COS10026
Computing Technology Inquiry Project

Lecture 7
PHP 1 – PHP Basics

Outline

- PHP Scripting
- PHP Variables and Constants
- Data Types
- Arrays
- Expressions

Server-Side Scripting and PHP

- **Server-side scripting** refers to a scripting language that is executed on a Web server
- **PHP** is a server-side ***embedded scripting language*** that is used to develop interactive web sites
  - Is easy to learn
  - Includes object-oriented programming capabilities
  - Supports many types of databases (MySQL, Oracle, Sybase, ODBC-compliant)

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Server-Side Scripting and PHP (continued)

- ***Embedded Scripts*** are scripts that are ***embedded*** or linked into HTML documents, and stored on the server.
- In response to client requests, the ***called pages are "parsed"*** by the ***server software***, the ***embedded scripts are "processed",*** and the requested information or content is ***returned as html***.
- Client requests often include parameters (key=value pairs) that are passed to the server, so the embedded scripts can query databases, or retrieve other dynamic information.
- As the server returns complete ***"plain html"*** web pages, the client response is ***browser independent***.
- The embedded script ***is not visible to the client***
  - the client only sees the completed html page.

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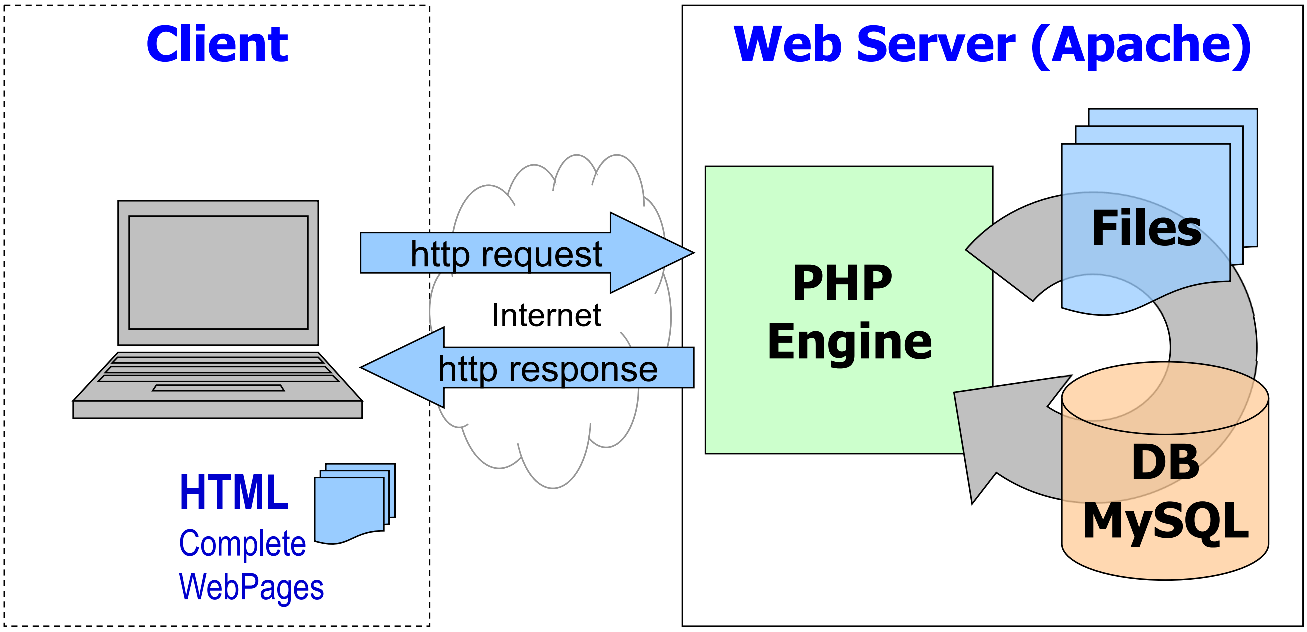
Server-Side Scripting and PHP (continued)

Apache/PHP/MySQL example



Server-Side Scripting and PHP (continued)

What is PHP? http://www.php.net

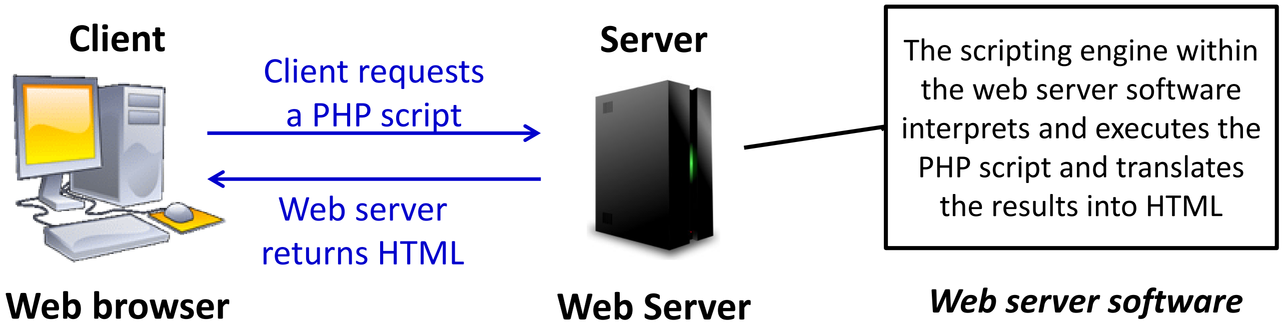
- **It generates HTML**
- **P**HP: **H**ypertext **P**reprocessor
- a server-side scripting language,
- scripts are executed on the server
- supports many databases (MySQL, Informix, Oracle, Sybase, Solid, PostgreSQL, Generic ODBC, etc.)
- open source software (OSS)
- free to download and use
- PHP filename .php

