

Loops and Arrays

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COP2500

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Repeating Code

- ▶ You're simulating collecting beautiful flowers. You collect them until your bouquet is full, say 10 flowers.
- ▶

```
document.write("You now have 1 flower.");  
document.write("You now have 2 flowers.");  
document.write("You now have 3 flowers.");  
...  
document.write("You now have 10 flowers.");
```

While Loops

- ▶ Code that is executed many times consecutively is a **loop**.
- ▶ You can repeat code *while* some condition is met with **while** loops.
- ▶ **var** bouquetSize = 0;
while(bouquetSize <= 10)
{
 document.write("You now have " + bouquetSize + "
flowers.");
 bouquetSize += 1;
}

For Loop

- ▶ There is a special loop which is designed for when you want to execute the same code a certain number of times, called a **for** loop.

- ▶ **var** i;

```
for( i = 0 ; i < 3 ; i ++ )
```

initialize condition increment

```
{
```

```
    document.write("Hello World <br>");
```

```
}
```

- ▶ This will output:

Hello World

Hello World

Hello World

Bouquet Example

```
► var bouquetSize;  
  for(  
    bouquetSize = 1; bouquetSize <= 10; bouquetSize ++  
    initialize      condition      increment  
  {  
    document.write("You have " + bouquetSize + "  
flowers.");  
  }
```

Summarizing for loop execution

```
► for(initialize; condition; increment)
{
    ...
}
```

1. Initialize
2. Check condition
3. Execute code in block
4. Increment
5. Repeat from step (2) until condition is false.

Tracing a For-Loop

Variable	Value
i	undefined

```
var i;  
for(i = 0; i < 3; i++)  
{  
    document.write("Hello World <br>");  
}
```

Tracing a For-Loop

Variable	Value
i	0

```
var i;  
for(i = 0; i < 3; i++)  
{  
    document.write("Hello World <br>");  
}
```


Tracing a For-Loop

Variable	Value
i	0

```
var i;  
for(i = 0; i < 3; i++)  
{  
    document.write("Hello World <br>");  
}
```

Tracing a For-Loop

Variable	Value
i	0

```
var i;  
for(i = 0; i < 3; i++)  
{  
    document.write("Hello World <br>");  
}
```

Output:

Hello World

Tracing a For-Loop

Variable	Value
i	1

```
var i;  
for(i = 0; i < 3; i++)  
{  
    document.write("Hello World <br>");  
}
```

Output:

Hello World

Tracing a For-Loop

Variable	Value
i	1

```
var i;  
for(i = 0; i < 3; i++)  
{  
    document.write("Hello World <br>");  
}
```

Output:

Hello World

Tracing a For-Loop

Variable	Value
i	1

```
var i;  
for(i = 0; i < 3; i++)  
{  
    document.write("Hello World <br>");  
}
```

Output:

Hello World
Hello World

Tracing a For-Loop

Variable	Value
i	2

```
var i;  
for(i = 0; i < 3; i++)  
{  
    document.write("Hello World <br>");  
}
```

Output:

Hello World
Hello World

Tracing a For-Loop

Variable	Value
i	2

```
var i;  
for(i = 0; i < 3; i++)  
{  
    document.write("Hello World <br>");  
}
```

Output:

Hello World
Hello World

Tracing a For-Loop

Variable	Value
i	2

```
var i;  
for(i = 0; i < 3; i++)  
{  
    document.write("Hello World <br>");  
}
```

Output:

Hello World
Hello World
Hello World

Tracing a For-Loop

Variable	Value
i	3

```
var i;  
for(i = 0; i < 3; i++)  
{  
    document.write("Hello World <br>");  
}
```

Output:

Hello World
Hello World
Hello World

Tracing a For-Loop

Variable	Value
i	3

```
var i;  
for(i = 0; i < 3; i++)  
{  
    document.write("Hello World <br>");  
}
```

Output:

Hello World
Hello World
Hello World

Odd Numbers

- ▶

```
for(var i = 1; i < 10; i+=2)
{
    document.write(i + " ");
}
```
- ▶ Will output:
1 3 5 7 9

Counting down

- ▶ For loops can also be used to count down:

- ▶ `for(var i = 10; i > 0; i--)`
 {
 document.write(i + " ");
 }

- ▶ Will output:

10 9 8 7 6 5 4 3 2 1

Necessity of Arrays

- ▶ You are hired to make a website for a salon, where you are asked to display different haircuts.
- ▶ **var** style1 = "buzzcut";
 var style2 = "trim";
 var style3 = "perm";
- ▶ What if you need to add 40 more hairstyles?

