ISIT307 - WEB SERVER PROGRAMMING

LECTURE 1.2 – FUNCTIONS AND CONTROL STRUCTURES

LECTURE PLAN

- Learn how to use functions to organize the PHP code
- Learn about variable scope
- Learn `if` statements, `if...else` statements, and `switch` statements
- Learn `while` statements, `do...while` statements, `for`, and `foreach` statements
- Learn about `include` and `require` statements

DEFINING FUNCTIONS

- **Functions** are groups of statements that can be executed as a single unit
- **Function definitions** are the lines of code that make up a function
- The syntax for defining a function is:

```
<?php
function name_of_function(parameters) {
    statements;
}
?>
```

DEFINING FUNCTIONS

- Functions, like all PHP code, must be contained within `<?php . . . ?>` tags
- A **parameter** is a variable declared within the function definition
- Parameters are placed within the parentheses that follow the function name
- Parameters can be assigned a default values
- Functions do not have to contain parameters
- The set of curly braces (called **function braces**) contain the function statements

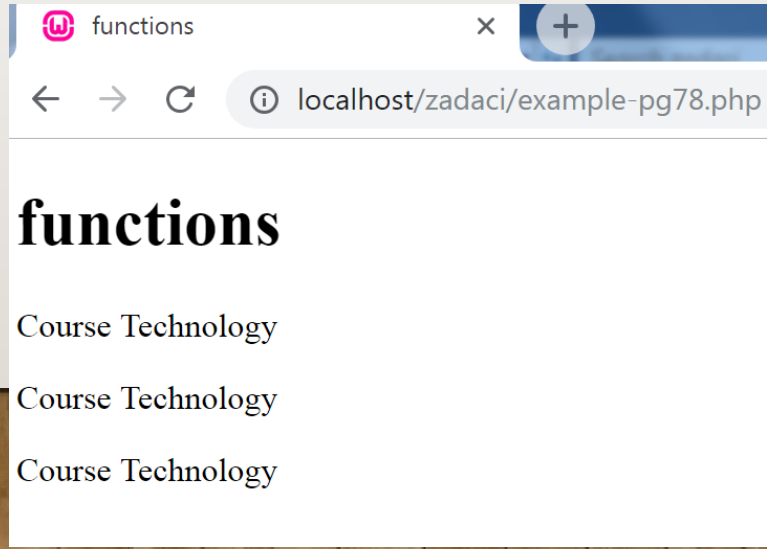
DEFINING FUNCTIONS

- **Function statements** do the actual work of the function and must be contained within the function braces

```
function displayCompanyName($Company1,
                            $Company2, $Company3) {
  echo "<p>$Company1</p>";
  echo "<p>$Company2</p>";
  echo "<p>$Company3</p>";
}
```

CALLING FUNCTIONS

```
<?php
function displayCompanyName($CompanyName) {
        echo "<p>$CompanyName</p>";
}
displayCompanyName("Course Technology");
DisplayCompanyName("Course Technology");
DISPLAYCOMPANYNAME("Course Technology");
?>
```



RETURNING VALUES

- A **return statement** returns a value to the statement that called the function
- Not all functions return values

```
function average_numbers($a, $b, $c) {
   $SumOfNumbers = $a + $b + $c;
   $Result = $SumOfNumbers / 3;
   return $Result;
 }
 echo average_numbers (5,6,7);
 echo average_numbers (5,5,7); //what is the output?
```

RETURNING VALUES

- The function can **return multiple values** within an array

```
function multi_calc($n1, $n2, $n3)
{
   $sum = $n1+$n2+$n3;  //$res[] = $n1+$n2+$n3;
   $prod = $n1*$n2*$n3;  //$res[] = $n1*$n2*$n3;
   return array($sum, $prod); //return $res;
}
$result = multi_calc(5, 6, 7);
echo "Results are: ", $result[0], " and ", $result[1];
```

PASSING PARAMETERS TO A FUNCTION

- You can pass a function parameter by **value** or by **reference**
  - A function parameter that is passed by value is a local copy of the variable
  - A function parameter that is passed by reference is a reference to the original variable