Source: w3schools

Server-Side Scripting and PHP (continued)

- PHP exists and executes solely on a web server, where it performs various types of processing or accesses databases
- PHP can’t access or manipulate a client-side web browser

Server-Side Scripting and PHP (continued)



The scripting engine within the web server software interprets and executes the PHP script and translates the results into HTML

How a Web server processes a PHP script

- **General rule:**
  Use ***client-side scripting*** to handle user interface processing and light processing, such as form data validation;
  Use ***server-side scripting*** for intensive calculations and data storage.

First PHP Example: myfirst_php.php

```
<!DOCTYPE html>
<html lang="en">
<head>
        <meta charset="utf-8" />
        <title>My Website</title>
        <!-- other meta here -->
</head>
<body>
<p>Hello World in unprocessed HTML</p>
<?php
   echo "<p>Hello World in HTML created by PHP</p>"
?>
</body>
</html>
```

Filename must have a PHP extension to be recognised by the pre-processor on the server

PHP code block

Output string in quotes as HTML

PHP Script Blocks

- **Code declaration blocks**
  are separate sections within a web page that are interpreted by the scripting engine
- There are four types of code declaration blocks:
  - **Standard PHP script delimiters**

    <?php statements; **?>** ✓ Use this coding template
  - (The `<script>` element)

    <script language ="php"> statements; </script> ✗
  - (Short PHP script delimiters)

    <? statements; ?> ✗
  - (ASP-style script delimiters)

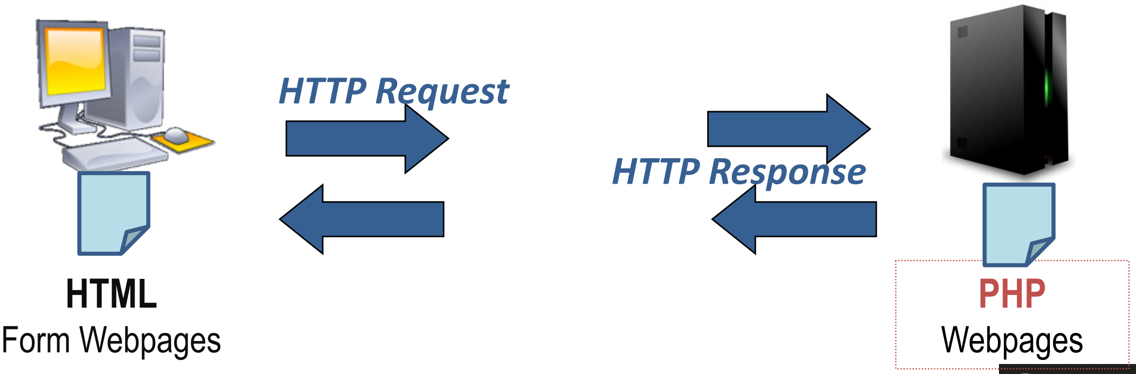
    <% statements; %> ✗

Generating HTML

- To return the results of any processing that occurs within a PHP code block, to the client, you must use an `echo` or `print` statement
- The **`echo`** and **`print`** **statements** create new text on a Web page that is returned as a response to a client
- `echo` and `print` statements are virtually identical except:
  - **`print`** statement accepts only a single argument and returns a value of 1
  - **`echo`** statement accepts multiple arguments and does not return any value

Generating HTML (continued)

- PHP scripts are executed.
  Only HTML elements are sent back to the client
- Unless there are `echo` or `print` statements, (or plain HTML codes) in the PHP page, the returned web page will be blank,



HTTP Request

HTTP Response

HTML
Form Webpages

PHP
Webpages

Generating HTML (continued)

Example. Given the following PHP embedded script

```
…
<body>
<h1>Multiple Script Sections</h1>
<h2>First Script Section</h2>
<?php echo "<p>Output from the first ".
  "script section.</p>"; ?>
<h2>Second Script Section</h2>
<?php echo "<p>Output from the second ".
  "script section.</p>"; ?>
</body>
</html>
```

Note: PHP source files will not validate as HTML!

Generating HTML (continued)

Example.

The following HTML code is returned to the client

```
...
</head>
<body>
<h1>Multiple Script Sections</h1>
<h2>First Script Section</h2>
<p>Output from the first script section.</p>
<h2>Second Script Section</h2>
<p>Output from the second script section.</p>
</body>
</html>
```

Note: Validate the HTML in the served page.

