PHP Arrays and Superglobals

Chapter 9

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Objectives

1. Arrays
2. $_GET and $_POST Superglobal arrays
3. $_SERVER Array
4. $_FILES Array
5. Reading/Writing Files

Section 1 of 5

ARRAYS

Arrays

Background

An array is a data structure that

- Collects a number of related elements together in a single variable.
- Allows the set to be Iterated
- Allows access of any element

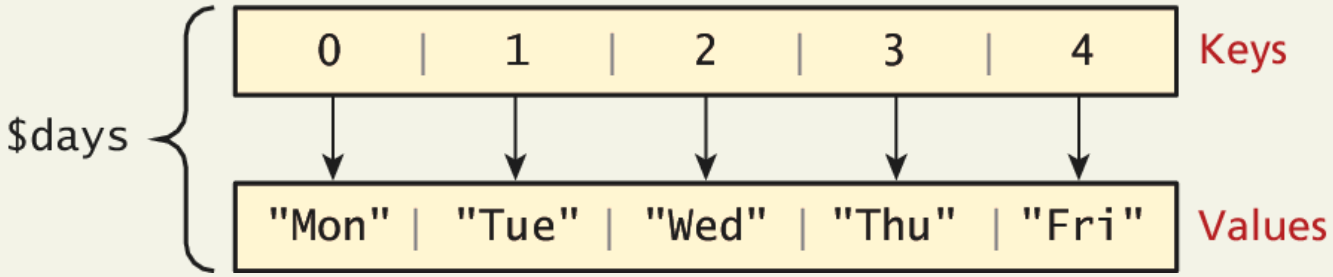
Since PHP implements an array as a dynamic structure:

- Add to the array
- Remove from the array

Arrays

Key Value

In PHP an array is actually an **ordered map**, which associates each value in the array with a key.



Arrays

Keys

Array keys are the means by which you reer to s ingle element in the array.

In most programming languages array keys are limited to integers, start at 0, and go up by 1.

In PHP, array keys *must* be either integers or strings and need not be sequential.

- Don't mix key types i.e. "1" vs 1
- If you don't explicitly define them they are 0,1,…

Arrays

Values

Array values, unlike keys, are not restricted to integers and strings.

They can be any object, type, or primitive supported in PHP.

You can even have objects of your own types, so long as the keys in the array are integers and strings.

Arrays

Defining an array

The following declares an empty array named days:

$days = array();

You can also initialize it with a comma-delimited list of values inside the ( ) braces using either of two following syntaxes:

```
$days = array("Mon","Tue","Wed","Thu","Fri");

$days = ["Mon","Tue","Wed","Thu","Fri"]; // alternate
```

Arrays

Defining an array

You can also declare each subsequent element in the array individually:

```
$days = array();

$days[0] = "Mon"; //set 0th key's value to "Mon"

$days[1] = "Tue";

// also alternate approach

$daysB = array();

$daysB[] = "Mon"; //set the next sequential value to "Mon"

$daysB[] = "Tue";
```

Arrays

Access values

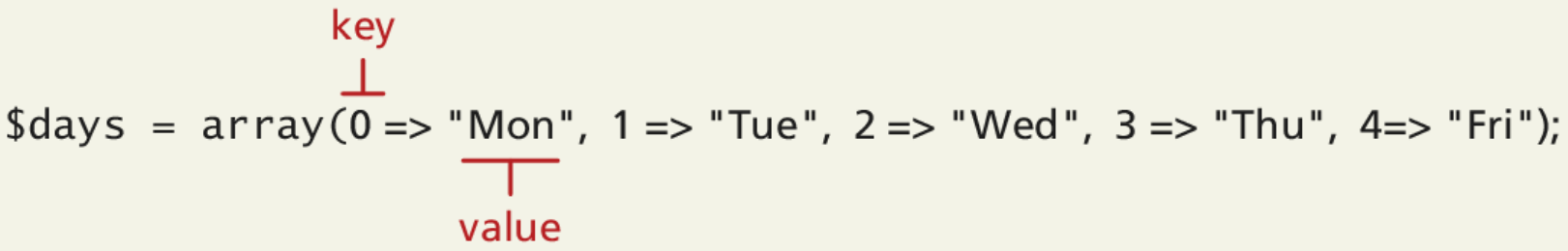
To access values in an array you refer to their key using the square bracket notation.

```
echo "Value at index 1 is ". $days[1];
```

Keys and Values

In PHP, you are also able to explicitly define the keys in addition to the values.

This allows you to use keys other than the classic 0, 1, 2, . . . , n to define the indexes of an array.



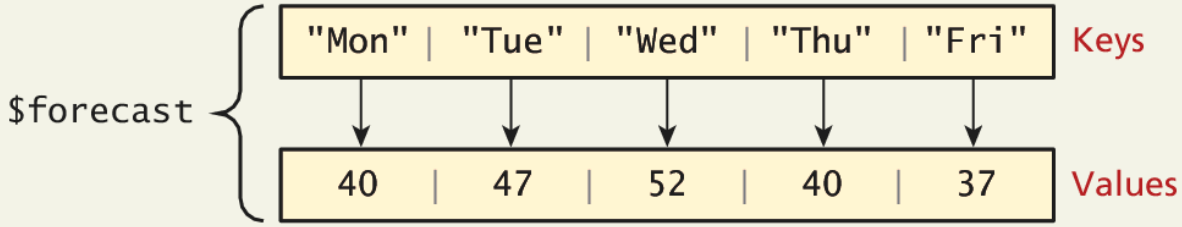
Super Explicit

Array declaration with string keys, integer values

```
$forecast = array("Mon" => 40, "Tue" => 47, "Wed" => 52, "Thu" => 40, "Fri" => 37);
```

key

value




```
echo $forecast["Tue"];  // outputs 47
echo $forecast["Thu"];  // outputs 40
```

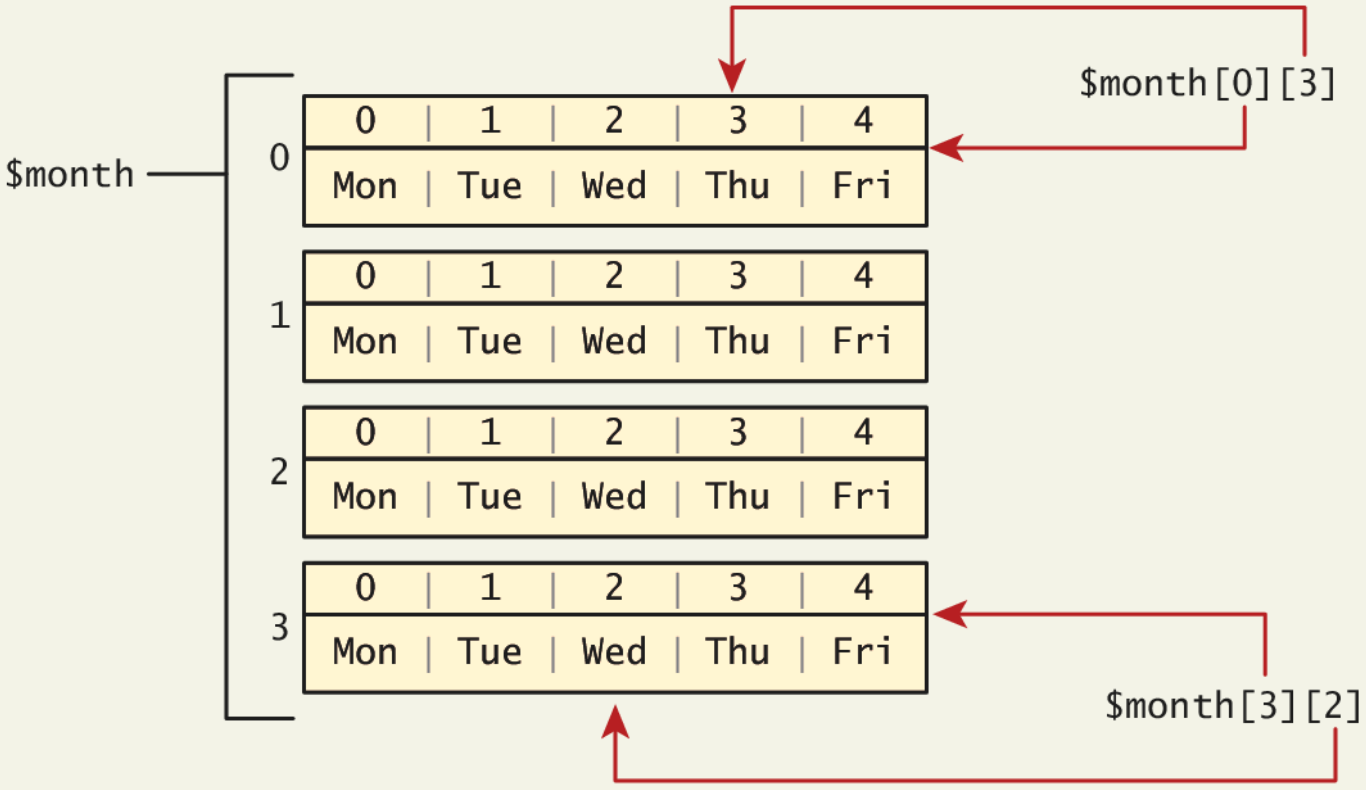
Multidimensional Arrays

Creation

```
$month = array(
        array("Mon","Tue","Wed","Thu","Fri"),
        array("Mon","Tue","Wed","Thu","Fri"),
        array("Mon","Tue","Wed","Thu","Fri"),
        array("Mon","Tue","Wed","Thu","Fri")
);
echo $month[0][3]; // outputs Thu
```

Multidimensional Arrays

Access



Multidimensional Arrays

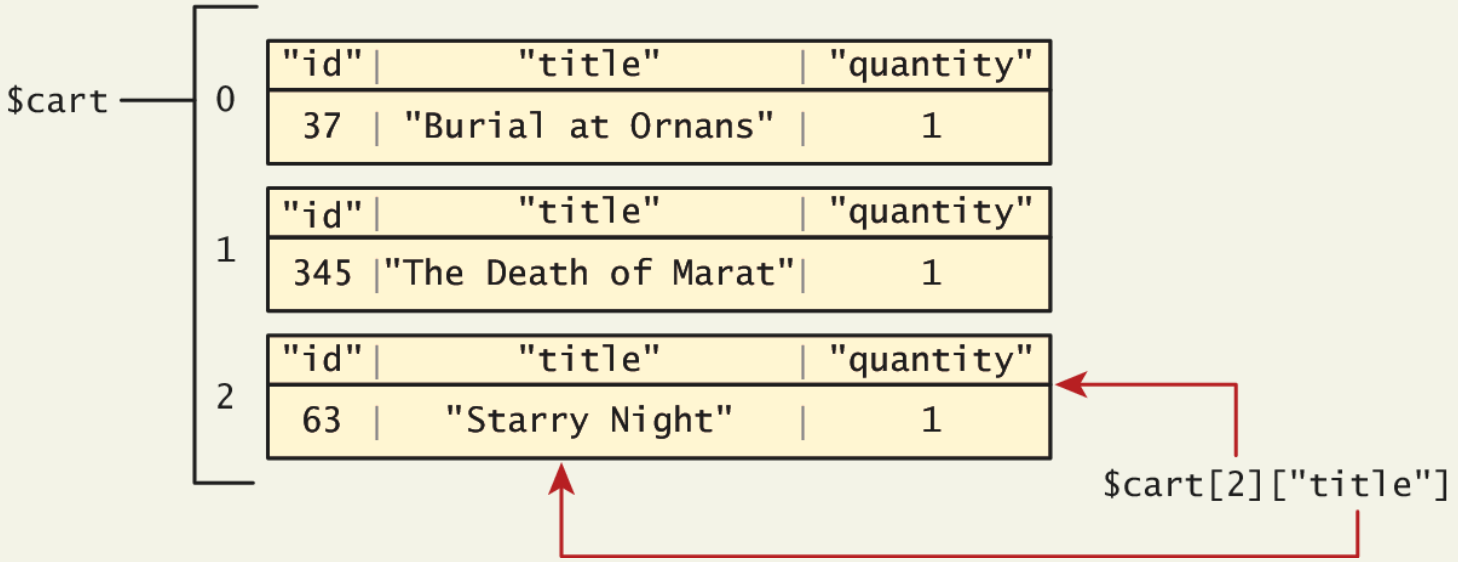
Another example

```
$cart = array();

$cart[] = array("id" => 37, "title" => "Burial at Ornans", "quantity" => 1);

$cart[] = array("id" => 345, "title" => "The Death of Marat", "quantity" => 1);

$cart[] = array("id" => 63, "title" => "Starry Night", "quantity" => 1);
```



Iterating through an array

```php
// while loop
$i=0;
while ($i < count($days)) {
   echo $days[$i] . "<br>";
   $i++;
}


// do While loop
$i=0;
do {
   echo $days[$i] . "<br>";
   $i++;
} while ($i < count($days));


// for loop
for ($i=0; $i<count($days); $i++) {
   echo $days[$i] . "<br>";
}
```

LISTING 9.2 Iterating through an array using while, do while, and for loops

Iterating through an array

Foreach loop is pretty nice

The challenge of using the classic loop structures is that when you have nonsequential integer keys (i.e., an associative array), you can't write a simple loop that uses the $i++ construct. To address the dynamic nature of such arrays, you have to use iterators to move through such an array.

```php
// foreach: iterating through the values
foreach ($forecast as $value) {
   echo $value . "<br>";
}

// foreach: iterating through the values AND the keys
foreach ($forecast as $key => $value) {
   echo "day" . $key . "=" . $value;
}
```

LISTING 9.3 Iterating through an associative array using a foreach loop

Adding to an array

To an array

An element can be added to an array simply by using a key/index that hasn't been used

```
$days[5] = "Sat";
```

A new element can be added to the end of any array

```
$days[ ] = "Sun";
```

Adding to an array

And quickly printing

PHP is more than happy to let you “skip” an index

```
$days = array("Mon","Tue","Wed","Thu","Fri");

$days[7] = "Sat";

print_r($days);
```

Array ([0] => Mon [1] => Tue [2] => Wed [3] => Thu [**4**] => Fri [**7**] => Sat)’

If we try referencing $days[6], it will return a **NULL** value

Deleting from an array

You can explicitly delete array elements using the unset() function

```php
$days = array("Mon","Tue","Wed","Thu","Fri");

unset($days[2]);
unset($days[3]);

print_r($days); // outputs: Array ( [0] => Mon [1] => Tue [4] => Fri )

$days = array_values($days);
print_r($days); // outputs: Array ( [0] => Mon [1] => Tue [2] => Fri )
```

LISTING 9.4 Deleting elements

Deleting from an array

You can explicitly delete array elements using the unset() function.

array_values() reindexes the array numerically

```
$days = array("Mon","Tue","Wed","Thu","Fri");

unset($days[2]);
unset($days[3]);

print_r($days); // outputs: Array ( [0] => Mon [1] => Tue [4] => Fri )

$days = array_values($days);
print_r($days); // outputs: Array ( [0] => Mon [1] => Tue [2] => Fri )
```

LISTING 9.4 Deleting elements

Checking for a value

Since array keys need not be sequential, and need not be integers, you may run into a scenario where you want to check if a value has been set for a particular key.

To check if a value exists for a key, you can therefore use the isset() function, which returns true if a value has been set, and false otherwise

```
$oddKeys = array (1 => "hello", 3 => "world", 5 => "!");
if (isset($oddKeys[0])) {
   // The code below will never be reached since $oddKeys[0] is not set!
   echo "there is something set for key 0";
}
if (isset($oddKeys[1])) {
   // This code will run since a key/value pair was defined for key 1
   echo "there is something set for key 1, namely ". $oddKeys[1];
}
```

LISTING 9.5 Illustrating nonsequential keys and usage of isset( )

Array Sorting

Sort it out

There are many built-in sort functions, which sort by key or by value. To sort the $days array by its values you would simply use:

sort($days);

As the values are all strings, the resulting array would be:

Array ([0] => Fri [1] => Mon [2] => Sat [3] => Sun [4] => Thu [5] => Tue [6] => Wed)

A better sort, one that would have kept keys and values associated together, is:

asort($days);

Array ([4] => Fri [0] => Mon [5] => Sat [6] => Sun [3] => Thu [1] => Tue [2] => Wed)

More array operations

Too many to go over in depth here…

- array_keys($someArray)
- array_values($someArray)
- array_rand($someArray, $num=1)
- array_reverse($someArray)
- array_walk($someArray, $callback, optionalParam)
- in_array($needle, $haystack)
- shuffle($someArray)
- …

Section 2 of 5

$_GET AND $_POST SUPERGLOBAL ARRAYS

Superglobal Arrays

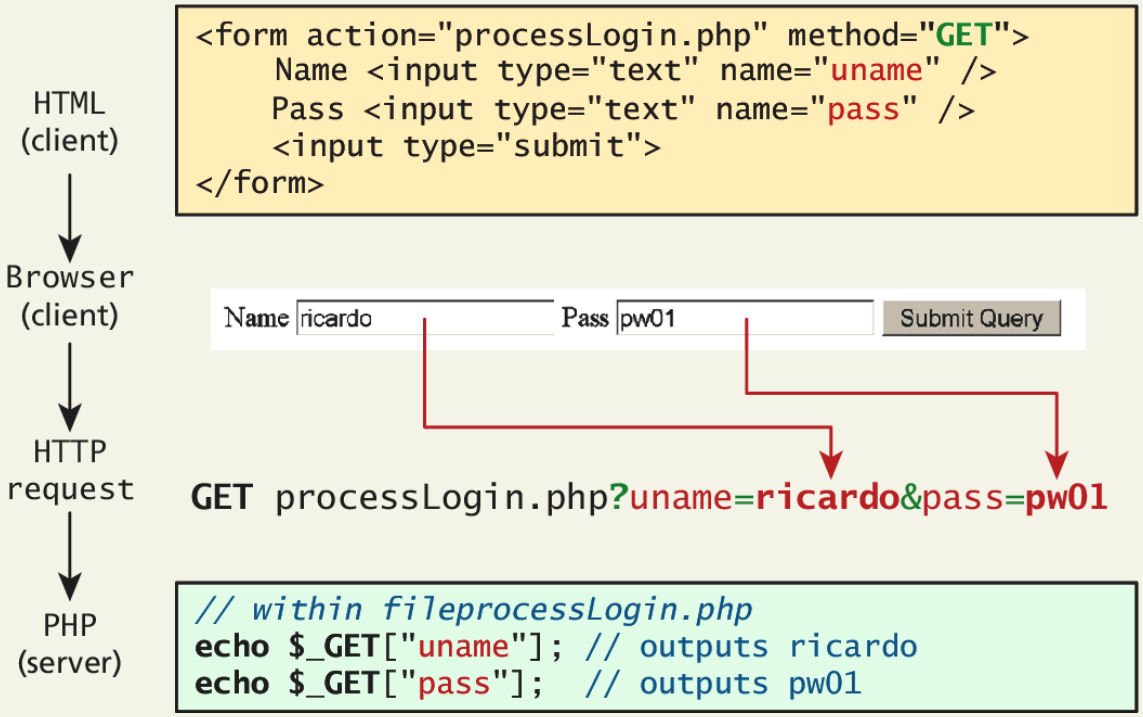
PHP uses special predefined associative arrays called **superglobal variables** that allow the programmer to easily access HTTP headers, query string parameters, and other commonly needed information.