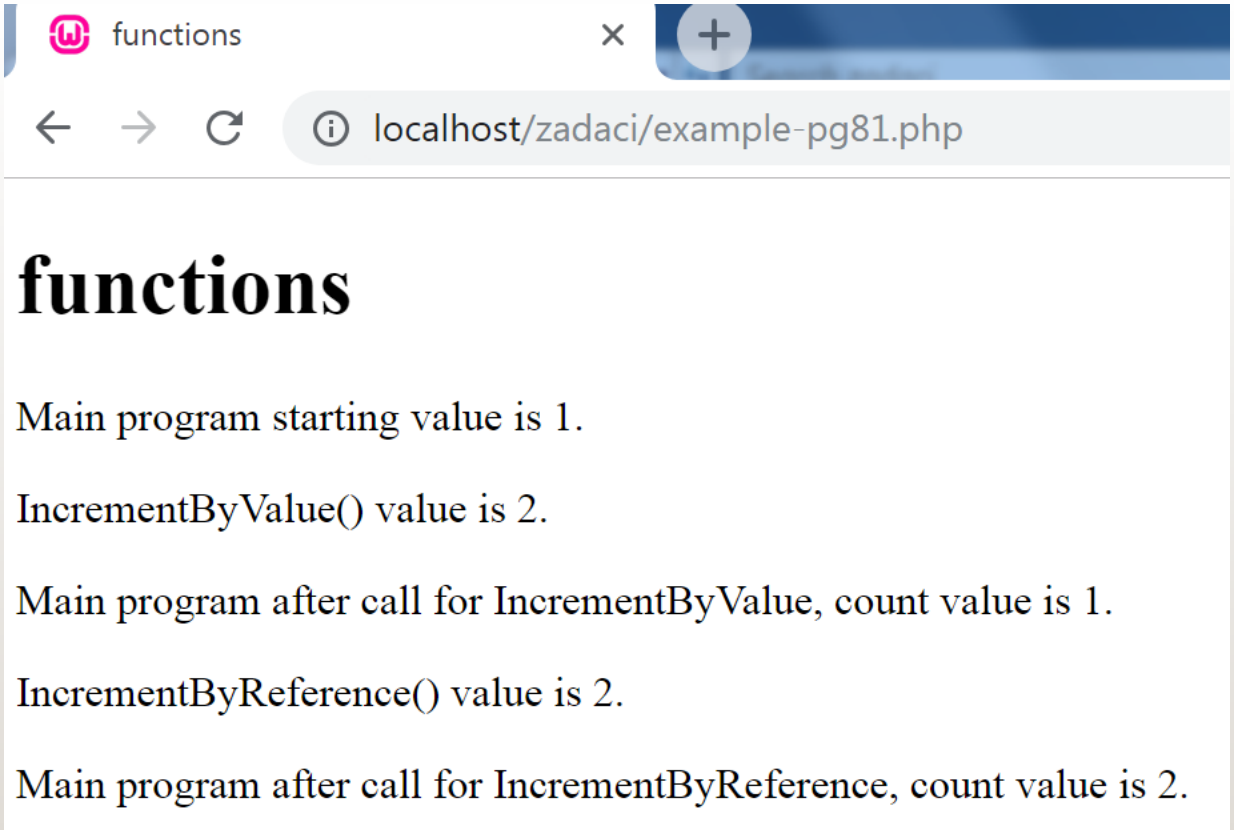
PASSING PARAMETERS TO A FUNCTION - EXAMPLE

```
<?php
function IncrementByValue($CountByValue) {
   ++$CountByValue;
   echo "<p>IncrementByValue() value is $CountByValue.</p>"; };

function IncrementByReference(&$CountByReference) {
   ++$CountByReference;
   echo "<p>IncrementByReference() value is $CountByReference. </p>";};

$Count = 1;
echo "<p>Main program starting value is $Count.</p>";
IncrementByValue($Count);
echo "<p>Main program after call for IncrementByValue, count value is$Count. </p>";
IncrementByReference($Count);
echo "<p>Main program after call for IncrementByReference, count value is $Count.
</p>";
?>
```

PASSING PARAMETERS TO A FUNCTION – EXAMPLE OUTPUT



FUNCTION – EXAMPLE
WHAT IS THE OUTPUT?

```
<?php
function add_some(&$text) {
   $text = $text."problem?";
}

$my_text = "Is there ";
echo "<p>",$my_text, "</p>";
add_some($my_text);
echo "<p>",$my_text, "</p>";

?>
```

