

PHP

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Index

Introduction	Variables	Control Structures	Strings	Arrays	
Functions	Classes	Exceptions	Databases	HTTP Parameters	
Sessions	Passwords	Headers	Includes	JSON	Best Practices

Introduction

PHP

- Originally called **P**ersonal **H**ome **P**age, it now stands for **PHP: H**ypertext **P**reprocessor, which is a recursive acronym
- Created by Rasmus Lerdorf in 1994.
- It is a **dynamically typed** programming language.
- Usually used to create dynamic web pages but can also be used to create standalone programs.

Hello World

The infamous hello world example in PHP:

```
<?php echo "Hello World";
```

or even shorter

```
<?php echo "Hello World";
```

PHP Delimiters

- The PHP interpreter only executes PHP code within its delimiters. Anything outside its delimiters is not processed by PHP.
- PHP code can be delimited using "`<?php`" and "`?>`", "`<?>`" and "`?>`" or "`<script language='php'>`" and "`</script>`".
- The purpose of all these delimiters is to separate PHP code from non-PHP code, including HTML.
- After processing, the PHP code blocks are replaced by their output.



becomes



Echo

- The **echo** function outputs one or more strings.
- It is not actually a function (it is a language construct), so you are not required to use parentheses with it.
- It also has a shortcut syntax, where you can immediately follow the opening tag with an equals sign.

Comments

There are two ways of creating single line comments:



Multiple line comments can also be used:




Resources

- References:
 - <http://php.net/manual/en/>
- Benchmarks:
 - <http://www.phpbench.com/>
- Books:
 - <http://www.phptherightway.com/>

Variables

Variables

- Variables in PHP are represented by a dollar sign followed by the name of the variable.
 - The variable name is **case-sensitive**.
 - PHP does not require (or support) explicit type definition in variable declaration
 - A variable's type is determined by the context in which the variable is used.
- 

Data Types

PHP supports the following scalar types:

- boolean
- integer
- float
- string

Assignment

- The type of a variable is defined when a value is assigned to it.
- Variables can change type when values of another type are assigned to them.
- Assignment is done by value unless the `&` sign is used.

Type Juggling

- PHP does automatic type conversion whenever it is needed.
- For example, the + (sum) operator expects two numerical values.

- PHP automatically converts the string into an integer.

If the string does not contain any of the characters '.', 'e', or 'E' and the numeric value fits into integer type limits (as defined by `PHP_INT_MAX`), the string will be evaluated as an integer. In all other cases it will be evaluated as a float.

The value is given by the initial portion of the string. If the string starts with valid numeric data, this will be the value used. Otherwise, the value will be 0 (zero). Valid numeric data is an optional sign, followed by one or more digits (optionally containing a decimal point), followed by an optional exponent. The exponent is an 'e' or 'E' followed by one or more digits.

Null Value

The special **null** value represents a variable with no value.

A variable is considered to be null if:

- it has been assigned the constant NULL.
- it has not been set to any value yet.
- it has been unset().



The constant **null** is case-insensitive.

Var Dump

The **var_dump** function displays structured information about one or more expressions that includes its type and value. Arrays and objects are explored recursively with values indented to show structure.



Very useful for simple and dirty debugging.

An alternative is **print_r**, a simplified form of **var_dump**.

Control Structures

Not so different from other languages

While

Executes the nested statement(s) repeatedly, as long as the while expression evaluates to *true*.



Do While

Similar to while loops, except the truth expression is checked at the end of each iteration instead of in the beginning.



For

The first expression is executed once unconditionally at the beginning of the loop.

In the beginning of each iteration, the second expression is evaluated. If it evaluates to *false*, the execution of the loop ends.

At the end of each iteration, the third expression is executed.



If

If the expression evaluates to *true*, executes the statement(s), and if it evaluates to *false*, ignores it(them).



Else

The **else** statement extends an **if** statement to execute a statement in case the expression in the if statement evaluates to *false*.



Break and Continue

Break ends execution of the current **for**, **foreach**, **while**, **do-while** or **switch** structure.

Continue skips the rest of the current loop iteration and continue execution at the condition evaluation.



Switch

The switch statement is similar to a series of *if* statements on the same expression.

After finding a true condition, PHP continues to execute the statements until the end of the switch block, or the first time it sees a break statement.



Die and Exit

Both **die** and **exit** stop the execution of the current PHP script.

They can receive a status as a string, that will be printed before stopping, or an integer, that will be as the exit status and not printed.



