CSE3026: Web Application Development Forms

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6.1: Form Basics

Web data

- most interesting web pages revolve around data
  - examples: Google, IMDB, Digg, Facebook, YouTube, Rotten Tomatoes
  - can take many formats: text, HTML, XML, multimedia
- many of them allow us to access their data
- some even allow us to submit our own new data
- most server-side web programs accept **parameters** that guide their execution

Query strings and parameters

```
URL?name=value&name=value...
```

```
http://www.google.com/search?q=Obama
http://example.com/student_login.php?username=lee&id=1234567
```

- **query string**: a set of parameters passed from a browser to a web server
  - often passed by placing name/value pairs at the end of a URL
  - above, parameter `username` has value `lee`, and `sid` has value `1234567`
- PHP code on the server can examine and utilize the value of parameters
- a way for PHP code to produce different output based on values passed by the user

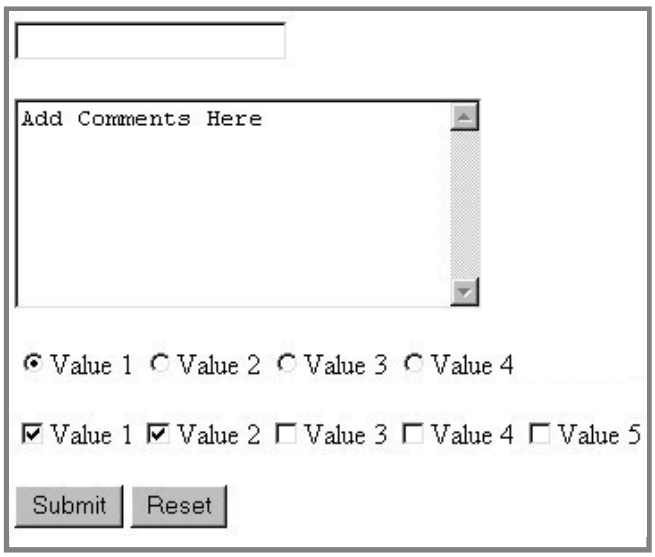
Query parameters: $_GET, $_POST

```
$user_name = $_GET["username"];
$id_number = (int) $_GET["id"];
$eats_meat = FALSE;
if (isset($_GET["meat"])) {
  $eats_meat = TRUE;
}
```

- `$_GET["`*parameter name*`"]` or `$_POST["`*parameter name*`"]` returns a GET/POST parameter's value as a string
- parameters specified as `http://....?`*name*`=`*value*`&`*name*`=`*value* are GET parameters
- test whether a given parameter was passed with `isset`

HTML forms

- **form**: a group of UI controls that accepts information from the user and sends the information to a web server
- the information is sent to the server as a **query string**
- JavaScript can be used to create interactive controls (seen later)



HTML form: `<form>`

```
<form action="destination URL">
  form controls
</form>
```

- required `action` attribute gives the URL of the page that will process this form's data
- when form has been filled out and **submitted**, its data will be sent to the `action`'s URL
- one page may contain many forms if so desired

Form example

```
<form action="http://www.google.com/search">
  <div>
    Let's search Google:
    <input name="q" />
    <input type="submit" />
  </div>
</form>
```

Let's search Google: 제출

- must wrap the form's controls in a block element such as `div`

6.2: Form Controls

- 6.1: Form Basics
- **6.2: Form Controls**
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- 6.4: Processing Form Data in PHP

Form controls: `<input>`

```
<!-- 'q' happens to be the name of Google's required parameter -->
<input type="text" name="q" value="Colbert Report" />
<input type="submit" value="Booyah!" />
```

Colbert Report Booyah!

- `input` element is used to create many UI controls
  - an inline element that MUST be self-closed
- `name` attribute specifies name of query parameter to pass to server
- `type` can be `button`, `checkbox`, `file`, `hidden`, `password`, `radio`, `reset`, `submit`, `text`, ...
- `value` attribute specifies control's initial text

Text fields: `<input>`

```
<input type="text" size="10" maxlength="8" /> NetID <br />
<input type="password" size="16" /> Password
<input type="submit" value="Log In" />
```

NetID
Password Log In

- `input` attributes: `disabled`, `maxlength`, `readonly`, `size`, `value`
- `size` attribute controls onscreen width of text field
- `maxlength` limits how many characters user is able to type into field

Text boxes: `<textarea>`

a multi-line text input area (inline)

```
<textarea rows="4" cols="20">
Type your comments here.
</textarea>
```

Type your comments here.