Handling quotes

- How could we **echo** an image element **<img src="logo.jpg" />** ?

```
echo "<img src="logo.jpg" />";
```

☹

```
echo "<img src=\"logo.jpg\" />";
```

Use escape characters

```
echo "<img src='logo.jpg' />";
```

Use nested single quotes

PHP Script Syntax

PHP script

- uses round brackets (   ) for operator precedence and argument lists
- uses square brackets [   ] for arrays and square bracket notation
- uses curly or brace brackets {   } for blocks

- is embedded into an HTML file
- is never sent to a client’s Web browser

PHP Script Syntax (continued)

A web page document

- that contains PHP code
  must have an extension of .php
  This is the default extension that most Web servers use to process PHP scripts
- that does not contain any PHP code
  should have an **.html** extension
  This reduces the server load on the Web server

Outline

- PHP Scripting
- ➡ PHP Variables and Constants
- Data Types
- Arrays
- Expressions

PHP Variables and Constants

http://php.net/manual/en/language.variables.php

http://php.net/manual/en/language.constants.php

Example with variables

```
<html>
...
<body>
<h1>Hello World!</h1>
<?php
 echo "<p>";
 $i=1;
 while($i<=5) {
   echo "The number is " . $i . "<br />";
   $i++;
 }
 echo "</p>";
?>
</body>
</html>
```

All variables start with the symbol **$**
Variables have **local scope** by default.

String concatenation operator in PHP

Would this work?

```
<?php
    for ($i = 1; $i < 7; $i++) {
        echo "<h$i>Heading $i</h$i>";
    }
?>
```

- Let’s test it.
- YES! Variable output can be any HTML
  – not just text nodes

But we need to be careful with our quotes. More later

Interleaving PHP with HTML

Would this work?

```
<?php
    for ($i = 1; $i < 7; $i++) {    echo "<h$i>“
?>
Heading
<?php
    echo "$i</h$i>"; }
?>
```

HTML outside PHP block

- YES!   PHP can be arbitrarily interleaved with HTML *(but don’t break a string)*

Variables and Constants

- Values stored in computer memory are called **variables** or **constants**
- Data contained in variables or constants are classified into categories known as **data types**
- The name you assign to a variable is called an **identifier** and in PHP it:
  - must begin with a dollar sign ($)
  - can include letters (A to Z, a to z) and numbers (0 to 9) or an underscore (_) … *but cannot start with a number*
  - cannot include spaces
  - is case sensitive

Variables - Naming

- Suggested naming style for variables

  `$votingAge`

  or

  `$voting_age`

- Q: Do the two variable names below, refer to the same variable (identifier)?
  - `$firstName`
  - `$FirstName`

PHP is Case Sensitive

Variables - Declaring, initialising,modifying

- Specifying and creating a variable name is called ***declaring the variable***
- Assigning a first value to a variable is called ***initialising the variable***
- In PHP, you must ***declare*** and ***initialise*** a variable in the same statement:

  ```
  $variable_name = value;
  ```

- You can later change the variable's value:

  ```
  $variable_name = new_value;
  ```

Variables - Declaring, initialising,modifying

- The data type of a variable (identifiers) or constant depends on the **data type** of the value assigned to it
  - $unitName = “Creating Web Applications”;
  - $lectureHours = 2;
  - $creditPoints = 12.5;
  - $isCoreUnit = TRUE;

Hint: Use meaningful names

Notice any naming pattern?

- Q: Are the following correct?
  - $unitCode = COS10011;
  - $creditPoints = 12.5cp;

Variables – Outputting the Values

- To output the contents of a variable, pass the variable name to the `echo` statement with/without enclosing it in double quotes:

```
$votingAge = 18;
echo $votingAge;
```

Outputting variables in strings

- 3 different techniques

```
<?php
    for ($i = 0; $i < 10; $i++) {
        echo "<p>Number " , $i , "</p>";

        echo "<p>Number " . $i . "</p>";

        echo "<p>Number $i</p>";
    }
?>
```

Technique 1 - listing ✓

Technique 2 - concatenation

Technique 3 – embedded (double quotes)

What would happen here?

```
<?php
    for ($i = 0; $i < 10; $i++) {
        echo "<p>Number $i +1 </p>";
    }
?>
```

Suppose we wanted to add 1 to the variable in the loop

Would not work. Need:

```
        echo "<p>Number ", $i +1, "</p>";
```

Technique 1 - listing ✓

Variables – Outputting the Values

- **Note differences if surrounded by double or single quotes**

```
echo "<p>The legal voting age is
    $votingAge.</p>";
```

The value contained in $votingAge will be printed

```
echo '<p>The legal voting age is
          $votingAge.</p>';
```

The text '$votingAge' will be printed

If in doubt, separate with commas

```
echo "<p>The legal voting age is ",
         $votingAge, ".</p>”;
```

Constants

- A **constant** contains a value that ***does not change*** during the course of program execution
- Constant names ***do not*** begin with a dollar sign ($)
- Method 1
  - Use the **define(“CONSTANT_NAME”, value)** function to create a constant

    `e.g. define("MAX_VAL", 5);`
  - The value can be a text string, number, or Boolean value
- Method 2
  - Use the **const** keyword (from PHP 5.3 on)
  - `e.g. const MAX_VAL = 5;`
  - Cannot be declared inside functions, loops, if statements or try/ catch blocks
- PHP includes numerous predefined constants that you can use in your scripts e.g. **PHP_INT_MAX**

Example: use of Constants

do not forget the quotes

```
<?php
    define ("MAX_ELEMENT", 8);
    echo "<ol>";
    for ($i = 0; $i < MAX_ELEMENT; $i++) {
        echo "<li>item ", $i+1, " </li>";
    }
    echo "</ol>";
?>
```

For calculations use Technique 1 – listing ✓

Constants – Naming

- Suggested naming style for constant

  `PASSING_MARK`

- Q: Which one of the following is a constant?

