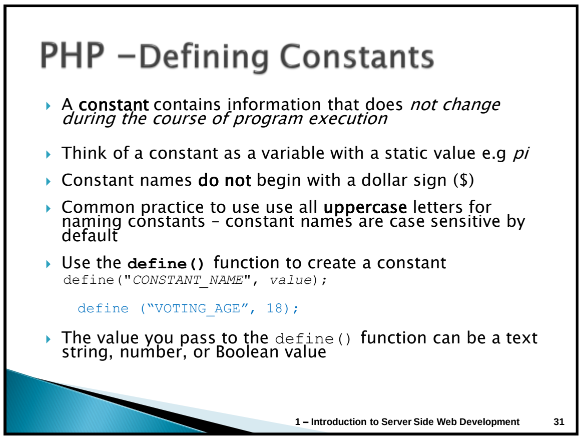

PHP –Defining Constants

- A **constant** contains information that does *not change during the course of program execution*
- Think of a constant as a variable with a static value e.g *pi*
- Constant names **do not** begin with a dollar sign ($)
- Common practice to use use all **uppercase** letters for naming constants – constant names are case sensitive by default
- Use the **`define()`** function to create a constant
  `define("CONSTANT_NAME", value);`

  ```
  define ("VOTING_AGE", 18);
  ```
- The value you pass to the `define()` function can be a text string, number, or Boolean value

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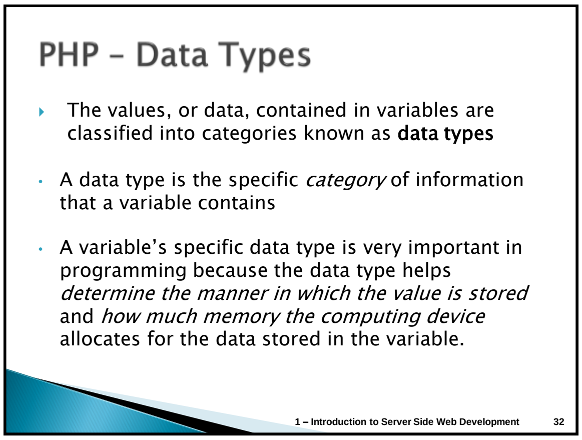

PHP – Data Types

- The values, or data, contained in variables are classified into categories known as **data types**
- A data type is the specific *category* of information that a variable contains
- A variable's specific data type is very important in programming because the data type helps *determine the manner in which the value is stored* and *how much memory the computing device* allocates for the data stored in the variable.

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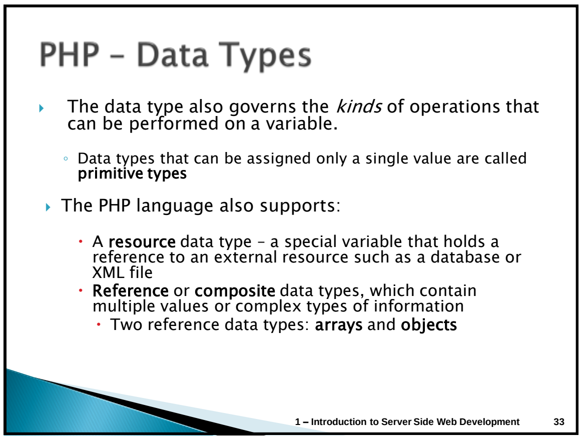

PHP – Data Types

- The data type also governs the *kinds* of operations that can be performed on a variable.
  - Data types that can be assigned only a single value are called **primitive types**
- The PHP language also supports:
  - A **resource** data type – a special variable that holds a reference to an external resource such as a database or 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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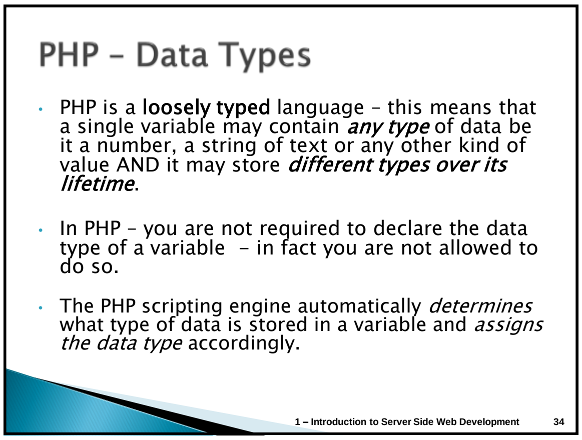

PHP – Data Types

- PHP is a **loosely typed** language – this means that a single variable may contain ***any type*** of data be it a number, a string of text or any other kind of value AND it may store ***different types over its lifetime***.
- In PHP – you are not required to declare the data type of a variable – in fact you are not allowed to do so.
- The PHP scripting engine automatically *determines* what type of data is stored in a variable and *assigns the data type* accordingly.