- initial text is placed inside `textarea` tag (optional)
- required `rows` and `cols` attributes specify height/width in characters
- optional `readonly` attribute means text cannot be modified

Checkboxes: `<input>`

yes/no choices that can be checked and unchecked (inline)

```
<input type="checkbox" name="lettuce" /> Lettuce
<input type="checkbox" name="tomato" checked="checked" /> Tomato
<input type="checkbox" name="pickles" checked="checked" /> Pickles
```

☐ Lettuce ☑ Tomato ☑ Pickles 제출

- none, 1, or many checkboxes can be checked at same time
- when sent to server, any checked boxes will be sent with value `on`:
  - `http://domain_name/params.php?tomato=on&pickles=on`
- use `checked="checked"` attribute in HTML to initially check the box

Radio buttons: `<input>`

sets of mutually exclusive choices (inline)

```
<input type="radio" name="cc" value="visa" checked="checked" /> Visa
<input type="radio" name="cc" value="mastercard" /> MasterCard
<input type="radio" name="cc" value="amex" /> American Express
```

◉ Visa ○ MasterCard ○ American Express 제출

- grouped by `name` attribute (only one can be checked at a time)
- must specify a `value` for each one or else it will be sent as value `on`

Text labels: `<label>`

```
<label><input type="radio" name="cc" value="visa" checked="checked" /> Visa</label>
<label><input type="radio" name="cc" value="mastercard" /> MasterCard</label>
<label><input type="radio" name="cc" value="amex" /> American Express</label>
```

Visa MasterCard American Express 제출

- associates nearby text with control, so you can click text to activate control
- can be used with checkboxes or radio buttons
- `label` element can be targeted by CSS style rules

Drop-down list: `<select>`, `<option>`

menus of choices that collapse and expand (inline)

```
<select name="favoritecharacter">
  <option>Jerry</option>
  <option>George</option>
  <option selected="selected">Kramer</option>
  <option>Elaine</option>
</select>
```

Kramer 제출

- `option` element represents each choice
- `select` optional attributes: `disabled`, `multiple`, `size`
- optional `selected` attribute sets which one is initially chosen

Using `<select>` for lists

```
<select name="favoritecharacter[]" size="3" multiple="multiple">
  <option>Jerry</option>
  <option>George</option>
  <option>Kramer</option>
  <option>Elaine</option>
  <option selected="selected">Newman</option>
</select>
```

Kramer
Elaine
Newman
제출

- optional `multiple` attribute allows selecting multiple items with shift- or ctrl-click
  - must declare parameter's name with `[]` if you allow multiple selections
- `option` tags can be set to be initially `selected`

Option groups: `<optgroup>`

```
<select name="favoritecharacter">
  <optgroup label="Major Characters">
    <option>Jerry</option>
    <option>George</option>
    <option>Kramer</option>
    <option>Elaine</option>
  </optgroup>
  <optgroup label="Minor Characters">
    <option>Newman</option>
    <option>Susan</option>
  </optgroup>
</select>
```

Jerry
제출

- What should we do if we don't like the bold italic?

Reset buttons

```
Name: <input type="text" name="name" /> <br />
Food: <input type="text" name="meal" value="pizza" /> <br />
<label>Meat? <input type="checkbox" name="meat" /></label> <br />
<input type="reset" />
```

Name:
Food: pizza
Meat?
초기화 제출

- when clicked, returns all form controls to their initial values
- specify custom text on the button by setting its `value` attribute

Common UI control errors

- "I changed the form's HTML code … but when I refresh, the page doesn't update!"
  - By default, when you refresh a page, it leaves the previous values in all form controls
  - it does this in case you were filling out a long form and needed to refresh/return to it
  - if you want it to clear out all UI controls' state and values, you must do a **full refresh**
    - Firefox: Shift-Ctrl-R
    - Mac: Shift-Command-R

Hidden input parameters

```
<input type="text" name="username" /> Name <br />
<input type="text" name="sid" /> SID <br />
<input type="hidden" name="school" value="HYU" />
<input type="hidden" name="year" value="2048" />
```

Name
SID
제출

- an invisible parameter that is still passed to the server when form is submitted
- useful for passing on additional state that isn't modified by the user

