

# Working with Forms and Regular Expressions

## Validating a Web Form with JavaScript

# Objectives

- Understand how to reference form element objects
- Extract data from input fields, selection lists, and option button groups
- Create a calculated field
- Format numeric values

# Objectives

- Understand the principles of form validation
- Perform a client-side validation
- Work with the properties and methods of string objects

# Objectives

- Learn to create a regular expression
- Explore the properties and methods of the regular expression object
- Apply regular expressions to ZIP code fields
- Apply the Luhn Formula to validate credit card numbers
- Learn how to pass data from one form to another

# Working with Forms and Fields

# Working with Forms and Fields

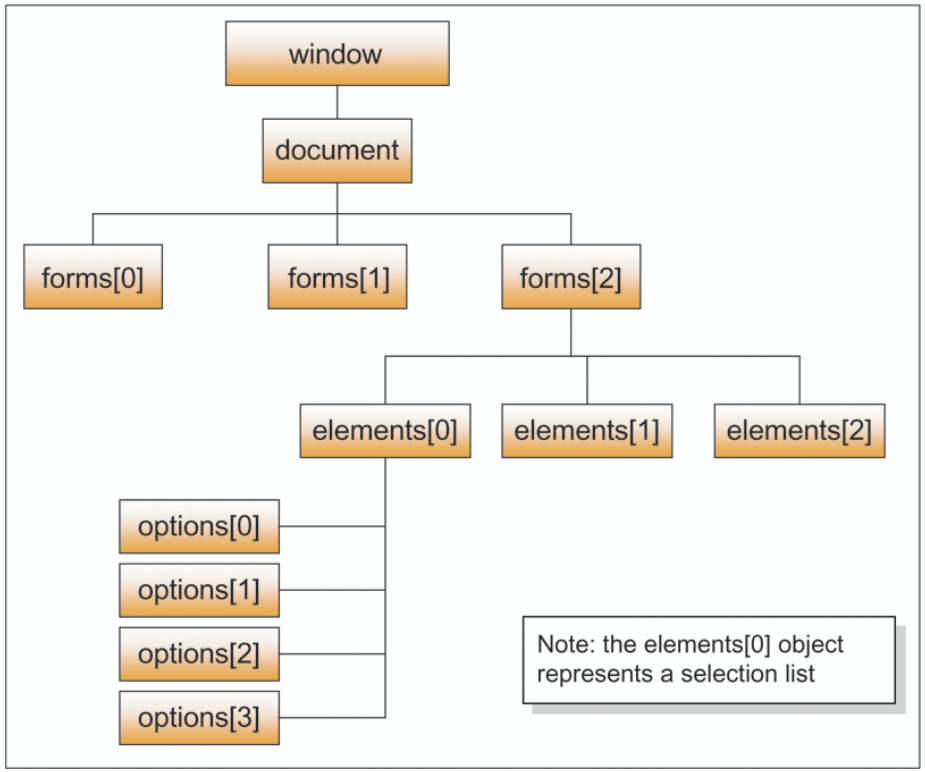
- Referencing a Web form
  - You have to work with the properties and methods of the form object and the elements it contains
  - JavaScript supports an object collection for forms

    **`document.forms[`*`idref`*`]`** or

    **`document.`*`fname`***

# Working with Forms and Fields

- Referencing a Web form



# Working with Forms and Fields

- Referencing a form element
  - The elements within a form are organized into an elements collection
  - Can reference a form element either by its position in the collection or by its name or id attributes

# Working with Forms and Fields

- Referencing a form element

| Object | Reference |
|---|---|
| The order form | document.form1 |
| The date field | document.form1.date |
| The product selection list | document.form1.prod |
| The quantity selection list | document.form1.qty |
| The price of the product field | document.form1.price |
| The group of shipping options | document.form1.shipType |
| The shipping cost field | document.form1.ship |
| The subtotal field | document.form1.sub |
| The tax field | document.form1.tax |
| The total field | document.form1.tot |
| The cancel button | document.form1.cancelb |
| The next button | document.form1.nextb |