Necessity of Arrays

- ▶ `var style1 = "buzzcut";`
`var style2 = "trim";`
`var style3 = "perm";`
`var style4 = "beehive";`
`var style5 = "shaved";`
`...`
`var style23 = "dreads";`
`var style24 = "afro";`
`var style25 = "braid";`
`var style26 = "mohawk";`
`var style27 = "sweep";`
`var style28 = "feather";`
`...`
`var style37 = "bob";`
`var style38 = "bowl cut";`
`var style39 = "up-do";`
`var style40 = "layered";`
- ▶ This is *clearly* unwieldy

Arrays

- ▶ Alternately, you can group the styles together with an **array**
- ▶ An array is a single variable standing in for multiple variables.
`var styles = new Array(); // create array`
- ▶ An **element** of an array is one of the variables inside the array.
- ▶ You can access different **elements** of your array with **[index]**, starting at **0**.

`styles[0] = "buzzcut";`

`styles[1] = "trim";`

`styles[2] = "perm";`

- ▶ In memory:

0	1	2
"buzzcut"	"trim"	"perm"

Using For Loops with Arrays

- ▶ Let's print the haircut styles with a for loop.
- ▶ **var** styles = new Array();
styles[0] = "buzzcut";
styles[1] = "trim";
styles[2] = "perm";
for(**var** i = 0; i < 3; i++)
{
 document.write(styles[i] + "
");
}

Tracing For Loops with Arrays

Variable	Value
styles	undefined

```
var styles = new Array();
styles[0] = "buzzcut";
styles[1] = "trim";
styles[2] = "perm";
for(var i = 0; i < 3; i++)
{
    document.write(styles[i] + "<br>");
}
```

Tracing For Loops with Arrays

Variable

Value

styles

0

"buzzcut"

```
var styles = new Array();
styles[0] = "buzzcut";
styles[1] = "trim";
styles[2] = "perm";
for(var i = 0; i < 3; i++)
{
    document.write(styles[i] + "<br>");
}
```

Tracing For Loops with Arrays

Variable

Value

styles

0	1
"buzzcut"	"trim"

```
var styles = new Array();
styles[0] = "buzzcut";
styles[1] = "trim";
styles[2] = "perm";
for(var i = 0; i < 3; i++)
{
    document.write(styles[i] + "<br>");
}
```

Tracing For Loops with Arrays

Variable

Value

styles

0	1	2
"buzzcut"	"trim"	"perm"

```
var styles = new Array();
styles[0] = "buzzcut";
styles[1] = "trim";
styles[2] = "perm";
for(var i = 0; i < 3; i++)
{
    document.write(styles[i] + "<br>");
}
```

Tracing For Loops with Arrays

Variable

Value

styles

i

0	1	2
"buzzcut"	"trim"	"perm"

0

```
var styles = new Array();
styles[0] = "buzzcut";
styles[1] = "trim";
styles[2] = "perm";
for(var i = 0; i < 3; i++)
{
    document.write(styles[i] + "<br>");
}
```

Tracing For Loops with Arrays

Variable

Value

styles

i

0	1	2
"buzzcut"	"trim"	"perm"

0

```
var styles = new Array();
styles[0] = "buzzcut";
styles[1] = "trim";
styles[2] = "perm";
for(var i = 0; i < 3; i++)
{
    document.write(styles[i] + "<br>");
}
```

Tracing For Loops with Arrays

Variable

Value

styles

0	1	2
"buzzcut"	"trim"	"perm"

i

0

```
var styles = new Array();  
styles[0] = "buzzcut";  
styles[1] = "trim";  
styles[2] = "perm";  
for(var i = 0; i < 3; i++)  
{  
    document.write(styles[i] + "<br>");  
}
```

Output:

"buzzcut"

Tracing For Loops with Arrays

Variable

Value

styles

0	1	2
"buzzcut"	"trim"	"perm"

i

1

```
var styles = new Array();  
styles[0] = "buzzcut";  
styles[1] = "trim";  
styles[2] = "perm";  
for(var i = 0; i < 3; i++)  
{  
    document.write(styles[i] + "<br>");  
}
```

