Introduction to Web Technology

Basics of JavaScript

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JavaScript

Objectives:

- learn basic JavaScript programming language syntax
- use JavaScript to make your website interactive

My First JavaScript

```
<button onClick="sayHi();">
Click me
</button>

<script>

function sayHi(){
  alert("Hi");
  console.log("Hi");
  console.log(2+2);
}

</script>
```

Where to include JavaScript

We can put JavaScript code anywhere in the HTML file.

Common practice:

- In the head
- At the end of body

```
<script>

function sayHi(){
  alert("Hi");
}

</script>
```

Where to include JavaScript

In the head

```
<head>
<title>JavaScript Example</title>
<script>
function sayHi(){
  alert("Hi");
}
</script>
</head>
```

Where to include JavaScript

At the end of body (just before the closing body tag)

```
...
<script>
function sayHi(){
  alert("Hi");
}
</script>
</body>
</html>
```

External JavaScript

Instead of putting javascript code inside the html file

```
<script>

function sayHi(){
  alert("Hi");
}

</script>
```

we can specify an external javascript file:

```
<script type="text/javascript" src="js/myscript.js"></script>
```

Basic JavaScript syntax

JavaScript statements are separated by semicolons

```
function silly(){
  alert('Hi');
  console.log(2+2);
}
```

Basic JavaScript syntax

JavaScript Comments

Code after double slashes // or between /* and */ is treated as a comment.

Comments are ignored, and will not be executed.

```
/*
this function does a few silly things
 */
function silly(){
  // display an alert box
  alert('Hi');

  // print out the number 4 on the console
  console.log(2+2);
}
```

Basic JavaScript syntax

JavaScript uses the `var` keyword to declare variables.

```
var studentName = "John";
var x, y;
x = 5;
y = x + 2;
```

All JavaScript identifiers are **case sensitive**.

- The variables studentName and StudentName are two different variables.
- The variables x and X are two different variables.

Basic JavaScript syntax

Variable naming: two common conventions

underscore:

student_name, student_id, first_name, last_name

camel case:

studentName, studentId, firstName, lastName

Basic JavaScript syntax

JavaScript has dynamic types. !!!

This means that the same variable can be used as **different types**:

```
var x;                    // x is undefined
alert(x);

var x = 2016;             // x is a number
alert(x);

var x = "Wollongong";     // x is a string
alert(x);
```

A variable declared without a value will have the value **undefined**.

Basic JavaScript syntax

JavaScript data type: number

```
var age = 19;
var pi = 3.14;
```

Arithmetic operators are used to perform arithmetic on numbers

```
+   Addition
-   Subtraction
*   Multiplication
/   Division
%   Modulus
```

Basic JavaScript syntax

JavaScript data type: string

```
var age = "19";
var name = 'John';
```

Basic JavaScript syntax

Strings are text, written within double or single quotes:

```
var firstName, lastName, fullName;

firstName = "John";       // using double quotes
lastName = 'Lee';         // using single quotes

fullName = firstName + " " + lastName;
alert(fullName);
```

Use + for string concatenation

Basic JavaScript syntax

Mixing between double or single quotes:

```
var x;

x = "I'm John";                //single quote inside double quotes
alert(x);

x = "My name is 'John'"; //single quotes inside double quotes
alert(x);

x = 'My name is "John"'; //double quotes inside single quotes
alert(x);
```

Basic JavaScript syntax

Change string to number

```
var ageString = "19";
var age = Number(ageString); // age is the number 19
```

Change number to string

```
var age = 19;
var ageString = age.toString(); // ageString is the string "19"
```

Basic JavaScript syntax

JavaScript evaluates expressions from left to right

```
var x;

x = 2016 + "Wollongong";        //2016Wollongong
alert(x);

x = 2016 + 1 + "Wollongong";    //2017Wollongong
alert(x);

x = "Wollongong" + 2016;        //Wollongong2016
alert(x);

x = "Wollongong" + 2016 + 1;    //Wollongong20161
alert(x);
```

Basic JavaScript syntax

JavaScript data type: boolean

```
var authenticated = false;
var isReturningUser = true;
```

```
var x = 5;
var positive = (x > 0);     //true

if(positive){
  alert("x is positive");
}
```

Basic JavaScript syntax

Comparison and Logical Operators

```
==        equal to
!=        not equal
>         greater than
<         less than
>=        greater than or equal to
<=        less than or equal to
```

Basic JavaScript syntax

```
var x = 5;
var y = 6;

if(x == y){
  alert("x and y are equal");
}else{
  alert("x and y NOT are equal");
}
```

```
var x = 5;
var y = 6;

if(x != y){
  alert("x and y are not equal");
}else{
  alert("x and y are equal");
}
```

Basic JavaScript syntax

```
var mark = 75;

if(mark > 85){
  alert("Grade A");
}else if (mark > 65){
  alert("Grade B");
}else if (mark > 50){
  alert("Grade C");
}else {
  alert("Grade D");
}
```