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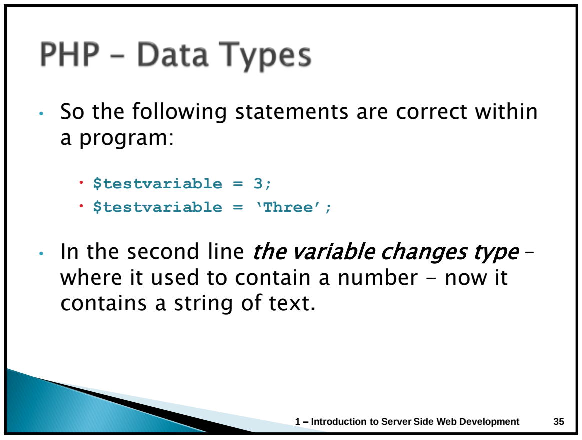

PHP – Data Types

- So the following statements are correct within a program:
  - `$testvariable = 3;`
  - `$testvariable = 'Three';`
- In the second line ***the variable changes type*** – where it used to contain a number – now it contains a string of text.

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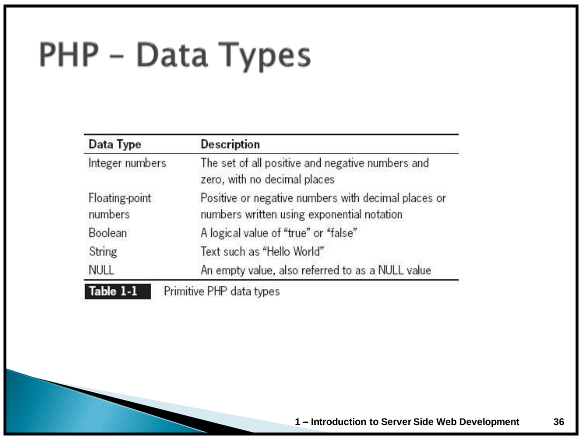

PHP – Data Types

Data Type	Description
Integer numbers	The set of all positive and negative numbers and zero, with no decimal places
Floating-point numbers	Positive or negative numbers with decimal places or numbers written using exponential notation
Boolean	A logical value of "true" or "false"
String	Text such as "Hello World"
NULL	An empty value, also referred to as a NULL value

Table 1-1 Primitive PHP data types

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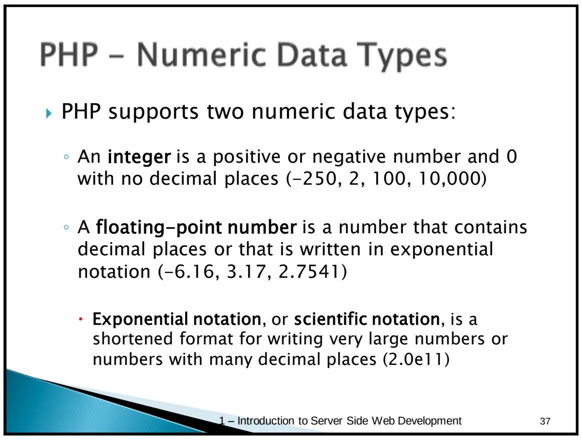
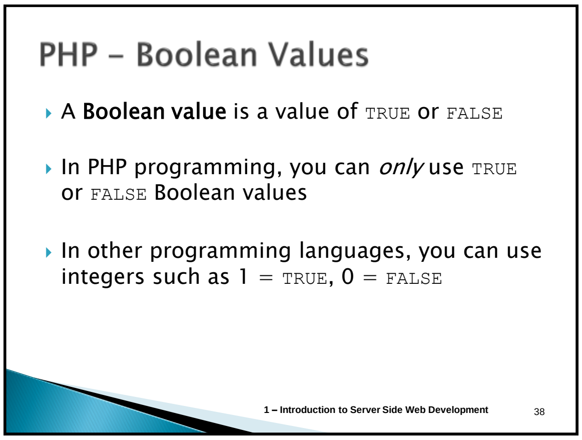


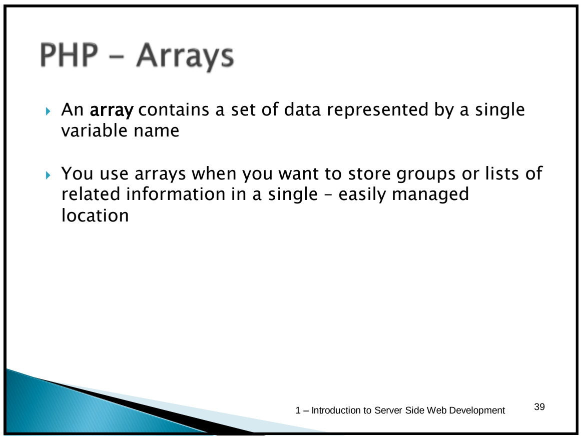
PHP – Numeric Data Types

- PHP supports two numeric data types:
  - An **integer** is a positive or negative number and 0 with no decimal places (-250, 2, 100, 10,000)
  - A **floating-point number** is a number that contains decimal places or that is written in exponential notation (-6.16, 3.17, 2.7541)
    - **Exponential notation**, or **scientific notation**, is a shortened format for writing very large numbers or numbers with many decimal places (2.0e11)