Output:

"buzzcut"

Tracing For Loops with Arrays

Variable

Value

styles

0	1	2
"buzzcut"	"trim"	"perm"

i

1

```
var styles = new Array();  
styles[0] = "buzzcut";  
styles[1] = "trim";  
styles[2] = "perm";  
for(var i = 0; i < 3; i++)  
{  
    document.write(styles[i] + "<br>");  
}
```

Output:

"buzzcut"

Tracing For Loops with Arrays

Variable

Value

styles

i

0	1	2
"buzzcut"	"trim"	"perm"

1

```
var styles = new Array();  
styles[0] = "buzzcut";  
styles[1] = "trim";  
styles[2] = "perm";  
for(var i = 0; i < 3; i++)  
{  
    document.write(styles[i] + "<br>");  
}
```

Output:

"buzzcut"

"trim"

Tracing For Loops with Arrays

Variable

Value

styles

i

0	1	2
"buzzcut"	"trim"	"perm"

2

```
var styles = new Array();  
styles[0] = "buzzcut";  
styles[1] = "trim";  
styles[2] = "perm";  
for(var i = 0; i < 3; i++)  
{  
    document.write(styles[i] + "<br>");  
}
```

Output:

"buzzcut"

"trim"

Tracing For Loops with Arrays

Variable

Value

styles

i

0	1	2
"buzzcut"	"trim"	"perm"

2

```
var styles = new Array();
styles[0] = "buzzcut";
styles[1] = "trim";
styles[2] = "perm";
for(var i = 0; i < 3; i++)
{
    document.write(styles[i] + "<br>");
}
```

Output:

"buzzcut"

"trim"

Tracing For Loops with Arrays

Variable

Value

styles

i

0	1	2
"buzzcut"	"trim"	"perm"

2

```
var styles = new Array();
styles[0] = "buzzcut";
styles[1] = "trim";
styles[2] = "perm";
for(var i = 0; i < 3; i++)
{
    document.write(styles[i] + "<br>");
}
```

Output:

"buzzcut"

"trim"

"perm"

Tracing For Loops with Arrays

Variable

Value

styles

i

0	1	2
"buzzcut"	"trim"	"perm"

3

```
var styles = new Array();
styles[0] = "buzzcut";
styles[1] = "trim";
styles[2] = "perm";
for(var i = 0; i < 3; i++)
{
    document.write(styles[i] + "<br>");
}
```

Output:

"buzzcut"

"trim"

"perm"

Tracing For Loops with Arrays

Variable

Value

styles

i

0	1	2
"buzzcut"	"trim"	"perm"

3

```
var styles = new Array();  
styles[0] = "buzzcut";  
styles[1] = "trim";  
styles[2] = "perm";  
for(var i = 0; i < 3; i++)  
{  
    document.write(styles[i] + "<br>");  
}
```

Output:

"buzzcut"

"trim"

"perm"

Caution on Indexing Arrays

- ▶ Just like you never use a variable in a condition without first initializing it, you **never index beyond the size of the array**, into uninitialized elements.
- ▶ You can get the size of an array with **length**

```
▶ var myArray = new Array();  
  // Initialize  
  myArray[0] = Math.random();  
  myArray[1] = Math.random();  
  // Print elements  
  for(var i = 0; i < myArray.length; i++)  
  {  
      document.write(myArray[i] + " ");  
  }
```


Computing the grade average

- ▶ We're computing the average of grades for a class of 100 students.
- ▶ **var** grades = new Array(); **var** i, sum = 0; // Randomly initialize grades for(i = 0; i < 100; i++)
 {
 grades[i] = Math.floor(Math.random() * 100);
 }
 // Get the average for(i = 0; i < grades.length; i++) {
 sum += grades[i]; }
document.write(" Average: " + sum/100);

How many students passed

- ▶ Say a passing grade is 60 or higher.

- ▶ **var** grades = new Array();
 var i, sum = 0;
 // Randomly initialize grades
 for(i = 0; i < 100; i++)
 {
 grades[i] = Math.floor(Math.random() * 100);
 }
 // Count how many passed
 for(i = 0; i < grades.length; i++)
 {
 if(grades[i] >= 60)
 sum++;
 }
 document.write("How many passed: " + sum);