# Working with Input Fields

- Setting the field value
  - To set the value contained in a field such as an input box, you use the value property
  - The general syntax is

```
formObject.element.value = fieldvalue;
```

# Working with Input Fields

- Setting the field value

| Property | Description |
|---|---|
| defaultvalue | The default value that is initially displayed in the field |
| form | References the form containing the field |
| maxlength | The maximum number of characters allowed in the field |
| name | The name of the field |
| size | The width of the input field in characters |
| type | The type of input field (button, check box, file, hidden, image, password, radio, reset, submit, text) |
| value | The current value of the field |

| Method | Description |
|---|---|
| blur() | Remove the focus from the field |
| focus() | Give focus to the field |
| select() | Select the field |

# Working with Input Fields

- Navigating between fields
  - To place the cursor in a particular field on a form

    **`formObject.element.focus()`**
  - To remove the focus from this field

    **`formObject.element.blur()`**

# Working with Selection Lists

- To reference a particular option in the collection

```
element.options[idref]
```

| *object* | *object*.text | *object*.value |
|---|---|---|
| document.form1.prod.options[0] | Products from GPS-ware | 0 |
| document.form1.prod.options[1] | GoMap 1.0 ($19.95) | 19.95 |
| document.form1.prod.options[2] | Drive Planner 2.0 ($29.95) | 29.95 |
| document.form1.prod.options[3] | Hiker 1.0 ($29.95) | 29.95 |
| document.form1.prod.options[4] | G-Receiver I ($149.50) | 149.50 |
| document.form1.prod.options[5] | G-Receiver II ($199.50) | 199.50 |
| document.form1.prod.options[6] | G-Receiver III ($249.50) | 249.50 |

# Working with Selection Lists

| selection list | Property | Description |
|---|---|---|
| | length | The number of options in the list |
| | name | The name of the selection list |
| | options | The collection of options in the list |
| | selectedIndex | The index number of the currently selected option in the list |

| selection list option | Property | Description |
|---|---|---|
| | defaultSelected | A Boolean value indicating whether the option is selected by default |
| | index | The index value of the option |
| | selected | A Boolean value indicating whether the option is currently selected |
| | text | The text associated with the option |
| | value | The value associated with the option |

# Working with Selection Lists

```
function calcPrice() {
   product = document.form1.prod;
   pindex = product.selectedIndex;
   product_price = product.options[pindex].value;
   quantity = document.form1.qty;
   qindex = quantity.selectedIndex;
   quantity_ordered = quantity.options[qindex].value;
   document.form1.price.value = product_price*quantity_ordered;
}

</script>
</head>
```

# Working with Option Buttons and Checkboxes

- Using option buttons
  - Have the reference

    **`Element[idref]`**
  - Where element is the reference to the group of option buttons and idref is either the index number or id of the individual option button

| Property | Description |
|---|---|
| checked | A Boolean value indicating whether the option button is currently selected |
| defaultChecked | A Boolean value indicating whether the option button is selected by default |
| name | The name of the option button |
| value | The value associated with the option button |

# Working with Option Buttons and Checkboxes

- Using the “this” keyword
  - The **this keyword** is a JavaScript object reference that refers to the currently selected object, whatever that may be

```
<td>
   <p><input type="radio" name="shipType" id="ship1" value="4.95"
       onclick="calcShipping(this)" />
       <label for="ship1">Standard (4-6 business days): $4.95</label>
   </p>
   <p><input type="radio" name="shipType" id="ship2" value="8.95"
       onclick="calcShipping(this)" />
       <label for="ship2">Express (2 days): $8.95</label>
   </p>
   <p><input type="radio" name="shipType" id="ship3" value="12.95"
       onclick="calcShipping(this)" />
       <label for="ship3">Next Day (1 day): $12.95</label>
   </p>
</td>
```

# Working with Option Buttons and Checkboxes

- Working with check boxes
  - Work the same way as option buttons
  - In addition, the value associated with a check box is stored in the value property of the check box object
  - This value is applied only when the check box is checked
  - When unchecked, its field has no value assigned to it

