Chapter 20

Iteration Principles
Iteration

• Process of repetition: looping through a series of statements to repeat them
### Syntax

```plaintext
while ( <condition> )
{
    <statement(s)>
}
```

### Example

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><code>var j = 1;</code></td>
</tr>
<tr>
<td>2</td>
<td><code>while ( j &lt;= 3 )</code></td>
</tr>
<tr>
<td>3</td>
<td><code>document.write(&quot;hi&quot;);</code></td>
</tr>
<tr>
<td>4</td>
<td><code>j = j + 1;</code></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

Condition: `true`
for Loop Syntax and Example

```javascript
for ( < init > ; < condition > ; < increment > )
{
   <statement(s)>
}
```

```
var j; 1 2 5
for ( j = 1 ; j <= 3 ; j++ )
{
   true 3 4
document.write("ho");
}
```
The sequence of operations on `j` from the for loop with control specification `(j = 1; j <= 3; j = j + 1)` is as follows:

<table>
<thead>
<tr>
<th>Operation</th>
<th>Operation Result</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>j = 1</code></td>
<td><code>j</code>’s value is 1</td>
<td>Initialize iteration variable</td>
</tr>
<tr>
<td><code>j &lt;= 3</code></td>
<td><code>true, j is less than 3</code></td>
<td>First <code>&lt;continuation&gt;</code> test, continue</td>
</tr>
<tr>
<td><code>j = j + 1</code></td>
<td><code>j</code>’s value is 2</td>
<td>First <code>&lt;next iteration&gt;</code> operation</td>
</tr>
<tr>
<td><code>j &lt;= 3</code></td>
<td><code>true, j is equal to 3</code></td>
<td>Second <code>&lt;continuation&gt;</code> test, continue</td>
</tr>
<tr>
<td><code>j = j + 1</code></td>
<td><code>j</code>’s value is 3</td>
<td>Second <code>&lt;next iteration&gt;</code> operation</td>
</tr>
<tr>
<td><code>j &lt;= 3</code></td>
<td><code>true, j is equal to 3</code></td>
<td>Third <code>&lt;continuation&gt;</code> test, continue</td>
</tr>
<tr>
<td><code>j = j + 1</code></td>
<td><code>j</code>’s value is 4</td>
<td>Third <code>&lt;next iteration&gt;</code> operation</td>
</tr>
<tr>
<td><code>j &lt;= 3</code></td>
<td><code>false, j is greater than 3</code></td>
<td>Fourth <code>&lt;continuation&gt;</code> test, terminate</td>
</tr>
</tbody>
</table>
for Example

text = "She said ";
for (j = 1; j <= 3; j = j + 1) {
    text = text + "Never! ";
}
alert(text);

which produces the following alert box.

She said Never! Never! Never!

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for Loop Rules

• Continuation/Termination Test
  – Any expression resulting in a Boolean value
  – Must involve iteration variable to avoid infinite loop

• Step Size
  – Amount of change from one iteration to next
  – Often called increment or decrement