They are called superglobal because they are always in scope, and always defined.

$_GET and $_POST

Sound familiar?

The $_GET and $_POST arrays are the most important superglobal variables in PHP since they allow the programmer to access data sent by the client in a query string.



$_GET and $_POST

Sound familiar?

- Get requests parse query strings into the $_GET array
- Post requests are parsed into the $POST array

This mechanism greatly simplifies accessing the data posted by the user, since you need not parse the query string or the POST request headers!

Determine if any data sent

```
<!DOCTYPE html>
<html>
<body>
<?php
if ($_SERVER["REQUEST_METHOD"] == "POST") {
   if ( isset($_POST["uname"]) && isset($_POST["pass"]) ) {
      // handle the posted data.
      echo "handling user login now ...";
      echo "... here we could redirect or authenticate ";
      echo " and hide login form or something else";
   }
}
?>
<h1>Some page that has a login form</h1>
<form action="samplePage.php" method="POST">
   Name <input type="text" name="uname"/><br/>
   Pass <input type="password" name="pass"/><br/>
   <input type="submit">
</form>
</body>
</html>
```

LISTING 9.6 Using isset() to check query string data

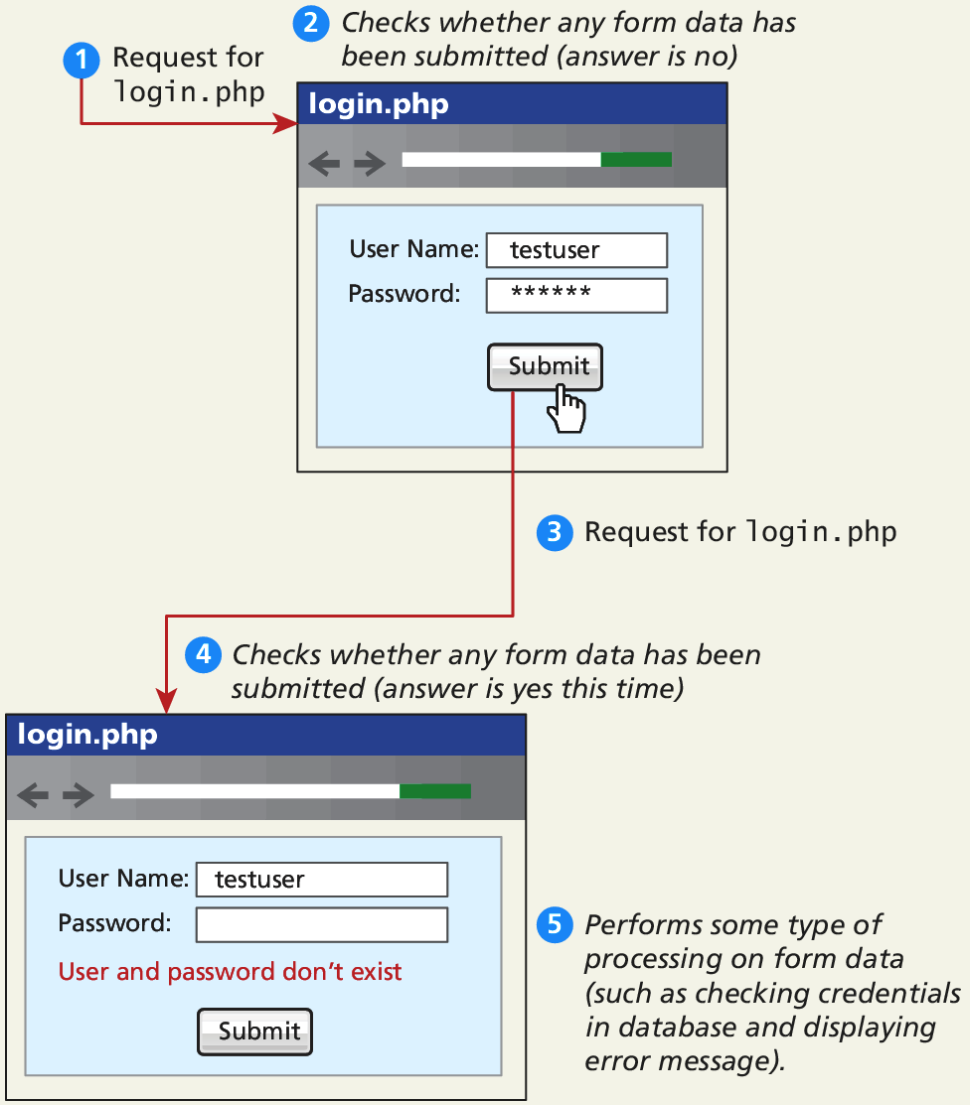
Determine if any data sent

Isset()

```
<!DOCTYPE html>
<html>
<body>
<?php
if ($_SERVER["REQUEST_METHOD"] == "POST") {
   if ( isset($_POST["uname"]) && isset($_POST["pass"]) ) {
      // handle the posted data.
      echo "handling user login now ...";
      echo "... here we could redirect or authenticate ";
      echo " and hide login form or something else";
   }
}
?>
<h1>Some page that has a login form</h1>
<form action="samplePage.php" method="POST">
   Name <input type="text" name="uname"/><br/>
   Pass <input type="password" name="pass"/><br/>
   <input type="submit">
</form>
</body>
</html>
```

LISTING 9.6 Using isset() to check query string data

Determine if any data sent



Determine if any data sent

Isset()

```
<!DOCTYPE html>
<html>
<body>
<?php
if ($_SERVER["REQUEST_METHOD"] == "POST") {
   if ( isset($_POST["uname"]) && isset($_POST["pass"]) ) {
      // handle the posted data.
      echo "handling user login now ...";
      echo "... here we could redirect or authenticate ";
      echo " and hide login form or something else";
   }
}
?>
<h1>Some page that has a login form</h1>
<form action="samplePage.php" method="POST">
   Name <input type="text" name="uname"/><br/>
   Pass <input type="password" name="pass"/><br/>
   <input type="submit">
</form>
</body>
</html>
```

LISTING 9.6 Using isset() to check query string data

Accessing Form Array Data

Sometimes in HTML forms you might have multiple values associated with a single name;

```
<form method="get">
   Please select days of the week you are free.<br />
   Monday <input type="checkbox" name="day" value="Monday" /> <br />
   Tuesday <input type="checkbox" name="day" value="Tuesday" /> <br />
   Wednesday <input type="checkbox" name="day" value="Wednesday" /> <br />
   Thursday <input type="checkbox" name="day" value="Thursday" /> <br />
   Friday <input type="checkbox" name="day" value="Friday" /> <br />
   <input type="submit" value="Submit">
</form>
```

LISTING 9.7 HTML that enables multiple values for one name

Accessing Form Array Data

HTML tweaks for arrays of data

Unfortunately, if the user selects more than one day and submits the form, the $_GET['day'] value in the superglobal array *will only contain the last value from the list* that was selected.

To overcome this limitation, you must change the name attribute for each checkbox from day to day[].

```
Monday <input type="checkbox" name="day[]" value="Monday" />

Tuesday <input type="checkbox" name="day[]" value="Tuesday" />
```

Accessing Form Array Data

Meanwhile on the server

After making this change in the HTML, the corresponding variable $_GET['day'] will now have a value that is of type array.

```php
<?php

echo "You submitted " . count($_GET['day']) . "values";
foreach ($_GET['day'] as $d) {
   echo $d . ", ";
}

?>
```

LISTING 9.8 PHP code to display an array of checkbox variables

Using Query String in Links

Design idea

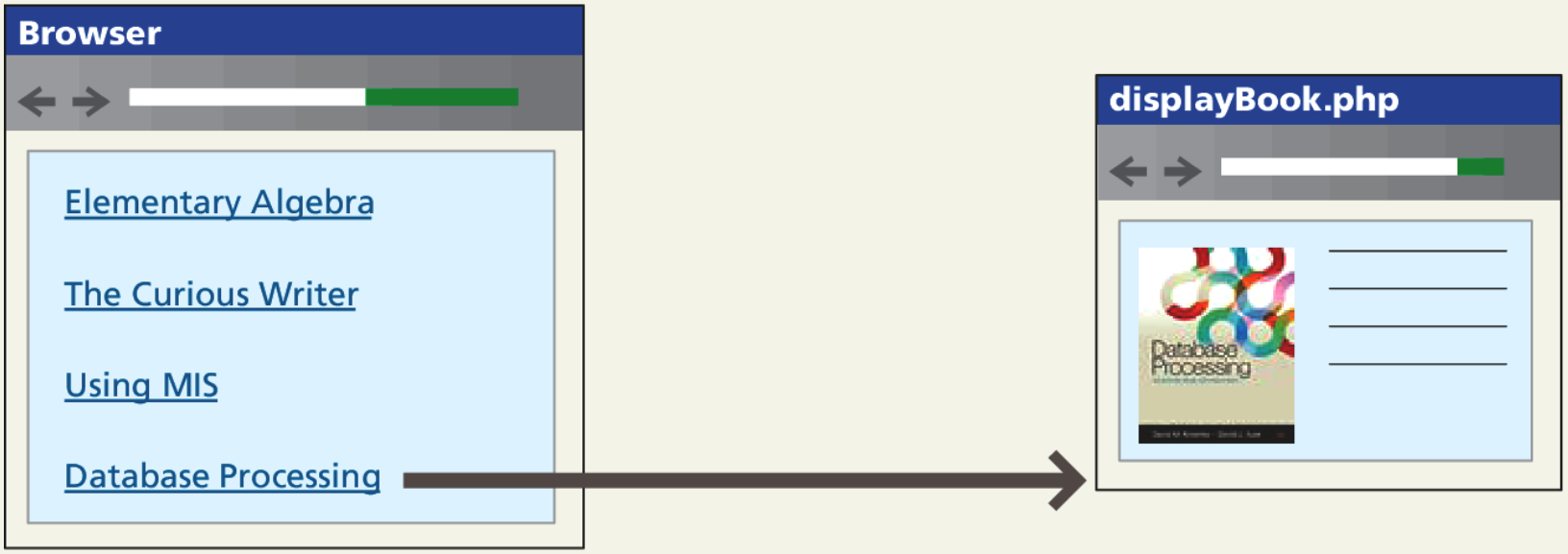
Imagine a web page in which we are displaying a list of book links. One approach would be to have a separate page for each book.

Using Query Strings in links

Not a great setup

Using Query Strings in links

Use the query string to reduce code duplication




```
<a href="displayBook.php?isbn=0132145375">Database Processing</a>
```

Query string

Sanitizing Query Strings

Just because you are expecting a proper query string, doesn't mean that you are going to get a properly constructed query string.

- **distrust all user input**

The process of checking user input for incorrect or missing information is sometimes referred to as the process of **sanitizing user inputs.**

Learn more about this in Chapter 11/12.

Sanitation

Don't forget trim()

```
// This uses a database API . . . we will learn about it in Chapter 11
$pid = mysqli_real_escape_string($link, $_GET['id']);

if ( is_int($pid) ) {
     // Continue processing as normal
}
else {
     // Error detected. Possibly a malicious user
}
```

LISTING 9.9 Simple sanitization of query string values

Section 3 of 5

$_SERVER ARRAY

$_SERVER

The $_SERVER associative array contains

- HTTP request headers (send by client)
- configuration options for PHP

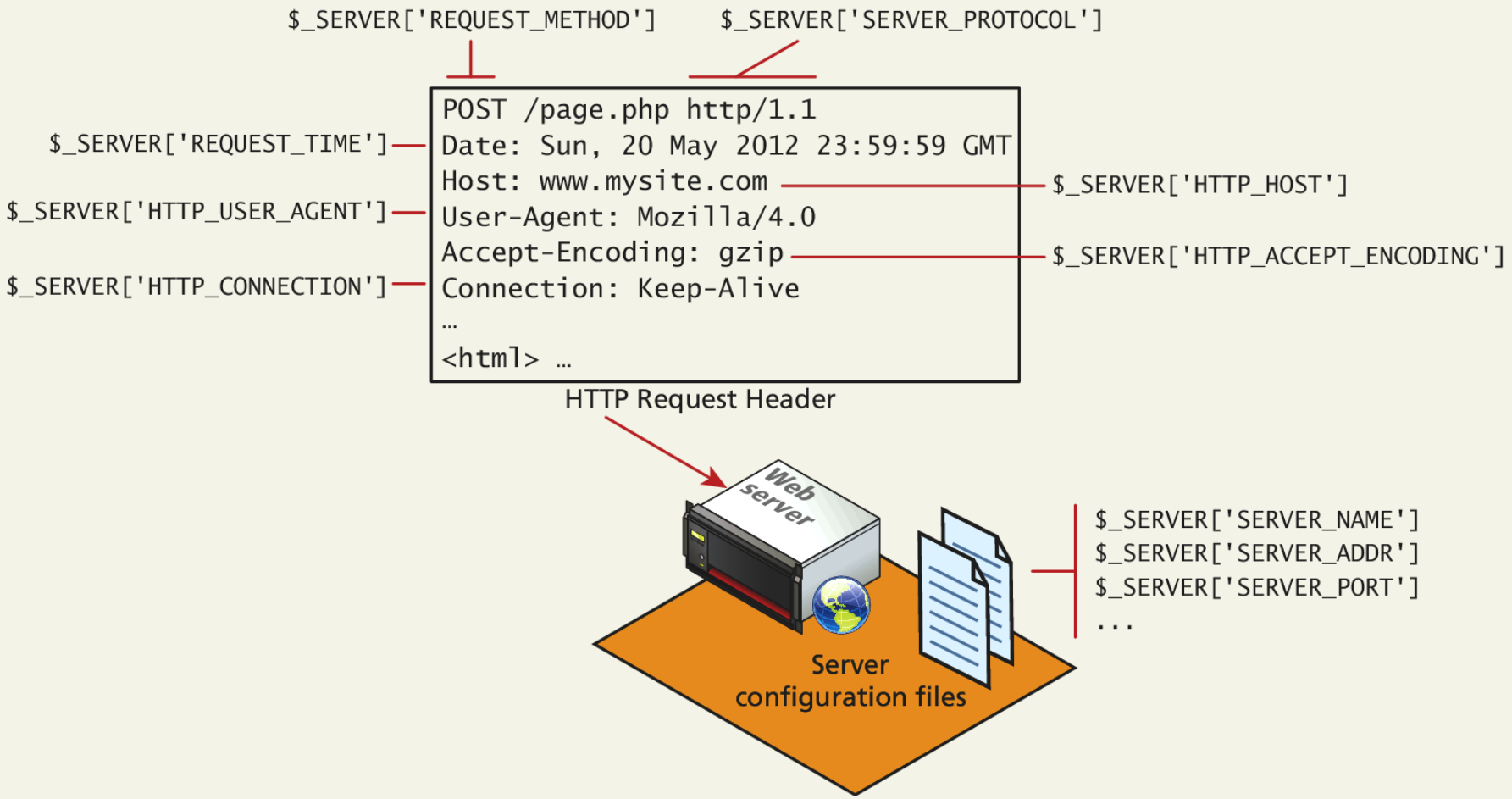
To use the $_SERVER array, you simply refer to the relevant case-sensitive keyname:

```
echo $_SERVER["SERVER_NAME"] . "<br/>";

echo $_SERVER["SERVER_SOFTWARE"] . "<br/>";

echo $_SERVER["REMOTE_ADDR"] . "<br/>";
```

$_SERVER


$_SERVER['REQUEST_METHOD']
$_SERVER['SERVER_PROTOCOL']
POST /page.php http/1.1
Date: Sun, 20 May 2012 23:59:59 GMT
Host: www.mysite.com
User-Agent: Mozilla/4.0
Accept-Encoding: gzip
Connection: Keep-Alive
…
<html> …
$_SERVER['REQUEST_TIME']
$_SERVER['HTTP_USER_AGENT']
$_SERVER['HTTP_CONNECTION']
$_SERVER['HTTP_HOST']
$_SERVER['HTTP_ACCEPT_ENCODING']
HTTP Request Header
Web server
Server configuration files
$_SERVER['SERVER_NAME']
$_SERVER['SERVER_ADDR']
$_SERVER['SERVER_PORT']
...

SERVER INFORMATION KEYS

- SERVER_NAME contains the name of the site that was requested
- SERVER_ADDR tells us the IP of the server
- DOCUMENT_ROOT tells us the location from which you are currently running your script
- SCRIPT_NAME key that identifies the actual script being executed

Request Header Keys

- REQUEST_METHOD returns the request method that was used to access the page: that is, GET, HEAD, POST, PUT
- REMOTE_ADDR key returns the IP address of the requestor
- HTTP_USER_AGENT contains the operating system and browser that the client is using
- HTTP_REFERER contains the address of the page that referred us to this one (if any) through a link

Header Access Examples

```php
<?php
echo $_SERVER['HTTP_USER_AGENT'];

$browser = get_browser($_SERVER['HTTP_USER_AGENT'], true);
print_r($browser);
?>
```

LISTING 9.10 Accessing the user-agent string in the HTTP headers

```php
$previousPage = $_SERVER['HTTP_REFERER'];
// Check to see if referer was our search page
if (strpos("search.php",$previousPage) != 0) {
   echo "<a href='search.php'>Back to search</a>";
}
// Rest of HTML output
```

LISTING 9.11 Using the HTTP_REFERER header to provide context-dependent output

Security

Headers can be forged

All headers can be forged!

- The HTTP_REFERER header can lie about where the referral came from
- The USER_AGENT can lie about the operating system and browser the client is using.

Section 4 of 5

$_FILES ARRAY

$_FILES Array

The **$_FILES** associative array contains items that have been uploaded in the current request.