FUNCTION PARAMETERS

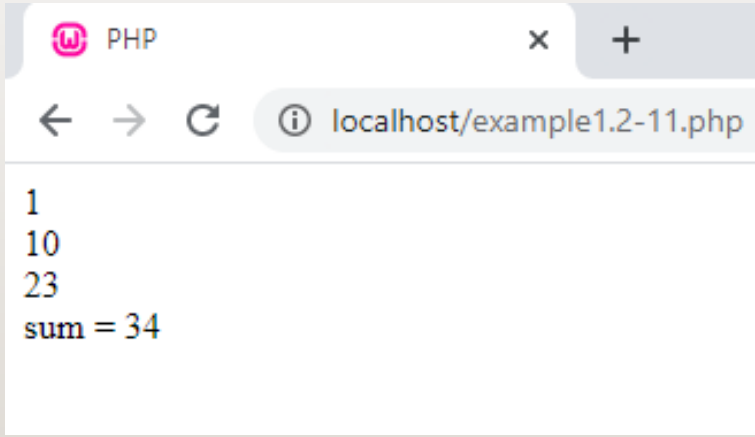
- PHP supports variable-length parameter lists - to define a function (variadic function) that accepts an arbitrary number of arguments
- Meaning you can pass 0, 1 or n number of arguments in function
- Parameter lists include **...** token preceding the last (or only) parameter in the function definition
  - passed arguments will be converted into an array

FUNCTION PARAMETERS

```
<?php
function sum(...$numbers) {
    $acc = 0;
    foreach ($numbers as $n) {
        echo $n, "<br \>";
        $acc += $n;
    }
    return $acc;
}

$sum = sum(1, 10, 23);
echo "sum = $sum";

?>
```



FUNCTION PARAMETERS - OPTIONAL PARAMETERS/DEFAULT VALUES

- PHP supports optional parameters
- A function may define default values for parameters
- The default value is used only when the parameter is not specified
  - If null value is passed the default value is omitted
- Optional parameters should be specified after any required parameters

FUNCTION PARAMETERS - OPTIONAL PARAMETERS/DEFAULT VALUES

```
<?php
function makecoffee($type = "cappuccino") {
  return "<p>Making a cup of $type. </p>";
};

echo makecoffee();
echo makecoffee(null);
echo makecoffee("espresso");

?>
```

FUNCTION PARAMETERS – OPTIONAL TYPE DECLARATIONS

- Optional type declarations (data type hints) were introduced in PHP7+
- With this we can restrict the type of information passed into and out of a function
  - the specific data type can precede the parameter in the function definition
  - can specify the data type that a function returns

FUNCTION PARAMETERS – OPTIONAL TYPE DECLARATIONS

```
<?php
function double_num(int $number) : int {
      return $number *= 2;
}
$num = 5;
echo '$num =', $num, '<br>';
echo 'double_num returns ', double_num($num), '<br>';

$num = 4.8;
echo '$num =', $num, '<br>'; //Deprecated: Implicit conversion
                             //from float 4.8 to int loses precision -
                             //warning will be displayed, but will return 8
echo 'double_num returns ', double_num($num), '<br>';
?>
```

If declare(strict_types=1) is used the error will be -> Fatal error: Uncaught TypeError: double_num():Argument #1 ($number) must be of type int, float given

strict_types declaration must be the very first statement in the script

FUNCTION PARAMETERS - SPECIFYING MULTIPLE DATA TYPES

- PHP 8 now permits union types
- Union types allow to combine two or more data types for function parameters or function return value

```
<?php
declare(strict_types=1);
function double_num(int|float $number) : int|float {
    return $number *= 2;
}

$num = 4.8;
echo '$num =', $num, '<br>';
echo 'double_num returns ', double_num($num), '<br>';
?>
```

FUNCTION PARAMETERS – NAMED ARGUMENTS

- Named Arguments (introduced in PHP 8) support function call by setting the parameters by their name
- With Named Arguments the order of the arguments is not important, as long as all the required parameters are passed
  - useful to skip over multiple optional parameters