Loose and Strict Comparisons

Comparisons can be tricky in PHP. There are two type of equality operators:

Loose comparison



Strict comparison



Loose and Strict Comparisons

Some Examples:



Learn more: <http://php.net/manual/en/types.comparisons.php>

Strings

Strings

A string is a series of characters.

The simplest way to specify a string is to enclose it in *single quotes*.

A *single quote* inside a string defined using *single quotes* must be escaped using a **backslash**. To specify a literal backslash, double it.

Single quoted strings don't recognize any other escape sequences.

Double Quote

If the string is enclosed in *double quotes*, more escape sequences for special characters are allowed (e.g. `\r`, `\n`, `\t`, `\\`, `\"`):



Double quoted strings also expand any variables inside them.



Some developers consider it a best practice to use single quotes when assigning string literals as they denote that there are no variables inside them.

Concatenation

As we have seen before, the *sum* operator expects two numeric values. If used with strings it will try to cast the string into numbers and then sum them.

A different operator is used to concatenate strings together.



Some String Functions

Returns the length of the given string.


Find the numeric position of the first occurrence of *needle* in the *haystack* string starting at *offset*. Returns false if not found.

Some String Functions

Returns the portion of string specified by the start and length parameters.

Returns a string or an array with all occurrences of search in subject replaced with the given replace value.

Some String Functions



Returns an array of strings, each of which is a substring of string formed by splitting it on boundaries formed by the string *delimiter*.



Join array elements with a *glue* string.

Arrays

Arrays

At first glance, PHP arrays might seem similar to arrays in other classical languages.



Arrays

An array is a **ordered map** organized as an ordered collection of **key-value** pairs.

Keys can be either **integers** or **strings** and values can hold any type of data. They can even hold different kinds of data in the same array.



Creating Arrays

Arrays can be created just by using a variable as an array. Or they can be explicitly created using the **array()** function.

They can also be initialized with some values.

Using Arrays

When a key is not provided, PHP will use the increment of the largest previously used integer key.



Note that the maximum integer key used for this need not currently exist in the array. It need only have existed in the array at some time since the last time the array was re-indexed.

We can even use arrays as an array value.



Cycling Arrays

As arrays might not have sequential keys, like in other languages, in PHP we use the following construct to cycle through them:



A similar construct can be used to cycle through the keys and values simultaneously:



Some Array Functions

Searching for data:

Searches haystack for needle using loose comparison unless strict is set. Returns true if found, false otherwise.

Returns the key for needle if it is found in the array, *false* otherwise.

Returns *true* if the given key is set in the array, *false* otherwise.

Some Array Functions

Sorting data:



Sorts an array such that array indexes maintain their correlation with the array elements they are associated with. **arsort** does the same but in reverse.



Sorts an array by key, maintaining key to data correlations. **krsort** does the same but in reverse.

Sort Flags: **SORT_REGULAR**, **SORT_NUMERIC**, **SORT_STRING**, **SORT_LOCALE_STRING**, **SORT_NATURAL** and **SORT_FLAG_CASE**.

Learn more: <http://php.net/manual/en/array.sorting.php>

Some Array Functions

Random arrays:



This function randomizes the order of the elements in an array. Returns *true* on success or *false* on failure.



Picks one or more random entries out of an array, and returns the key (or keys) of the random entries. When picking only one entry, returns the key, otherwise returns an array of keys.

Some Array Functions

Used to assign a list of variables in one operation. This is not really a function, but a language construct.

Many more functions: <http://php.net/manual/en/ref.array.php>

Functions

Functions

Any valid PHP code may appear inside a function, even other functions and class definitions.

Functions need not be defined before they are referenced, except when a function is conditionally defined.

Function names are **case-insensitive**.

To create a function, we use the *function* keyword:



Arguments

Information may be passed to functions via the argument list.

Arguments have no type specified.

By default, function arguments are passed by value. To have an argument to a function always passed by reference, prepend an ampersand (&) to the argument name in the function definition.

Default Values

Arguments can have a default value.

When using default arguments, any defaults should be on the right side of any non-default arguments



Returning Values

PHP functions can return values.

The type of the returned value does not need to be specified. In fact, a function can return different types of values depending on some condition.

There is no distinction between a procedure (a function that doesn't return a value) and a function.

Returning Multiple Values

There is no way for a function to return multiple values.

But we can achieve a similar result using *arrays* and the *list* construct.



Global

As PHP variables do not need to be defined before usage, to use a global variable inside a function we need to declare it as global.