A server script must process the upload file(s) in some way; the **$_FILES** array helps in this process.

the **$_FILES** array will contain a key=value pair for each file uploaded in the post

First a refresher on HTML forms for uploading files…

HTML Required for File Uploads

1. You must ensure that the HTML form uses the HTTP POST **method**, since transmitting a file through the URL is not possible.
2. You must add the **enctype="multipart/form-data"** attribute to the HTML form that is performing the upload so that the HTTP request can
3. You must include an input type of file in your form.

```
<form enctype='multipart/form-data' method='post'>
   <input type='file' name='file1' id='file1' />
   <input type='submit' />
</form>
```

LISTING 9.12 HTML for a form that allows an upload

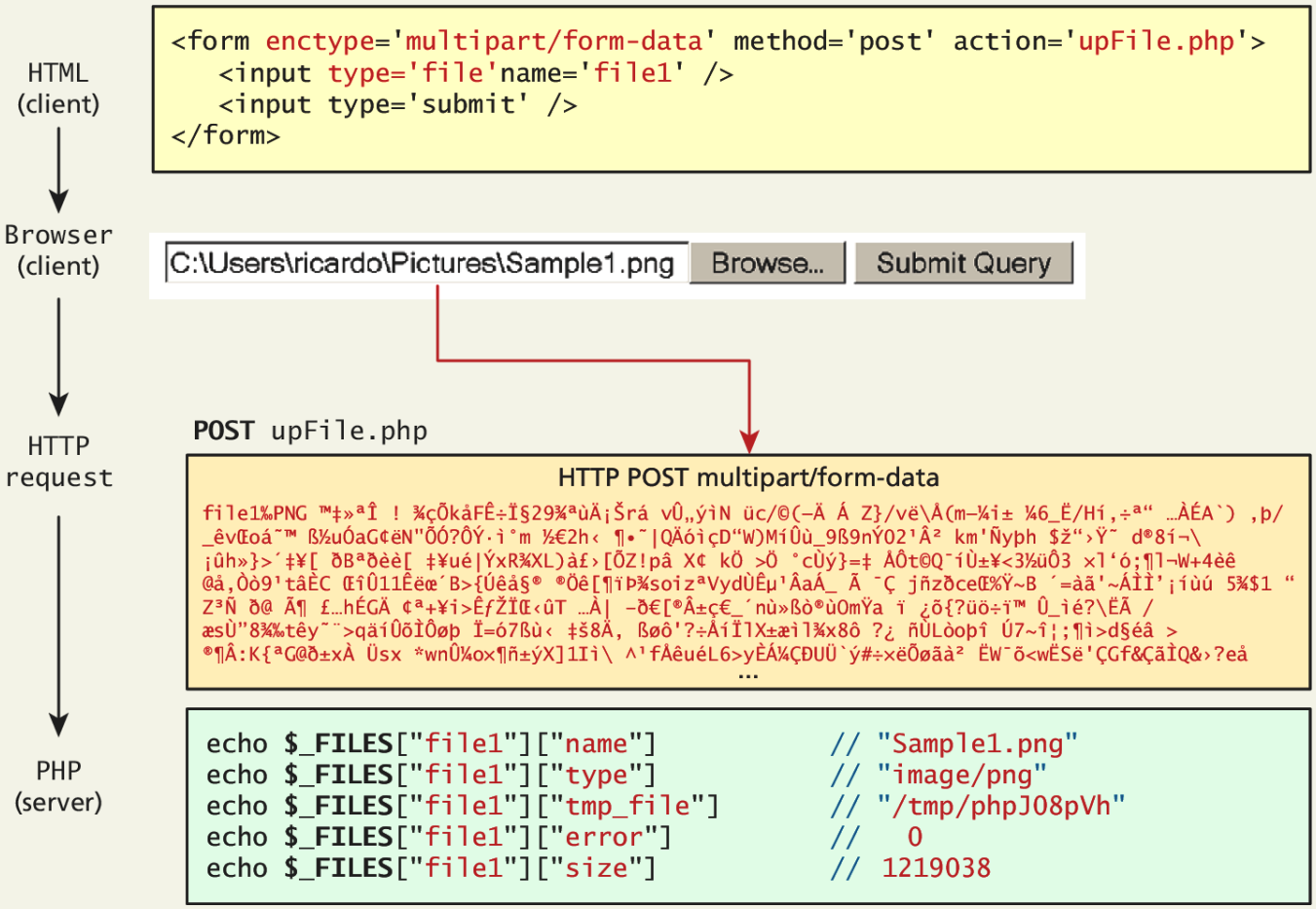
Handling File upload in PHP

The $_FILES array will contain a key=value pair for each file uploaded in the post.

The key for each element will be the name attribute from the HTML form, while the value will be an array containing information about the file as well as the file itself.

The keys in that array are the name, type, tmp_name, error, and size.

Handling File upload in PHP



Handling File upload in PHP

Keys. We still have to do something with this data

- **name** is a string containing the full file name used on the client machine, including any file extension.
- **type** defines the MIME type of the file
- **tmp_name** is the full path to the location on your server where the file is being temporarily stored.
- **error** is an integer that encodes many possible errors and is set to UPLOAD_ERR_OK (integer value 0) if the file was uploaded successfully.
- **size** is an integer representing the size in bytes of the uploaded file.

Check for errors

For every uploaded file, there is an error value associated with it in the $_FILES array.

The value for a successful upload is **UPLOAD_ERR_OK**, and should be looked for before proceeding any further.

```
foreach ($_FILES as $fileKey => $fileArray) {
   if ($fileArray["error"] != UPLOAD_ERR_OK) { // error
      echo "Error: " . $fileKey . " has error" . $fileArray["error"]
           . "<br>";
   }
   else {   // no error
      echo $fileKey . "Uploaded successfully ";
   }
}
```

LISTING 9.13 Checking each file uploaded for errors

Check for errors

For every uploaded file, there is an error value associated with it in the $_FILES array.

The value for a successful upload is **UPLOAD_ERR_OK**, and should be looked for before proceeding any further.

```
foreach ($_FILES as $fileKey => $fileArray) {
   if ($fileArray["error"] != UPLOAD_ERR_OK) { // error
      echo "Error: " . $fileKey . " has error" . $fileArray["error"]
           . "<br>";
   }
   else {   // no error
      echo $fileKey . "Uploaded successfully ";
   }
}
```

LISTING 9.13 Checking each file uploaded for errors

File Size Restrictions

There are three main mechanisms for maintaining uploaded file size restrictions:

- HTML in the input form
- via JavaScript in the input form
- via PHP coding.

HTML in the input form

Add an hidden input field before any other input fields in your HTML form with a name of MAX_FILE_SIZE

The file uploading must be complete before an error message can be received.

```
<form enctype='multipart/form-data' method='post'>
   <input type="hidden" name="MAX_FILE_SIZE" value="1000000" />
   <input type='file' name='file1' />
   <input type='submit' />
</form>
```

LISTING 9.14 Limiting upload file size via HTML

Via JavaScript

Allows a client side check to happen before any data transmitted. (Easily overridden).

```
<script>
var file = document.getElementById('file1');
var max_size = document.getElementById("max_file_size").value;
if (file.files && file.files.length ==1){
   if (file.files[0].size > max_size) {
      alert("The file must be less than " + (max_size/1024) + "KB");
      e.preventDefault();
   }
}
</script>
```

LISTING 9.15 Limiting upload file size via JavaScript

via PHP

The only one you HAVE to do.

The third mechanism for limiting the uploaded file size is to add a simple check on the server side (just in case JavaScript was turned off or the user modified the MAX_FILE_SIZE hidden field).

```
$max_file_size = 10000000;
foreach($_FILES as $fileKey => $fileArray) {
   if ($fileArray["size"] > $max_file_size) {
      echo "Error: " . $fileKey . " is too big";
   }
   printf("%s is %.2f KB", $fileKey, $fileArray["size"]/1024);
}
```

LISTING 9.16 Limiting upload file size via PHP

Limiting the type of File Upload

I won't allow .abc, .def now let me be

What if you wanted the user to upload an image and they uploaded a Microsoft Word document?

You might also want to limit the uploaded image to certain image types, such as jpg and png, while disallowing bmp and others.

- examine the file extension
- and the type field

Limiting the type of File Upload

Example code

```
$validExt = array("jpg", "png");
$validMime = array("image/jpeg","image/png");
foreach($_FILES as $fileKey => $fileArray ){
   $extension = end(explode(".", $fileArray["name"]));
   if (in_array($fileArray["type"],$validMime) &&
          in_array($extension, $validExt)) {
      echo "all is well. Extension and mime types valid";
   }
   else {
      echo $fileKey." Has an invalid mime type or extension";
   }
}
```

LISTING 9.17 PHP code to look for valid mime types and file extensions

Moving the File

Finally!

You must move the temporary file to a permanent location on your server.

move_uploaded_file() takes in the temporary file location and the file's final destination.

```
$fileToMove = $_FILES['file1']['tmp_name'];
$destination = "./upload/" . $_FILES["file1"]["name"];
if (move_uploaded_file($fileToMove,$destination)) {
   echo "The file was uploaded and moved successfully!";
}
else {
   echo "there was a problem moving the file";
}
```

LISTING 9.18 Using move_uploaded_file() function

Section 5 of 5

READING/WRITING FILES

Reading/Writing

There are two basic techniques for read/writing files in PHP:

- **Stream access**. In this technique, our code will read just a small portion of the file at a time. While this does require more careful programming, it is the most memory-efficient approach when reading very large files.
- **All-In-Memory access**. In this technique, we can read the entire file into memory. While not appropriate for large files, it does make processing of the file extremely easy.

Stream Access

C style

C style file access. More difficult, but more memory efficient.

The function fopen() takes a file location or URL and access mode as parameters. The returned value is a **stream resource**, which you can then read sequentially.

Use fread() or fgets() to read ahead in the file. Fclose() is invoked when you are done.

Writing done much the same with fwrite().

Stream Access

Just show me the code

```
$f = fopen("sample.txt", "r");
$ln = 0;
while ($line = fgets($f)) {
   $ln++;
   printf("%2d: ", $ln);
   echo $line . "<br>";
}
fclose($f);
```

LISTING 9.19 Opening, reading lines, and closing a file

In-Memory File Access

Easy as pie

- **file()** Reads the entire file into an array, with each array element corresponding to one line in the file
- **file_get_contents()** reads the entire file into a string variable
- **file_put_contents()** writes the contents of a string variable out to a file

In-Memory File Access

To read an entire file into a variable you simply use:

$fileAsString = file_get_contents(FILENAME);

To write the contents of a string $writeme to a file:

file_put_contents(FILENAME, $writeme);

In-Memory File Access

Consider a realistic example

imagine we have a comma-delimited text file that contains information about paintings, where each line in the file corresponds to a different painting:

01070,Picasso,The Actor,1904

01080,Picasso,Family of Saltimbanques,1905

02070,Matisse,The Red Madras Headdress,1907

05010,David,The Oath of the Horatii,1784

In-Memory File Access

Parsing our file

```
// read the file into memory; if there is an error then stop processing
$paintings = file($filename) or die('ERROR: Cannot find file');

// our data is comma-delimited
$delimiter = ',';

// loop through each line of the file
foreach ($paintings as $painting) {

   // returns an array of strings where each element in the array
   // corresponds to each substring between the delimiters
   $paintingFields = explode($delimiter, $painting);

   $id= $paintingFields[0];
   $artist = $paintingFields[1];
   $title = $paintingFields[2];
   $year = $paintingFields[3];

   // do something with this data
   . . .
}
```

LISTING 9.20 Processing a comma-delimited file

What You've Learned

1. Arrays
2. $_GET and $_POST Superglobal arrays
3. $_SERVER Array
4. $_FILES Array
5. Reading/Writing Files

PHP Classes and Objects

Chapter 10

Randy Connolly and Ricardo Hoar

Objectives

1. Object-Oriented Overview
2. Classes and Objects in PHP
3. Object Oriented Design

Section 1 of 3

OBJECT-ORIENTED OVERVIEW

Overview

Object-Oriented Overview

PHP is a full-fledged object-oriented language with many of the syntactic constructs popularized in languages like Java and C++.

Earlier versions of PHP do not support all of these object-oriented features,

- PHP versions after 5.0 do

Terminology

Object-Oriented Terminology

The notion of programming with objects allows the developer to think about an item with particular **properties** (also called attributes or **data members**) and methods (functions).

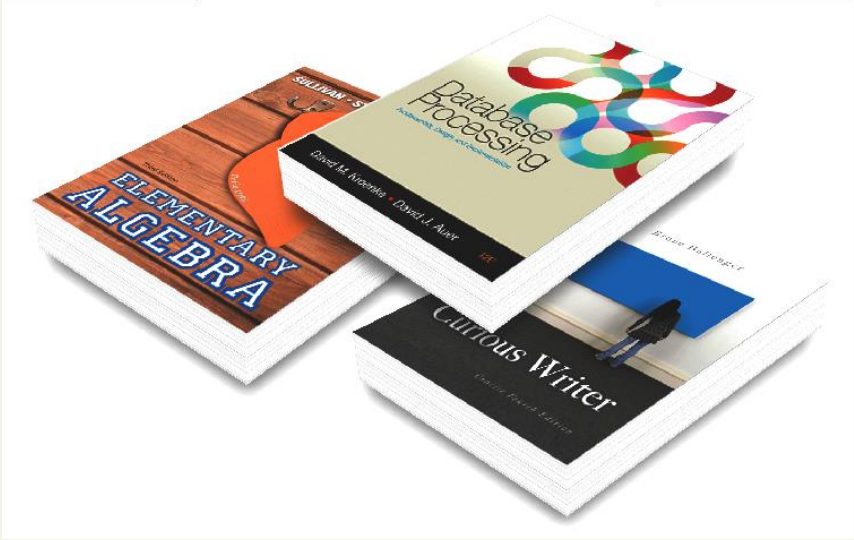
The structure of these **objects** is defined by **classes**, which outline the properties and methods like a blueprint.

Each variable created from a class is called an object or **instance**, and each object maintains its own set of variables, and behaves (largely) independently from the class once created.

Relationship between Class and Objects

Book class

Defines properties such as:
title, author, and number of pages



Objects (or instances of the Book class)

Each instance has its own title, author, and number of pages property values

UML

The Unified Modelling Language

The standard diagramming notation for object-oriented design is **UML (Unified Modeling Language).**

Class diagrams and object diagrams, in particular, are useful to us when describing the properties, methods, and relationships between classes and objects.

For a complete definition of UML modeling syntax, look at the Object Modeling Group's living specification

UML Class diagram

By example

Every Artist has a

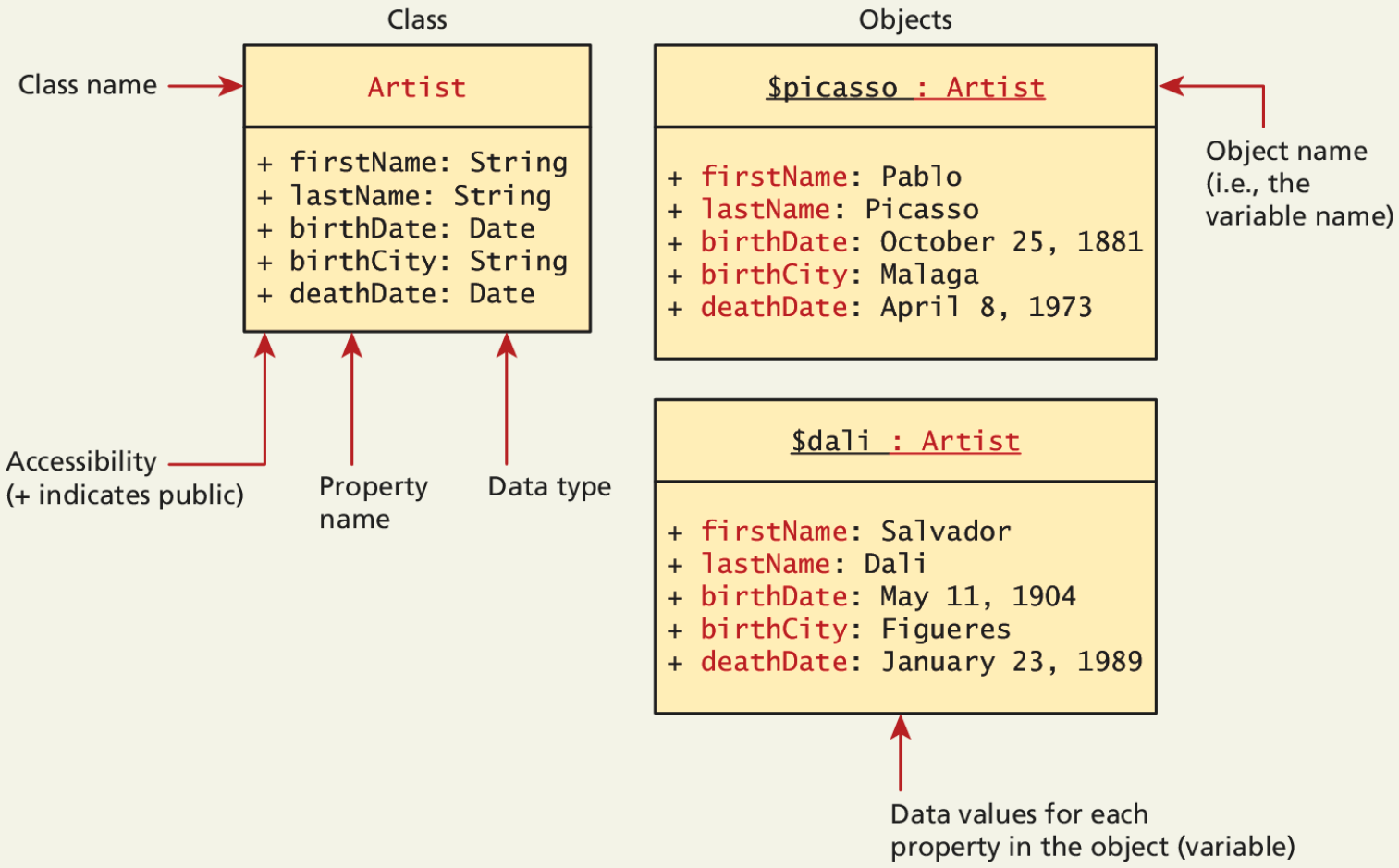
- first name,
- last name,
- birth date,
- birth city, and
- death date.

Using objects we can encapsulate those properties together into a class definition for an Artist.