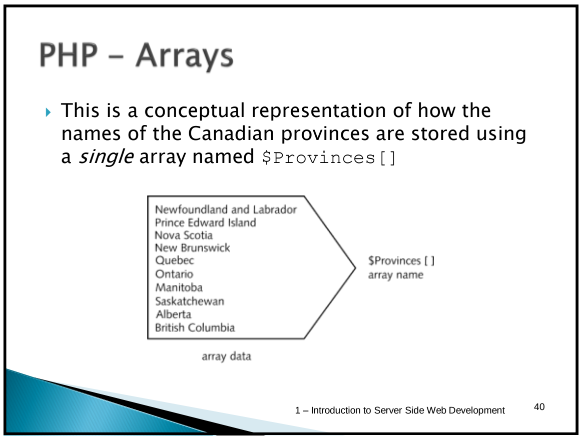
PHP – Boolean Values

- A **Boolean value** is a value of `TRUE` or `FALSE`
- In PHP programming, you can *only* use `TRUE` or `FALSE` Boolean values
- In other programming languages, you can use integers such as 1 = `TRUE`, 0 = `FALSE`



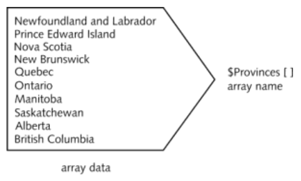
PHP – Arrays

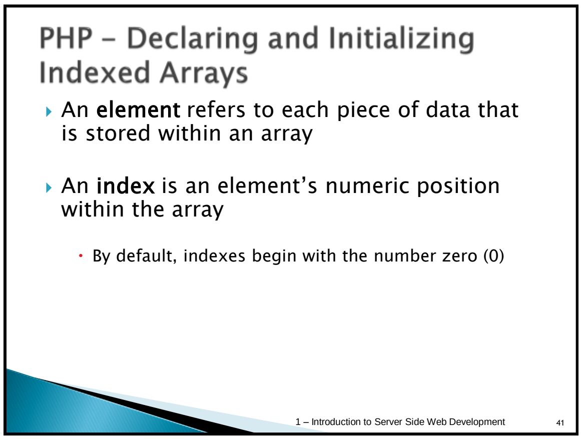
- An **array** contains a set of data represented by a single variable name
- You use arrays when you want to store groups or lists of related information in a single – easily managed location



PHP – Arrays

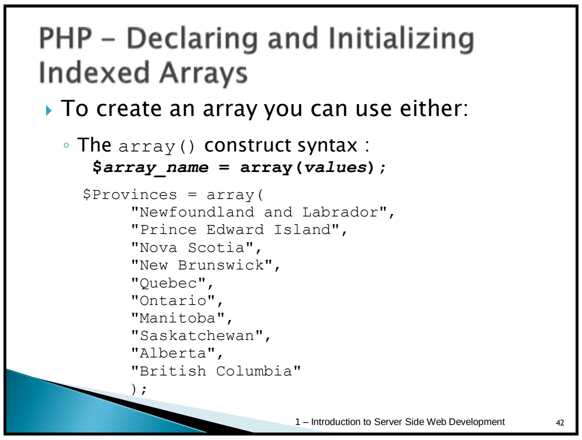
- This is a conceptual representation of how the names of the Canadian provinces are stored using a *single* array named `$Provinces[]`





PHP – Declaring and Initializing Indexed Arrays

- An **element** refers to each piece of data that is stored within an array
- An **index** is an element's numeric position within the array
    - By default, indexes begin with the number zero (0)



PHP – Declaring and Initializing Indexed Arrays

- To create an array you can use either:
  - The `array()` construct syntax :

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

PHP – Declaring and Initializing Indexed Arrays

- Or
  - Array name and brackets syntax:***$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";
```

PHP – Accessing Array Elements

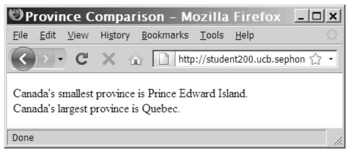
- An element is referenced by enclosing its **index** in brackets at the end of the array name:

```
$Provinces[1]
```

- refers to the `Prince Edward Island` state

PHP – Accessing Element Information

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


Province Comparison – Mozilla Firefox
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Done

Canada's smallest province is Prince Edward Island.
Canada's largest province is Quebec.

Output of elements in the `$Provinces[]` array

PHP – Arrays

- In PHP – *each array space* can contain **any type of value**