For-Loop statement:

```
for(var i = 0; i < 5; i++){
  alert(i);
}
```

Useful tags for dynamic content:

- The `<div>` tag defines a generic section container

- The `<span>` tag defines a generic inline container

Change content by JavaScript

- **Step 1:** give the HTML element that we want to change an **ID**
- **Step 2:** use the function

  ```
  var e = document.getElementById("the-id");
  ```

  to get the HTML element that we want to change
- **Step 3:** change the content of the HTML element

  for span, div, etc.:

  ```
  e.innerHTML = "the-new-content";
  ```

  for input text field:

  ```
  e.value = "the-new-value";
  ```

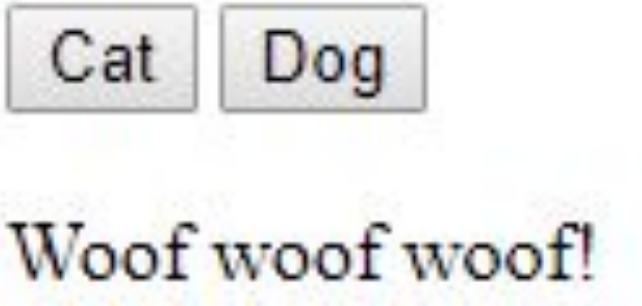
  for image:

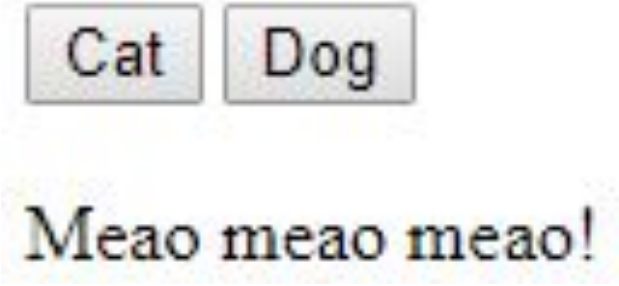
  ```
  e.src = "the-new-image-src";
  ```

Cat & Dog 1

The web page displays **2 buttons**: “Cat” and “Dog”.

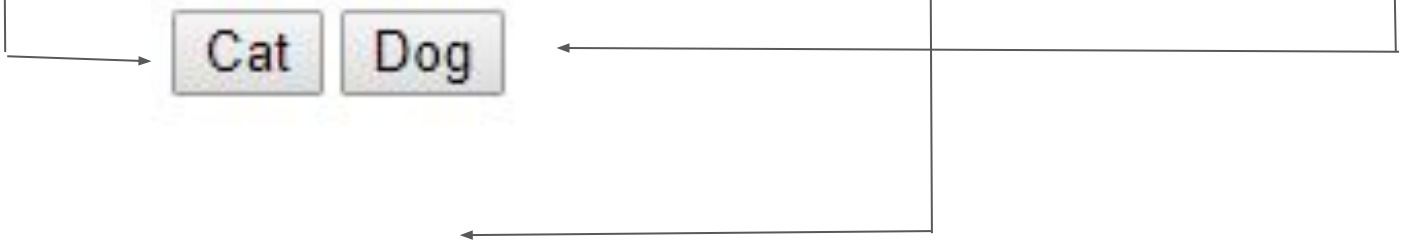
If the user clicks the “Cat” button, a meao-meao message is displayed, and if the user clicks the “Dog” button, a woof-woof message is displayed.





Cat & Dog 1

```
<button onClick="cat()">Cat</button>
<button onClick="dog()">Dog</button>
<br /> <br />
<span id="display"></span>
```



Cat & Dog 1

```
function dog(){
  // get the span element


  // show dog message


}
```

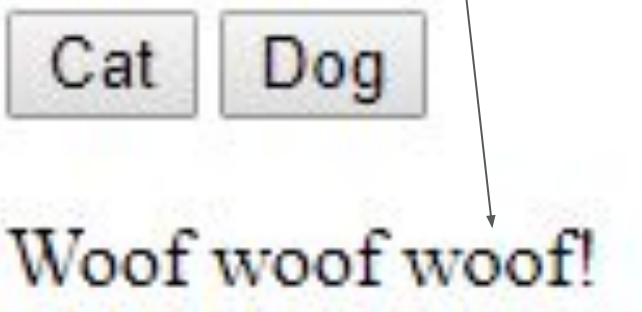
Cat & Dog 1

```
function dog(){
  // get the span element
  var displaySpan = document.getElementById("display");


  // show dog message


}
```


```
<span id="display"></span>
```

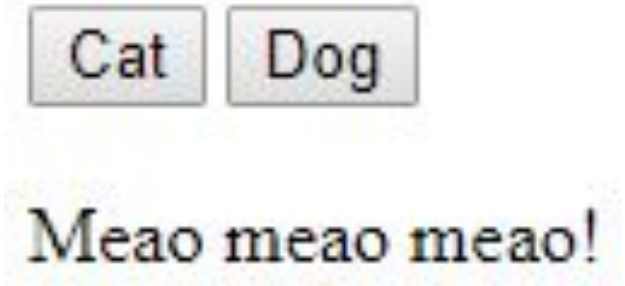
Cat & Dog 1

```
function dog(){
  // get the span element
  var displaySpan = document.getElementById("display");

  // show dog message
  displaySpan.innerHTML = "Woof woof woof!";
}
```