# Creating Calculated Fields

- Converting between text strings and numeric values
  - One simple way to convert a text string to a number is to perform an arithmetic operation (other than the plus operator) that does not change the number's value

```
priceVal = document.form1.price.value*1;
```

  - To instead convert a number to text, you can add a text string, as in the following expression

```
priceText = priceVal + "";
```

# Creating Calculated Fields

- Converting between text strings and numeric values
  - More reliable to explicitly indicate that you want to convert

    **parseInt(*text*)**

    **parseFloat(*text*)**

    **String(*value*)**
  - If you're unsure whether JavaScript considers a particular value to be text or a number, you can use the typeof() function to find out

    **typeof(*value*)**

# Creating Calculated Fields

- Formatting numeric values

| Method | Description |
|---|---|
| isFinite(*value*) | Returns a Boolean value indicating whether *value* is finite and a legal number |
| isNaN(*value*) | Returns a Boolean value indicating whether *value* is "not a number" |
| parseFloat(*string*) | Extracts the first numeric value from a text string |
| parseInt(*string*) | Extracts the first integer value from a text string |
| String(*object*) | Converts an *object* to a text string representing the object's value; when used with numeric values, it changes the number to a text string |
| *value*.toExponential(*n*) | Returns a text string displaying *value* in exponential notation with *n* digits to the right of the decimal point |
| *value*.toFixed(*n*) | Returns a text string displaying the *value* to *n* decimal places |
| *value*.toPrecision(*n*) | Returns a text string displaying the *value* to *n* significant digits either to the left or to the right of the decimal point |

# Creating Calculated Fields

- Working with Older Browsers
  - You must format your output using a JavaScript program

```
function roundValue(value, n) {
 return Math.round(Math.pow(10,n)*value)/Math.pow(10,n);
}
function toFixed2(value) {
    n = Math.round(value*100)/100;
    if (n == Math.round(n)) return n+".00";
    else if (n*10 == Math.round(n*10)) return n+"0";
    else return String(n);
}
```

# Working with Form Validation

- **Form validation** is a process by which the server or user's browser checks a form for data entry errors
- With **server-side validation**, a form is sent to the Web server for checking
- In **client-side validation**, the Web browser checks the form, which is not submitted to the server until it passes inspection

# Working with Form Validation

- Submitting a Form
  - To control this submission process, JavaScript provides the onsubmit event handler

```
<form onsubmit="return function()"> ...
  </form>
```

  - If the function returns a value of false, the submit event is cancelled, while a value of true allows the submit event to continue unabated

# Working with Form Validation

- Resetting a Form
  - Clicking the reset button has the effect of resetting all form fields to their default values
  - You can control how the reset event is handled by adding an onreset event handler

```
<body onload = "startForm()">
<form name="form1" id="form1" method="post" action="form2.htm"
      onsubmit="return checkForm1()" onreset="location.reload()">
```

when the form is reset reload the page

# Working with Text Strings

- The string object
  - JavaScript treats each text string as an object called a **string object**
  - The most common way to create a string object is to assign a text string to a variable
  - You can also create a string object using the object constructor

```
stringVariable = new String("text")
```

# Working with Text Strings

- Calculating the length of a text string
  - The following code calculates the number of characters in the stringVar variable, storing the value 17 in the lengthValue variable

```
stringVar = "GPS-ware Products";
lengthValue = stringVar.length
```

# Working with Text Strings

- Working with the string object methods
  - To determine the number of characters in a text string, use the object property **`string.length`**
  - To extract a character from a text string, use the method **`string.charAt(i)`**
  - To extract a substring from a text string, use the method **`string.slice(start, end)`**

# Working with Text Strings

- Working with the string object methods
  - To split a string into several substrings, use the command **`strArray = string.split(str)`**
  - To search a string, use the method **`string.indexOf(str, start)`**