Grouping input: `<fieldset>`, `<legend>`

groups of input fields with optional caption (block)

```
<fieldset>
  <legend>Credit cards:</legend>
  <input type="radio" name="cc" value="visa" checked="checked" /> Visa
  <input type="radio" name="cc" value="mastercard" /> MasterCard
  <input type="radio" name="cc" value="amex" /> American Express
</fieldset>
```

Credit cards:
Visa MasterCard American Express
제출

- `fieldset` groups related input fields, adds a border; `legend` supplies a caption

Styling form controls

```
element[ attribute=" value" ] {
   property : value;
   property : value;
   ...
   property : value;
}
```

```
input[type="text"] {
  background-color: yellow;
  font-weight: bold;
}
```

Borat

- **attribute selector**: matches only elements that have a particular attribute value
- useful for controls because many share the same element (`input`)

6.3: Submitting Data

- 6.1: Form Basics
- 6.2: Form Controls
- **6.3: Submitting Data**
- 6.4: Processing Form Data in PHP

Problems with submitting data

```
<label><input type="radio" name="cc" /> Visa</label>
<label><input type="radio" name="cc" /> MasterCard</label> <br />
Favorite Star Trek captain:
<select name="startrek">
  <option>James T. Kirk</option>
  <option>Jean-Luc Picard</option>
</select> <br />
```

Visa MasterCard
Favorite Star Trek captain: James T. Kirk
제출

- this form submits to our handy params.php tester page
- the form may look correct, but when you submit it...
- `[cc] => on`, `[startrek] => Jean-Luc Picard`

The `value` attribute

```
<label><input type="radio" name="cc" value="visa" /> Visa</label>
<label><input type="radio" name="cc" value="mastercard" /> MasterCard</label> <br />
Favorite Star Trek captain:
<select name="startrek">
  <option value="kirk">James T. Kirk</option>
  <option value="picard">Jean-Luc Picard</option>
</select> <br />
```

Visa MasterCard
Favorite Star Trek captain: James T. Kirk
제출

- `value` attribute sets what will be submitted if a control is selected
- `[cc] => visa, [startrek] => picard`

URL-encoding

- certain characters are not allowed in URL query parameters:
  - examples: `" "`, `"/"`, `"="`, `"&"`
- when passing a parameter, it is **URL-encoded** (reference table)
  - `"Scott's cool!?"` → `"Scott%27s+cool%3F%21"`
- you don't usually need to worry about this:
  - the browser automatically encodes parameters before sending them
  - the PHP `$_GET` and `$_POST` arrays automatically decode them
  - … but occasionally the encoded version does pop up (e.g. in Firebug)

Submitting data to a web server

- though browsers mostly retrieve data, sometimes you want to submit data to a server
  - Hotmail: Send a message
  - Flickr: Upload a photo
  - Google Calendar: Create an appointment
- the data is sent in HTTP requests to the server
  - with HTML forms
  - with **Ajax** (seen later)
- the data is placed into the request as parameters

HTTP `GET` vs. `POST` requests

- **`GET`** : asks a server for a page or data
  - if the request has parameters, they are sent in the URL as a query string
- **`POST`** : submits data to a web server and retrieves the server's response
  - if the request has parameters, they are embedded in the request's HTTP packet, not the URL
- For submitting data, a `POST` request is more appropriate than a `GET`
  - `GET` requests embed their parameters in their URLs
  - URLs are limited in length (~ 1024 characters)
  - URLs cannot contain special characters without encoding
  - private data in a URL can be seen or modified by users

Form POST example

```
<form action="http://foo.com/app.php" method="post">
  <div>
    Name: <input type="text" name="name" /> <br />
    Food: <input type="text" name="meal" /> <br />
    <label>Meat? <input type="checkbox" name="meat" /></label> <br />
    <input type="submit" />
  <div>
</form>
```

Name:
Food:
Meat?
제출

GET or POST?

```
if ($_SERVER["REQUEST_METHOD"] == "GET") {
  # process a GET request
  …
} elseif ($_SERVER["REQUEST_METHOD"] == "POST") {
  # process a POST request
  …
}
```

- some PHP pages process both GET and POST requests
- to find out which kind of request we are currently processing,
  look at the global `$_SERVER` array's `"REQUEST_METHOD"` element

6.4: Processing Form Data in PHP

- 6.1: Form Basics
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- **6.4: Processing Form Data in PHP**

"Superglobal" arrays

Array	Description
`$_GET`, `$_POST`	parameters passed to GET and POST requests
`$_FILES`	files uploaded with the web request
`$_SESSION`, `$_COOKIE`	"cookies" used to identify the user (seen later)
`$_SERVER`, `$_ENV`	information about the web server

- PHP **superglobal** arrays contain information about the current request, server, etc.:
- These are special kinds of arrays called **associative arrays**.