UML articulates that design

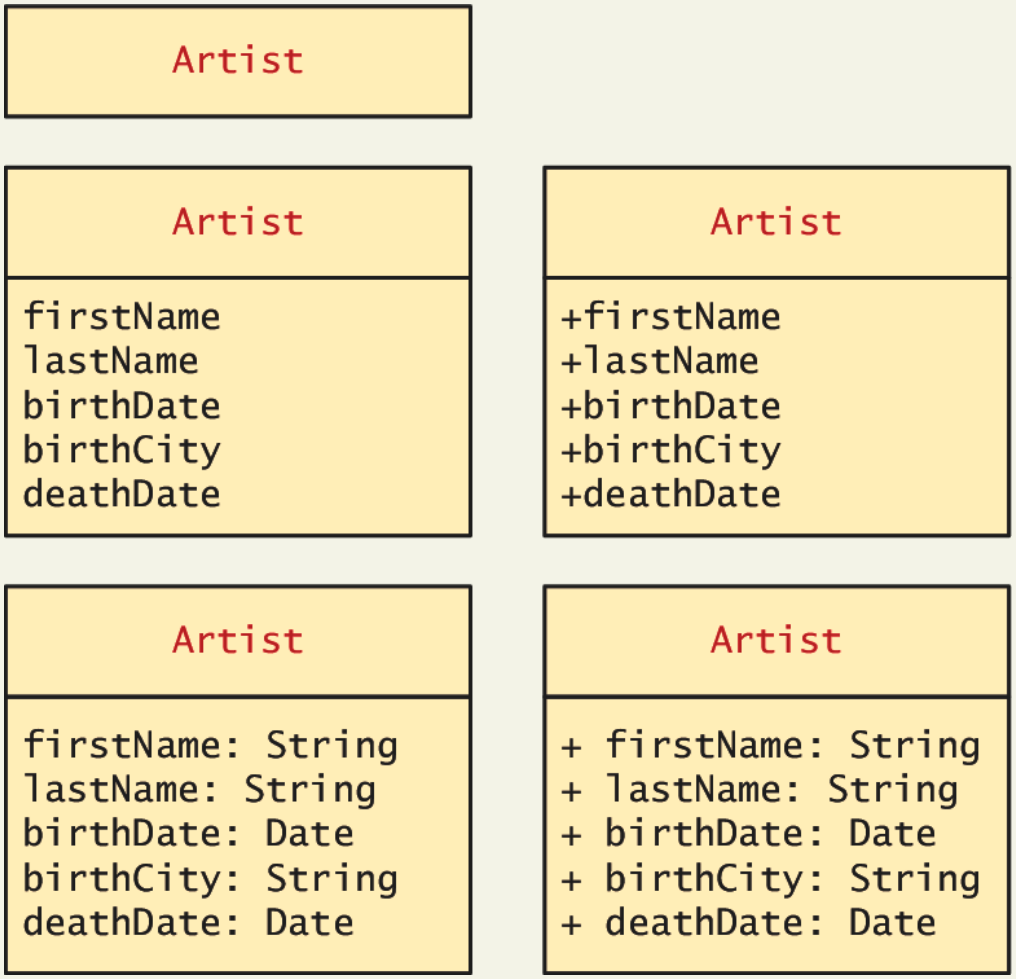
UML Class diagram

Class and a couple of objects



UML Class diagram

Different levels of detail



Server and Desktop Objects

Not the same

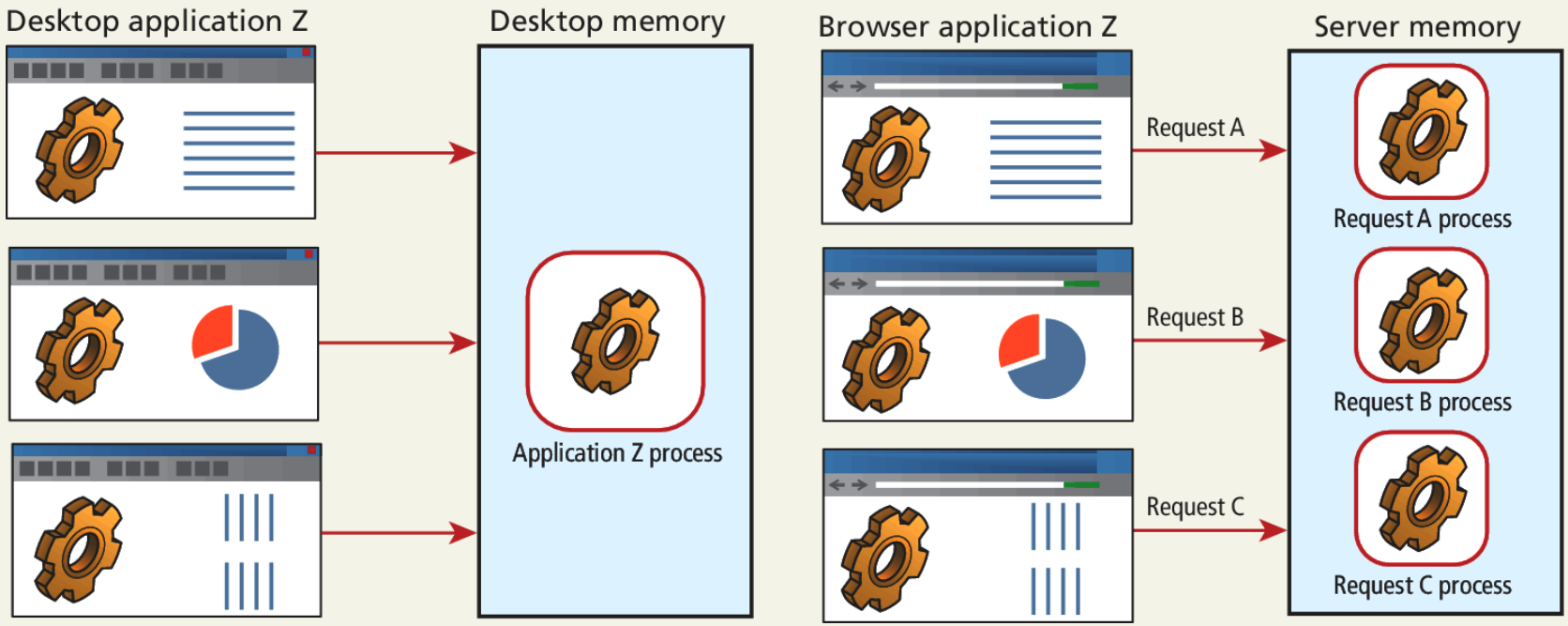
While desktop software can load an object into memory and make use of it for several user interactions, a PHP object is loaded into memory only for the life of that HTTP request.

We must use classes differently than in the desktop world, since the object must be recreated and loaded into memory

Unlike a desktop, there are potentially many thousands of users making requests at once, so not only are objects destroyed upon responding to each request, but memory must be shared between many simultaneous requests, each of which may load objects into memoryor each request that requires it

Server and Desktop Objects

Not the same



Section 2 of 3

OBJECTS AND CLASSES IN PHP

Defining Classes

In PHP

The PHP syntax for defining a class uses the class keyword followed by the class name and { } braces

```
class Artist {
   public   $firstName;
   public   $lastName;
   public   $birthDate;
   public   $birthCity;
   public   $deathDate;
}
```

LISTING 10.1 A simple Artist class

Instantiating Objects

In PHP

Defining a class is not the same as using it. To make use of a class, one must **instantiate** (create) objects from its definition using the *new* keyword.

```
$picasso = new Artist();

$dali = new Artist();
```

Properties

The things in the objects

Once you have instances of an object, you can access and modify the properties of each one separately using the variable name and an arrow (->).

```
$picasso = new Artist();
$dali = new Artist();
$picasso->firstName = "Pablo";
$picasso->lastName = "Picasso";
$picasso->birthCity = "Malaga";
$picasso->birthDate = "October 25 1881";
$picasso->deathDate = "April 8 1973";
```

LISTING 10.2 Instantiating two Artist objects and setting one of those object's properties

Constructors

A Better way to build

Constructors let you specify parameters during instantiation to initialize the properties within a class right away.

In PHP, constructors are defined as functions (as you shall see, all methods use the function keyword) with the name **__construct().**

Notice that in the constructor each parameter is assigned to an internal class variable using the $this-> syntax. you **must** always use the $this syntax to reference all properties and methods associated with this particular instance of a class.

Constructors

An Example

```
class Artist {
   // variables from previous listing still go here
   ...

   function __construct($firstName, $lastName, $city, $birth,
                        $death=null) {
      $this->firstName = $firstName;
      $this->lastName = $lastName;
      $this->birthCity = $city;
      $this->birthDate = $birth;
      $this->deathDate = $death;
   }
}
```

LISTING 10.3 A constructor added to the class definition

Constructors

Using the constructor

```
$picasso = new Artist("Pablo","Picasso","Malaga","Oct 25,1881","Apr 8,1973");

$dali = new Artist("Salvador","Dali","Figures","May 11 1904", "Jan 23 1989");
```

Methods

Functions In a class

Methods and are like functions, except they are associated with a class.

They define the tasks each instance of a class can perform and are useful since they associate behavior with objects.

```
$picasso = new Artist( . . . )

echo $picasso->outputAsTable();
```

Methods

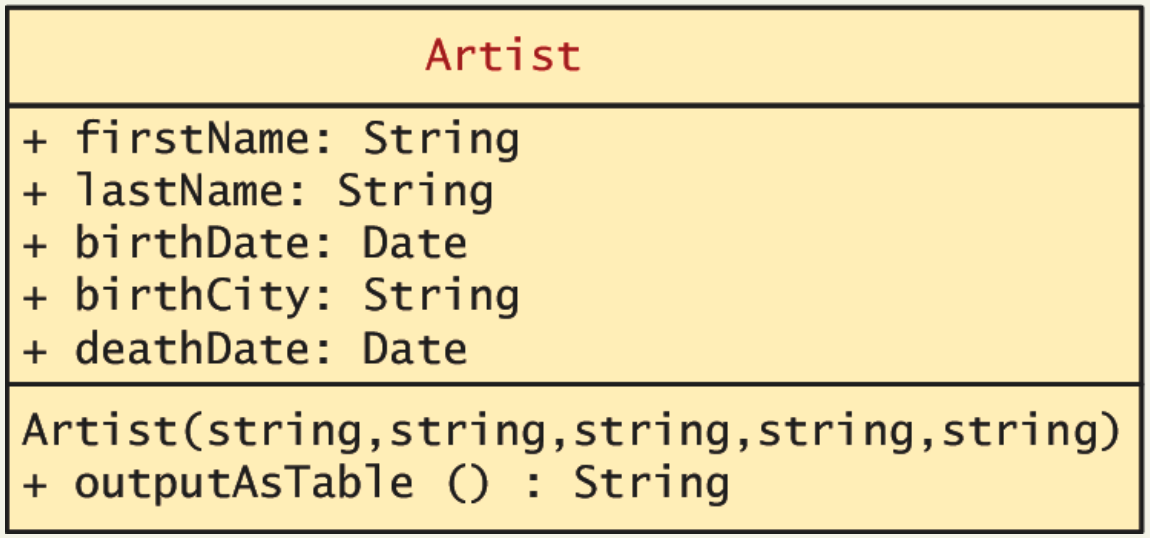
The example definition

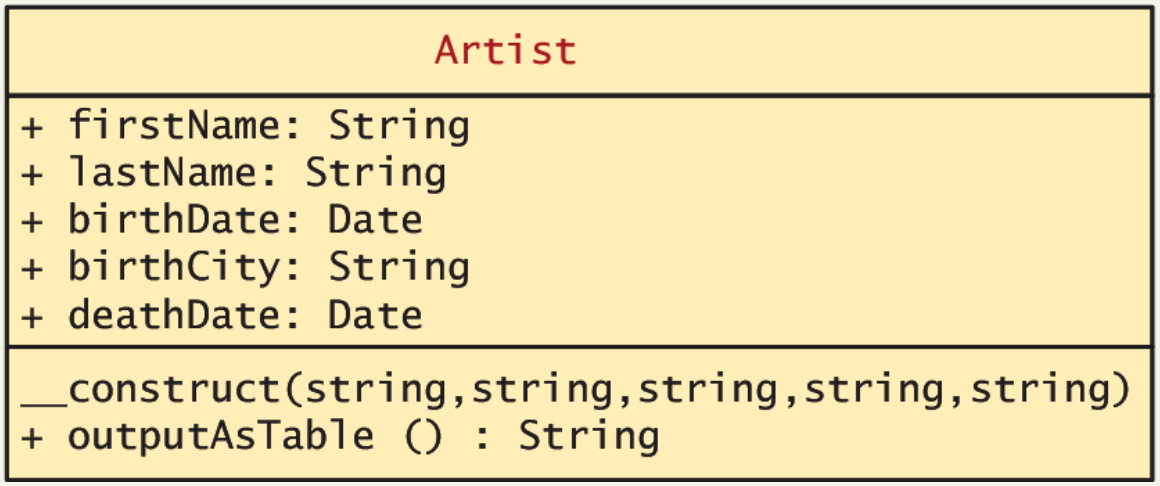
```
class Artist {
    ...
    public function outputAsTable() {
      $table = "<table>";
      $table .= "<tr><th colspan='2'>";
      $table .= $this->firstName . " " . $this->lastName;
      $table .= "</th></tr>";
      $table .= "<tr><td>Birth:</td>";
      $table .= "<td>" . $this->birthDate;
      $table .= "(" . $this->birthCity . ")</td></tr>";
      $table .= "<tr><td>Death:</td>";
      $table .= "<td>" . $this->deathDate . "</td></tr>";
      $table .= "</table>";
      return $table;
    }
}
```

LISTING 10.4 Method definition

Methods

UML class diagrams adding the method





Visibility

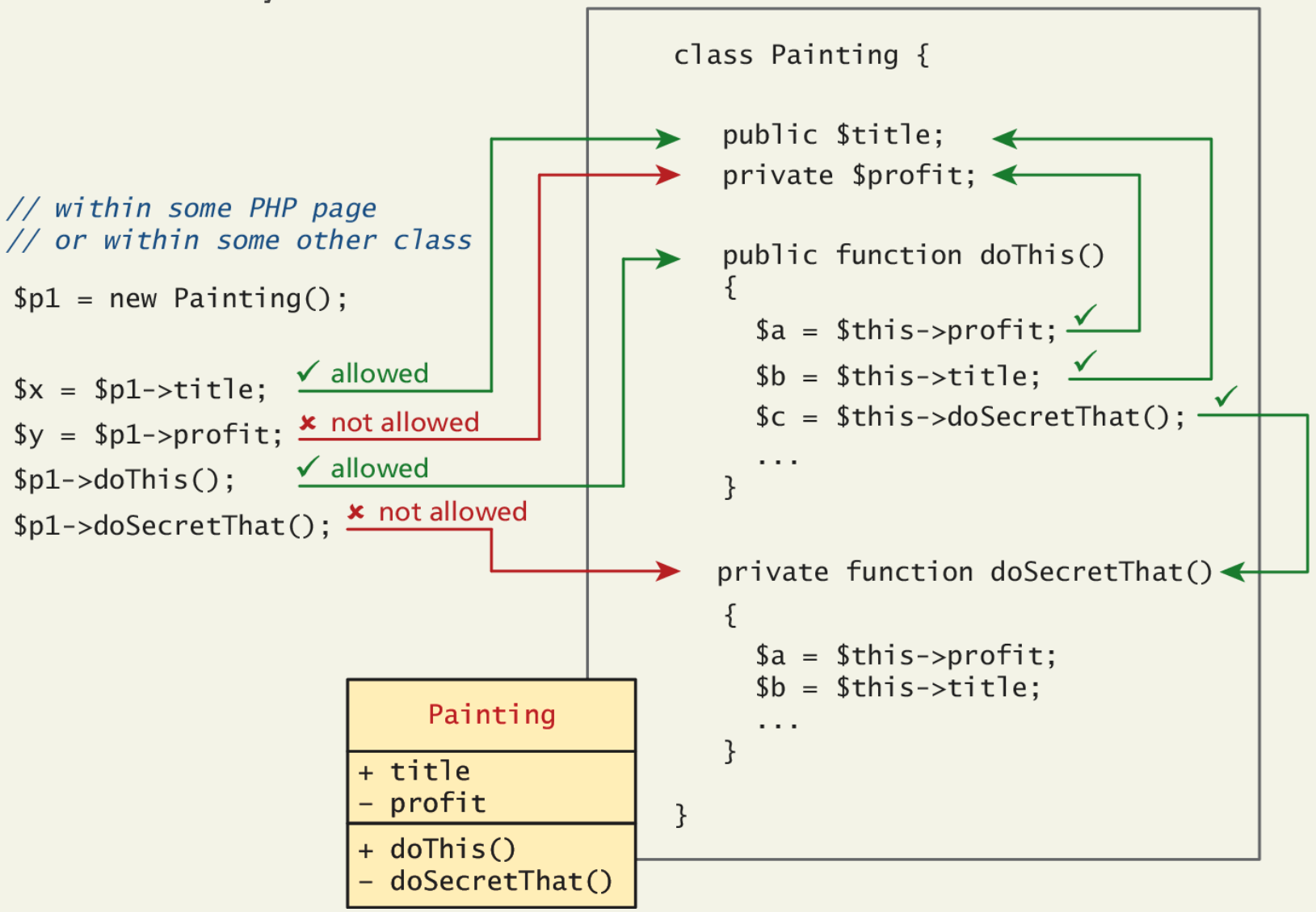
Or accessibility

The **visibility** of a property or method determines the accessibility of a **class member** and can be set to:

- **Public** the property or method is accessible to any code that has a reference to the object
- **Private** sets a method or variable to only be accessible from within the class
- **Protected** is related to inheritance…

Visibility

Or accessibility



Static Members

A **static** member is a property or method that all instances of a class share.

Unlike an instance property, where each object gets its own value for that property, there is only one value for a class's static property.

Static members use the self:: syntax and are not associated with one object

They can be accessed without any instance of an Artist object by using the class name, that is, via **Artist::$artistCount.**

Static Members

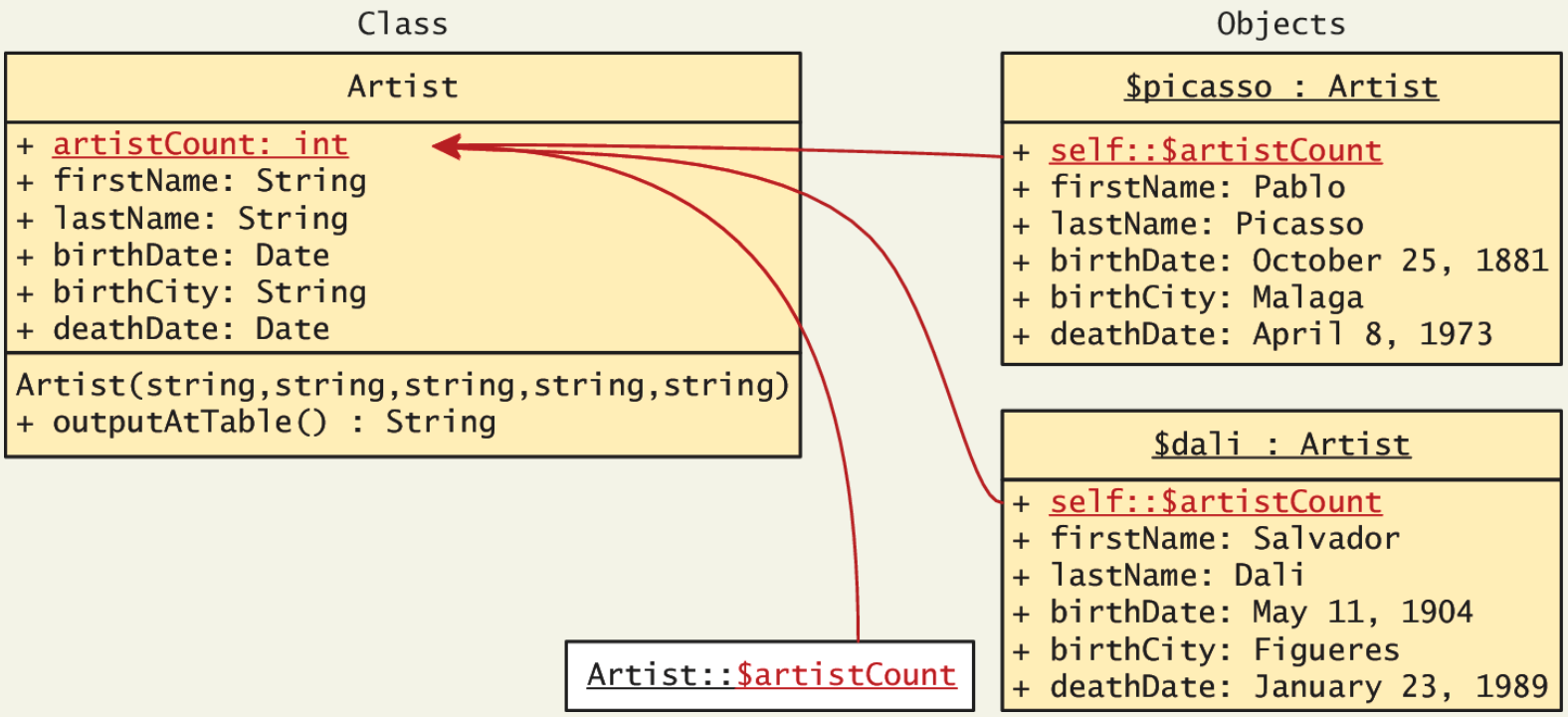
```
class Artist {
    public static $artistCount = 0;
    public   $firstName;
    public   $lastName;
    public   $birthDate;
    public   $birthCity;
    public   $deathDate;

    function __construct($firstName, $lastName, $city, $birth,
                         $death=null) {
       $this->firstName = $firstName;
       $this->lastName = $lastName;
       $this->birthCity = $city;
       $this->birthDate = $birth;
       $this->deathDate = $death;
       self::$artistCount++;
    }
 }
```

LISTING 10.5 Class definition modified with static members

Static Members

Uml again



Class constants

Never changes

Constant values can be stored more efficiently as class constants so long as they are not calculated or updated

They are added to a class using the **const** keyword.

```
const EARLIEST_DATE = 'January 1, 1200';
```

Unlike all other variables, constants don't use the $ symbol when declaring or using them.