# Working with Text Strings

- Formatting test strings

| Method | Description | HTML Equivalent |
|---|---|---|
| *string*.anchor(*text*) | Creates an anchor with the anchor name *text* | `<a name="text">string</a>` |
| *string*.big() | Changes the size of the *string* font to big | `<big>string</big>` |
| *string*.blink() | Changes *string* to blinking text | `<blink>string</blink>` |
| *string*.bold() | Changes the font weight of *string* to bold | `<bold>string</bold>` |
| *string*.fixed() | Changes the font of *string* to a fixed width font | `<tt>string</tt>` |
| *string*.fontcolor(*color*) | Changes the color of *string* to the hexadecimal *color* value | `<font color="color">string</font>` |
| *string*.fontsize(*value*) | Changes the font size of *string* to *value* | `<font size="value">string</font>` |
| *string*.italics() | Changes *string* to italics | `<i>string</i>` |
| *string*.link(*url*) | Changes *string* to a link pointing to *url* | `<a href="url">string</a>` |
| *string*.small() | Changes the size of the *string* font to small | `<small>string</small>` |
| *string*.strike() | Adds strikethrough characters to *string* | `<strike>string</strike>` |
| *string*.sub() | Changes *string* to a subscript | `<sub>string</sub>` |
| *string*.sup() | Changes *string* to a superscript | `<sup>string</sup>` |
| *string*.toLowerCase() | Changes *string* to lowercase letters | |
| *string*.toUpperCase() | Changes *string* to uppercase letters | |

# Introducing Regular Expressions

- A **regular expression** is a text string that defines a character pattern
- One use of regular expressions is **pattern-matching**, in which a text string is tested to see whether it matches the pattern defined by a regular expression

# Introducing Regular Expressions

- **Creating a regular expression**
  - You create a regular expression in JavaScript using the command

    ```
    re = /pattern/;
    ```

  - This syntax for creating regular expressions is sometimes referred to as a **regular expression literal**

# Introducing Regular Expressions

- **Matching a substring**
  - The most basic regular expression consists of a substring that you want to locate in the test string
  - The regular expression to match the first occurrence of a substring is **`/chars/`**

# Introducing Regular Expressions

- **Setting regular expression flags**
  - To make a regular expression not sensitive to case, use the regular expression literal **`/pattern/i`**
  - To allow a global search for all matches in a test string, use the regular expression literal **`/pattern/g`**

# Introducing Regular Expressions

- Defining character positions

| Character | Description | Example |
|---|---|---|
| ^ | Indicates the beginning of the text string | /^GPS/ matches "GPS-ware" but not "Products from GPS-ware" |
| $ | Indicates the end of the text string | /ware$/ matches "GPS-ware" but not "GPS-ware Products" |
| \b | Indicates the presence of a word boundary | /\bart/ matches "art" and "artists" but not "dart" |
| \B | Indicates the absence of a word boundary | /art\B/ matches "dart" but not "artist" |

# Introducing Regular Expressions

- Defining character positions

| Character | Description | Example |
|---|---|---|
| \d | A digit (from 0 to 9) | /\dth/ matches "5th" but not "ath" |
| \D | A non-digit | /\Ds/ matches "as" but not "5s" |
| \w | A word character (an upper or lower case letter, a digit, or an underscore) | /\w\w/ matches "to" or "A1" but not "$x" or " *" |
| \W | A non-word character | /\W/ matches "$" or "&" but not "a", "B", or "3" |
| \s | A white space character (a blank space, tab, new line, carriage return, or form feed) | /\s\d\s/ matches " 5 " but not "5" |
| \S | A non-white space character | /\S\d\S/ matches "345" or "a5b" but not "5" |
| . | Any character | /./ matches anything |

# Introducing Regular Expressions

- Defining character positions
  - Can specify a collection of characters known a **character class** to limit the regular expression to only a select group of characters

