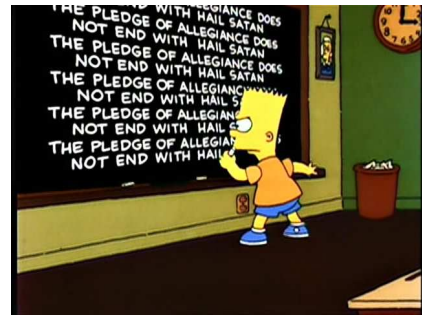# Iteration

Chapter 21

Iteration = Repetition

Looping Via The `for` Loop

- **`for` loop**: A block of code that executes a group of statements repeatedly until a given test fails.

- General syntax:
  ```
  for (<initialization>; <test>; <update>) {
      <statement>;
      <statement>;
      ...
      <statement>;
  }
  ```

- Example:
  ```
  for (var i = 1; i <= 6; i = i + 1) {
      alert("The Pledge of Allegiance...");
  }
  ```

Shortcut: Adding One

- Can shorten

  ```
  i = i + 1     to     i++
  ```

- Example:
  ```
  for (var i = 1; i <= 6; i++) {
      alert("The Pledge of Allegiance...");
  }
  ```

`for` Loop Over Range Of Numbers

- We'll write `for` loops over integers in a given range.
  - The **<initialization>** declares a *loop counter* variable that is used in the test, update, and body of the loop.

    ```
    for (var <name> = 1; <name> <= <value>; <name>++) {
    ```
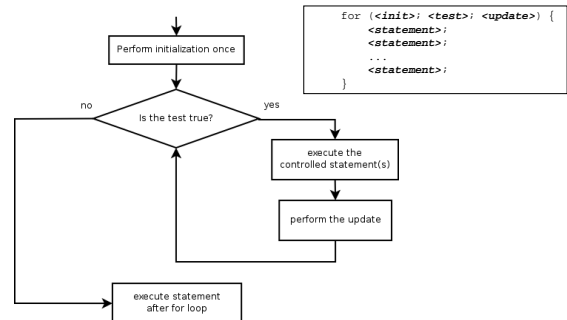
- Example:
  ```
  for (var i = 1; i <= 3; i++) {
      alert("After " + i + " is " + (i + 1));
  }
  ```
  "For each i from 1 through 3, ..."

`for` Loop Flow Diagram

```
for (<init>; <test>; <update>) {
    <statement>;
    <statement>;
    ...
    <statement>;
}
```

Perform initialization once

no ← Is the test true? → yes

execute the controlled statement(s)
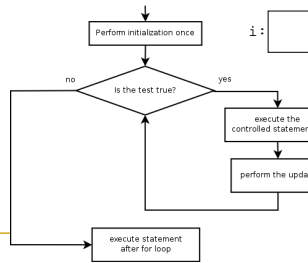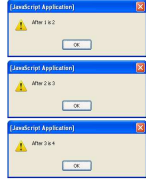
perform the update

execute statement after for loop

Loop Walkthrough

- Code:
```
for (var i = 1; i <= 3; i++) {
    alert("After " + i + " is " + (i + 1));
}
```

- Result:

i: [ ]

Perform initialization once

Is the test true?   no   yes

execute the controlled statement(s)

perform the update

execute statement after for loop

[JavaScript Application] After 1 is 2 OK
[JavaScript Application] After 2 is 3 OK
[JavaScript Application] After 3 is 4 OK

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Exercise

- Create a web page that looks as follows:

Times: [ ]
[Generate Song]

When the user clicks "Generate Song", the phrase "round and round" will be repeated the specified number of times after "The wheels on the bus go".

Times: [2]
[Generate Song]

The wheels on the bus go round and round round and round

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The Wheels On The Bus Go…

```
<div>
    Times: <input type="text" id="times" /><br />
    <input type="button" value="Generate Song"
     onclick="generate();" />
    <p id="output">
    </p>
</div>                                          HTML
```

```
function generate() {
    var times = document.getElementById("times").value;
    var text = "The wheels on the bus go ";
    for (var i = 1; i <= times; i++) {
        text = text + "round and round ";
    }
    document.getElementById("output").innerHTML = text;
}                                              JavaScript
```

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The Wheels On The Bus Go…

- Can shorten

```
text = text + ...     to     text += ...
```

```
function generate() {
    var times = document.getElementById("times").value;
    var text = "The wheels on the bus go ";
    for (var i = 1; i <= times; i++) {
        text += "round and round ";
    }
    document.getElementById("output").innerHTML = text;
}                                              JavaScript
```

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Exercise

- Create a web page that looks as follows (example values filled in):

Text: [Hello, world!]
Times: [5]
[Generate Sentences]

When the user clicks "Generate Sentences", the text will be repeated the specified number of times.

Text: [Hello, world!]
Times: [5]
[Generate Sentences]

Hello, world!
Hello, world!
Hello, world!
Hello, world!
Hello, world!

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Solution

```
<div>
    Text: <input type="text" id="text" /><br />
    Times: <input type="text" id="times" /><br />
    <input type="button" value="Generate Sentences"
     onclick="generate();" />
    <p id="output">
    </p>
</div>                                          HTML
```

```
function generate() {
    var times = document.getElementById("times").value;
    var sentence = document.getElementById("text").value;
    var text = "";
    for (var i = 1; i <= times; i++) {
        text += sentence + "<br />";
    }
    document.getElementById("output").innerHTML = text;
}                                              JavaScript
```

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Revisiting Radio Buttons

```html
<label>
    <input type="radio" name="cards" id="cards1"
     value="MasterCard" onchange="showCard(1);" />MasterCard
</label>
<label>
    <input type="radio" name="cards" id="cards2"
     value="Visa" onchange="showCard(2);" />Visa
</label>
<label>
    <input type="radio" name="cards" id="cards3"
     value="Discover" onchange="showCard(3);" />Discover
</label>                                                    HTML
```

```javascript
function showCard(num) {
    var value = document.getElementById("cards" + num).value;
    alert("You picked: " + value);
}                                                     JavaScript
```

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Revisiting Radio Buttons

```html
<label>
    <input type="radio" name="cards" id="cards1"
     value="MasterCard" onchange="showCard();" />MasterCard
</label>
<label>
    <input type="radio" name="cards" id="cards2"
     value="Visa" onchange="showCard();" />Visa
</label>
<label>
    <input type="radio" name="cards" id="cards3"
     value="Discover" onchange="showCard();" />Discover
</label>                                                    HTML
```

- It is possible to use the same parameter-less function.
  - Use document.getElementById("<ID>").checked to see if each radio button is activated
  - The checked attribute is a Boolean value (true or false).

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Revisiting Radio Buttons

```javascript
function showCard() {
   if (document.getElementById("cards1").checked) {
       var value = document.getElementById("cards1").value;
       alert("You picked: " + value);
   }
   if (document.getElementById("cards2").checked) {
       var value = document.getElementById("cards2").value;
       alert("You picked: " + value);
   }
   if (document.getElementById("cards3").checked) {
       var value = document.getElementById("cards3").value;
       alert("You picked: " + value);
   }
}                                                     JavaScript
```

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Revisiting Radio Buttons

- Can loop over element IDs

```javascript
function showCard() {
    for (var i = 1; i <= 3; i++) {
        var idToTry = "cards" + i;
        if (document.getElementById(idToTry).checked) {
            var value = document.getElementById(idToTry).value;
            alert("You picked: " + value);
        }
    }
}                                                     JavaScript
```

- Although the previous slide is acceptable as a solution in this class, you should learn to make the computer do most of the work for you as above.

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