Accessed both inside and outside the class using

- **self::EARLIEST_DATE** in the class and
- **classReference::EARLIEST_DATE** outside.

Section 2 of 3

OBJECT ORIENTED DESIGN

Data Encapsulation

What is it?

Perhaps the most important advantage to object-oriented design is the possibility of **encapsulation**, which generally refers to restricting access to an object's internal components.

Another way of understanding encapsulation is: it is the hiding of an object's implementation details

A properly encapsulated class will define an interface to the world in the form of its public methods, and leave its data, that is, its properties, hidden (that is, private).

Data Encapsulation

Getters and setters

If a properly encapsulated class makes its properties private, then how do you access them?

- **getters**
- **setters**

Data Encapsulation

Getters

A getter to return a variable's value is often very straightforward and should not modify the property.

```
public function getFirstName() {

        return $this->firstName;

}
```

Data Encapsulation

Setters

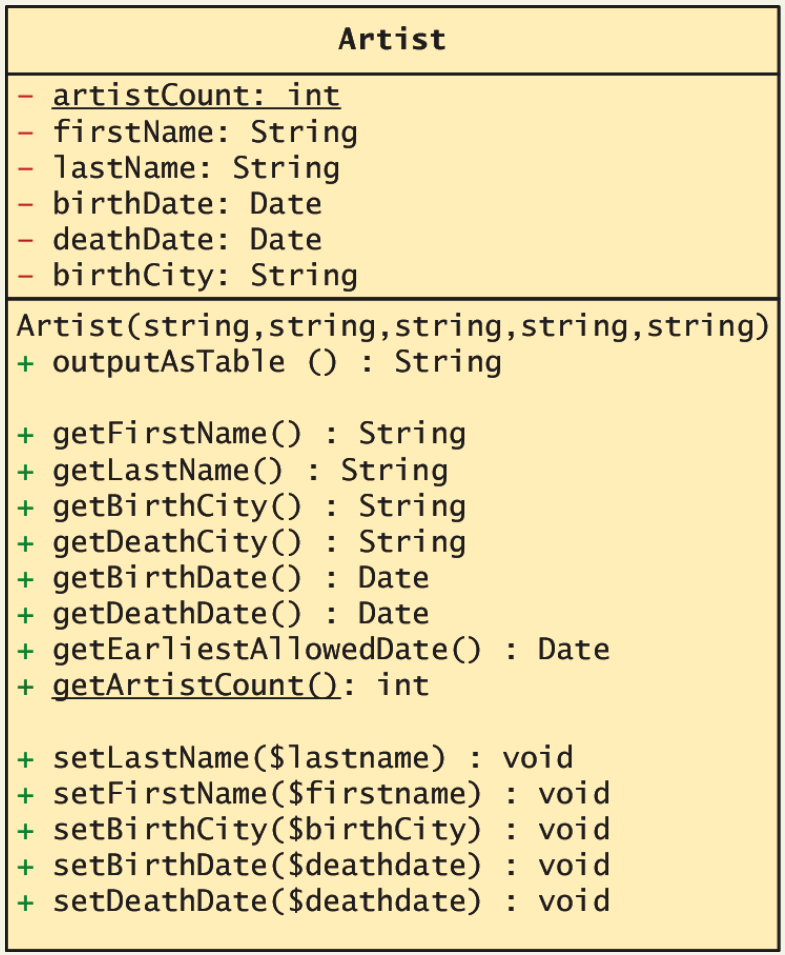
Setter methods modify properties, and allow extra logic to be added to prevent properties from being set to strange values.

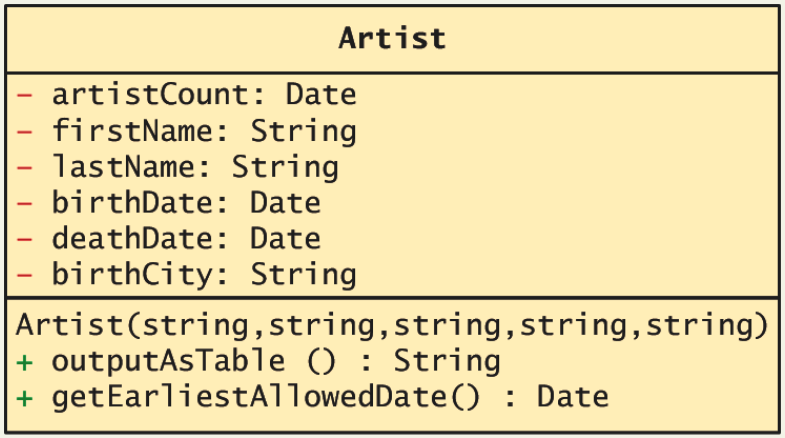
```
public function setBirthDate($birthdate){
        // set variable only if passed a valid date string
        $date = date_create($birthdate);
        if ( ! $date ) {
                $this->birthDate = $this->getEarliestAllowedDate();
        }
        else {
        // if very early date then change it to
        // the earliest allowed date
                if ( $date < $this->getEarliestAllowedDate() ) {
                    $date = $this->getEarliestAllowedDate();
                }
                $this->birthDate = $date;
        }

}
```

Data Encapsulation

UML





Data Encapsulation

Using an encapsulated class

```
<html>
  <body>
  <h2>Tester for Artist class</h2>

  <?php
  // first must include the class definition
  include 'Artist.class.php';

  // now create one instance of the Artist class
  $picasso = new Artist("Pablo","Picasso","Malaga","Oct 25,1881",
                        "Apr 8,1973");

  // output some of its fields to test the getters
  echo $picasso->getLastName() . ': ';
  echo date_format($picasso->getBirthDate(),'d M Y') . ' to ';
  echo date_format($picasso->getDeathDate(),'d M Y') . '<hr>';

  // create another instance and test it
  $dali = new Artist("Salvador","Dali","Figures","May 11,1904",
                     "January 23,1989");

  echo $dali->getLastName() . ': ';
  echo date_format($dali->getBirthDate(),'d M Y') . ' to ';
  echo date_format($dali->getDeathDate(),'d M Y'). '<hr>';

  // test the output method
  echo $picasso->outputAsTable();

  // finally test the static method: notice its syntax
  echo '<hr>';
  echo 'Number of Instantiated artists: ' . Artist::getArtistCount();

  ?>
  </body>
  </html>
```

LISTING 10.7 Using the encapsulated class

Inheritance

Inheritance enables you to create new PHP classes that reuse, extend, and modify the behavior that is defined in another PHP class.

- PHP only allows you to inherit from one class at a time
- A class that is inheriting from another class is said to be a **subclass** or a **derived class**
- The class that is being inherited from is typically called a **superclass** or a **base class**

A PHP class is defined as a subclass by using the ***extends*** keyword.

class Painting **extends** Art { . . . }

Referencing the Base Class

Inheritance enables you to create new PHP classes that reuse, extend, and modify the behavior that is defined in another PHP class.

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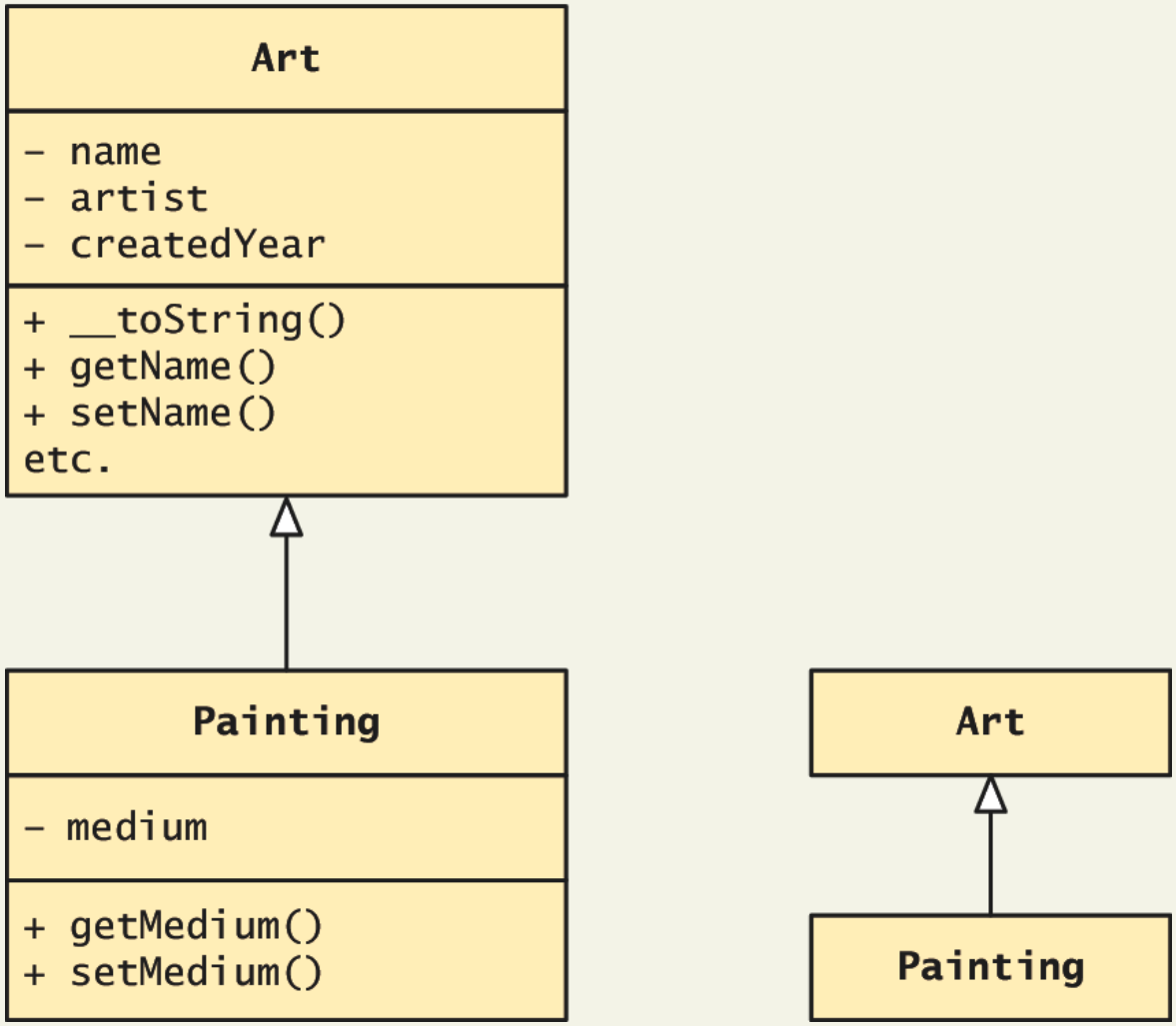
- A class that is inheriting from another class is said to be a **subclass** or a **derived class**
- The class that is being inherited from is typically called a **superclass** or a **base class**

A PHP class is defined as a subclass by using the ***extends*** keyword.

class Painting **extends** Art { . . . }

Inheritance

There's UML for that too

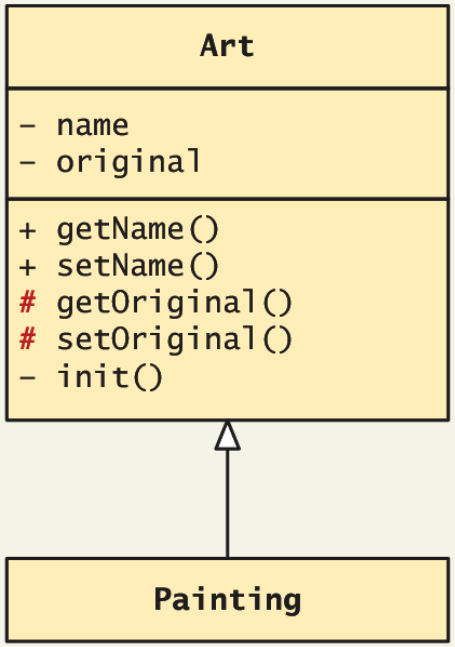


Example usage

```
$p = new Painting();

. . .

echo $p->getName(); // defined in base class

echo $p->getMedium(); // defined in subclass
```

Protected access modifier

Remember Protected?

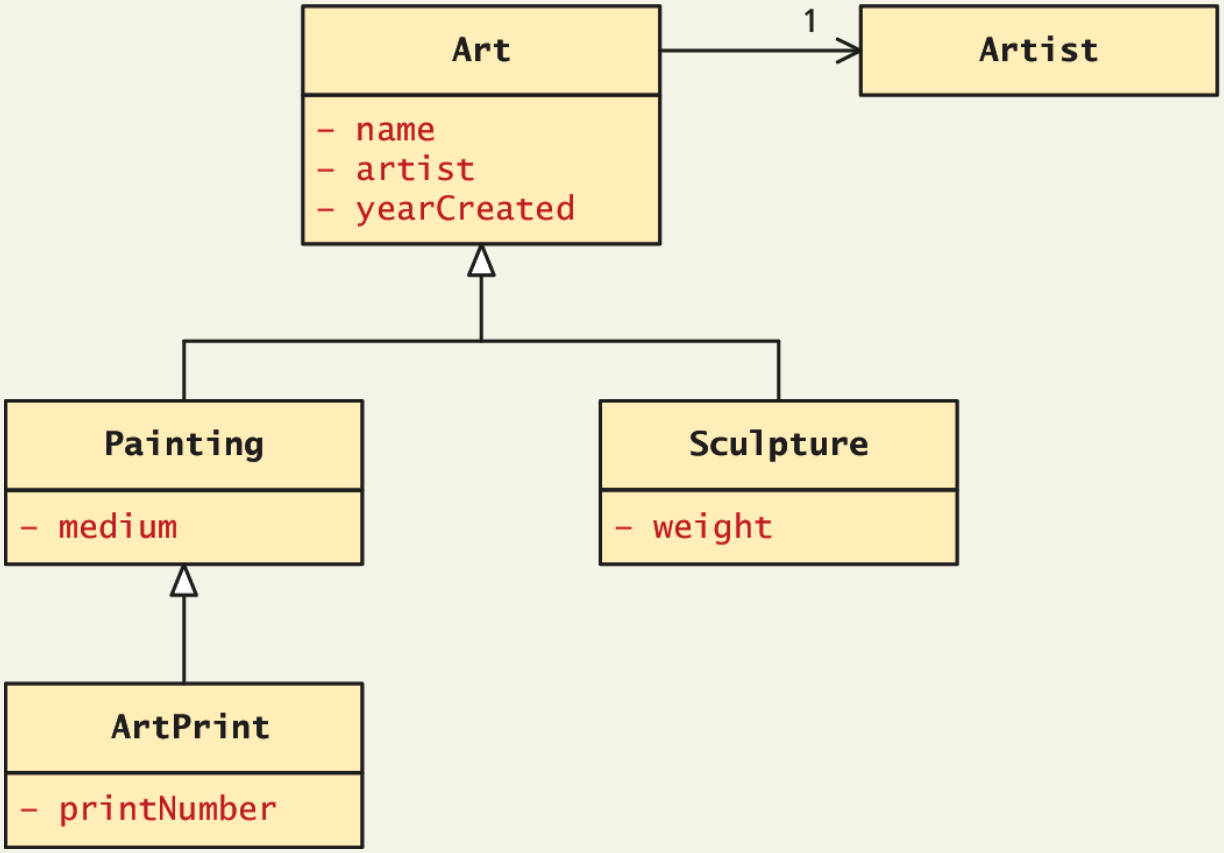



```
class Painting extends Art {
   …
   private function foo() {
     …
     // these are allowed
✓    $w = parent::getName();
✓    $x = parent::getOriginal();

     // this is not allowed
✘    $y = parent::init();
   }
}
```

```
// in some page or other class
$p = new Painting();
$a = new Art();

// neither of these references are allowed
✘ $w = $p->getOriginal();
✘ $y = $a->getOriginal();
```

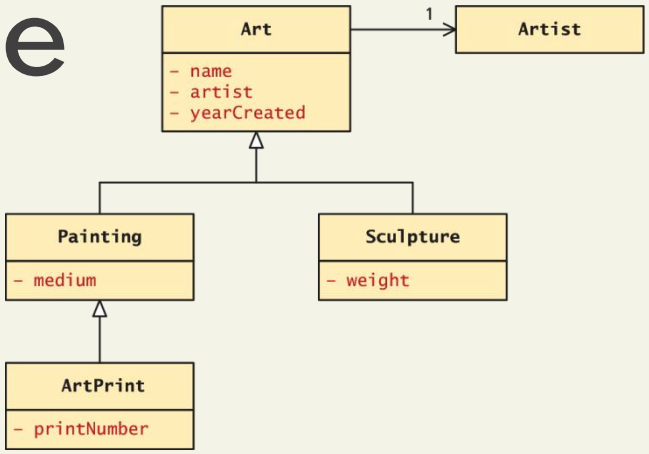
A More Complex Example

Using inheritance



Extended example

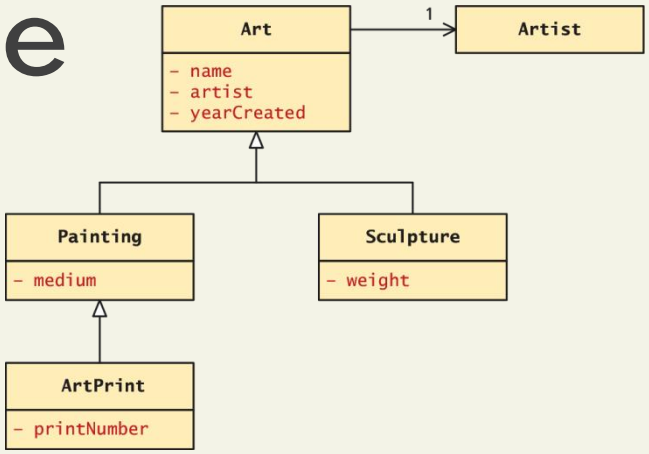
All art has certain properties




```
/* The abstract class that
 contains functionality required by
 all types of Art */

abstract class Art {

        private $name;

        private $artist;

        private $yearCreated;

        //... constructor, getters, setters
```