Cat & Dog 1

```
function cat(){
  // get the span element
  var displaySpan = document.getElementById("display");

  // show cat message
  displaySpan.innerHTML = "Meao meao meao!";
}
```



Change content by JavaScript

- **Step 1:** give the HTML element that we want to change an **ID**
- **Step 2:** use the function

```
var e = document.getElementById("the-id");
```

to get the HTML element that we want to change

- **Step 3:** change the content of the HTML element

for span, div, etc.:

```
e.innerHTML = "the-new-content";
```

for input text field:

```
e.value = "the-new-value";
```

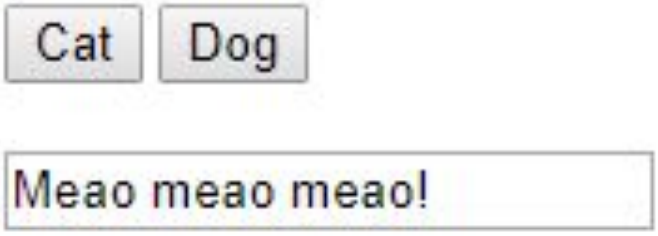
for image:

```
e.src = "the-new-image-src";
```

Cat & Dog 2

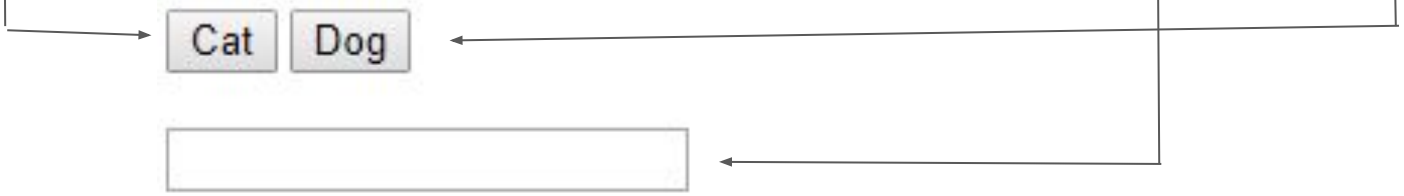
The web page displays **2 buttons**: “Cat” and “Dog”, and **a text field**.

If the user clicks the “Cat” button, a meao-meao message is displayed inside a text field, and if the user clicks the “Dog” button, a woof-woof message is displayed in a text field.



Cat & Dog 2

```
<button onClick="cat()">Cat</button>
<button onClick="dog()">Dog</button>
<br /> <br />
<input type="text" id="display" />
```



Cat & Dog 2

```
function cat(){
  // get the text field element


  // show cat message


}
```

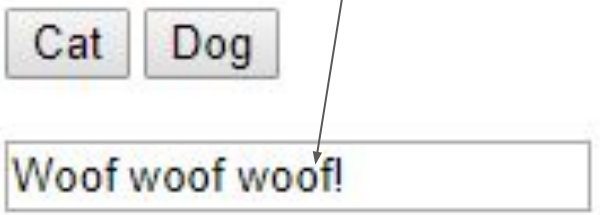
Cat & Dog 2

```
function cat(){
  // get the text field element
  var displayField = document.getElementById("display");

  // show cat message
  displayField.value = "Meao meao meao!";
}
```


```
<input type="text" id="display" />
```

Cat & Dog 2

```
function dog(){
  // get the text field element
  var displayField = document.getElementById("display");

  // show cat message
  displayField.value = "Woof woof woof!";
}
```




```
<input type="text" id="display" />
```

Change content by JavaScript

- **Step 1:** give the HTML element that we want to change an **ID**
- **Step 2:** use the function

```
var e = document.getElementById("the-id");
```

to get the HTML element that we want to change

- **Step 3:** change the content of the HTML element

for span, div, etc.:

```
e.innerHTML = "the-new-content";
```

for input text field:

```
e.value = "the-new-value";
```

for image:

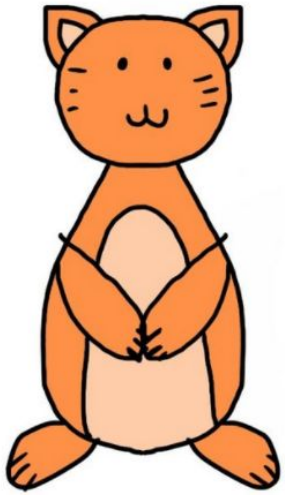
```
e.src = "the-new-image-src";
```

Cat & Dog 3

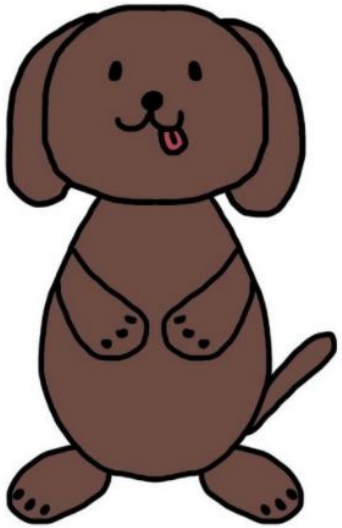
The web page displays **2 buttons**: “Cat” and “Dog”.