# Introducing Regular Expressions

- Defining character positions

| Character | Description | Example |
|---|---|---|
| [*chars*] | Match any character in the list of characters, *chars* | /[dog]/ matches "god" and "dog" |
| [^*chars*] | Do not match any character in *chars* | /[^dog]/ matches neither "god" nor "dog" |
| [*char1-charN*] | Match characters in the range *char1* through *charN* | /[a-c]/ matches the lowercase letters a through c |
| [^*char1-charN*] | Do not match characters in the range *char1* through *charN* | /[^a-c]/ does not match the lowercase letters a through c |
| [a-z] | Match lowercase letters | /[a-z][a-z]/ matches any two consecutive lowercase letters |
| [A-Z] | Match uppercase letters | /[A-Z][A-Z]/ matches any two consecutive uppercase letters |
| [a-zA-Z] | Match letters | /[a-zA-Z][a-zA-Z]/ matches any two consecutive letters |
| [0-9] | Match digits | /[1][0-9]/ matches the numbers "10" through "19" |
| [0-9a-zA-Z] | Match digits and letters | /[0-9a-zA-Z][0-9a-zA-Z]/ matches any two consecutive letters or numbers |

# Introducing Regular Expressions

- Repeating characters

| Repetition Character(s) | Description | Example |
|---|---|---|
| * | Repeat 0 or more times | /\s*/ matches 0 or more consecutive white space characters |
| ? | Repeat 0 or 1 time | /colou?r/ matches "color" or "colour" |
| + | Repeat 1 or more times | /\s+/ matches 1 or more consecutive white space characters |
| {*n*} | Repeat exactly *n* times | /\d{9}/ matches a nine digit number |
| {*n*, } | Repeat at least *n* times | /\d{9,}/ matches a number with at least nine digits |
| {*n*,*m*} | Repeat at least *n* times but no more than *m* times | /\d{5,9}/ matches a number with 5 to 9 digits |

# Introducing Regular Expressions

- Escape Sequences
  - An **escape sequence** is a special command inside a text string that tells the JavaScript interpreter not to interpret what follows as a character
  - The character which indicates an escape sequence in a regular expression is the backslash character \

# Introducing Regular Expressions

- Escape Sequences

| Escape Sequence | Represents | Example |
|---|---|---|
| \/ | The / character | /\d\/\d/ matches "5/9" "3/1" but not "59" or "31" |
| \\ | The \ character | /\d\\\d/ matches "5\9" or "3\1" but not "59" or "31" |
| \. | The . character | /\d\.\d\d/ matches "3.20" or "5.95" but not "320" or "595" |
| * | The * character | /\[a-z]{4}*/ matches "help*" or "pass*" |
| \+ | The + character | /\d\+\d/ matches "5+9" or "3+1" but not "59" or "39" |
| \? | The ? character | /[a-z]{4}\?/ matches "help?" or "info?" |
| \| | The \| character | /a\|b/ matches "a\|b" |
| \( \) | The ( and ) characters | /\(\d{3}\)/ matches "(800)" or "(555)" |
| \{ \} | The { and } characters | /\{[a-z]{4}\}/ matches "{pass}" or "{info}" |
| \^ | The ^ character | /\d+\^\d/ matches "321^2" or "4^3" |
| \$ | The $ character | /\$\d{2}\.\d{2}/ matches "$59.95" or "$19.50" |
| \n | A new line | /\n/ matches the occurrence of a new line in the text string |
| \r | A carriage return | /\r/ matches the occurrence of a carriage return in the text string |
| \t | A tab | /\t/ matches the occurrence of a tab in the text string |

# Introducing Regular Expressions

- Alternating Patterns and Grouping

| Characters | Description | Example |
|---|---|---|
| *pattern1*\|*pattern2* | Matches either *pattern1* or *pattern2* | /color\|colour/ matches either "color" or "colour" |
| (*pattern*) | Treats *pattern* as a single group and allows a back-reference to the captured group | /(Mr\.\s)?\w+/ matches either "Mr. Smith" or "Smith" |
| \n | Back-reference to group *n* in the regular expression | /(\s)\1/ matches consecutive occurrences of white space |
| (?*pattern*) | Treats *pattern* as a single group, but does not allow for back-referencing | |