Extended example

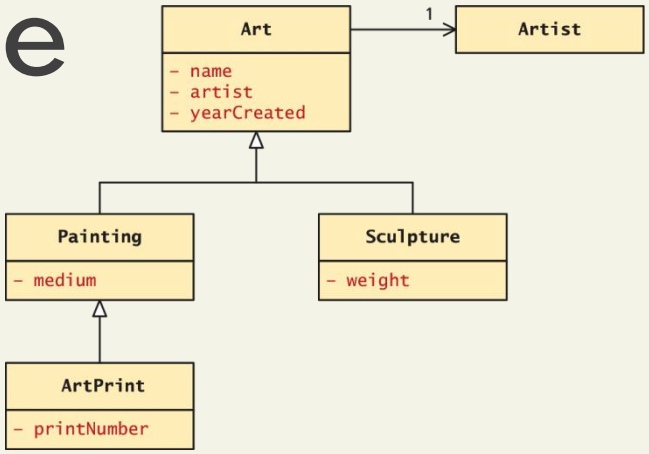
Painting require a "medium"




```
class Painting extends Art {

        private $medium;

        //...constructor, getters, setters

        public function __toString() {

        return parent::__toString() . ", Medium: " .
                                        $this->getMedium();

    }

}
```

Extended example

Sculptures have weight




```
class Sculpture extends Art {

        private $weight;

        //...constructor, getters, setters

        public function __toString() {

                return parent::__toString() . ", Weight: " .

                                $this->getWeight() ."kg";

        }
}
```

Extended example

Using the classes

```
...
$picasso = new Artist("Pablo","Picasso","Malaga","May 11,904”,"Apr 8, 1973");
$guernica = new Painting("1937",$picasso,"Guernica”, "Oil on canvas");
$woman = new Sculpture("1909",$picasso,"Head of a Woman", 30.5);
?>
<h2>Paintings</h2>
<p><em>Use the __toString() methods </em></p>
<p><?php echo $guernica; ?></p>
<h2>Sculptures</h2>
<p> <?php echo $woman; ?></p>
```

Polymorphism

No thank you, I'll have water

Polymorphism is the notion that an object can in fact be multiple things at the same time.

Consider an instance of a Painting object named $guernica created as follows:

```
$guernica = new Painting("1937",$picasso,"Guernica","Oil on canvas");
```

The variable $guernica is both a *Painting* object and an *Art* object due to its inheritance.

The advantage of polymorphism is that we can manage a list of Art objects, and call the same overridden method on each.

Polymorphism

```
$picasso = new Artist("Pablo","Picasso","Malaga","Oct 25, 1881",
                      "Apr 8, 1973");

// create the paintings
$guernica = new Painting("1937",$picasso,"Guernica","Oil on canvas");
$chicago = new Sculpture("1967",$picasso,"Chicago", 454);
```

```
// create an array of art
$works = array();
$works[0] = $guernica;
$works[1] = $chicago;
// to test polymorphism, loop through art array
foreach ($works as $art)
{
// the beauty of polymorphism:
// the appropriate __toString() method will be called!
   echo $art;
}

// add works to artist ... any type of art class will work
$picasso->addWork($guernica);
$picasso->addWork($chicago);
// do the same type of loop
foreach ($picasso->getWorks() as $art) {
   echo $art;  // again polymorphism at work
}
```

LISTING 10.10 Using polymorphism

Interfaces

Defining the interface

An object **interface** is a way of defining a formal list of methods that a class **must** implement without specifying their implementation.

Interfaces are defined using the interface keyword, and look similar to standard PHP classes, except an interface contains no properties and its methods do not have method bodies defined.

```
interface Viewable {

        public function getSize();

        public function getPNG();

}
```

Interfaces

Defining the interface

An object **interface** is a way of defining a formal list of methods that a class **must** implement without specifying their implementation.

Interfaces are defined using the interface keyword, and look similar to standard PHP classes, except an interface contains no properties and its methods do not have method bodies defined.

```
interface Viewable {

        public function getSize();

        public function getPNG();

}
```

Interfaces

Imnplmeneting the Interface

In PHP, a class can be said to *implement* an interface, using the implements keyword:

class *Painting* extends Art **implements** Viewable { ... }

This means then that the class *Painting* must provide implementations for the getSize() and getPNG() methods.

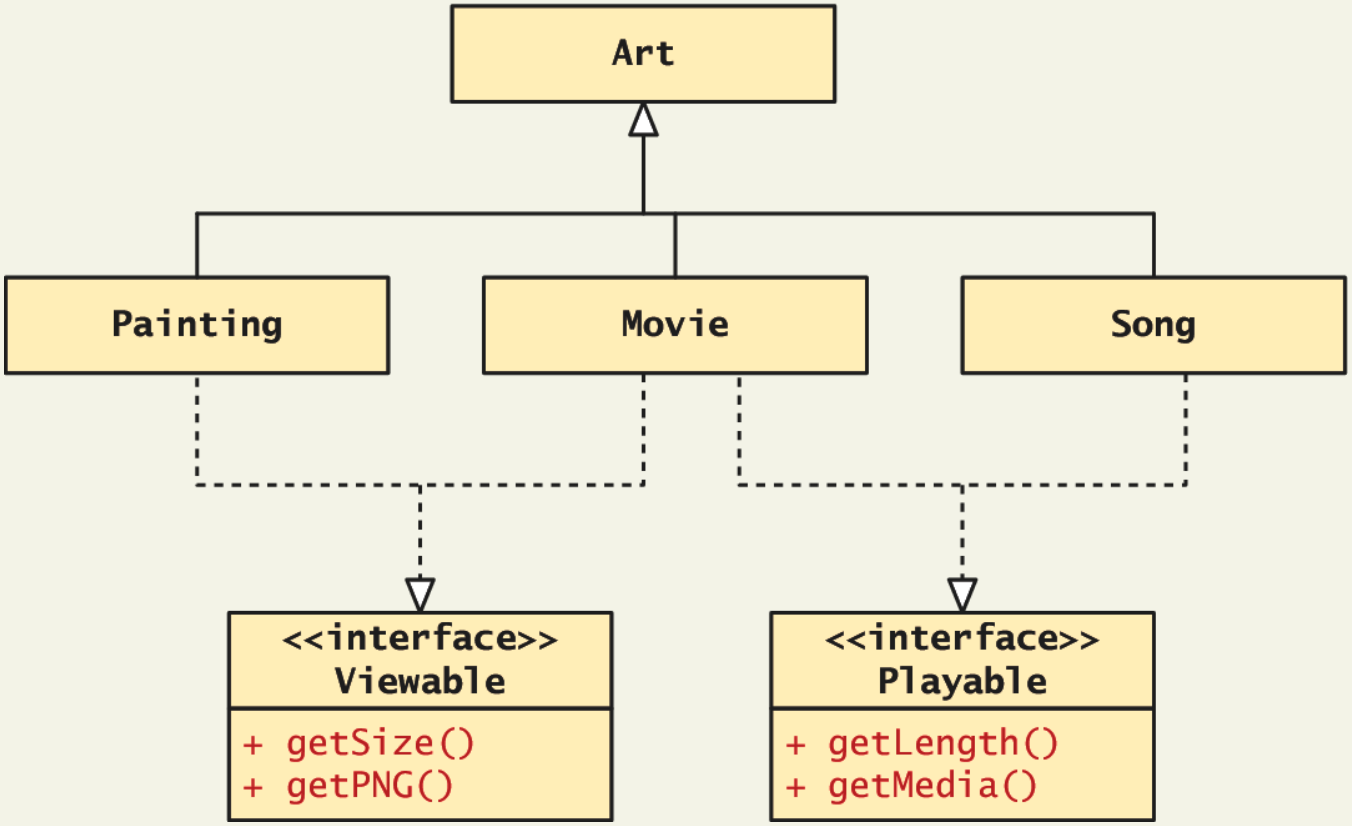
Interface Example

```
interface Viewable {
   public function getSize();
   public function getPNG();
}

class Painting extends Art implements Viewable {
   ...
   public function getPNG() {
      //return image data would go here
      ...
   }
   public function getSize() {
      //return image size would go here
      ...
   }
}
```

LISTING 10.11 Painting class implementing an interface

Interfaces

An Extended example



What You've Learned

1. Object-Oriented Overview
2. Classes and Objects in PHP
3. Object Oriented Design

Error Handling and Validation

Chapter 12

Randy Connolly and Ricardo Hoar

Objectives

1. What are Errors and Exceptions?
2. PHP Error Reporting
3. PHP Error and Exception Handling
4. Regular Expressions
5. Validating User Input
6. Where to Perform Validation

Section 1 of 6

WHAT ARE ERRORS AND EXCEPTIONS?

Types of Errors

- Expected errors

  Things that you expect to go wrong. Bad user input, database connection, etc…

- Warnings

  problems that generate a PHP warning message but will not halt the execution of the page

- Fatal errors

  are serious in that the execution of the page will terminate unless handled in some way

Checking user input

Checking for values

Notice that this parameter has no value.

Example query string: `id=0&name1=&name2=smith&name3=%20`

This parameter's value is a space character (URL encoded).

`isset($_GET['id'])`	returns	**true**	
`isset($_GET['name1'])`	returns	**true**	Notice that a missing value for a parameter is still considered to be `isset`.
`isset($_GET['name2'])`	returns	**true**	
`isset($_GET['name3'])`	returns	**true**	
`isset($_GET['name4'])`	returns	**false**	Notice that only a missing parameter name is considered to be not `isset`.
`empty($_GET['id'])`	returns	**true**	Notice that a value of zero is considered to be empty. This may be an issue if zero is a "legitimate" value in the application.
`empty($_GET['name1'])`	returns	**true**	
`empty($_GET['name2'])`	returns	**false**	
`empty($_GET['name3'])`	returns	**false**	Notice that a value of space is considered to be **not** empty.
`empty($_GET['name4'])`	returns	**true**	

Checking user input

Checking for a number

```
$id = $_GET['id'];
if (!empty($id) && is_numeric($id) ) {
   // use the query string since it exists and is a numeric value
   ...
}
```

LISTING 12.1 Testing a query string to see if it exists and is numeric

Exceptions vs Errors

Not the same thing

- An **error** is some type of problem that generates a nonfatal warning message or that generates an error message that terminates the program's execution.
- An **exception** refers to objects that are of type Exception and which are used in conjunction with the object-oriented try . . . catch language construct for dealing with runtime errors.

Section 2 of 6

PHP ERROR REPORTING

PHP error reporting

Lots of control

PHP has a flexible and customizable system for reporting warnings and errors that can be set programmatically at runtime or declaratively at design-time within the **php.ini** file. There are three main error reporting flags:

- error_reporting
- display_errors
- log_errors

The error_reporting setting

What is an error?

The **error_reporting** setting specifies which type of errors are to be reported.

It can be set programmatically inside **any** PHP file:

```
error_reporting(E_ALL);
```

It can also be set within the **php.ini** file:

```
error_reporting = E_ALL
```

The error_reporting setting

Some error reporting constants

Constant Name	Value	Description
E_ALL	8191	Report all errors and warnings
E_ERROR	1	Report all fatal runtime errors
E_WARNING	2	Report all nonfatal runtime errors (that is, warnings)
	0	No reporting

The display_errors setting

To show or not to show

The **display_error** setting specifies whether error messages should or should not be displayed in the browser.

It can be set programmatically via the ini_set() function:

```
ini_set('display_errors','0');
```

It can also be set within the **php.ini** file:

```
display_errors = Off
```

The log_error setting

To record or not to record

The **log_error** setting specifies whether error messages should or should not be sent to the server error log.

It can be set programmatically via the ini_set() function:

```
ini_set('log_errors','1');
```

It can also be set within the **php.ini** file:

```
log_errors = On
```

The log_error setting

Where to store.

The location to store logs in can be set programatically:

```
ini_set('error_log', '/restricted/my-errors.log');
```

It can also be set within the **php.ini** file:

```
error_log = /restricted/my-errors.log
```

The log_error setting

Error_log()

You can also programmatically send messages to the error log at any time via the error_log() function

```
$msg = 'Some horrible error has occurred!';

// send message to system error log (default)
error_log($msg,0);

// email message
error_log($msg,1,'support@abc.com','From: somepage.php@abc.com');

// send message to file
error_log($msg,3, '/folder/somefile.log');
```

Section 3 of 6

PHP ERROR AND EXCEPTION HANDLING

Procedural Error Handling

Recall connecting to a database, that there may be an error…

```
$connection = mysqli_connect(DBHOST, DBUSER, DBPASS, DBNAME);

$error = mysqli_connect_error();
if ($error != null) {
   // handle the error
   ...
}
```

LISTING 12.2 Procedural approach to error handling

OO Exception Handling

Try, catch, finally

When a runtime error occurs, PHP *throws* an *exception*.

This exception can be *caught* and handled either by the function, class, or page that generated the exception or by the code that called the function or class.

If an exception is not caught, then eventually the PHP environment will handle it by terminating execution with an "Uncaught Exception" message.

OO Exception Handling

Try, catch, finally

```php
// Exception throwing function
function throwException($message = null,$code = null) {
  throw new Exception($message,$code);
}

try {
  // PHP code here
  $connection = mysqli_connect(DBHOST, DBUSER, DBPASS, DBNAME)
    or throwException("error");
 //...
}
catch (Exception $e) {
  echo ' Caught exception: ' .  $e->getMessage();
  echo ' On Line : ' .  $e->getLine();
  echo ' Stack Trace: '; print_r($e->getTrace());
} finally {
  // PHP code here that will be executed after try or after catch
}
```

LISTING 12.3 Example of try . . . catch block

OO Exception Handling

Finally

The finally block is optional. Any code within it will always be executed *after* the code in the try or in the catch blocks, even if that code contains a return statement.

The finally block is only available in PHP 5.5 and later

Throw your own exception

Object oriented way of dealing with the unexpected

```
try {
  // PHP code here
}
catch (Exception $e) {
    // do some application-specific exception handling here
    ...
    // now rethrow exception
    throw $e;
}
```

LISTING 12.5 Rethrowing an exception


```
try {
  // PHP code here
}
catch (Exception $e) {
    // do some application-specific exception handling here
    ...
    // now rethrow exception
    throw $e;
}
```

LISTING 12.5 Rethrowing an exception

Custom Handlers

Error and Exception Handlers

What should a custom error or exception handler do?

It should provide the *developer* with detailed information about the state of the application when the exception occurred, information about the exception, and when it happened.

It should hide any of those details from the regular end user, and instead provide the user with a generic message such as “Sorry but there was a problem”

Once a handler function is defined, it must be registered, using the following code:

```
set_exception_handler('my_exception_handler');
```

Custom Handlers

Error and Exception Handlers

```
function my_exception_handler($exception) {

  // put together a detailed exception message
  $msg = "<p>Exception Number " . $exception->getCode();
  $msg .= $exception->getMessage() . " occurred on line ";
  $msg .= "<strong>" . $exception->getLine() . "</strong>";
  $msg .= "and in the file: ";
  $msg .= "<strong>" . $exception->getFile() . "</strong> </p>";

  // email error message to someone who cares about such things
  error_log($msg, 1, 'support@domain.com',
            'From: reporting@domain.com');

  // if exception serious then stop execution and tell maintenance fib
  if ($exception->getCode() !== E_NOTICE) {
     die("Sorry the system is down for maintenance. Please try
          again soon");
  }
}
```

LISTING 12.6 Custom exception handler

Section 4 of 6

REGULAR EXPRESSIONS

Regular Expressions

May seem irregular at first glance

A **regular expression** is a set of special characters that define a pattern.

They are a type of language that is intended for the matching and manipulation of text.

Regular expressions are a concise way to eliminate the conditional logic that would be necessary to ensure that input data follows a specific format.

Regular Expressions

Syntax

A regular expression consists of two types of characters: **literals** and **metacharacters**.

- A **literal** is a character you wish to match in the target
- A **metacharacter** is a special symbol that acts as a command to the regular expression parser

Regular Expressions

Characters with Special Meaning

.	[	]	\	(	)	^	$	|	*	?	{	}	+

TABLE 12.2 Regular Expression Metacharacters (i.e., Characters with Special Meaning)

To use a metacharacter as a literal, you will need to escape it by prefacing it with a backslash (\)

Regular Expressions

Table of typical patterns

Expression	Description
^ … $	If used at the very start and end of the regular expression, it means that the entire string (and not just a substring) must match the rest of the regular expression contained between the ^ and the $ symbols.
\t	Matches a tab character.
\n	Matches a new line character.
.	Matches any character other than \n.
[qwerty]	Matches any single character of the set contained within the brackets.
[^qwerty]	Matches any single character not contained within the brackets.
[a-z]	Matches any single character within range of characters.
\w	Matches any word character. Equivalent to [a-zA-Z0-9].
\W	Matches any nonword character.
\s	Matches any white-space character.
\S	Matches any nonwhite-space character.
\d	Matches any digit.
\D	Matches any nondigit.
*	Indicates zero or more matches.
+	Indicates one or more matches.
?	Indicates zero or one match.
{n}	Indicates exactly n matches.
{n,}	Indicates n or more matches.
{n,m}	Indicates at least n but no more than m matches.
|	Matches any one of the terms separated by the | character. Equivalent to Boolean OR.
()	Groups a subexpression. Grouping can make a regular expression easier to understand.

Regular Expressions

Building one example

Consider a regular expression that would match a North American phone number without the area code.

A valid number contains three numbers, followed by a dash, followed by four numbers without any other character.

The regular expression for this would be:

```
^\d{3}–\d{4}$
```

Regular Expressions

three numbers, followed by a dash, followed by four numbers

^\d{3}–\d{4}$

- The dash is a literal character; the rest are all metacharacters
- The **^** and **$** symbol indicate the beginning and end of the string, respectively
- The metacharacter \d indicates a digit, while the metacharacters {3} and {4} indicate three and four repetitions of the previous match (i.e., a digit), respectively

Regular Expressions

three numbers, followed by a dash, followed by four numbers

A more sophisticated regular expression for a phone number would not allow the first digit in the phone number to be a zero ("0") or a one ("1").

The modified regular expression for this would be:

^[2-9]\d{2}–\d{4}$

Regular Expressions

Any number (but 0,1), then 2 more, a dash and 4 more.