If the user clicks the “Cat” button, a cat picture is displayed, and if the user clicks the “Dog” button, a dog picture is displayed.

Cat Dog

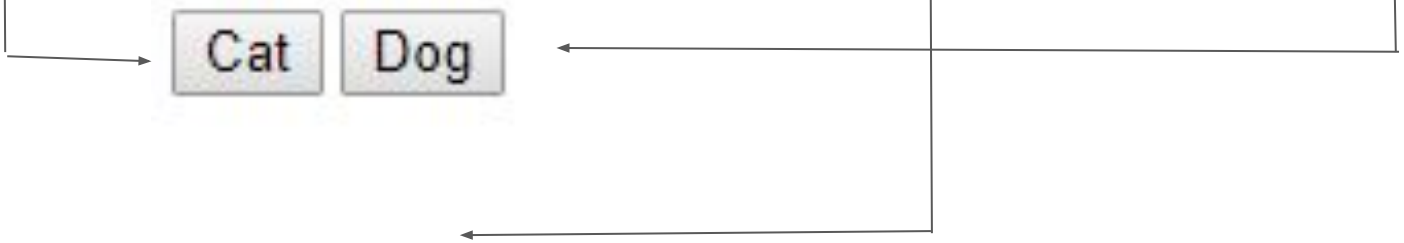


Cat Dog



Cat & Dog 3

```
<button onClick="cat()">Cat</button>
<button onClick="dog()">Dog</button>
<br /> <br />
<img id="display" />
```



(empty image: no src)

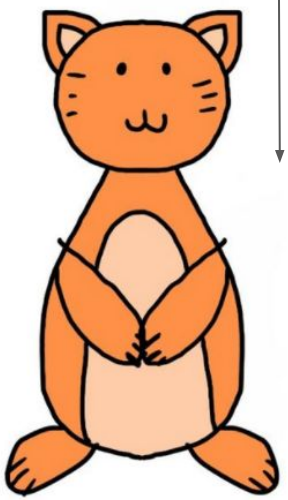
Cat & Dog 3

```
function cat(){
  // get the image element


  // show cat picture
}
```

Cat & Dog 3

```
function cat(){
  // get the image element
  var image = document.getElementById("display");


  // show cat picture
  image.src = "cat.png";
}
```

Cat Dog

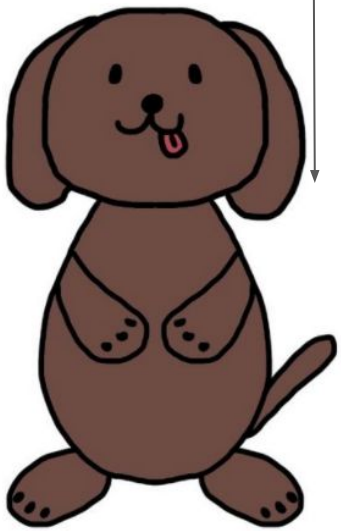


```
<img id="display" />
```

Cat & Dog 3

```
function dog(){
  // get the image element
  var image = document.getElementById("display");


  // show dog picture
  image.src = "dog.png";
}
```

Cat Dog



```
<img id="display" />
```

Using variables to save state information

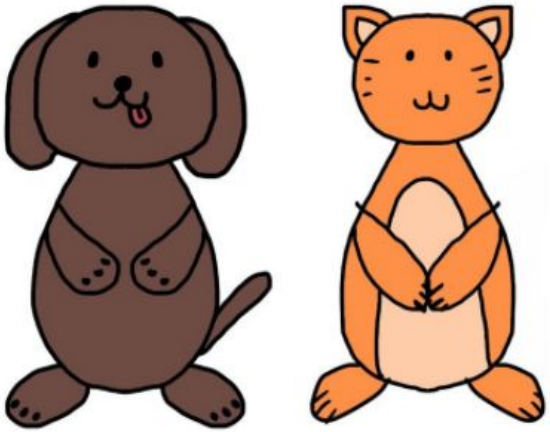
Sometime we use variables to save the **current status** of the page.

Cat & Dog 4

The web page displays **2 images**: “Cat” and “Dog”, and **2 click counters**.