  `$MAX_ELEMENTS`

  `MAX_ELEMENTS`

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PHP Data Types

http://php.net/manual/en/language.types.php

PHP Data Types

PHP is a loosely typed programming language

- **Strongly typed programming languages** require you to declare the data types of variables
  - **Static** or **strong typing** refers to data types that ***do not*** change after they have been declared
  - *C is a strongly typed programming language*
- **Loosely typed programming languages** do not require you to declare the data types of variables
  - **Dynamic** or **loose typing** refers to data types that can change after they have been declared
  - *PHP is a loosely typed programming language*.

PHP Data Types (continued)

- A **data type** is the specific category of information that a variable contains
- Data types that can be assigned only a single value are called **primitive types**

Data Type	Description
Integer	Positive or negative numbers with no decimal places
Floating-point numbers	Positive or negative numbers with decimal places, or expressed in exponential notation
Boolean	Logical value represented by true or false
String	Any sequence of characters
NULL	An empty value

Numeric

PHP supports two *numeric* data types:

- An **integer** is a positive or negative number with no decimal places
  e.g. -250, 2, 100, 10,000
- A **floating-point number** is a number that contains decimal places or that is written in exponential notation
  e.g. -6.16, 3.17, 2.7541
  - **Exponential notation**, or **scientific notation**, is a short way for writing very large numbers or numbers with many decimal places   eg. 2.0e11

Boolean

- A **Boolean** is a value of **true** or **false**
- It decides which part of a program should execute and which part should compare data

String

- **String** is a sequence of characters
- It is created directly by placing the series of characters between double or single quotes, for example
  - "This is a string"
  - 'This is also a string'

PHP Data Types (continued)

The PHP language supports:

- A **resource** data type – a special variable that holds a reference to an external resource, such as a database or an XML file
- **Reference** or **composite** data types, which contain multiple values or complex types of information
  - Two reference data types: **arrays** and **objects**

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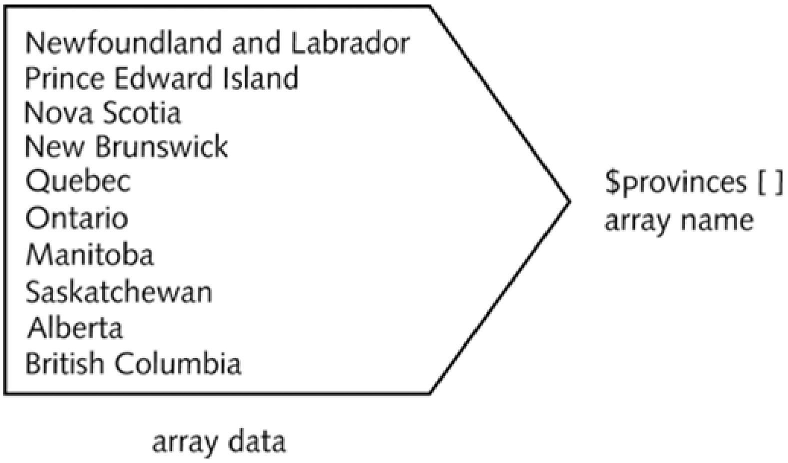
PHP Arrays

http://php.net/manual/en/language.types.array.php

Arrays

- An **array** contains a set of data represented by a single variable name



Conceptual example of an array

Canada’s provinces

Declaring and Initialising Indexed Arrays

- An **element** refers to each piece of data that is stored within an array
  - By default, it starts with the number zero (0)
- An **index** is an element’s numeric position within the array
  - Referenced by enclosing its index in brackets at the end of the array name:
  - **`$provinces[1]`**

Creating an Array

- The `array()` construct syntax is:

```
$array_name = array(values);
```

```
$provinces = array(
     "Newfoundland and Labrador",
     "Prince Edward Island",
     "Nova Scotia",
     "New Brunswick",
     "Quebec",
     "Ontario",
     "Manitoba",
     "Saskatchewan",
     "Alberta",
     "British Columbia"
     );
```

Creating an Array (continued)

- Array name and brackets syntax is:

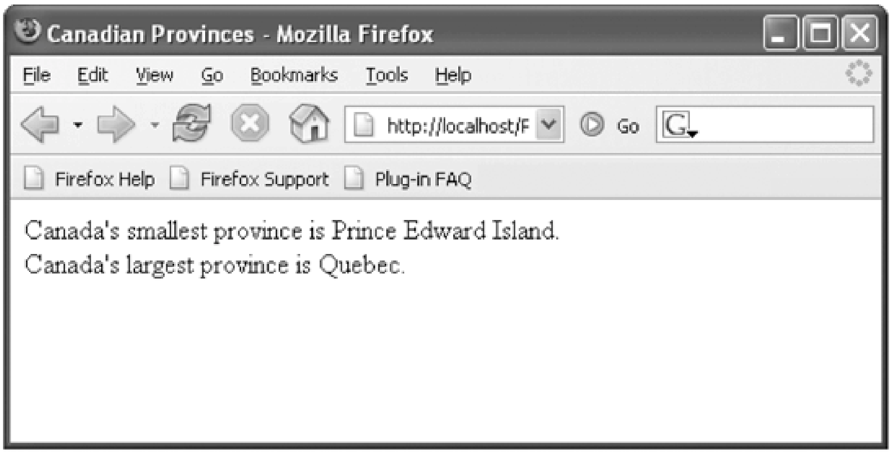
```
$array_name[ ]
```

```
$provinces[] = "Newfoundland and Labrador";
$provinces[] = "Prince Edward Island";
$provinces[] = "Nova Scotia";
$provinces[] = "New Brunswick";
$provinces[] = "Quebec";
$provinces[] = "Ontario";
$provinces[] = "Manitoba";
$provinces[] = "Saskatchewan";
$provinces[] = "Alberta";
$provinces[] = "British Columbia";
```

Note: *In PHP, array elements can be of different data types*

Accessing Element Information

```
echo "<p>Canada's smallest province is
     $provinces[1].<br />";
echo "Canada's largest province is
     $provinces[4].</p>";
```


Canadian Provinces - Mozilla Firefox
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Canada's smallest province is Prince Edward Island.
Canada's largest province is Quebec.

Output of elements in the $provinces[ ] array

`count()` Function

- Use the **`count()`** function to find the total number of elements in an array

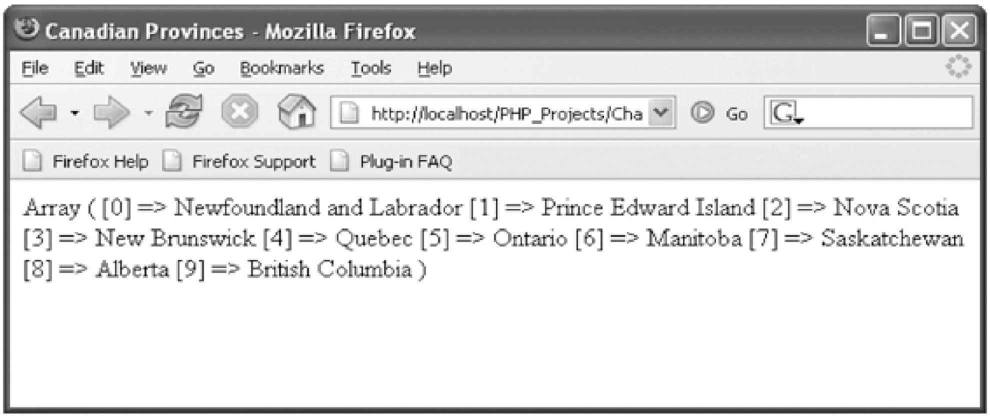
```
$provinces = array("Newfoundland and Labrador",
"Prince Edward Island", "Nova Scotia",
"New Brunswick", "Quebec", "Ontario", " Manitoba",
"Saskatchewan", "Alberta", "British Columbia");

$territories = array("Nunavut",
"Northwest Territories", "Yukon Territory");

echo "<p>Canada has ",
count($provinces), " provinces and ",
count($territories), " territories.</p>";
```

Output:

```
Canada has 10 provinces and 3 territories.
```

`print_r()` Function

- Use to print or return information about variables
- Most useful with arrays because they print the index and value of each element



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```
Array ( [0] => Newfoundland and Labrador [1] => Prince Edward Island [2] => Nova Scotia
[3] => New Brunswick [4] => Quebec [5] => Ontario [6] => Manitoba [7] => Saskatchewan
[8] => Alberta [9] => British Columbia )
```

Output of the `$provinces[]` array with the `print_r()` function

Modifying Array Elements

- To change an array value, use the index of an individual element of the array:

```
$hospitalDepts = array(
    "Anesthesia",         // first element [0]
    "Molecular Biology",// second element [1]
    "Neurology");         // third element [2]
```

To change the first array element in the **`$hospitalDepts[]`** array from “Anesthesia” to “Anesthesiology” use:

```
$hospitalDepts[0] = "Anesthesiology";
```

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- PHP Scripting
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- Data Types
- Arrays
- ➡ Expressions

PHP Expressions
http://php.net/manual/en/language.expressions.php

PHP Expressions

- An **expression** is a literal value or variable
  - that can be evaluated by the PHP scripting engine to produce a result
- **Operands** are variables and literals contained in an expression
- A **literal** is a value such as a literal string or a number
- **Operators** are symbols (e.g. +, *) that are used in expressions to manipulate operands

PHP Expressions (continued)

PHP Operator Types

Operator Type	Description
Array	Performs operations on arrays
Arithmetic	Performs mathematical calculations
Assignment	Assigns values to variables
Comparison	Compares and returns a Boolean value
Logical	Performs Boolean operations on Boolean operands
Special	Performs various tasks, these operators do not fit within other operator categories

- A **binary operator** requires an operand before and after the operator
- A **unary operator** requires a ***single*** operand either before or after the operator

Arithmetic Operators

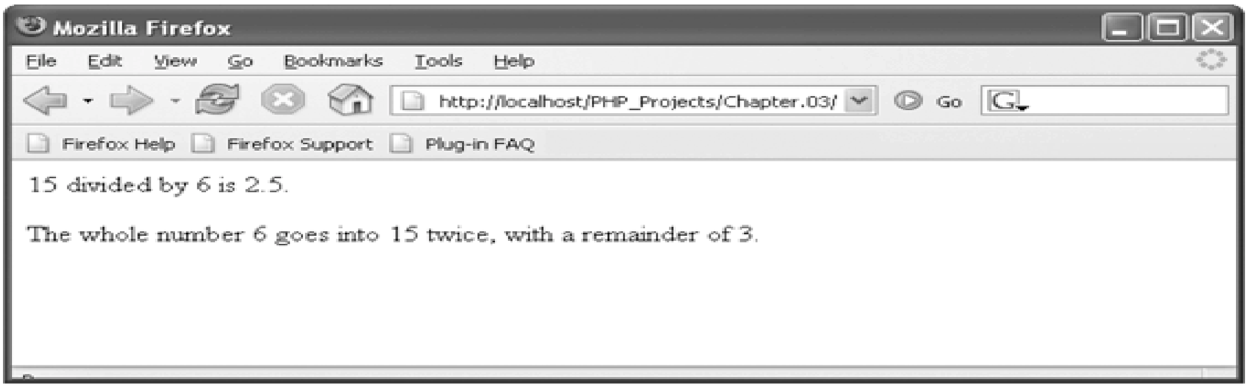
- **Arithmetic operators** are used in PHP to perform mathematical calculations

PHP arithmetic binary operators

Operator	Name	Description
+	Addition	Adds two operands
-	Subtraction	Subtracts one operand from another operand
*	Multiplication	Multiplies one operand by another operand
/	Division	Divides one operand by another operand
%	Modulus	Divides one operand by another operand and returns the remainder

Arithmetic Operators (continued)

```
$divisionResult = 15 / 6;
$modulusResult = 15 % 6;
echo "<p>15 divided by 6 is $divisionResult.</p>";
  // result of '2.5'
echo "The whole number 6 goes into 15 twice, with a
  remainder of $modulusResult.</p>";
  // result of '3'
```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```
15 divided by 6 is 2.5.

The whole number 6 goes into 15 twice, with a remainder of 3.
```

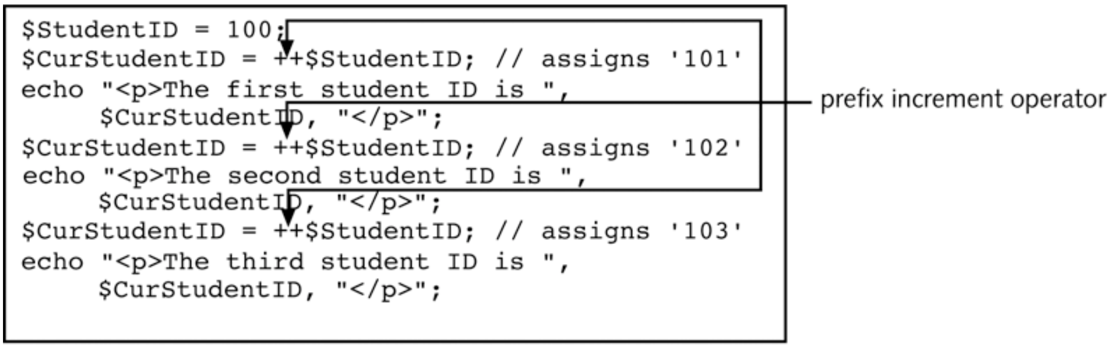
Arithmetic Unary Operators

- The increment (++) and decrement (--) unary operators can be used as prefix or postfix operators
- A **prefix operator** is placed before a variable
- A **postfix operator** is placed after a variable

PHP arithmetic unary operators

Operator	Name	Description
++	Increment	Increases an operand by a value of one
--	Decrement	decreases an operand by a value of one

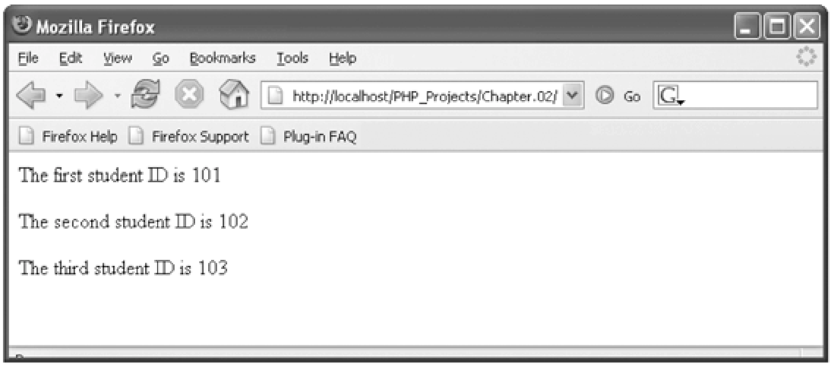
Arithmetic Unary Operators (continued)



```
$StudentID = 100;
$CurStudentID = ++$StudentID; // assigns '101'
echo "<p>The first student ID is ",
     $CurStudentID, "</p>";
$CurStudentID = ++$StudentID; // assigns '102'
echo "<p>The second student ID is ",
     $CurStudentID, "</p>";
$CurStudentID = ++$StudentID; // assigns '103'
echo "<p>The third student ID is ",
     $CurStudentID, "</p>";
```