# Introducing Regular Expressions

- The regular expression object constructor
  - To create a regular expression object

    ***re* = new RegExp(*pattern, flags*)**

  - *re* is the regular expression object, *pattern* is a text string of the regular expression pattern, and *flags* is a text string of the regular expression flags

# Working with the Regular Expression Object

- Regular Expression methods

| Method | Description |
|---|---|
| *re*.compile(*pattern*,*flags*) | Compiles or recompiles a regular expression *re*, where *pattern* is the text string of new regular expression pattern and *flags* are flags applied to the *pattern* |
| *re*.exec(*text*) | Executes a search on *text* using the regular expression *re*; pattern results are returned in an array and reflected in the properties of the global RegExp object |
| *re*.match(*text*) | Performs a pattern match in *text* using the *re* regular expression; matched substrings are stored in an array |
| *text*.replace(*re*, *newsubstr*) | Replaces the substring defined by the regular expression *re* in the text string *text* with *newsubstr* |
| *text*.search(*re*) | Searches *text* for a substring matching the regular expression *re*; returns the index of the match, or -1 if no match is found |
| *text*.split(*re*) | Splits *text* at each point indicated by the regular expression *re*; the substrings are stored in an array |
| *re*.test(*text*) | Performs a pattern match on the text string *text* using the regular expression *re*, returning the Boolean value true if a match is found and false otherwise |

# Working with the Regular Expression Object

- Validating a ZIP code

```
function checkForm2() {
   if (document.form2.fname.value.length == 0)
      {alert("You must enter a first name");
       return false;}
   else if (document.form2.lname.value.length == 0)
      {alert("You must enter a last name");
       return false;}
   else if (document.form2.street.value.length == 0)
      {alert("You must enter a street address");
       return false;}
   else if (document.form2.city.value.length == 0)
      {alert("You must enter a city name");
       return false;}
   else if (checkzip2(document.form2.zip.value) == false)
      {alert("You must enter a valid zip code");
       return false;}
   else return true;
}

function checkZip(zip) {
   if (zip.length != 5 && zip.length != 0) return false;
   else {
      validchars = "0123456789";
      for (i=0; i<5; i++) {
         zipchar=zip.charAt(i);
         if (validchars.indexOf(zipchar) == -1) return false;
      }
   }
   return true;
}

function checkzip2(zip) {
   re = /^\d{5}(-\d{4})?$|^$/;
   return re.test(zip);
}
</script>
```

# Validating Financial Information

| Object | Reference |
|---|---|
| The American Express radio button | document.form3.ccard[0] |
| The Diners Club radio button | document.form3.ccard[1] |
| The Discover radio button | document.form3.ccard[2] |
| The MasterCard radio button | document.form3.ccard[3] |
| The Visa radio button | document.form3.ccard[4] |
| The credit card name field | document.form3.cname |
| The credit card number field | document.form3.cnumber |
| The credit card month selection list | document.form3.cmonth |
| The credit card year selection list | document.form3.cyear |
| The previous button | document.form3.prevb |
| The next button | document.form3.nextb |

# Validating Financial Information

- Removing blank spaces from credit card numbers

match all white space in the text string

```
function selectedCard() {
   card=-1;
   for (i=0; i<5; i++) {
      if (document.form3.ccard[i].checked) card=i;
   }
   return card;
}

function checkNumber() {
   wsre = /\s/g
   cnum = document.form3.cnumber.value.replace(wsre,"");
}
</script>
</head>
```