```
$myarray = array('one', 2, '3');
```

- Contains three values:

⇨	'one'	a string
⇨	2	a number
⇨	'3'	a string

PHP – Modifying Arrays

```
$myarray = array('one', 2, '3');
```

- You can use an array index in square brackets to :
  - add new elements
  - assign new values to existing elements

```
$myarray[1] = 'two';    // Assign a new value
$myarray[3] = 'four';   // Create a new element
```

PHP – Accessing Element Information in Associative Arrays

- To access an array element in an associative array – use the appropriate string index in square brackets after the array variable name:

```
echo 'My birthday is: ' . $birthdays['Kevin'];
```

concatenation operator

associated string index

array variable name

PHP – Accessing Element Information in Arrays

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

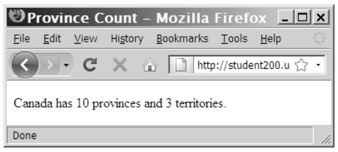
```
$Provinces = array("Newfoundland and Labrador",
"Prince Edward
Island", "Nova Scotia", "New Brunswick", "Quebec",
"Ontario", " Manitoba", "Saskatchewan", "Alberta",
"British Columbia");

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

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

PHP – Accessing Element Information in Arrays

Output of the `count()` function


Province Count – Mozilla Firefox
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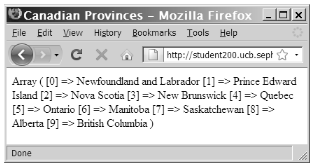
Done

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

PHP – Accessing Element Information in Arrays

Output of the `$Provinces[ ]` array with the **`print_r()`** function:


Canadian Provinces – Mozilla Firefox
File Edit View History Bookmarks Tools Help
http://student200.ucb.sept
Done

```
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 )
```

PHP – Modifying Elements

- To modify an array element. include the index for 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";
```

PHP – Avoiding Assignment Notation Pitfalls

- **Assigns** the string “Hello” to a variable named `$list`

```
$list = "Hello";
```

- **Assigns** the string “Hello” to a new element appended to the end of the `$list` array

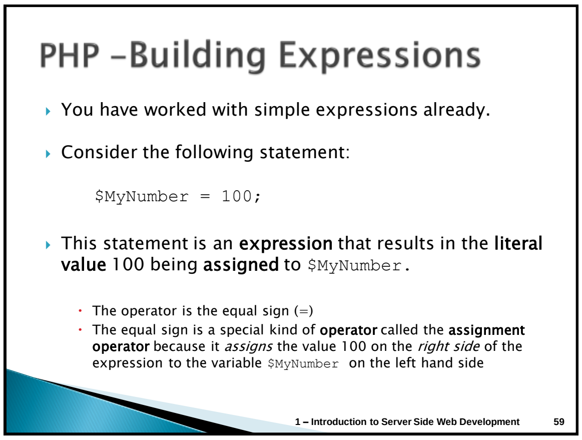
```
$list[] = "Hello";
```

- **Replaces** the value stored in the first element (index 0) of the $list array with the string “Hello”

```
$list[0] = "Hello";
```

PHP –Building 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 static value such as a literal string or a number
- **Operators** are symbols (+) (*) that are used in expressions to manipulate operands



PHP –Building Expressions

- You have worked with simple expressions already.
- Consider the following statement:

```
$MyNumber = 100;
```

- This statement is an **expression** that results in the **literal value** 100 being **assigned** to `$MyNumber`.
  - The operator is the equal sign (=)
  - The equal sign is a special kind of **operator** called the **assignment operator** because it *assigns* the value 100 on the *right side* of the expression to the variable `$MyNumber` on the left hand side

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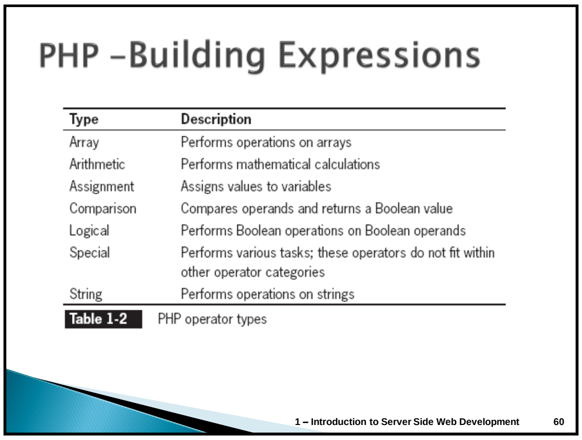

PHP –Building Expressions

Type	Description
Array	Performs operations on arrays
Arithmetic	Performs mathematical calculations
Assignment	Assigns values to variables
Comparison	Compares operands 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
String	Performs operations on strings

Table 1-2 PHP operator types

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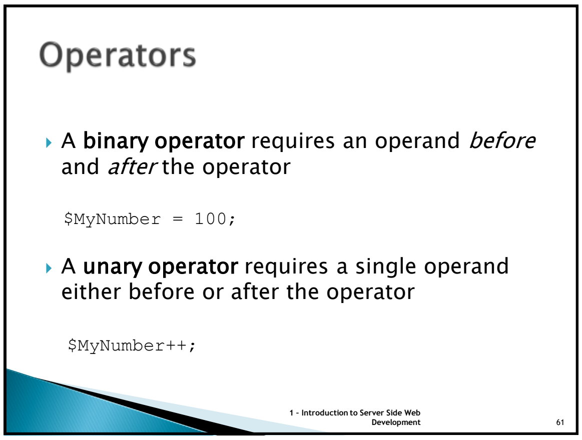

Operators

- A **binary operator** requires an operand *before* and *after* the operator