Classes

Classes

PHP 5 marks the introduction of a brand new object model for PHP.

Every class starts with the word `class` followed by its name and the class definition (inside curly brackets):



Properties

Properties are defined by using one of the visibility keywords **public**, **protected**, or **private**, followed by a normal variable declaration.

This declaration may include an initialization, but this initialization must be a constant value.



Methods

Methods are like functions that have access to the private properties of the class. They also have the same visibility keywords as properties.

However, due to the dynamic typed nature of PHP, to access these properties the pseudo-variable **\$this** must be used:



Creating

To create an instance of a class, the **new** keyword must be used.

An object will always be created unless the object has a constructor defined that throws an exception on error.

Constructors

PHP allows developers to declare constructor methods for classes.

Classes which have a constructor method call this method on each newly-created object.

The constructor method is always called `__construct` and can receive any number of parameters. The destructor method is, as expected, called `__destruct`.



Extends

A class can inherit the methods and properties of another class by using the keyword `extends` in the class declaration. It is not possible to extend multiple classes; a class can only inherit from one base class.

Static

The static keyword allows us to define static properties and methods that are shared between all instances of the class.



Static members can be accessed using the name of the class and the `::` operator.

Obviously, `$this` cannot be used inside a static method.

Scope

There are three special keywords that are used to access properties or methods from inside the class definition

- **self::** – accesses the current class (different from **\$this**)
- **parent::** – accesses the parent class
- **static::** – accesses a static member of property

Self vs Static



Abstract

Classes defined as abstract may not be instantiated. Classes that contain at least one abstract method must also be abstract. Methods defined as abstract cannot define the implementation. When inheriting from an abstract class, all methods marked abstract in the parent's class declaration must:

- be defined by the child;
- be defined with the same (or a less restricted) visibility;

Interfaces

Interfaces are defined using the **interface** keyword, in the same way as a standard class, but without any of the methods having their contents defined.

The **implements** specifies that a specific class implements the interface.

Final

The final keyword, prevents child classes from overriding a method by prefixing the definition with final.

If the class itself is being defined final then it cannot be extended.



Exceptions

Exceptions

Exceptions are events that occur during the execution of a script that disrupt the normal flow of instructions.

Like in other programming languages, exceptions can be thrown, and caught within PHP.

To throw an exception we use the throw keyword:



Exceptions

Exception is a class with the following public methods:



A user defined Exception class can be defined by extending the built-in Exception class.

Try and Catch

The **try-catch** statement consists of a try block followed by one or more catch clauses, which specify handlers for different exceptions.



Databases

PDO

The PHP Data Objects (PDO) extension defines a lightweight, consistent interface for accessing databases in PHP.

Connecting

To connect to a database we use a PDO object.

The connection string is database dependent.



Prepared Statements

Prepared statements are the recommended way of executing queries as they prevent SQL injection attacks.



Prepared Statements

Another form of prepared statements.



Values are bound to each question mark in order.

Getting Results

To get the results of a SELECT query the function **fetch** can be used.

This function fetchs one row at a time and returns false if there are no more rows.



Getting Results

The `fetch_all` function returns the complete result as an array of rows.



If the query result is large, using `fetch_all` might waste a lot of memory.

Fetch Mode

Query results can return results in several different modes. Some of them:

- `PDO::FETCH_ASSOC`: returns an array indexed by column name
- `PDO::FETCH_NUM`: returns an array indexed by column number
- `PDO::FETCH_BOTH` (default): returns an array indexed by both column name and 0-indexed column number

Changing the default fetch mode (has to be done every time a connection is created):



Transactions

Unfortunately, not every database supports transactions, so PDO needs to run in what is known as "auto-commit" mode when you first open the connection.

If you need a transaction, you must use the **beginTransaction()** method to initiate one.



Error Handling

PDO offers you a choice of 3 different error handling strategies:

- **PDO::ERRMODE_SILENT** The default mode. No error is shown. You can use the `errorCode()` and `errorInfo()` on both database and statement objects to inspect the error.
- **PDO::ERRMODE_WARNING** Similar to previous one but a warning is shown.
- **PDO::ERRMODE_EXCEPTION** In addition to setting the error code, PDO will throw a `PDOException` and set its properties to reflect the error code and error information.

Error Handling

Setting the default error handling strategy:



Using PDO exceptions:



HTTP Parameters

`$_GET` and `$_POST`

The special `$_GET` variable is an associative array of variables passed to the current script via the **URL** parameters. The special `$_POST` variable is an associative array of variables passed to the current script via the **HTTP Header**.