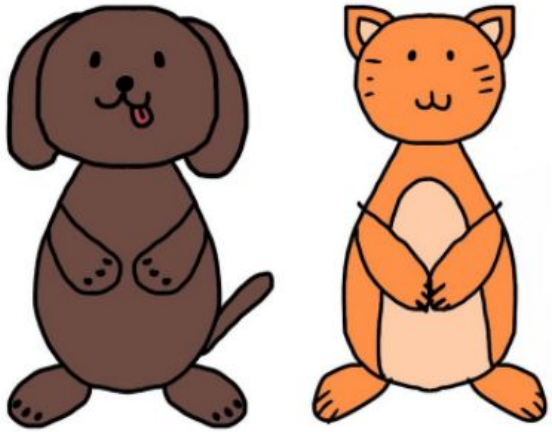
If the user clicks the “Cat” image, then the click counter for cat is increased.

If the user clicks the “Dog” image, then the click counter for dog is increased.



Dog click count: 0

Cat click count: 0

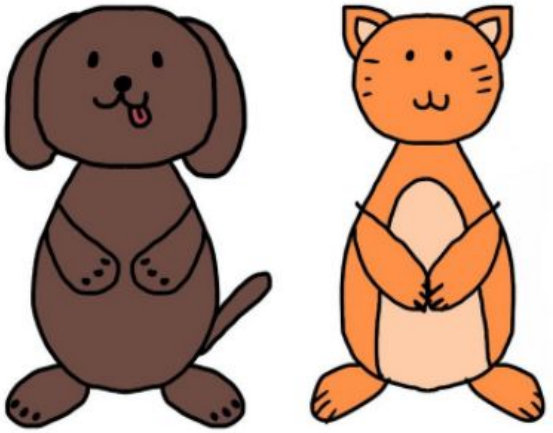


Dog click count: 3

Cat click count: 7

Cat & Dog 4

```
<img src="dog.png" onClick="dog()" />
<img src="cat.png" onClick="cat()" />
<br /> <br />
Dog click count: <span id="dogDisplay">0</span>
<br /> <br />
Cat click count: <span id="catDisplay">0</span>
```



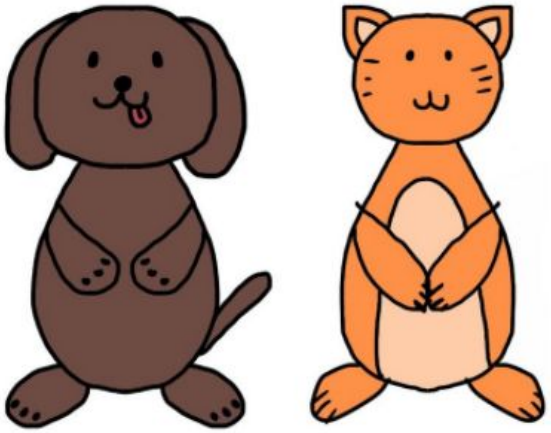
Dog click count: 0

Cat click count: 0

Cat & Dog 4

```
// variable to save the number of dog clicks
var dogClick = 0;
// variable to save the number of cat clicks
var catClick = 0;
```

We use **variables** to save the current number of **dog-clicks** and **cat-clicks**.

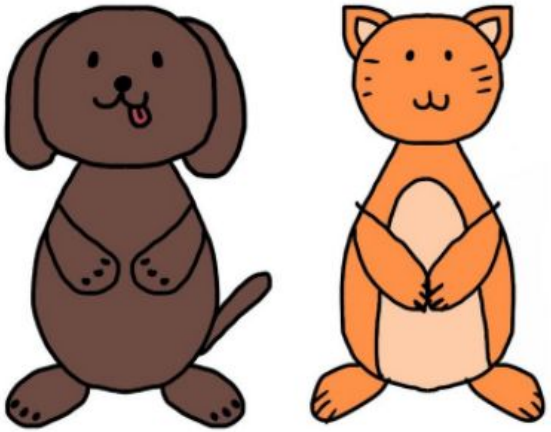


Dog click count: 0

Cat click count: 0

Cat & Dog 4

```
// variable to save the number of dog clicks
var dogClick = 0;

function dog(){
  // increase the number of dog clicks by 1


  // display the number of dog clicks
}
```

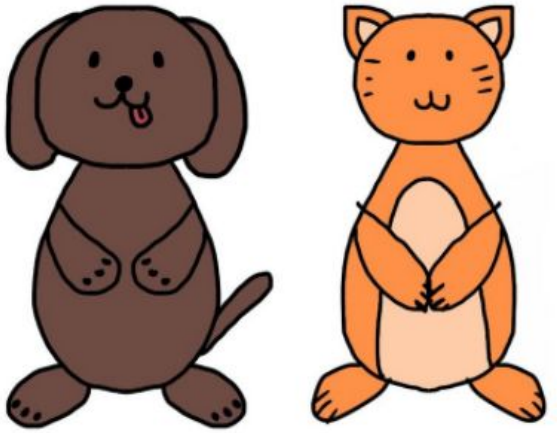


Dog click count: 0

Cat click count: 0

Cat & Dog 4

```
// variable to save the number of dog clicks
var dogClick = 0;

function dog(){
  // increase the number of dog clicks by 1
  dogClick = dogClick + 1;

  // display the number of dog clicks
  var dogSpan = document.getElementById("dogDisplay");
  dogSpan.innerHTML = dogClick;
}
```