```
$MyNumber = 100;
```

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

```
$MyNumber++;
```

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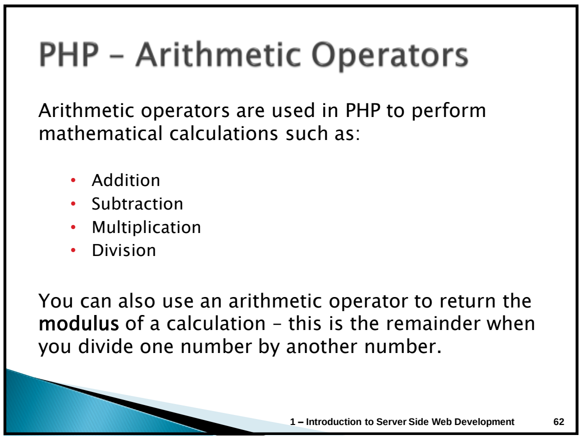

PHP – Arithmetic Operators

Arithmetic operators are used in PHP to perform mathematical calculations such as:

- Addition
- Subtraction
- Multiplication
- Division

You can also use an arithmetic operator to return the **modulus** of a calculation – this is the remainder when you divide one number by another number.

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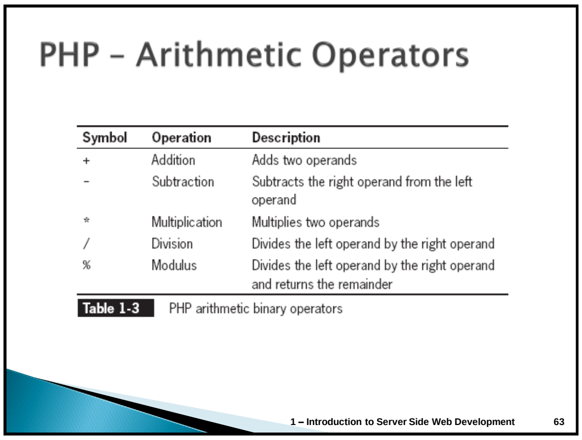

PHP – Arithmetic Operators

Symbol	Operation	Description
+	Addition	Adds two operands
-	Subtraction	Subtracts the right operand from the left operand
*	Multiplication	Multiplies two operands
/	Division	Divides the left operand by the right operand
%	Modulus	Divides the left operand by the right operand and returns the remainder

Table 1-3 PHP arithmetic binary operators

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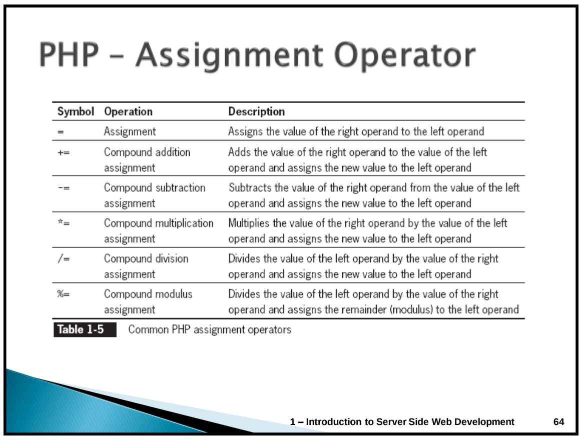

PHP – Assignment Operator

Symbol	Operation	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 new value to the left operand
-=	Compound subtraction assignment	Subtracts the value of the right operand from the value of the left operand and assigns the new value to the left operand
*=	Compound multiplication assignment	Multiplies the value of the right operand by the value of the left operand and assigns the new value to the left operand
/=	Compound division assignment	Divides the value of the left operand by the value of the right operand and assigns the new value to the left operand
%=	Compound modulus assignment	Divides the value of the left operand by the value of the right operand and assigns the remainder (modulus) to the left operand

Table 1-5 Common PHP assignment operators

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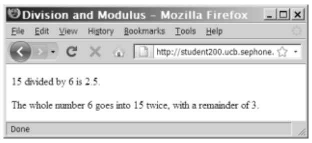
PHP – Arithmetic Operators

Use of arithmetic operators:

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


Division and Modulus - Mozilla Firefox
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Done

```
15 divided by 6 is 2.5.