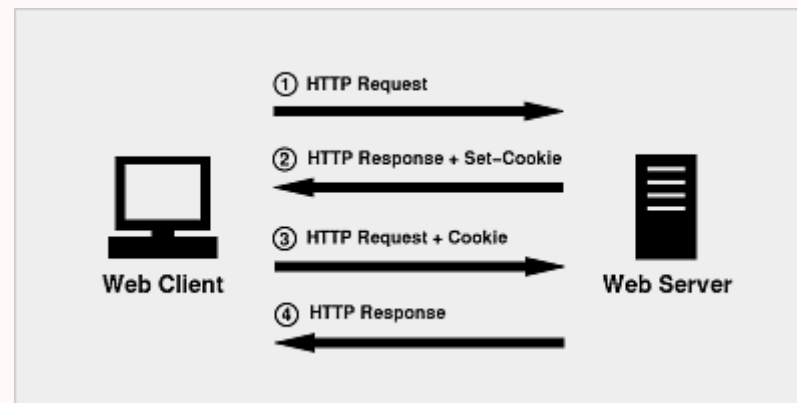


These are **superglobal**, or automatic global, variables. There is no need to do **global \$variable**; to access them within functions or methods.

Sessions

Cookies

Cookies are a mechanism for storing data in the remote browser.



Cookies

You can set a cookie using the **setcookie** function:



Like other header functions, cookies must be sent before any output from your script (this is a protocol restriction). This requires that you place calls to this function prior to any output, including and tags as well as any **whitespace**.

You can access the cookies sent by the browser using the special **\$_COOKIE** array.

If you set a cookie, it won't be sent back until the next request and so the data won't be present in **\$_COOKIE**.