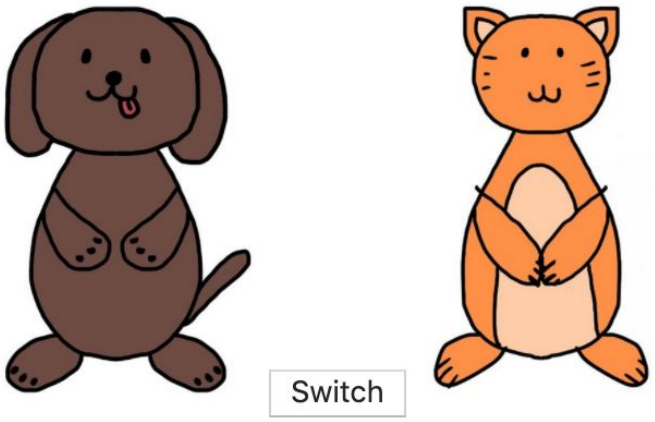
Dog click count: 0

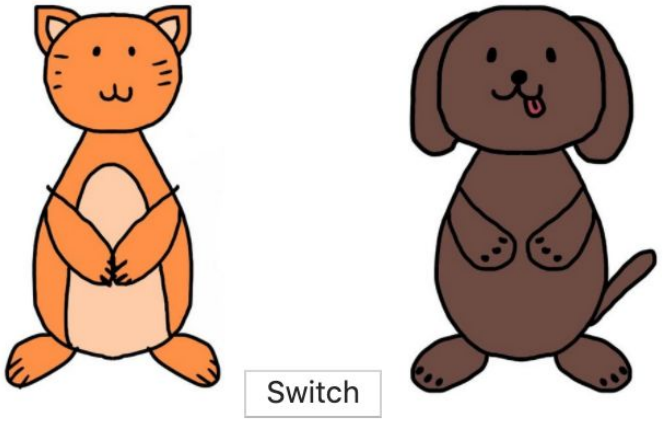
Cat click count: 0

```
<span id="dogDisplay">0</span>
```

Cat & Dog 5

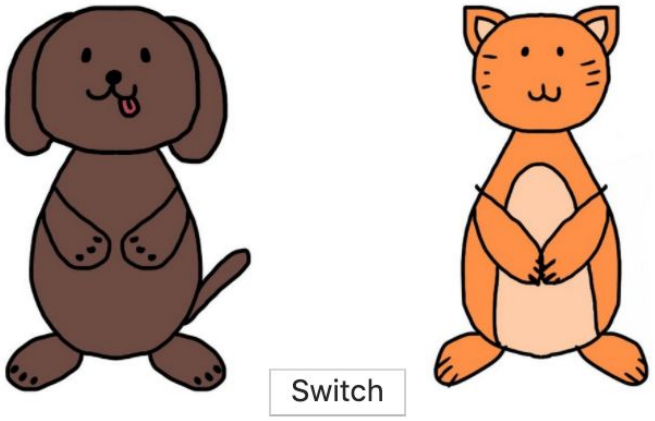
The web page displays **2 images**: “Dog” on the **left**, “Cat” on the **right**, and a **button** “Switch”.
If the user clicks the “Switch” button, then the two images switch their places.





Cat & Dog 5

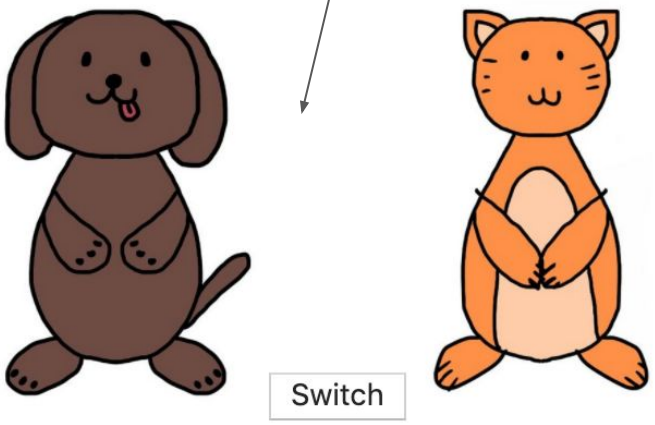
```
<img id="left" src="dog.png" />
<button onClick="switchImage()">
Switch
</button>
<img id="right" src="cat.png" />
```



Cat & Dog 5

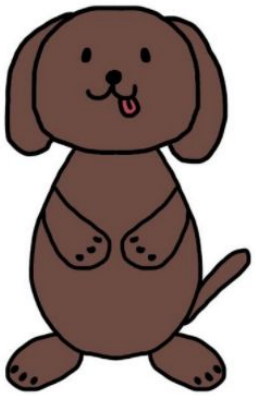
```
// variable to save the position of dog and cat images
// two values: "dog-cat" or "cat-dog"
// original position is "dog-cat"
var position = "dog-cat";
```