FUNCTION PARAMETERS – NAMED ARGUMENTS

```
<?php
function make_sentence($name, $activity="no activity", $hours="") {
    return "Hi $name, you have $activity for $hours hrs";
}

echo make_sentence("John"), '<br>';
echo make_sentence("John", "swimming"), '<br>';
echo make_sentence("John", "swimming", "1"), '<br>';

echo make_sentence("John", activity: "hiking"), '<br>';

echo make_sentence(activity: "hiking", name: "John",  hours: "8"), '<br>';
echo make_sentence("John", hours: "8", activity: "hiking"), '<br>';

echo make_sentence("John", hours: "5"), '<br>';
echo make_sentence(hours: "5", name: "John"), '<br>';

?>
```

UNDERSTANDING VARIABLE SCOPE

- **Variable scope** is where in your program a declared variable can be used
- A variable's scope can be either global or local
- A **global variable** is one that is declared outside a function and is available to all parts of your program
- A **local variable** is declared inside a function and is only available within the function in which it is declared

THE GLOBAL KEYWORD

- You must declare a global variable with the `global` keyword inside a function definition to make the variable available within the scope of that function

```
<?php
    $GlobalVariable = "this is my value";

    function scopeExample() {
        global $GlobalVariable;
        echo "<p>$GlobalVariable</p>";
        $GlobalVariable = "if I change it";
    }
    scopeExample();
    echo "<p>$GlobalVariable</p>";
?>
```

MAKING DECISIONS

- **Decision making** or **flow control** is the process of determining the order in which statements execute in a program
- The special types of PHP statements used for making decisions are called **decision-making statements** or **decision-making structures**

IF STATEMENTS

- Used to execute specific programming code if the evaluation of a conditional expression returns a value of TRUE
- The syntax for a simple if statement is:

```
if (conditional expression)
  statement;
```

IF STATEMENTS (CONTINUED)

- Contains three parts:
  - the keyword `if`
  - a conditional expression enclosed within parentheses
  - the executable statements
- A **command block** is a group of statements contained within a set of braces
- Each command block must have an opening brace ({) and a closing brace (})

IF STATEMENTS (CONTINUED)

```
$ExampleVar = 5;
if ($ExampleVar == 5) {   // condition evaluates to 'TRUE'
     echo " <p>The condition evaluates to true.</p> ";
     echo '<p>$ExampleVar is equal to ', " $ExampleVar.</p> ";
     echo " <p>Each of these lines will be printed.</p> ";
}
echo " <p>This statement always executes after the if
                                                  statement.</p> ";
```

IF...ELSE STATEMENTS

- An `if` statement that includes an `else` clause is called an **`if...else` statement**
- An `else` clause executes when the condition in an `if...else` statement evaluates to `FALSE`
- The syntax for an `if...else` statement is:

```
if (conditional expression)
    statement;
else
    statement;
```

IF...ELSE STATEMENTS (CONTINUED)

- An `if` statement can be constructed without the `else` clause
- The `else` clause can only be used with an `if` statement

```
$Today = "Tuesday";
 if ($Today == "Monday")
     echo "<p>Today is Monday</p>";
 else
     echo "<p>Today is not Monday</p>";
```

NESTED `IF` AND `IF...ELSE` STATEMENTS

- When one decision-making statement is contained within another decision-making statement, they are referred to as nested **decision-making structures**

```
if ($SalesTotal >= 50)
    if ($SalesTotal <= 100)
        echo "<p>The sales total is between 50 and
                        100, inclusive.</p>";
```

- *Check the* **<=> *rocket ship operator*** *(available in PHP7+)*

SWITCH STATEMENTS

- Control program flow by executing a specific set of statements depending on the value of an expression
- Compare the value of an expression to a value contained within a special statement called a **case label**
- A **case label** is a specific value that contains one or more statements that execute if the value of the case label matches the value of the switch statement's expression

SWITCH STATEMENTS (CONTINUED)

- Consist of the following components:
  - The `switch` keyword
  - An expression
  - An opening brace
  - One or more `case` labels (witch can be different data types)
  - The executable statements
  - The `break` keyword
  - A `default` label
  - A closing brace

SWITCH STATEMENTS (CONTINUED)

- The syntax for the `switch` statement is:

```
switch (expression) {
        case label:
              statement(s);
              break;
        case label:
              statement(s);
              break;
        ...
        default:
              statement(s);
              break;
}
```

SWITCH STATEMENTS (CONTINUED)