Associative arrays

```
$blackbook = array();
$blackbook["scott"] = "031-400-5238";
$blackbook["jaejin"] = "031-400-4754";
...
print "Scott's number is " . $blackbook["scott"] . ".\n";
```

- **associative array** (a.k.a. **map**, **dictionary**, **hash table**) : uses non-integer indexes
- associates a particular index "key" with a value
  - key `"scott"` maps to value `"031-400-5238"`
- syntax for embedding an associative array element in interpreted string:

```
print "Scott's number is {$blackbook['scott']}.\n";
```

Uploading files

```
<form action="resources/params.php"
      method="post" enctype="multipart/form-data">
  Upload an image as your avatar:
  <input type="file" name="avatar" />
  <input type="submit" />
</form>
```

Upload an image as your avatar: 파일 선택 선택된 파일 없음 제출

- add a file upload to your form as an `input` tag with `type` of `file`
- must also set the `enctype` attribute of the form

- it makes sense that the form's request method must be `post` (an entire file can't be put into a URL!)
- form's `enctype` (data encoding type) must be set to `multipart/form-data` or else the file will not arrive at the server

Processing an uploaded file in PHP

- uploaded files are placed into global array `$_FILES`, not `$_POST`
- each element of `$_FILES` is itself an associative array, containing:
  - `name` : the local filename that the user uploaded
  - `type` : the MIME type of data that was uploaded, such as `image/jpeg`
  - `size` : file's size in bytes
  - `tmp_name` : a filename where PHP has temporarily saved the uploaded file
    - to permanently store the file, move it from this location into some other file

Uploading details

```
<input type="file" name="avatar" />
```

파일 선택 선택된 파일 없음 제출

- example: if you upload `borat.jpg` as a parameter named `avatar`,
  - `$_FILES["avatar"]["name"]` will be `"borat.jpg"`
  - `$_FILES["avatar"]["type"]` will be `"image/jpeg"`
  - `$_FILES["avatar"]["tmp_name"]` will be something like `"/var/tmp/phpZtR4TI"`

Processing uploaded file, example

```
$username = $_POST["username"];
if (is_uploaded_file($_FILES["avatar"]["tmp_name"])) {
  move_uploaded_file($_FILES["avatar"]["tmp_name"], "$username/avatar.jpg");
  print "Saved uploaded file as $username/avatar.jpg\n";
} else {
  print "Error: required file not uploaded";
}
```

- functions for dealing with uploaded files:
  - `is_uploaded_file(`*filename*`)`
    returns `TRUE` if the given filename was uploaded by the user
  - `move_uploaded_file(`*from*`, `*to*`)`
    moves from a temporary file location to a more permanent file
- proper idiom: check `is_uploaded_file`, then do `move_uploaded_file`

Including files: `include`

```
include("filename");
```

```
include("header.php");
include("shared-code.php");
```

- inserts the entire contents of the given file into the PHP script's output page
- encourages modularity
- useful for defining reused functions needed by multiple pages

Extra stuff about associative arrays

- 6.1: Form Basics
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- 6.4: Processing Form Data in PHP
- **More about associative arrays**

Creating an associative array

```
$name = array();
$name["key"] = value;
...
$name["key"] = value;
```

```
$name = array(key => value, ..., key => value);
```

```
$blackbook = array("scott"  => "031-400-5238",
                   "jaejin" => "031-400-4754",
                   "cathy"  => "031-400-7777");
```

- can be declared either initially empty, or with a set of predeclared key/value pairs

Printing an associative array

```
print_r($blackbook);
```

```
Array
(
    [scott] => 031-400-5238
    [jaejin] => 031-400-4754
    [cathy] => 031-400-7777
)
```

- `print_r` function displays all keys/values in the array
- `var_dump` function is much like `print_r` but prints more info
- unlike `print`, these functions require parentheses