We use a **variable** to save the current position of the images

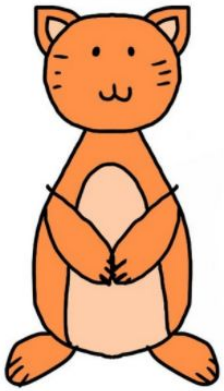


Cat & Dog 5

```
var position = "dog-cat";
function switchImage(){
  // check what is the current position, then switch it
  // change position variable
  // change the images
}
```

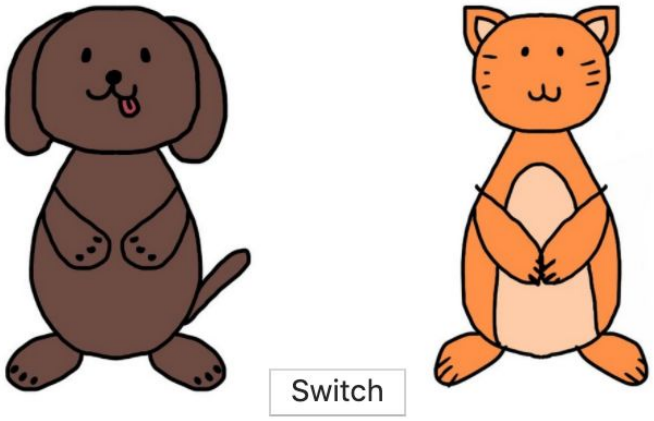


Switch



Cat & Dog 5

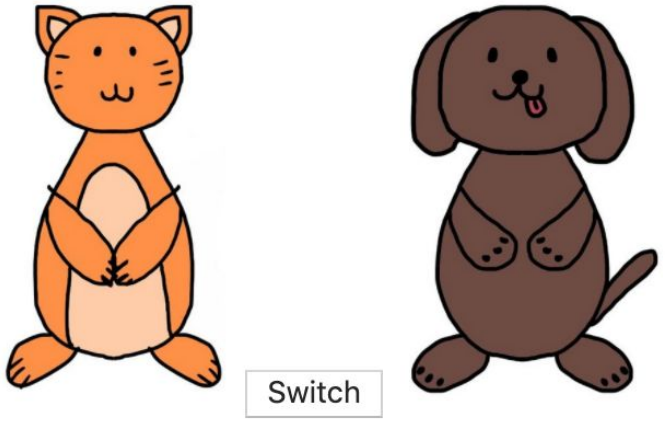
```
if(position == "dog-cat"){
  // change position variable
  position = "cat-dog";

  // change the images
  var leftImage = document.getElementById("left");
  leftImage.src = "cat.png";

  var rightImage = document.getElementById("right");
  rightImage.src = "dog.png";
}else...
```



Current position is dog-cat

Cat & Dog 5

```
else{
  // change position variable
  position = "dog-cat";

  // change the images
  var leftImage = document.getElementById("left");
  leftImage.src = "dog.png";

  var rightImage = document.getElementById("right");
  rightImage.src = "cat.png";
}
```



Current position is cat-dog

Cat & Dog 6

The web page displays a “Dog” picture.
If the user clicks the “Dog” picture, then it turns into a “Cat” picture.
If the user clicks the “Cat” picture, then it turns back to the “Dog” picture.

Cat & Dog 6

```
<img id="animal" src="dog.png" onClick="changeImage()" />
```

Cat & Dog 6

```
// variable to save the current displayed animal
// two values: "dog" or "cat"
// original value is "dog"
var animal = "dog";
```

We use a **variable** to save the current displayed animal

Cat & Dog 6

```
var animal = "dog";
function changeImage(){
  // check what is the current animal, then change it
  // change animal variable
  // change the image
}
```

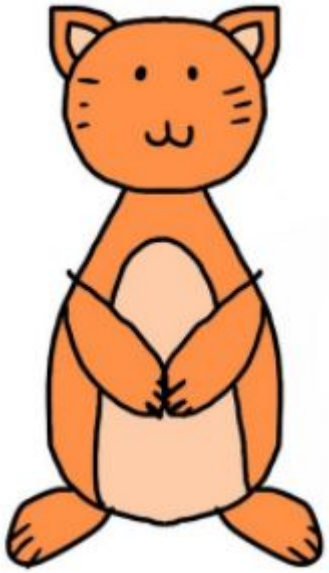
Cat & Dog 6

```
if(animal == "dog"){
  // change animal variable
  animal = "cat";

  // change the image
  var image = document.getElementById("animal");
  image.src = "cat.png";
}else...
```

Current animal is dog

Cat & Dog 6

```
else{
  // change animal variable
  animal = "dog";

  // change the image
  var image = document.getElementById("animal");
  image.src = "dog.png";
}
```



