPITALIZATION matters. "getElementById" will work, but "GetElementByID" will not.

Making it Happen

Now that we know how to read element values and change element values, we need to do something useful with them.

Let's look at the function $f(x-2)$. Here is the code we use to make this function work.

Note the structure of the if statement. To compare things in JavaScript we use "==" , not "=".

```
if(condition){  
  
    //THIS IS A COMMENT. IT DOES NOTHING AND YOU DO NOT NEED A SEMICOLON AT THE END  
  
    CODE GOES HERE;  
  
}
```

Just like in math, the order that we do the calculation is very very important.

For the function $f(x-2)$ we need to decrease x by 2 before we evaluate it using the user input function.

In mathematics, you would need 2 variables to do this, however, in JavaScript you only need one.

Math: $z = x - 2$

$x = z$

JavaScript: $x = x - 2$

```
if(chosen_function=="f(x-2){  
  //fx = f(x-2)  
  //x is decreased by 2 before calculating  
  x = x - 2;  
  //Calculate  
  fx=eval(document.getElementById("text_user_function").value);  
  //No change in fx  
  //y = f(x)  
  y = fx;  
}
```

Step 1: Reduce x by 2

Step 2: Calculate the function input by the user

Step 3: Set y equal to the result (fx)

Depending on function you choose, steps 1 and 3 will change, but the order will not.

Challenge

Your challenge is to program the code for the following functions:

- $f(-x)$
- $f(2x)$
- $f(x)-2$
- $-f(x)$