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

PHP – Unary Arithmetic Operators

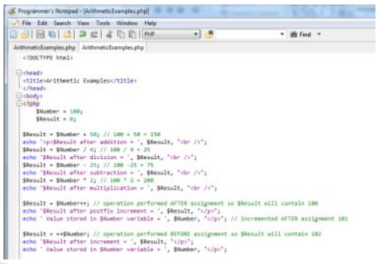
- The increment (++) and decrement (--) *unary* operators can be used as prefix or postfix operators
- A **prefix operator** is placed before a variable
- A **postfix operator** is placed after a variable

Symbol	Operation	Description
++	Increment	Increases an operand by a value of 1
--	Decrement	Decreases an operand by a value of 1

Table 1-4 PHP arithmetic unary operators

PHP – Arithmetic Operators

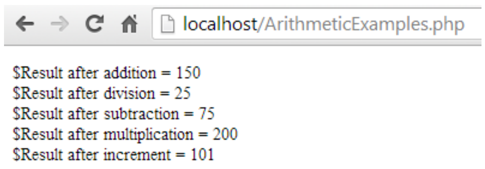
- Sample code in `ArithmeticExamples.php`:


Programmer's Notepad - [ArithmeticExamples.php]
File Edit Search View Tools Window Help
Find
ArithmeticExamples.php
ArithmeticExamples.php

```
<!DOCTYPE html>

<head>
<title>Arithmetic Examples</title>
</head>
<body>
<?php
    $Number = 100;
    $Result = 0;

$Result = $Number + 50; // 100 + 50 = 150
echo '<p>$Result after addition = ', $Result, "<br />";
$Result = $Number / 4; // 100 / 4 = 25
echo '$Result after division = ', $Result, "<br />";
$Result = $Number - 25; // 100 -25 = 75
echo '$Result after subtraction = ', $Result, "<br />";
$Result = $Number * 2; // 100 * 2 = 200
echo '$Result after multiplication = ', $Result, "<br />";

$Result = $Number++; // operation performed AFTER assignment so $Result will contain 100
echo '$Result after postfix increment = ', $Result, "</p>";
echo ' Value stored in $Number variable = ', $Number, "</p>"; // incremented AFTER assignment 101

$Result = ++$Number; // operation performed BEFORE assignment so $Result will contain 102
echo '$Result after increment = ', $Result, "</p>";
echo ' Value stored in $Number variable = ', $Number, "</p>";
```

PHP – Arithmetic Operators

Results of arithmetic expressions:



```
$Result after addition = 150
$Result after division = 25
$Result after subtraction = 75
$Result after multiplication = 200
$Result after increment = 101
```

PHP– Operands

- Expressions consist of two types of components: *operands* and *operators.*
- Operands are the objects that are manipulated and operators are the symbols that represent specific actions.

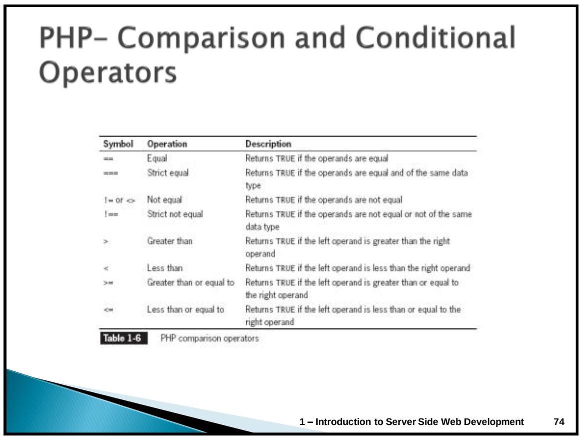
For example, in the expression

5 + x

- *x* and 5 are operands and + is an operator. All expressions have at least one operand.

PHP– Comparison and Conditional Operators

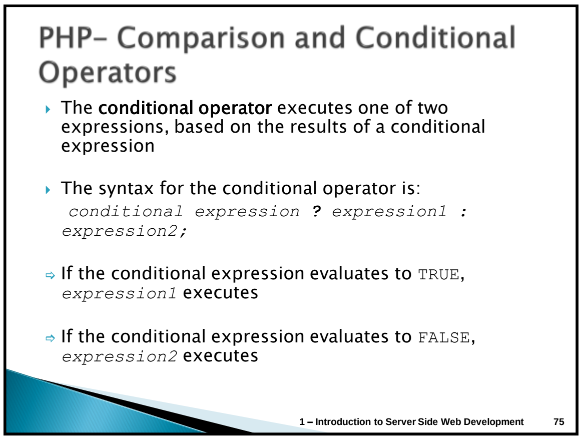
- **Comparison operators** are used to compare two operands and determine how one operand compares to another
- A Boolean value of `TRUE` or `FALSE` is returned after two operands are compared
- The comparison operator *compares* values, whereas the assignment operator *assigns* values
- Comparison operators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



