Episode 7

Control Structures I: Loops

Introduction

In this episode we are going to learn about loops: The for loop, the while loop and the do while loop. Loops are very helpful whenever we find ourselves in need to write a block of code that must be executed several times.
Let's dive right in.

Goals

In this section of the course your goals are:

- ☐ To learn how to use the for loop
- ☐ To learn how to use the while loop
- ☐ To learn how to use the do while loop

The For Loop

The for loop is used in the following manner:

```
for ($x = 0; $x < 10; $x++) {
    echo $x."<br>";
}
```

Notice that in between the parenthesis there are three statements separated by semicolons:

- The initialization: `$x = 0`
- The conditional statement: `$x < 10`
- The incrementation: `$x++`

This is the flow of the for loop:

1. `$x = 0` executed only once.
2. `$x < 10` if this is true, step 3 is executed. Otherwise, the loop ends.
3. `echo $x."<br>"`
4. `$x++` Go back to step 2.

For loops are mostly used when you know in advance how many times you want the loop to be executed. For example, if you're going to print something to the screen 5 times or if you want to know how much 100 numbers add up to.

The While Loop

Let's take a look at how the while loop works:

```
$y = 0;
$msg = '';

while ($y < 10) {
    $msg = $msg.' '.$y.' |';
    $y++;
}

echo $msg."<br>";
```

Notice that the variables $y and $msg are initialized outside of the loop. Then comes the **while** keyword and next in between parenthesis is the conditional statement. The body of the loop will be executed only if the conditional is true. And inside the body of the loop, we find $y++. If we don't change the value of the variable that is being used for the conditional statement, then what the conditional statement yields will never change. If it starts by being true, we will have an infinite loop.

Do While Loop

A do while loop is used when you know that the body of the loop must be executed at least once.

```
$z = 9;

do {
    echo $z."<br>";
    $z--;
} while ($z > 0);
```

As in the while loop, variables are initialized outside of the body of the loop and don't forget to change the value of the variable being used to test whether the loop should run again. Notice that the loop is executed once before the conditional statement is tested.

Debugging Code

Examine the following code. Find and fix the errors. Both an HTML file and a PHP file are included for you

to be able to test the script. The errors are found only in the PHP file. The CSS file in the link is the same used in episode 6.

```
<!DOCTYPE html>
<html>
<head>
    <meta charset="utf-8">
    <title>Debugging</title>
    <link type="text/css" href="../chapter-06/forms.css" rel="stylesheet">
</head>
<body>
    <main>
    <h2>Factorials</h2>
    <form action="debug.php" method="post">
        <label>Enter a number: </label>
        <input type="text" name="number"/><br>
        <input type="submit" value="Enter">
    </form>
    </main>
</body>
</html>
```

```
<?php
$number = $_POST['number'];

for($i = 1, $total = 1, $i = $number; $i){
    $total *= $i;
}

?>
<!DOCTYPE html>
<html>
<head>
    <meta charset="utf-8">
    <title>Forms</title>
    <link type="text/css" href="../chapter-06/forms.css" rel="stylesheet">
</head>
<body>
    <main>
    <h2><?php echo "$number! is total"; ?></h2>
    </main>
</body>
</html>
```

Lab Exercises

1. Write a script that lets the user enter a number from 1 to 100 and displays the sum from 1 to the number the user entered. For example if the user enters 4 then, 10 should be displayed (1 + 2 + 3 + 4). Use a for loop to get the answer.

2. Use a while loop to create the following table:

Pounds	Kilograms
1	0.4536
2	0.9072
3	1.3608
4	1.8144
5	2.2680
6	2.7216
7	3.1751
8	3.6287
9	4.0823
10	4.5359

Note: 1 pound = 0.45359 Kg.

3. Suppose the annual tuition for a university is $30,000, and it increases by 5% every year. Using a do while loop find the cost of the yearly tuition for the next 10 years. Hint: To find next's year cost of tuition multiply by 1.05.