^[2-9]\d{2}–\d{4}$

- The [2-9] metacharacter indicates that the first character must be a digit within the range 2 through 9
- Since only two more numbers are needed the pattern **\d{3}** becomes **\d{2}**

Regular Expressions

Allow a space, period, or dash in the number.

We can make our regular expression a bit more flexible by allowing either a single space (440 6061), a period (440.6061), or a dash (440-6061) between the two sets of numbers.

We can do this via the [] metacharacter:

```
^[2-9]\d{2}[–\s\.]\d{4}$
```

Regular Expressions

Allow a space, period, or dash in the number.

```
^[2-9]\d{2}[–\s\.]\d{4}$
```

This expression indicates that the fourth character in the input must match one of the three characters contained within the square brackets (– matches a dash, \s matches a white space, and \. matches a period)

We must use the escape character for the dash and period, since they have a metacharacter meaning when used within the square brackets

Regular Expressions

Allow multiple spaces

If we want to allow multiple spaces (but only a single dash or period) in our number:

```
^[2-9]\d{2}[–\s\.]\s*\d{4}$
```

The metacharacter sequence \s* matches zero or more white spaces.

Regular Expressions

How about area code

To allow the area code to be

- Surrounded by Brackets (403) 440-6061
- Separated with spaces 403 440 6061
- A Dash 403-440-6061
- A Period 403.440.6061

```
^\(?\s*\d{3}\s*[\)–\.]?\s*[2-9]\d{2}\s*[–\.]\s*\d{4}$
```

Regular Expressions

How about area code

^\(?\s*\d{3}\s*[\)–\.]?\s*[2-9]\d{2}\s*[–\.]\s*\d{4}$

The expression now matches

- zero or one "(" characters **\(?**
- zero or more spaces **\s***three digits **\d{3}**
- zero or more spaces **\s***
- either a ")" a "-", or a "." character **[\)-\.]?**
- zero or more spaces **\s***

Regular Expressions

How about area code

Finally, to make the area code optional we will group the area code by surrounding the area code subexpression within grouping metacharacters— which are "(" and ")"— and then make the group optional using the ? metacharacter.

^(\(?\s*\d{3}\s*[\)–\.]?\s*)?[2-9]\d{2}\s*[–\.]\s*\d{4}$

This may seem frightening, but compare to :

Regular Expressions Alternative

^(\(?\s*\d{3}\s*[\)–\.]?\s*)?[2-9]\d{2}\s*[–\.]\s*\d{4}$

```
var phone=document.getElementById("phone").value;
var parts = phone.split(".");                    // split on .
if (parts.length !=3){
   parts = phone.split("-");                     // split on -
}
if (parts.length == 3) {
   var valid=true;                    // use a flag to track validity
   for (var i=0; i < parts.length; i++) {
      // check that each component is a number
      if (!isNumeric(parts[i])) {
         alert( "you have a non-numeric component");
         valid=false;
      } else { // depending on which component make sure it's in range
         if (i<2) {
            if (parts[i]<100 || parts[i]>999) {
               valid=false;
            }
         }
         else {
            if (parts[i]<1000 || parts[i]>9999) {
               valid=false;
            }
         }
      }
      } // end if isNumeric
      } // end for loop
if (valid) {
   alert(phone + "is a valid phone number");
}
}
alert ("not a valid phone number");
```

LISTING 12.7 A phone number validation script without regular expressions

Some Common Regular Expressions

Regular Expression	Description
^\S{0,8}$	Matches 0 to 8 nonspace characters.
^[a-zA-Z]\w{8,16}$	Simple password expression. The password must be at least 8 characters but no more than 16 characters long.
^\d{5}(-\d{4})?$	American zip code.
^((0[1-9])|(1[0-2]))\/(\d{4})$	Month and years in format mm/yyyy.
^(.+)@([^\.].*)\.([a-z]{2,})$	Email validation based on current standard naming rules.
^((http|https)://)?([\w-] +\.)+[\w]+(/[\w- ./?]*)?$	URL validation. After either http:// or https://, it matches word characters or hyphens, followed by a period followed by either a forward slash, word characters, or a period.
^4\d{3}[\s\-]d{4}[\s\-] d{4}[\s\-]d{4}$	Visa credit card number
^5[1-5]\d{2}[\s\-]d{4}[\s\-] d{4}[\s\-]d{4}$	Mastercard credit card number

Regex is everywhere

Including MySQL

MySQL also supports regular expressions through the REGEXP operator.

For instance, the following SQL statement matches all art works whose title contains one or more numeric digits:

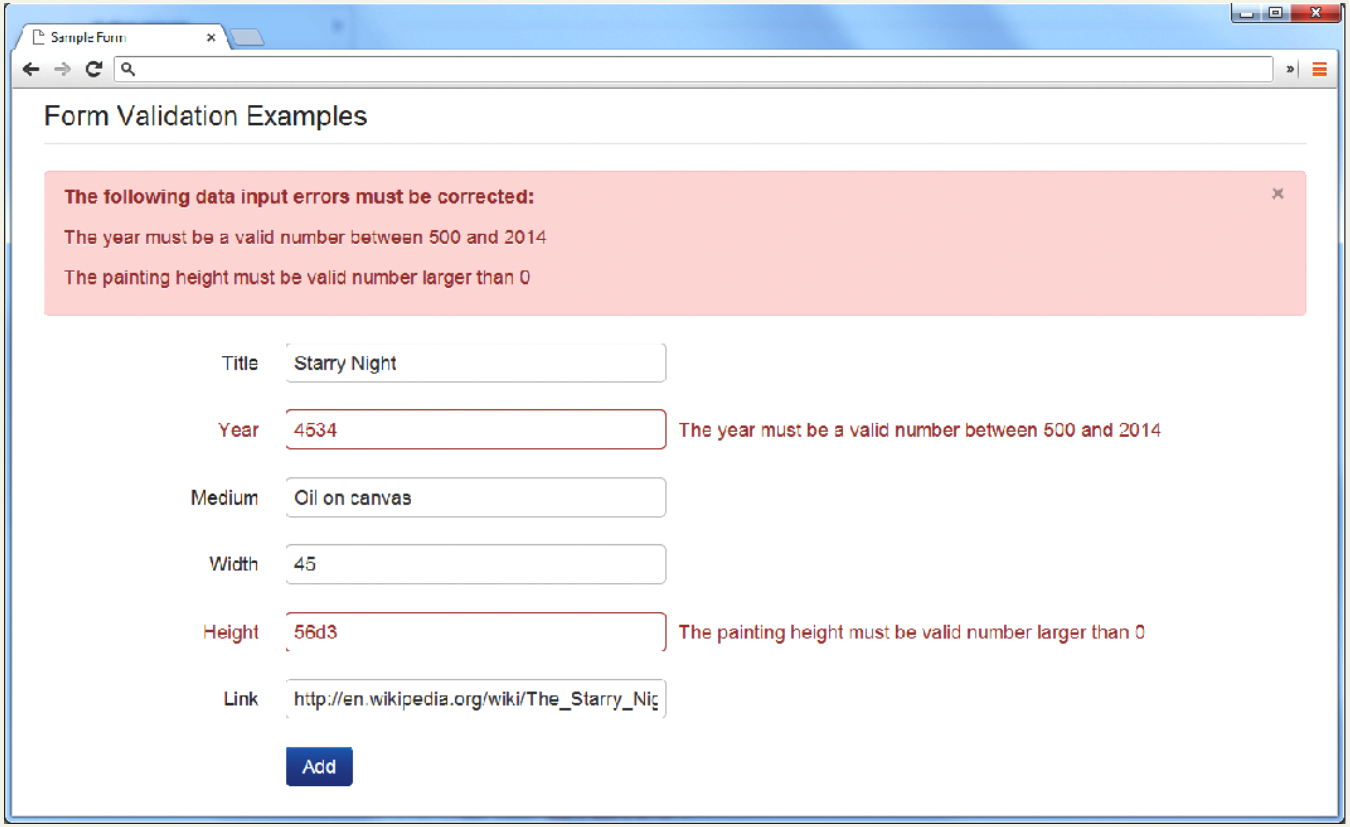
```
SELECT * FROM ArtWorks WHERE Title REGEXP '[0-9]+'
```

Section 5 of 6

VALIDATING USER INPUT

Notifying the User

What's wrong, where is it, and how to fix it.



Types of Input Validation

- **Required information**. Some data fields just cannot be left empty. For instance, the principal name of things or people is usually a required field. Other fields such as emails, phones, or passwords are typically required values.
- **Correct data type**. Some input fields must follow the rules for its data type in order to be considered valid.
- **Correct format**. Some information, such as postal codes, credit card numbers, and social security numbers have to follow certain pattern rules.

Types of Input Validation

Continued

- **Comparison**. Perhaps the most common example of this type of validation is entering passwords: most sites require the user to enter the password twice to ensure the two entered values are identical.
- **Range check**. Information such as numbers and dates have infinite possible values. However, most systems need numbers and dates to fall within realistic ranges.
- **Custom**. Some validations are more complex and are unique to a particular application

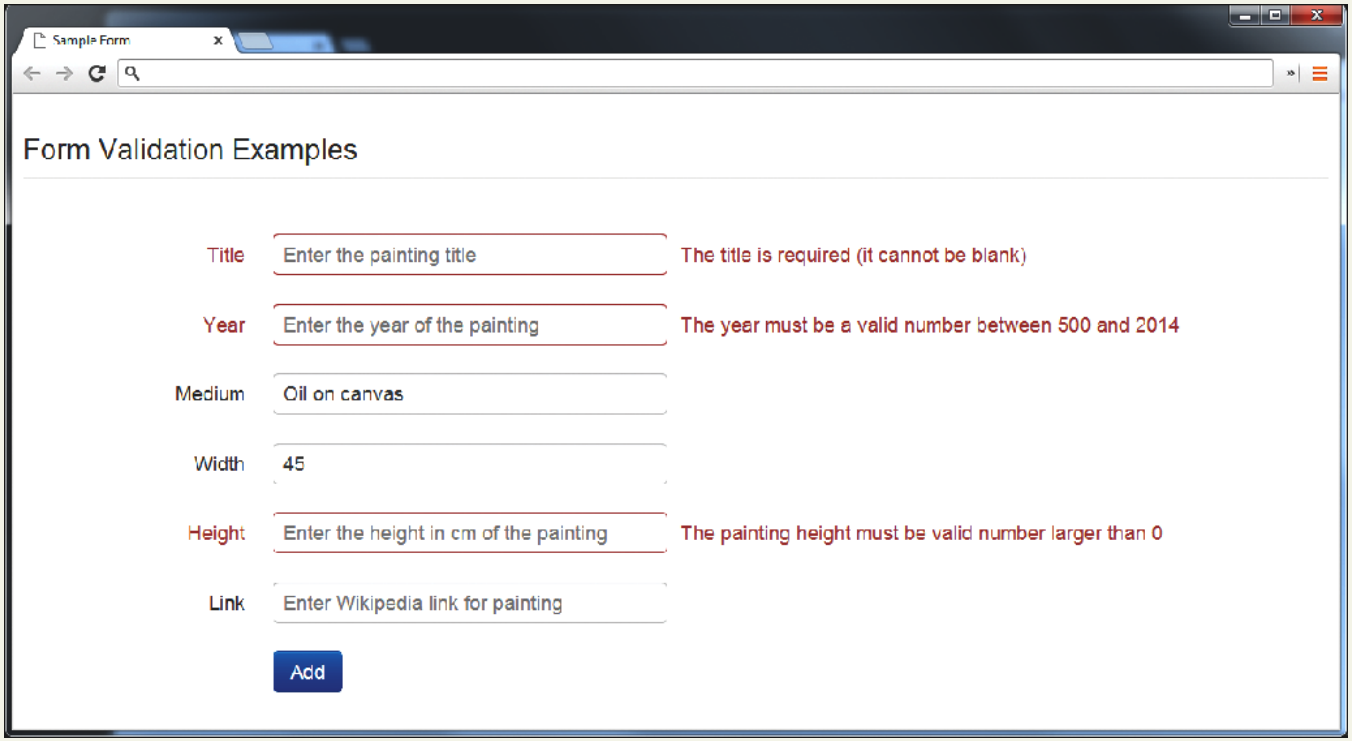
Notifying the User

We found an error, now what?

- **What is the problem?** Users do not want to read lengthy messages to determine what needs to be changed. They need to receive a visually clear and textually concise message.
- **Where is the problem?** Some type of error indication should be located near the field that generated the problem.
- **If appropriate, how do I fix it?** For instance, don't just tell the user that a date is in the wrong format, tell him or her what format you are expecting, such as "The date should be in yy/mm/dd format."

Another illustrative examples

What's wrong, where is it, and how to fix it.



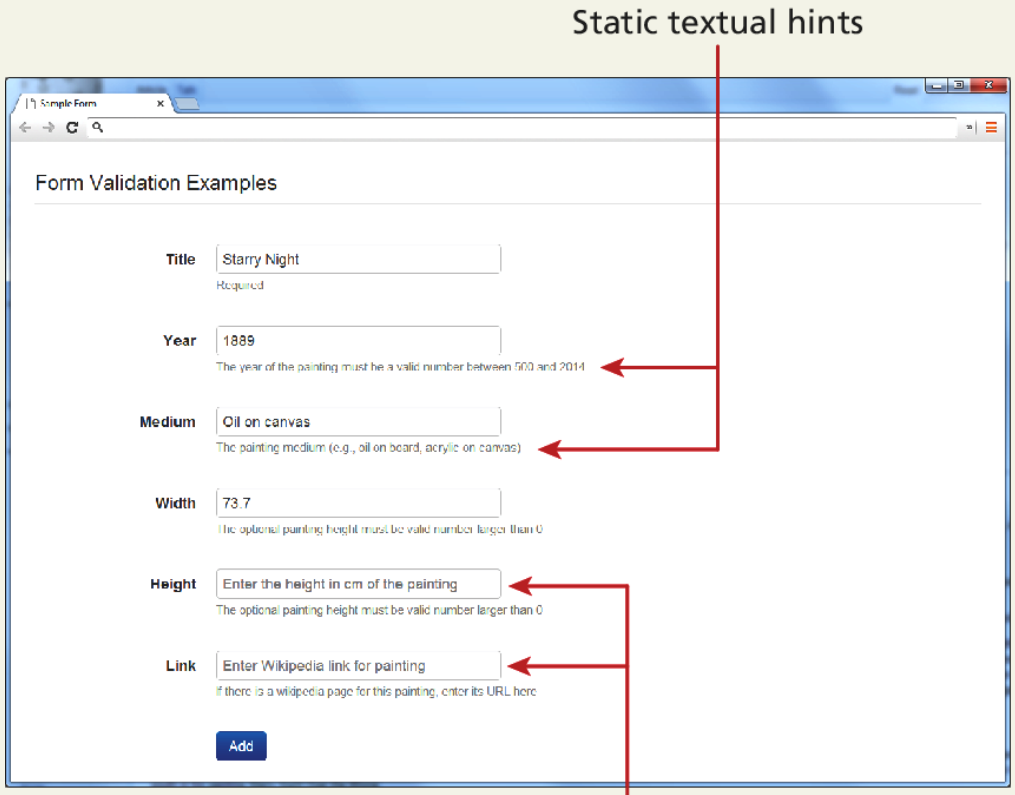
How to reduce validation errors

An ounce of prevention is worth a pound of cure

- Using pop-up JavaScript alert (or other popup) messages
- Provide textual hints to the user on the form itself
- Using tool tips or pop-overs to display context-sensitive help about the expected input
- a JavaScript-based mask

How to reduce validation errors

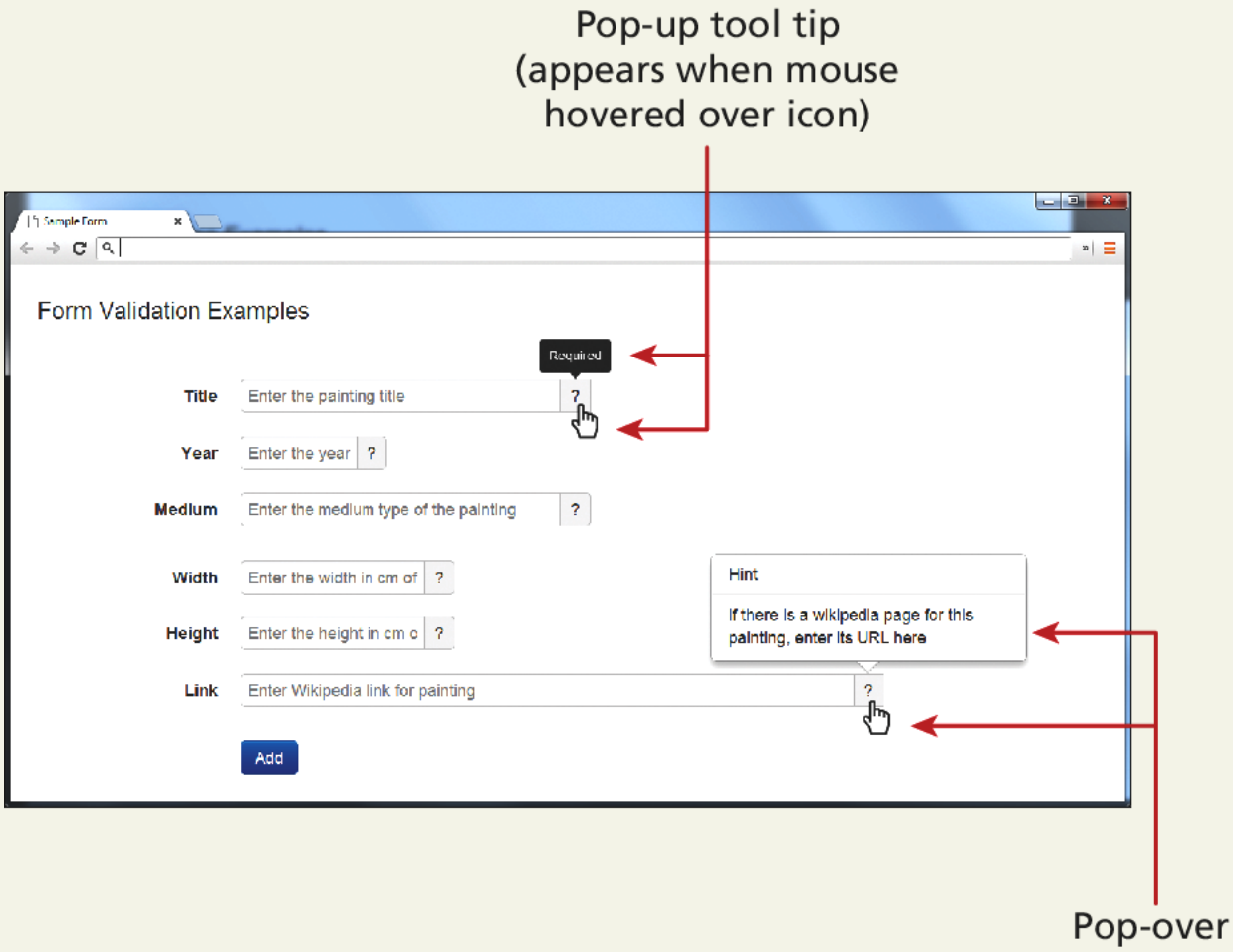
An ounce of prevention is worth a pound of cure




```
<input type="text" … placeholder="Enter the height ...">
```