PHP– Comparison and Conditional Operators

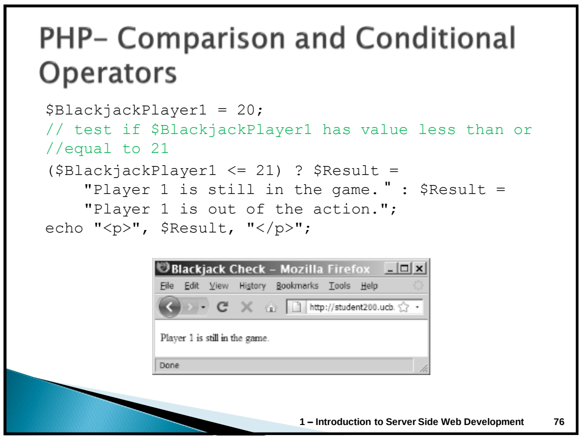
Symbol	Operation	Description
==	Equal	Returns TRUE if the operands are equal
===	Strict equal	Returns TRUE if the operands are equal and of the same data type
!= or <>	Not equal	Returns TRUE if the operands are not equal
!==	Strict not equal	Returns TRUE if the operands are not equal or not of the same data 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 to	Returns TRUE if the left operand is greater than or equal to the right operand
<=	Less than or equal to	Returns TRUE if the left operand is less than or equal to the right operand

Table 1-6 PHP comparison operators



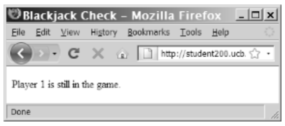
PHP– Comparison and Conditional Operators

- 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

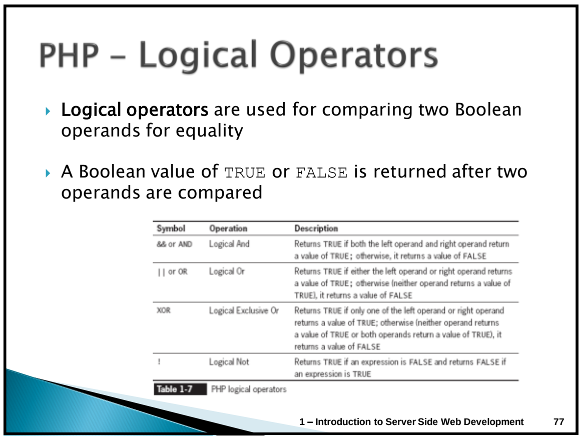


PHP– Comparison and Conditional Operators

```
$BlackjackPlayer1 = 20;
// test if $BlackjackPlayer1 has value less than or
//equal to 21
($BlackjackPlayer1 <= 21) ? $Result =
     "Player 1 is still in the game." : $Result =
     "Player 1 is out of the action.";
echo "<p>", $Result, "</p>";
```


Blackjack Check – Mozilla Firefox
File Edit View History Bookmarks Tools Help
http://student200.ucb.
Done

Player 1 is still in the game.

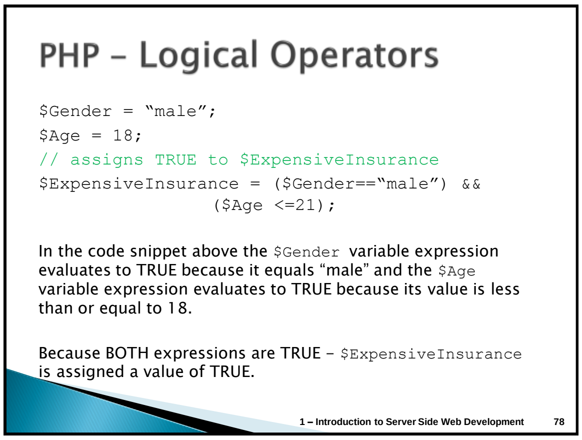


PHP – Logical Operators

- **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

Symbol	Operation	Description
&& or AND	Logical 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	Logical Or	Returns TRUE if either the left operand or right operand returns a value of TRUE; otherwise (neither operand returns a value of TRUE), it returns a value of FALSE
XOR	Logical Exclusive Or	Returns TRUE if only one of the left operand or right operand returns a value of TRUE; otherwise (neither operand returns a value of TRUE or both operands return a value of TRUE), it returns a value of FALSE
!	Logical Not	Returns TRUE if an expression is FALSE and returns FALSE if an expression is TRUE