Associative array functions

```
if (isset($blackbook["scott"])) {
  print "Scott's phone number is {$blackbook['scott']}\n";
} else {
  print "No phone number found for Scott Lee.\n";
}
```

name(s)	category
isset, array_key_exists	whether the array contains value for given key
array_keys, array_values	an array containing all keys or all values in the assoc.array
asort, arsort	sorts by value, in normal or reverse order
ksort, krsort	sorts by key, in normal or reverse order

foreach loop and associative arrays

```
foreach ($blackbook as $key => $value) {
  print "$key's phone number is $value\n";
}
```

```
scott's phone number is 031-400-5238
jaejin's phone number is 031-400-4754
cathy's phone number is 031-400-7777
```

- both the key and the value are given a variable name
- the elements will be processed in the order they were added to the array

Form Validation

- 6.1: Form Basics
- 6.2: Form Controls
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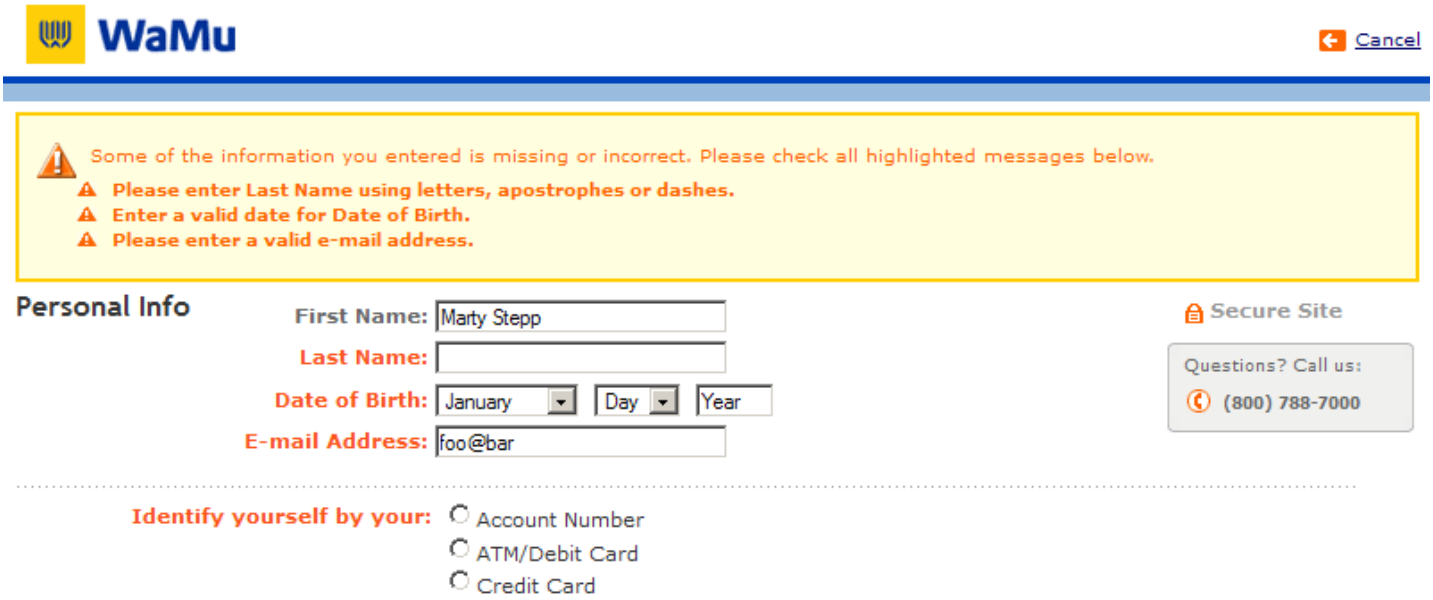
- 6.4: Processing Form Data in PHP
- **Form Validation**

What is form validation?