prefix increment operator

Script that uses the prefix increment operator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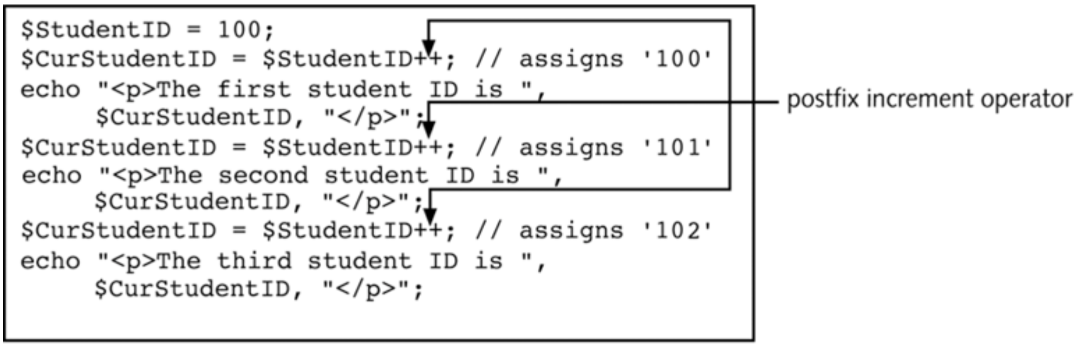
```
The first student ID is 101

The second student ID is 102

The third student ID is 103
```

Output of the prefix version of the student ID script

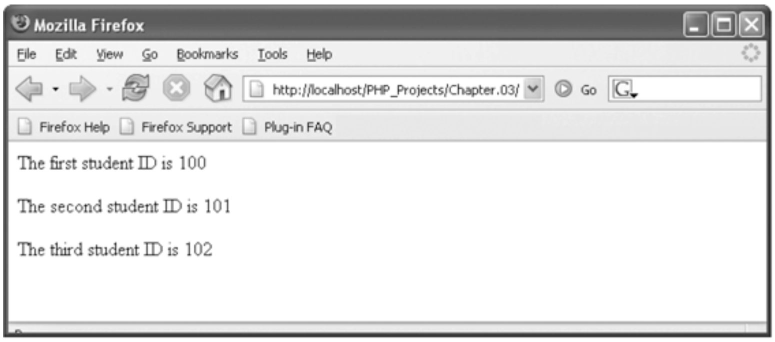
Arithmetic Unary Operators (continued)



```
$StudentID = 100;
$CurStudentID = $StudentID++; // assigns '100'
echo "<p>The first student ID is ",
     $CurStudentID, "</p>";
$CurStudentID = $StudentID++; // assigns '101'
echo "<p>The second student ID is ",
     $CurStudentID, "</p>";
$CurStudentID = $StudentID++; // assigns '102'
echo "<p>The third student ID is ",
     $CurStudentID, "</p>";
```

postfix increment operator

Script that uses the postfix increment operator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```
The first student ID is 100

The second student ID is 101

The third student ID is 102
```

Output of the postfix version of the student ID script

Assignment Operators

- **Assignment operators**
  are used for assigning a value to a variable:

```
$myFavoriteSuperHero = "Superman";
$myFavoriteSuperHero = "Batman";
```

- **Compound assignment operators**
  perform mathematical calculations on variables and literal values in an expression, and then assign a new value to the left operand

Assignment Operators (continued)

PHP assignment operators

Operator	Name	description
=	Assignment	Assigns the value of the right operand to the left operand
+=	Compound addition assignment	Adds the value of the right operand to the value of the left operand and assigns the sum to the left operand
-=	Compound subtraction assignment	Subtracts the value of the right operand to the value of the left operand and assigns the difference to the left operand
*=	Compound multiplication assignment	Multiplies the value of the right operand to the value of the left operand and assigns the product to the left operand
/=	Compound division assignment	Divides the value of the right operand to the value of the left operand and assigns the quotient to the left operand
%=	Compound modulus assignment	Divides the value of the right operand to the value of the left operand and assigns the remainder (modulus) to the left operand

Assignment Operators (continued)

```
$x = 100;
$y = 200;
$x += $y;
```
same as `$x = $x + $y;`

(Answer: 300)