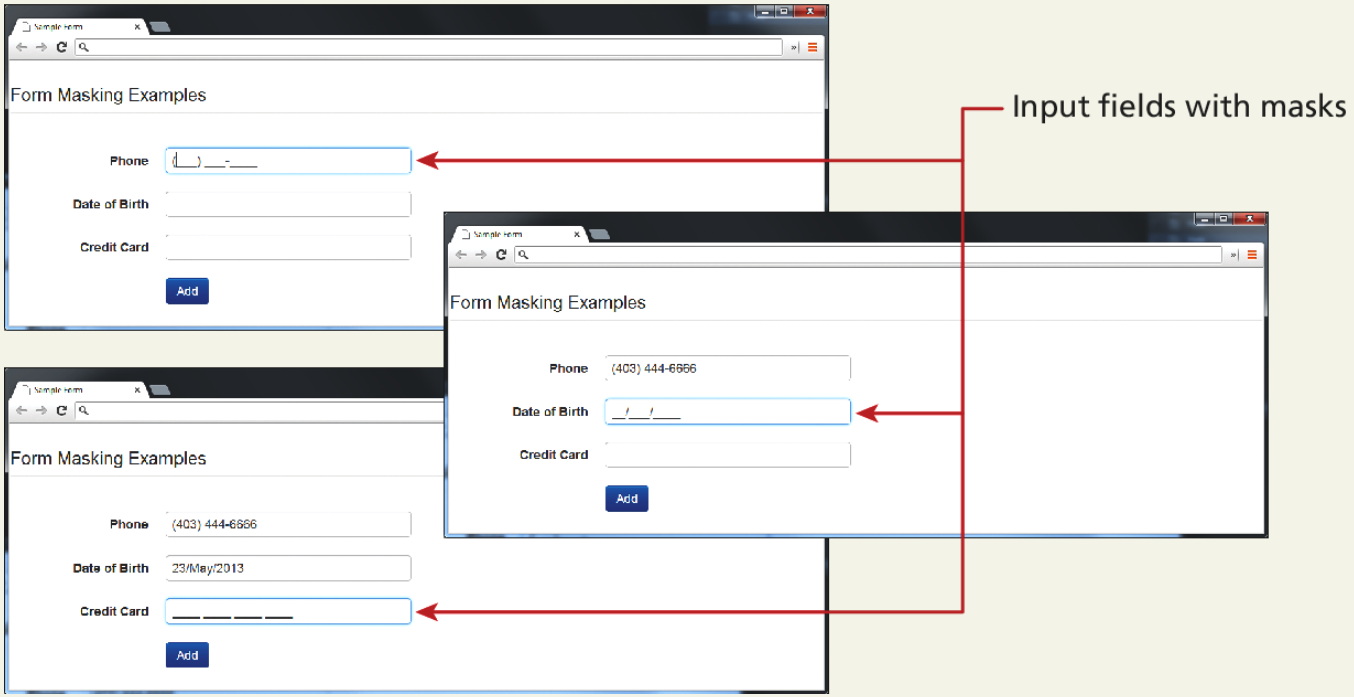
How to reduce validation errors

Tool Tips and popovers



How to reduce validation errors

JavaScript Mask



How to reduce validation errors

HTML 5 input types

Many user input errors can be eliminated by choosing a better data entry type than the standard

```
<input type="text">
```

If you need to get a date from the user, use the HTML5

```
<input type="date”>
```

If you need a number, use the HTML5

```
<input type="number">
```

CAPTCHA

Completely Automated Public Turing test to tell Computers and Humans Apart

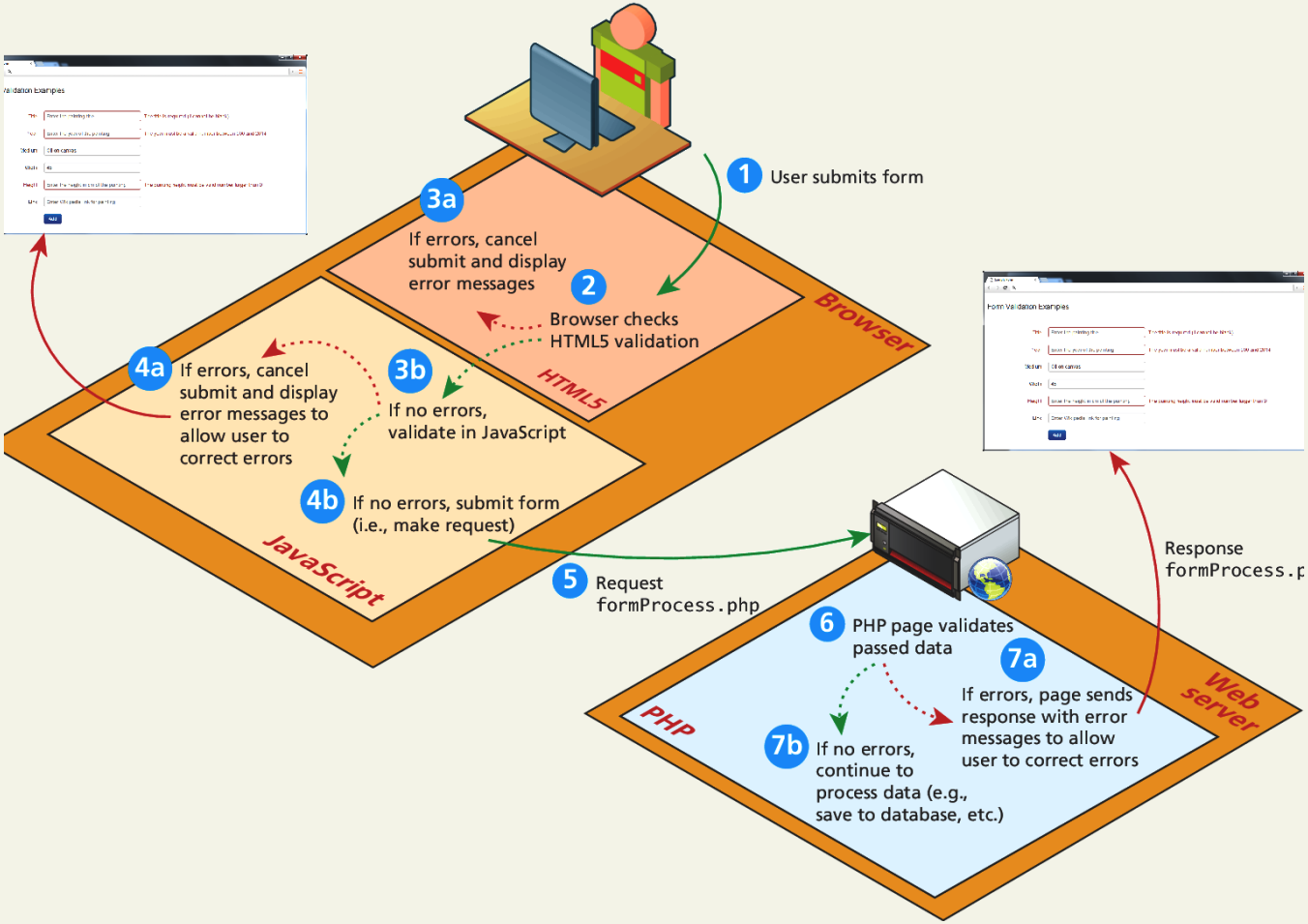
Automated form bots (often called **spam bots**) can flood a web application form with hundreds or thousands of bogus requests

This problem is generally solved by a test commonly referred to as a **CAPTCHA** which ask the user to enter a string of numbers and letters that are displayed in an obscured image that is difficult for a software bot to understand.

Section 6 of 6

WHERE TO PERFORM VALIDATION

Where to Validate?



Where to Validate?

So many places

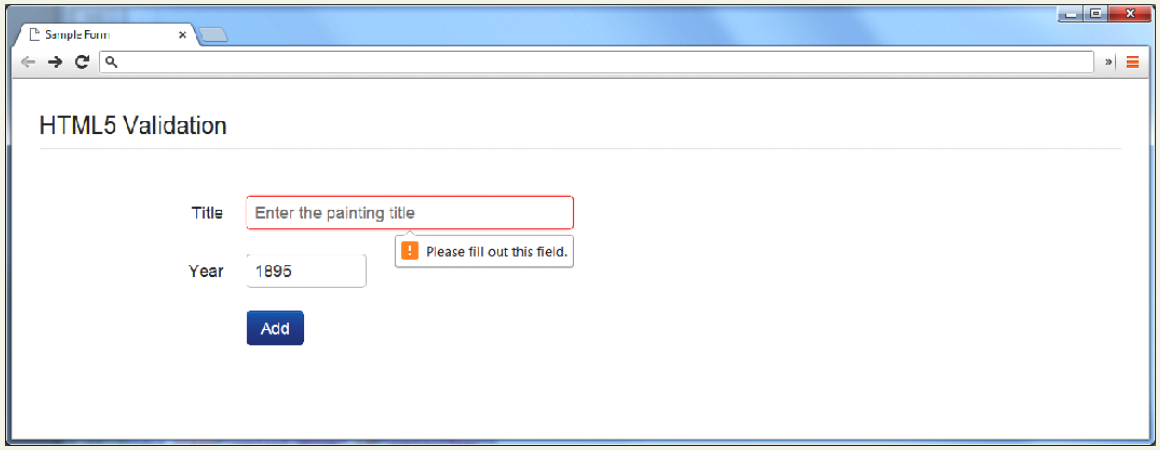
- Client-side using HTML5
- Client-Side using JavaScript
- **Server-Side using PHP**

While both client and server side validation is ideal, you must know that client-side scripts are not guaranteed to be executed. Therefore you must always perform server-side validation.

HTML5 validation

Client-Side

The *required* attribute can be added to an input element, and browsers that support it will perform their own validation and message.



To disable HTML form validation

<form id="sampleForm" method=". . ." action=". . ." *novalidate*>

JavaScript validation

Client-Side

Consider that we want to validate on a form submit.

```
function init() {
    var sampleForm = document.getElementById('sampleForm');
    sampleForm.onsubmit = validateForm
;}
 // call the init function once all the html has been loaded
window.onload = init;
```

JavaScript validation

Client-Side

For instance, to check if the value in the form's password input element is between 8 and 16 characters, the JavaScript would be:

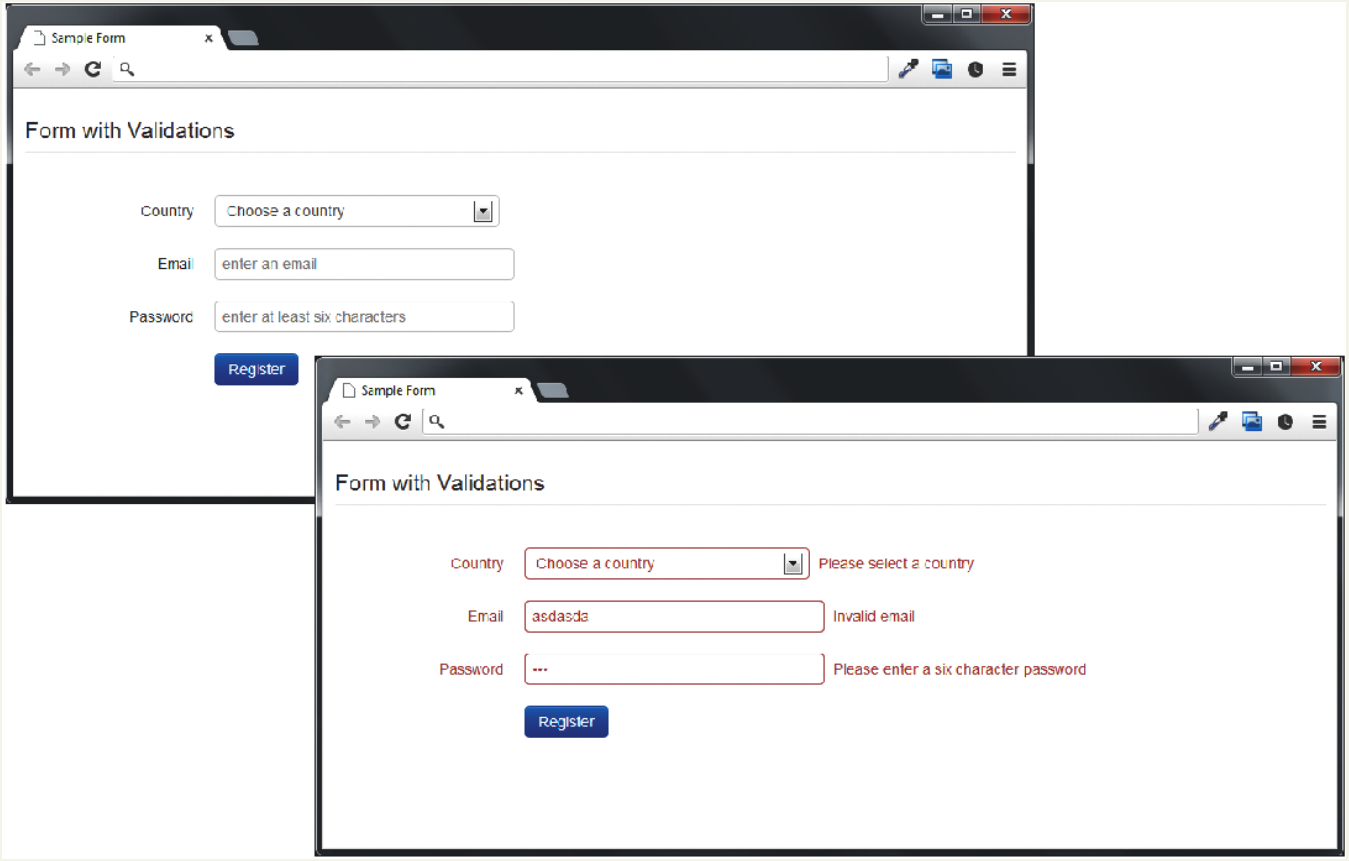
```
var passReg = /^[a-zA-Z]\w{8,16}$/;
if (! passReg.test(password.value)) {
    // provide some type of error message
}
```

What do we want to do when the JavaScript finds a validation error?

- Highlight errors by adding CSS classes to the input elements causing the error

JavaScript validation

Client-Side



JavaScript Code

Function to add an error message to a certain elemenet (by id)

```
<script>
// we will reference these repeatedly
var country = document.getElementById('country');
var email = document.getElementById('email');
var password = document.getElementById('password');

/*
  Add passed message to the specified element
*/
function addErrorMessage(id, msg) {
   // get relevant span and div elements
   var spanId = 'error' + id;
   var span = document.getElementById(spanId);
   var divId = 'control' + id;
   var div = document.getElementById(divId);

   // add error message to error <span> element
   if (span) span.innerHTML = msg;
   // add error class to surrounding <div>
   if (div) div.className = div.className + " error";
}
```

JavaScript Code

Set up the event handlers

```
/*
  sets up event handlers
*/
function init() {
   var sampleForm = document.getElementById('sampleForm');
   sampleForm.onsubmit = validateForm;

   country.onchange = resetMessages;
   email.onchange = resetMessages;
   password.onchange = resetMessages;
}
```

JavaScript Code

The actual checks (part 1)

```
/*
  perform the validation checks
*/
function validateForm() {
   var errorFlag = false;

   // check email
   var emailReg = /(.+)@([^\.].*)\.([a-z]{2,})/;
   if (! emailReg.test(email.value)) {
      addErrorMessage('Email', 'Enter a valid email');
      errorFlag = true;
   }

   // check password
   var passReg = /^[a-zA-Z]\w{8,16}$/;
   if (! passReg.test(password.value)) {
      addErrorMessage('Password', 'Enter a password between 9-16
                      characters');
      errorFlag = true;
   }
```

JavaScript Code

The actual checks (part 2)

```
    // check country
    if ( country.selectedIndex <= 0 ) {
       addErrorMessage('Country', 'Select a country');
       errorFlag = true;
    }

    // if any error occurs then cancel submit; due to browser
    // irregularities this has to be done in a variety of ways
    if (! errorFlag)
       return true;
    else {
       if (e.preventDefault) {
          e.preventDefault();
       } else {
          e.returnValue = false;
       }
       return false;
    }
}

// set up validation handlers when page is downloaded and ready
window.onload = init;
```

LISTING 12.9 Complete JavaScript validation

PHP Validation

The only one you HAVE to do

No matter how good the HTML5 and JavaScript validation, client-side prevalidation can always be circumvented by hackers, or turned off by savvy users.

Validation on the server side using PHP is the most important form of validation and the only one that is absolutely essential.

PHP Validation

An abridged example…

```
// if GET then just display form
//
// if POST then user has submitted data, we need to validate it
if ($_SERVER["REQUEST_METHOD"] == "POST") {
   $emailValid = ValidationResult::checkParameter("email",
                 '/(.+)@([^\.].*)\.([a-z]{2,})/',
                 'Enter a valid email [PHP]');
   $passValid = ValidationResult::checkParameter("password",
                '/^[a-zA-Z]\w{8,16}$/',
                'Enter a password between 8-16 characters [PHP]');
   $countryValid = ValidationResult::checkParameter("country",
                   '/[1-4]/', 'Choose a country [PHP]');

   // if no validation errors redirect to another page
   if ($emailValid->isValid() && $passValid->isValid() &&
                                 $countryValid->isValid() ) {
      header( 'Location: success.php' );
   }
```

PHP Validation

The only one you HAVE to do

```php
<?php
// turn on error reporting to help potential debugging
error_reporting(E_ALL);
ini_set('display_errors','1');

include_once('ValidationResult.class.php');

// create default validation results
$emailValid = new ValidationResult("", "", "", true);
$passValid = new ValidationResult("", "", "", true);
$countryValid = new ValidationResult("", "", "", true);

// if GET then just display form
//
// if POST then user has submitted data, we need to validate it
if ($_SERVER["REQUEST_METHOD"] == "POST") {
   $emailValid = ValidationResult::checkParameter("email",
                 '/(.+)@([^\.].*)\.([a-z]{2,})/',
                 'Enter a valid email [PHP]');
   $passValid = ValidationResult::checkParameter("password",
                '/^[a-zA-Z]\w{8,16}$/',
                'Enter a password between 8-16 characters [PHP]');
   $countryValid = ValidationResult::checkParameter("country",
                   '/[1-4]/', 'Choose a country [PHP]');

   // if no validation errors redirect to another page
   if ($emailValid->isValid() && $passValid->isValid() &&
                                 $countryValid->isValid() ) {
      header( 'Location: success.php' );
   }
```

What You've Learned

1. What are Errors and Exceptions?
2. PHP Error Reporting
3. PHP Error and Exception Handling
4. Regular Expressions
5. Validating User Input
6. Where to Perform Validation