- **validation**: ensuring that form's values are correct
- some types of validation:
  - preventing blank values (email address)
  - ensuring the type of values
    - integer, real number, currency, phone number, Social Security number, postal address, email address, date, credit card number, ...
  - ensuring the format and range of values (ZIP code must be a 5-digit integer)
  - ensuring that values fit together (user types email twice, and the two must match)

A real form that uses validation



Client vs. server-side validation

Validation can be performed:

- **client-side** (before the form is submitted)
  - can lead to a better user experience, but not secure (why not?)
- **server-side** (in PHP code, after the form is submitted)
  - needed for truly secure validation, but slower
- both
  - best mix of convenience and security, but requires most effort to program

An example form to be validated

```
<form action="http://foo.com/foo.php" method="get">
    <div>
        City:  <input name="city" /> <br />
        State: <input name="state" size="2" maxlength="2" /> <br />
        ZIP:   <input name="zip" size="5" maxlength="5" /> <br />
        <input type="submit" />
    </div>
</form>
```

City:
State:
ZIP:
제출

- Let's validate this form's data on the server…

One problem: Users submitting HTML content

<h1>pwned</h1>

- A user might submit information to a form that contains HTML syntax
- If we're not careful, this HTML will be inserted into our pages (why is this bad?)

The `htmlspecialchars` function

`htmlspecialchars`	returns an HTML-escaped version of a string

- text from files / user input / query params might contain <, >, &, etc.
- we could manually write code to strip out these characters
- better idea: allow them, but **escape** them

```
$text = "<p>hi 2 u & me</p>";
$text = htmlspecialchars($text);   # "&lt;p&gt;hi 2 u &amp; me&lt;/p&gt;"
```

Basic server-side validation code

```
$city  = $_POST["city"];
$state = $_POST["state"];
$zip   = $_POST["zip"];
if (!$city || strlen($state) != 2 || strlen($zip) != 5) {
    print "Error, invalid city/state/zip submitted.";
}
```

- *basic idea:* examine parameter values, and if they are bad, show an error message and abort. But:
  - How do you test for integers vs. real numbers vs. strings?
  - How do you test for a valid credit card number?
  - How do you test that a person's name has a middle initial?
  - (How do you test whether a given string matches a particular complex format?)

Regular expressions

```
/^[a-zA-Z_\-]+@(([a-zA-Z_\-])+\.)+[a-zA-Z]{2,4}$/
```

- **regular expression** ("regex"): a description of a pattern of text
  - can test whether a string matches the expression's pattern
  - can use a regex to search/replace characters in a string
- regular expressions are extremely powerful but tough to read
  (the above regular expression matches email addresses)
- regular expressions occur in many places:
  - Java: `Scanner`, `String`'s `split` method
  - supported by PHP, JavaScript, and other languages
  - many text editors (TextPad) allow regexes in search/replace

Basic regular expressions

```
/abc/
```

- in PHP, regexes are strings that begin and end with `/`
- the simplest regexes simply match a particular substring
- the above regular expression matches any string containing `"abc"`:
  - YES: `"abc"`, `"abcdef"`, `"defabc"`, `".=.abc.=."`, ...
  - NO: `"fedcba"`, `"ab c"`, `"PHP"`, ...

Wildcards: `.`

- A dot `.` matches any character except a `\n` line break
  - `/.oo.y/` matches `"Doocy"`, `"goofy"`, `"LooNy"`, ...
- A trailing `i` at the end of a regex (after the closing `/`) signifies a case-insensitive match
  - `/mart/i` matches `"Marty Stepp"`, `"smart fellow"`, `"WALMART"`, ...

Special characters: `|`, `()`, `\`

- `|` means *OR*
  - `/abc|def|g/` matches `"abc"`, `"def"`, or `"g"`
  - There's no *AND* symbol. Why not?
- `()` are for grouping
  - `/(Homer|Marge) Simpson/` matches `"Homer Simpson"` or `"Marge Simpson"`
- `\` starts an **escape sequence**
  - many characters must be escaped to match them literally: `/ \ $ . [ ] ( ) ^ * + ?`
  - `/<br \/>/` matches lines containing `<br />` tags

Quantifiers: `*`, `+`, `?`

- `*` means 0 or more occurrences
  - `/abc*/` matches `"ab"`, `"abc"`, `"abcc"`, `"abccc"`, ...
  - `/a(bc)*/` matches `"a"`, `"abc"`, `"abcbc"`, `"abcbcbc"`, ...
  - `/a.*a/` matches `"aa"`, `"aba"`, `"a8qa"`, `"a!?xyz__9a"`, ...
- `+` means 1 or more occurrences
  - `/a(bc)+/` matches `"abc"`, `"abcbc"`, `"abcbcbc"`, ...
  - `/Goo+gle/` matches `"Google"`, `"Gooogle"`, `"Goooogle"`, ...
- `?` means 0 or 1 occurrences
  - `/a(bc)?/` matches `"a"` or `"abc"`