- A `case` label consists of:
  - The keyword **case**
  - A literal value or variable name
  - A colon (:)
- A `case` label can be followed by a single statement or multiple statements
- Multiple statements for a `case` label do not need to be enclosed within a command block

`SWITCH` STATEMENTS (CONTINUED)

- The **`default` label** contains statements that execute when the value returned by the `switch` statement expression does not match a `case` label
- A `default` label consists of the keyword `default` followed by a colon (:)

REPEATING CODE

- A **loop statement** is a control structure that repeatedly executes a statement or a series of statements while a specific condition is `TRUE` or until a specific condition becomes `TRUE`
- There are four types of loop statements:
  - `while` statements
  - `do...while` statements
  - `for` statements
  - `foreach` statements

WHILE STATEMENTS

- Tests the condition prior to executing the series of statements at each iteration of the loop
- The syntax for the `while` statement is:

```
while (conditional expression) {
        statement(s);
}
```

- As long as the conditional expression evaluates to `TRUE`, the statement or command block that follows executes repeatedly

WHILE STATEMENTS (CONTINUED)

- Each repetition of a looping statement is called an **iteration**
- A `while` statement keeps repeating until its conditional expression evaluates to `FALSE`
- A **counter** is a variable that increments or decrements with each iteration of a loop statement

WHILE STATEMENTS – WHAT IS THE OUTPUT?

(ex. 1)

```
$Count = 1;
while ($Count <= 5) {
        echo "$Count<br />";
        ++$Count;
}
echo "<p>You have printed 5 numbers.</p>";
```

WHILE STATEMENTS - WHAT IS THE OUTPUT?

(ex. 2)

```
$Count = 10;
while ($Count > 0) {
    echo "$Count<br />";
    --$Count;
}
echo "<p>We have liftoff. </p>";
```

(ex. 3)

```
$Count = 1;
while ($Count <= 100) {
      echo "$Count<br />";
      $Count *= 2;
}
```

WHILE STATEMENTS – INFINITE LOOP

- In an **infinite loop**, a loop statement never ends because its conditional expression is never FALSE

```
$Count = 1;
while ($Count <= 10) {
     echo "The number is $Count";
}
```

DO...WHILE STATEMENTS

- Test the condition after executing a series of statements then repeats the execution as long as a given conditional expression evaluates to TRUE
- The syntax for the do...while statement is:

```
do {
        statement(s);
} while (conditional expression);
```

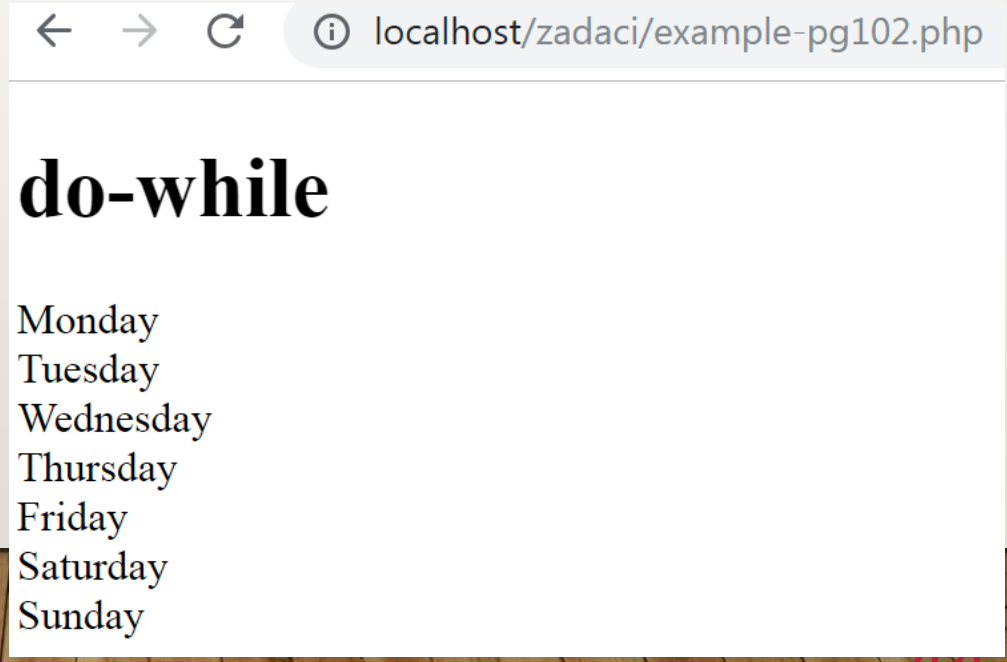
DO...WHILE STATEMENTS

- do...while statements always execute once, before a conditional expression is evaluated

```
$Count = 2;
do {
    echo "<p>The count is equal to $Count</p>";
    ++$Count;
} while ($Count < 2);
```