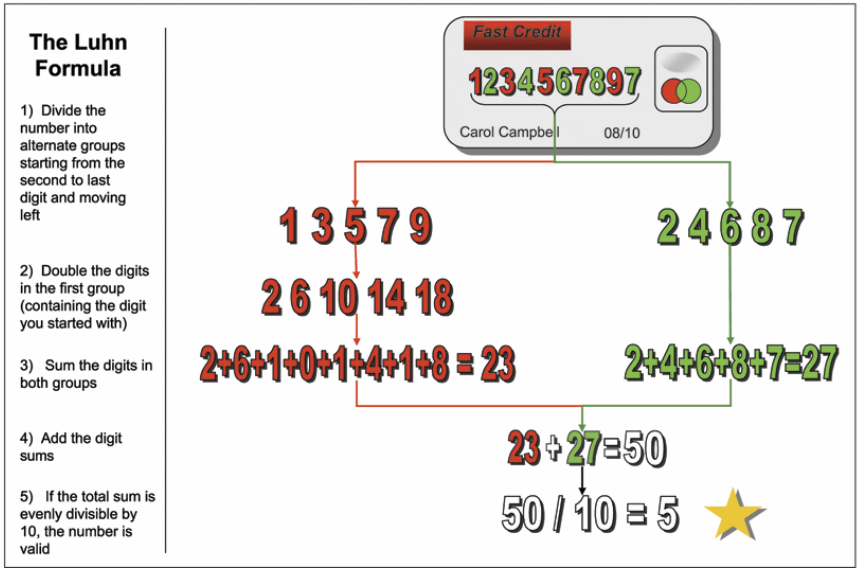
# Validating Financial Information

- Validating credit card number patterns

| Credit Card | Number Pattern | Regular Expression |
|---|---|---|
| American Express | Starts with 34 or 37 followed by 13 other digits | `/^3[47]\d{13}$/` |
| Diners Club | Starts with 300-305 followed by 11 digits, or starts with 36 or 38 followed by 12 digits | `/^30[0-5]\d{11}$\|^3[68] \d{12}$/` |
| Discover | Starts with 6011 followed by 12 other digits | `/^6011\d{12}$/` |
| MasterCard | Starts with 51, 52, 53, 54, or 55 followed by 14 other digits | `/^5[1-5]\d{14}$/` |
| Visa | Starts with a 4 followed by 12 or 15 other digits | `/^4(\d{12}\|\d{15})$/` |

# Validating Financial Information

- The Luhn Formula
  - All credit card numbers must satisfy the **Luhn Formula**, or **Mod10 algorithm**, which is a formula developed by a group of mathematicians in the 1960s to provide a quick validation check on an account number by adding up the digits in the number



# Passing Data from a Form

- Appending data to a URL
  - Text strings can be appended to any URL by adding the ? character to the Web address followed by the text string

```
<a href="form2.htm?GPS-ware">Go to
  form2</a>
```

  - One property of the location object is the location.search property, which contains the text of any data appended to the URL, including the ? character

# Passing Data from a Form

- Appending data to a URL
  - There are several limitations to the technique of appending data to a URL
  - URLs are limited in their length
  - Characters other than letters and numbers cannot be passed in the URL without modification
  - Because URLs cannot contain blank spaces, for example, a blank space is converted to the character code %20

# Passing Data from a Form

- Appending and retrieving form data
  - Can use the technique of appending data to the URL with Web forms, too
  - Do this by setting a form's action attribute to the URL of the page to which you want to pass the data, and setting the method of the form to "get"

# Passing Data from a Form

- Appending and retrieving form data
  - Use the location.search property and the slice() method to extract only the text string of the field names and values
  - Use the unescape() function to remove any escape sequences characters from the text string
  - Convert each occurrence of the + symbol to a blank space
  - Split the text string at every occurrence of a = or & character, storing the substrings into an array

# Tips for Validating Forms

- Use selection lists, option buttons, and check boxes to limit the ability of users to enter erroneous data
- Indicate to users which fields are required, and if possible, indicate the format that each field value should be entered in
- Use the maxlength attribute of the input element to limit the length of text entered into a form field

# Tips for Validating Forms

- Format financial values using the toFixed() and toPrecision() methods. For older browsers  use custom scripts to format financial data
- Apply client-side validation checks to lessen the load of the server
- Use regular expressions to verify that field values correspond to a required pattern

# Tips for Validating Forms

- Use the length property of the string object to test whether the user has entered a value in a required field
- Test credit card numbers to verify that they match the patterns specified by credit card companies
- Test credit card numbers to verify that they fulfill the Luhn Formula