More quantifiers: `{min,max}`

- `{`*min*`,`*max*`}` means between *min* and *max* occurrences (inclusive)
  - `/a(bc){2,4}/` matches `"abcbc"`, `"abcbcbc"`, or `"abcbcbcbc"`
- *min* or *max* may be omitted to specify any number
  - `{2,}` means 2 or more
  - `{,6}` means up to 6
  - `{3}` means exactly 3

Anchors: ^ and $

- ^ represents the beginning of the string or line;
  $ represents the end
  - /Jess/ matches all strings that contain Jess;
    /^Jess/ matches all strings that *start with* Jess;
    /Jess$/ matches all strings that *end with* Jess;
    /^Jess$/ matches the exact string "Jess" only
  - /^Mart.*Stepp$/ matches "MartStepp", "Marty Stepp", "Martin D Stepp", ...
    but NOT "Marty Stepp stinks" or "I H8 Martin Stepp"
- (on the other slides, when we say, /PATTERN/ matches "text", we really mean that it matches any string that contains that text)

Character sets: [ ]

- [ ] group characters into a **character set**; will match any single character from the set
  - /[bcd]art/ matches strings containing "bart", "cart", and "dart"
  - equivalent to /(b|c|d)art/ but shorter
- inside [ ], many of the modifier keys act as normal characters
  - /what[!*?]*/ matches "what", "what!", "what?**!", "what??!", ...
- What regular expression matches DNA (strings of A, C, G, or T)?
  - /[ACGT]+/

Character ranges: `[start-end]`

- inside a character set, specify a range of characters with `-`
  - `/[a-z]/` matches any lowercase letter
  - `/[a-zA-Z0-9]/` matches any lower- or uppercase letter or digit
- an initial `^` inside a character set negates it
  - `/[^abcd]/` matches any character other than a, b, c, or d
- inside a character set, `-` must be escaped to be matched
  - `/[+\-]?[0-9]+/` matches an optional `+` or `-`, followed by at least one digit
- What regular expression matches letter grades such as A, B+, or D- ?
  - `/[ABCDF][+\-]?/`

Escape sequences

- special escape sequence character sets:
  - `\d` matches any digit (same as `[0-9]`); `\D` any non-digit (`[^0-9]`)
  - `\w` matches any "word character" (same as `[a-zA-Z_0-9]`); `\W` any non-word char
  - `\s` matches any whitespace character (, `\t`, `\n`, etc.); `\S` any non-whitespace
- What regular expression matches dollar amounts of at least $100.00 ?
  - `/\$\d{3,}\.\d{2}/`

Regular expressions in PHP (PDF)

- regex syntax: strings that begin and end with `/`, such as `"/[AEIOU]+/"`

function	description
`preg_match(`*regex*`,` *string*`)`	returns `TRUE` if *string* matches *regex*
`preg_replace(`*regex*`,` *replacement*`,` *string*`)`	returns a new string with all substrings that match *regex* replaced by *replacement*
`preg_split(`*regex*`,` *string*`)`	returns an array of strings from given *string* broken apart using given *regex* as delimiter (like `explode` but more powerful)

PHP form validation w/ regexes

```
$state = $_POST["state"];
if (!preg_match("/^[A-Z]{2}$/", $state)) {
    print "Error, invalid state submitted.";
}
```

- `preg_match` and regexes help you to validate parameters
- sites often *don't* want to give a descriptive error message here (why?)

Regular expression PHP example

```
# replace vowels with stars
$str = "the quick    brown        fox";

$str = preg_replace("/[aeiou]/", "*", $str);
                         # "th* q**ck    br*wn        f*x"

# break apart into words
$words = preg_split("/[ ]+/", $str);
                         # ("th*", "q**ck", "br*wn", "f*x")

# capitalize words that had 2+ consecutive vowels
for ($i = 0; $i < count($words); $i++) {
    if (preg_match("/\\*{2,}/", $words[$i])) {
        $words[$i] = strtoupper($words[$i]);
    }
}                        # ("th*", "Q**CK", "br*wn", "f*x")
```

- notice how \ must be escaped to \\