DO...WHILE STATEMENTS - EXAMPLE

```
$DaysOfWeek = array("Monday", "Tuesday", "Wednesday", "
              Thursday", "Friday", "Saturday", "Sunday");
$Count = 0;
do {
          echo $DaysOfWeek[$Count], "<br />";
          ++$Count;
} while ($Count < 7);
```



FOR STATEMENTS

- Combine the initialize, conditional expression, and update portions of a loop into a single statement
- Repeat a statement or a series of statements as long as a given conditional expression evaluates to `TRUE`
- If the conditional expression evaluates to `TRUE`, the `for` statement executes and continues to execute repeatedly until the conditional expression evaluates to `FALSE`

FOR STATEMENTS (CONTINUED)

- Can also include code that initializes a counter and changes its value with each iteration
- The syntax of the `for` statement is:

```
for (counter declaration and initialization;
  condition; update statement) {
     statement(s);
   }
```

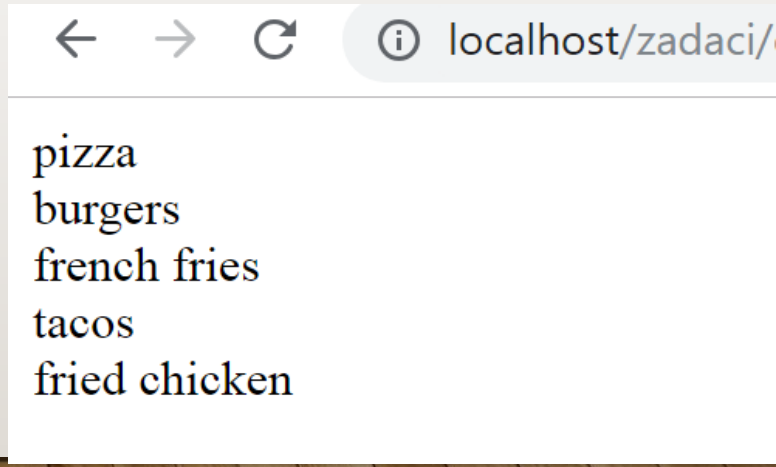
FOR STATEMENTS - EXAMPLE

```
$FastFoods = array("pizza", "burgers", "french fries",
  "tacos", "fried chicken");

for ($Count = 0; $Count < 5; ++$Count) {

      echo $FastFoods[$Count], "<br />";

}
```



FOREACH STATEMENTS

- Used to iterate or loop through the elements in an array
- Do not require a counter, instead, you specify an array expression within a set of parentheses following the `foreach` keyword
- The syntax for the `foreach` statement is:

```
foreach ($array_name as $variable_name) {
        statements;
}
---
foreach ($array_name as $index_name => $variable_name) {
        statements;
}
```

FOREACH STATEMENTS - EXAMPLE

```
$DaysOfWeek = array("Monday", "Tuesday",
          "Wednesday", "Thursday", "Friday",
                    "Saturday", "Sunday");

foreach ($DaysOfWeek as $Day) {
     echo "<p>$Day</p>";
}

foreach ($DaysOfWeek as $DayNum => $Day) {
     echo "<p>$DayNum is $Day</p>";
}
```

INCLUDING FILES

- The `include` and `require` statements reuse content by allowing you to insert the content of an external file on multiple Web pages
  - The `include` statement generates a warning if the include file cannot be found
  - The `require` statement halts the processing of the Web page and displays an error if the include file cannot be found
- The `include_once` and `require_once` statements assure that the external file is added to the script only one time

INCLUDING FILES

- The file path can be either absolute or relative to the current document

```
require 'C:/wamp64/www/my_folder/script.php';

include('my_folder/script.php');
// include 'my_folder/script.php';
```

- When using a relative file path, it's recommended to use `./` to indicate that the path begins in the current folder

```
include('./my_folder/script.php');
```