```
$x = 2;
$y = 6;
$x *= $y;
```
same as `$x = $x * $y;`

(Answer: 12)

Comparison and Conditional Operators

- **Comparison operators**
  are used to compare two operands and determine how one operand compares to another.
- A Boolean value of **true** or **false** is returned after two operands are compared
- *The comparison operator compares values, whereas the assignment operator assigns values*
- Comparison operators are used with **conditional statements** and **looping statements**

Comparison and Conditional Operators

(continued)

PHP comparison operators

Operator	Name	Description
==	Equal	Returns true if the operands are equal
===	Strict equal	Returns true if the operands are equal and of the same type
!= or <>	Not equal	Returns true if the operands are not equal
!==	Strict not equal	Returns true if the operands are not equal or not of the same type
>	Greater than	Returns true if the left operand is greater than the right operand
<	Less than	Returns true if the left operand is less than the right operand
>=	Greater than or equal	Returns true if the left operand is greater than or equal to the right operand
<=	Less than or equal	Returns true if the left operand is less than or equal to the right operand

Comparison and Conditional Operators

(continued)

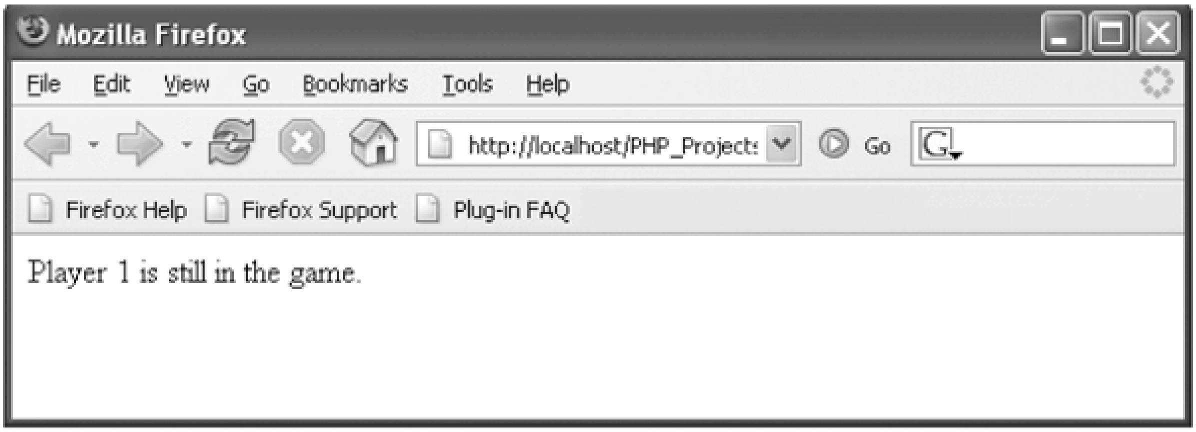
- The **conditional operator** executes one of two expressions, based on the results of a conditional expression
- The syntax for the conditional operator is:

```
conditional expression
      ? expression1 :  expression2;
```

- If the conditional expression evaluates to **true**, `expression1` executes
- If the conditional expression evaluates to **false**, `expression2` executes

Comparison and Conditional Operators
(continued)

```
$blackjackPlayer1 = 20;
($blackjackPlayer1 <= 21)
    ? $result = "Player 1 is still in the game.“
    : $result = "Player 1 is out of the action.";
 echo "<p>", $result, "</p>";
```


Mozilla Firefox
File Edit View Go Bookmarks Tools Help
http://localhost/PHP_Project:
Go
Firefox Help
Firefox Support
Plug-in FAQ

```
Player 1 is still in the game.
```

Output of a script with a conditional operator

Logical Operators

- **Logical operators** are used for comparing two Boolean operands for equality
- A Boolean value of true or false is returned after two operands are compared

PHP logical operators

Operator	Name	Description
&&, and	And	Returns true if both the left operand and right operand return a value of true; otherwise, it returns a value of false
||, or	Or	Returns true if either the left operand or right operand returns a value of true; if neither operand returns a value of true, it returns a value of false
!	Not	Returns true if an expression is false and returns false if an expression is true

Special Operators

PHP special operators

Operator	Description
new	Created a new instance of a user-defined or predefined object type
[]	Accesses an element of an array
=>	Specifies the index or key of an array element
,	Separates arguments in a list
?:	Executes one of two expressions based on the results of a conditional expression
instanceof	Returns true is an object is of a specified object type
@	Suppresses any error messages that might be generated by an expression to which it is prepended
(int), (integer), (bool), (boolean), (double), (string), (array), (object)	Casts or transform a variable of one data type into a variable of another data type

***Note**: These Special Operators are introduced throughout this unit as necessary*

Operator Precedence

- **Operator precedence** refers to the order in which operations in an expression are evaluated
- **Associativity** is the order in which operators of equal precedence execute

- *What to do if not certain when you write code? Add parentheses*

Operator Precedence (continued)

Operator precedence in PHP

Operator	Description	Associativity
new	New object	None
[]	Array elements	Right to left
!	Logical Not	Right to left
++	Increment	Right to left
--	Decrement	Right to left
(int) …	Cast	Right to left
@	Suppress error message	Right to left
* / %	Multiplication/division	Left to right
+ - .	Addition/subtraction/string concatenation	Left to right
< <= > >=	Comparison	None
== != <> === !==	Equality	None
&&	Logical And	Left to right
||	Logical Or	Left to right
?:	Conditional	Left to right
= += -= *= /= %=	Assignment	Right to left
and	Logical And	Left to right
or	Logical Or	Left to right
,	List separator	Left to right