Current animal is cat

String

```
var text = "One Fish, Two Fish, Red Fish, Blue Fish";

var textLength = text.length;
                 → 39

var upper = text.toUpperCase();
                 → ONE FISH, TWO FISH, RED FISH, BLUE FISH

var lower = text.toLowerCase();
                 → one fish, two fish, red fish, blue fish

var fishIndex = text.indexOf("Fish");          → 4
var catIndex = text.indexOf("cat");            → -1

var redFound = text.includes("Red");           → true
var greenFound = text.includes("Green");       → false
```

String

```
var text = "One Fish, Two Fish, Red Fish, Blue Fish";

var s1 = text.slice(10, 12);   → Tw

var s2 = text.slice(10);       → Two Fish, Red Fish, Blue Fish

var s3 = text.slice(-9, -6);   → Blu

var s4 = text.slice(-9);       → Blue Fish
```

Date

There are several ways to create a Date object.

```
var d = new Date(); //current date & time
var d = new Date(millisec);
var d = new Date(dateString);
var d = new Date(year, month, day, hour, min, sec, millisec);
```

Date

```
var d = new Date(millisec);
```

Dates are calculated in milliseconds from 01 January, 1970 00:00:00 Universal Time (UTC). One day contains 86,400,000 millisecond.

```
var d = new Date(86400000);
alert(d);     //02 Jan 1970 00:00:00 UTC
```

Date

```
var d = new Date(dateString);

//using YYYY-MM-DD format
var d = new Date("2000-01-30");
alert(d);

//using YYYY-MM-DDTHH:MI:SS
var d = new Date("2000-01-30T10:00:00");
alert(d);
```

Date

```
var d = new Date(year, month, day, hour, min, sec, millisec);
```

The last 4 parameters can be omitted.

Months count from 0 to 11. January is 0. December is 11.

```
var d = new Date(2000, 0, 1);   // 01 Jan 2000
alert(d);
```

Date

`getDate()`	Get the day as a number (1-31)
`getDay()`	Get the weekday as a number (**0-6**)
	Sunday is 0, Saturday is 6
`getFullYear()`	Get the four digit year (yyyy)
`getHours()`	Get the hour (0-23)
`getMilliseconds()`	Get the milliseconds (0-999)
`getMinutes()`	Get the minutes (0-59)
`getMonth()`	Get the month (**0-11**)
	January is 0, December is 11
`getSeconds()`	Get the seconds (0-59)
`getTime()`	Get the milliseconds since 01/Jan/1970

Date

```
var now = new Date();
alert("now is " + now);
alert("getDate returns " + now.getDate());
alert("getDay returns " + now.getDay());
alert("getFullYear returns " + now.getFullYear());
alert("getHours returns " + now.getHours());
alert("getMilliseconds returns " + now.getMilliseconds());
alert("getMinutes returns " + now.getMinutes());
alert("getMonth returns " + now.getMonth());
alert("getSeconds returns " + now.getSeconds());
alert("getTime returns " + now.getTime());
```

Date

`setDate()`	Set the day as a number (1-31)
`setFullYear()`	Set the year (optionally month and day)
`setHours()`	Set the hour (0-23)
`setMilliseconds()`	Set the milliseconds (0-999)
`setMinutes()`	Set the minutes (0-59)
`setMonth()`	Set the month (0-11)
`setSeconds()`	Set the seconds (0-59)
`setTime()`	Set the milliseconds since 01/Jan/1970

Date

```
var now = new Date();
alert(now);

var tomorrow = new Date();
tomorrow.setDate(now.getDate() + 1);
alert(tomorrow);

var hundredDayAgo = new Date();
hundredDayAgo.setDate(now.getDate() - 100);
alert(hundredDayAgo);
```

Array

```
var arrayName = [item0, item1, ...];
```

```
var subjects = ["ISIT206", "MATH121", "CSCI301"];

subjects[1] = "LOGIC101";  //change the content of item 1
subjects[3] = "LAW201";    //add new item 3

alert(subjects[0]);        //ISIT206
alert(subjects[1]);        //LOGIC101
alert(subjects[2]);        //CSCI301
alert(subjects[3]);        //LAW201
```

Array

Length of array

```
var subjects = ["ISIT206", "MATH121", "CSCI301"];

// loop through an array

for(var i = 0; i < subjects.length; i++){
  alert(subjects[i]);
}
```

Array

```
var square = [];  //empty array

for(var i = 0; i < 10; i++) {
    square[i] = i*i;
}

for(var i = 0; i < square.length; i++) {
    alert(square[i]);
}
```

Array

The `push()` method adds a new element to the end of an array

```
var square = [];  //empty array

for(var i = 0; i < 10; i++) {
    square.push(i*i);
}

for(var i = 0; i < square.length; i++) {
    alert(square[i]);
}
```

Array

```
var subjects = ["ISIT206", "MATH121", "CSCI301", "PHY211"];
```

The `indexOf(item)` method searches the array for the specified item, and returns its position

```
var index = subjects.indexOf("MATH121");
```

The `splice(index, howmany)` method removes elements at a position

```
var removedSubjects = subjects.splice(1, 2);
```

References

- http://www.w3schools.com/js
- http://developer.mozilla.org/en-US/docs/Web/JavaScript