Table 1-7 PHP logical operators

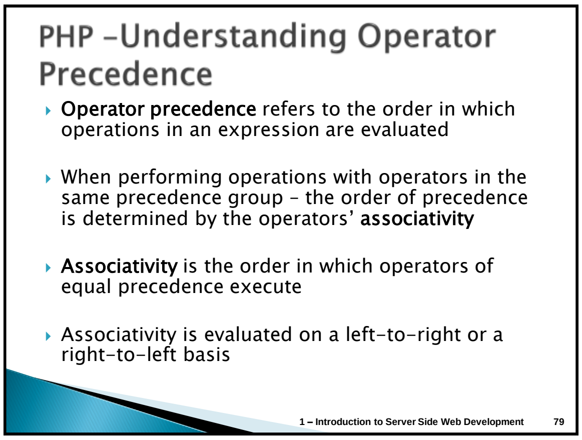


PHP – Logical Operators

```
$Gender = "male";
$Age = 18;
// assigns TRUE to $ExpensiveInsurance
$ExpensiveInsurance = ($Gender=="male") &&
                      ($Age <=21);
```

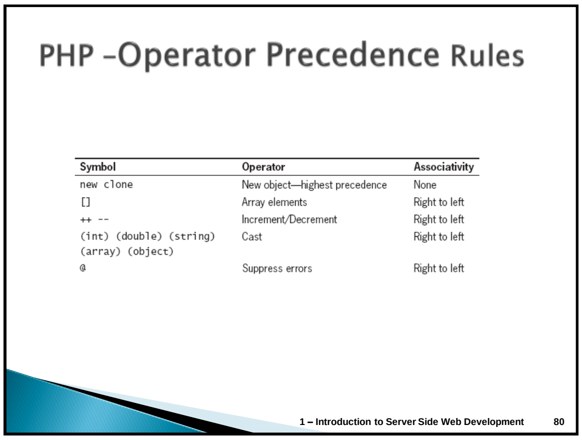
In the code snippet above the `$Gender` variable expression evaluates to TRUE because it equals "male" and the `$Age` variable expression evaluates to TRUE because its value is less than or equal to 18.

Because BOTH expressions are TRUE – `$ExpensiveInsurance` is assigned a value of TRUE.



PHP –Understanding Operator Precedence

- **Operator precedence** refers to the order in which operations in an expression are evaluated
- When performing operations with operators in the same precedence group – the order of precedence is determined by the operators' **associativity**
- **Associativity** is the order in which operators of equal precedence execute
- Associativity is evaluated on a left-to-right or a right-to-left basis



PHP –Operator Precedence Rules

Symbol	Operator	Associativity
`new clone`	New object—highest precedence	None
`[]`	Array elements	Right to left
`++ --`	Increment/Decrement	Right to left
`(int) (double) (string) (array) (object)`	Cast	Right to left
`@`	Suppress errors	Right to left

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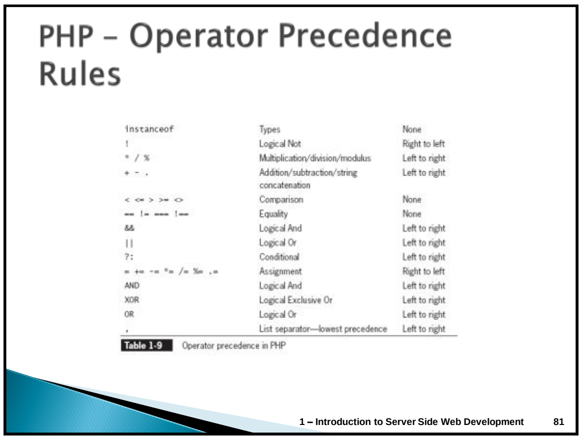

PHP – Operator Precedence Rules

`instanceof`	Types	None
`!`	Logical Not	Right to left
`* / %`	Multiplication/division/modulus	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
XOR	Logical Exclusive Or	Left to right
OR	Logical Or	Left to right
`,`	List separator—lowest precedence	Left to right

Table 1-9 Operator precedence in PHP

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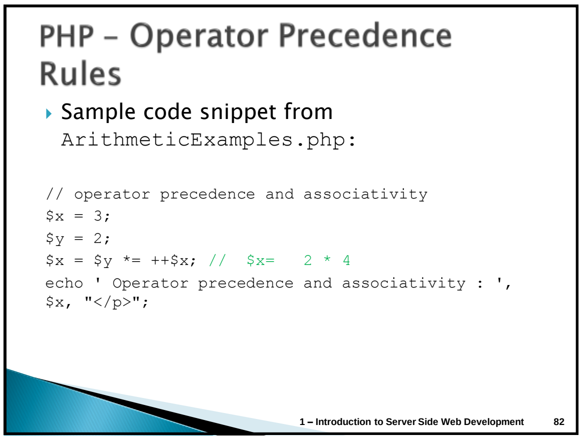

PHP – Operator Precedence Rules

- Sample code snippet from `ArithmeticExamples.php:`

```
// operator precedence and associativity
$x = 3;
$y = 2;
$x = $y *= ++$x; //  $x=   2 * 4
echo ' Operator precedence and associativity : ',
$x, "</p>";
```

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