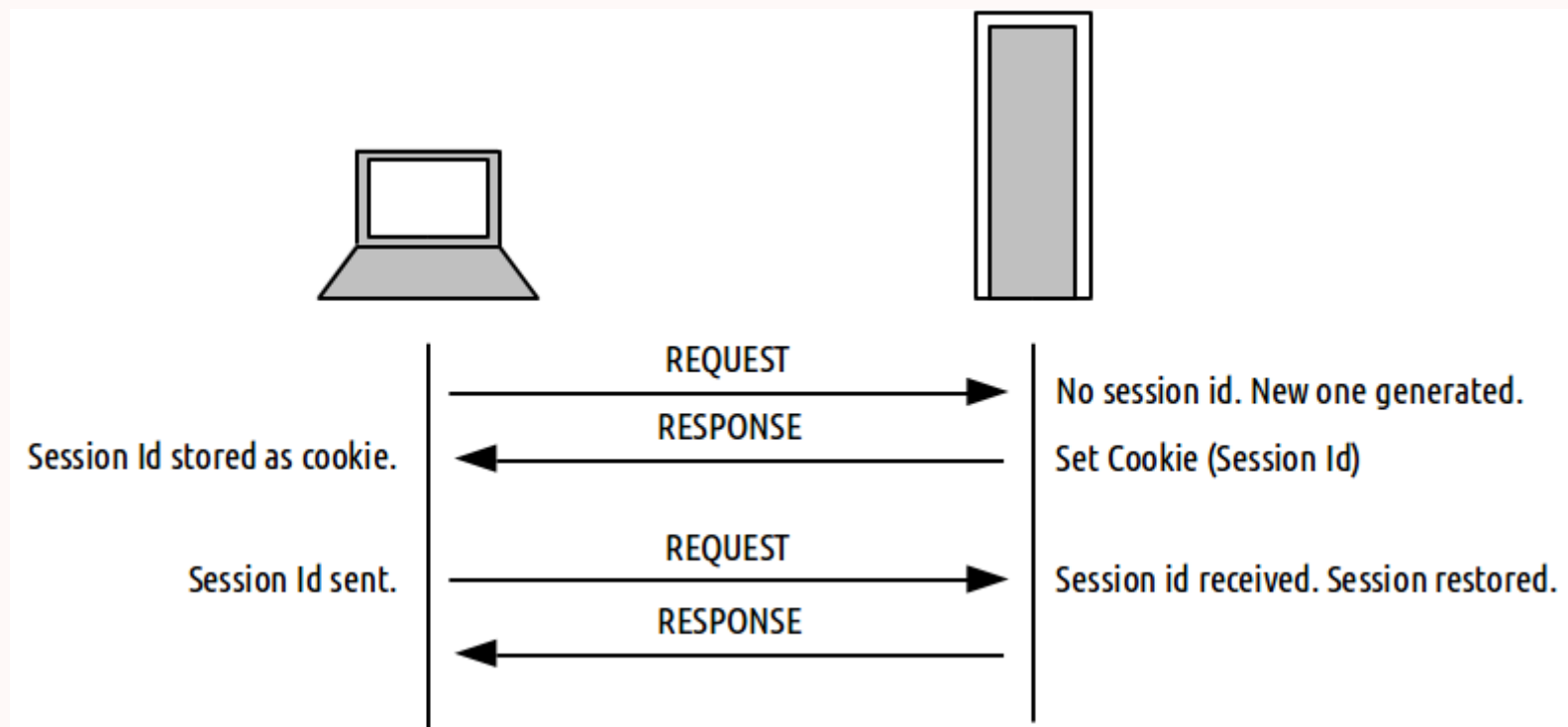
Sessions

As cookies are stored in the browser, they cannot be used as a secure mechanism for storing sensitive information (e.g. the current user).

Sessions are a mechanism, using cookies, that can be used to persist state information between page requests in the server:

1. When a session is started, PHP will either:
 - **retrieve** an existing session using the ID passed (usually from a session cookie) or
 - if no session is passed it will **create** a new session.
2. PHP will populate the `$_SESSION` superglobal with any session data after the session has started.
3. When the script ends, it will automatically take the contents of the `$_SESSION` superglobal, serialize it, and send it for storage.

Sessions



Session Start

Sessions can be started using the `session_start` function:



Like other header functions, sessions must be started before any output from your script (this is a protocol restriction). This requires that you place calls to this function prior to any output, including and tags as well as any **whitespace**.

Normally called in every page to ensure session variables are always accessible.

`$_SESSION`

The special `$_SESSION` variable is an associative array containing session variables available to the current script.



The correct way of verifying if a session variable exists is:



But do not forget that it can exist and still be empty.

Session Destroy

The function `session_destroy` destroys all of the data associated with the current session.

It does not unset any of the global variables associated with the session, or unset the session cookie.

In order to kill the session altogether, like to log the user out, the session id must also be unset.



Session Parameters

The parameters of the cookie used for the session cookie can be changed using the `session_set_cookie_params` function.



- **lifetime** of the session cookie, defined in seconds. The value 0 means "until the browser is closed"
- **path** on the domain where the cookie will work. Use a single slash ('/') for all paths on the domain.
- Cookie **domain**, for example 'www.fe.up.pt'. To make cookies visible on all subdomains then the domain must be prefixed with a dot like '.fe.up.pt'.

Storing Passwords

Hash Functions

Password should never be stored in plain text. Instead you should use a one-way hashing function.



HTTP Headers

Header

The header function sends a raw HTTP header to the browser.

This can be used, for example, to redirect the browser to another page:



Like other header functions, headers must be sent before any output from your script (this is a protocol restriction). This requires that you place calls to this function prior to any output, including and tags as well as any **whitespace**.

Do not forget that this does not stop the execution of the script. If you want to stop execution you must follow this instruction with **die()** or **exit()**.

Includes

Includes

The **include** statement includes and evaluates the specified file.

The **require** statement is identical to include except upon failure it will also produce a fatal **E_COMPILE_ERROR** level error.

The **include_once** statement is identical to include except PHP will check if the file has already been included.

The **require_once** statement is identical to require except PHP will check if the file has already been included.

Relative Includes

In PHP, includes are relative to the **file requested** by the browser, not the file that contains the include command. This means that:



But:



Magic Constants (for files)

To make including files in PHP easier, we can use the following **magic constants**:

And the following function that returns the folder of a file:

For example:

JSON

JSON

- JSON (JavaScript Object Notation) is a lightweight data-interchange format.
- It is easy for **humans** to read and write.
- It is easy for **machines** to parse and generate.



JSON

The PHP `json_encode` and `json_decode` functions can be used to encode from and to JSON easily.



Best Practices

Validate your input

Never trust the user:



Separate your PHP and HTML code

Always start by calculating/querying all your data and only then start outputting HTML.



You can use the short version of echo to make your code look nicer.

PHP delimiters can break in the middle of a block and pickup later.

DRY

Don't Repeat Yourself

Use include and/or functions to avoid code repetitions:



DRY

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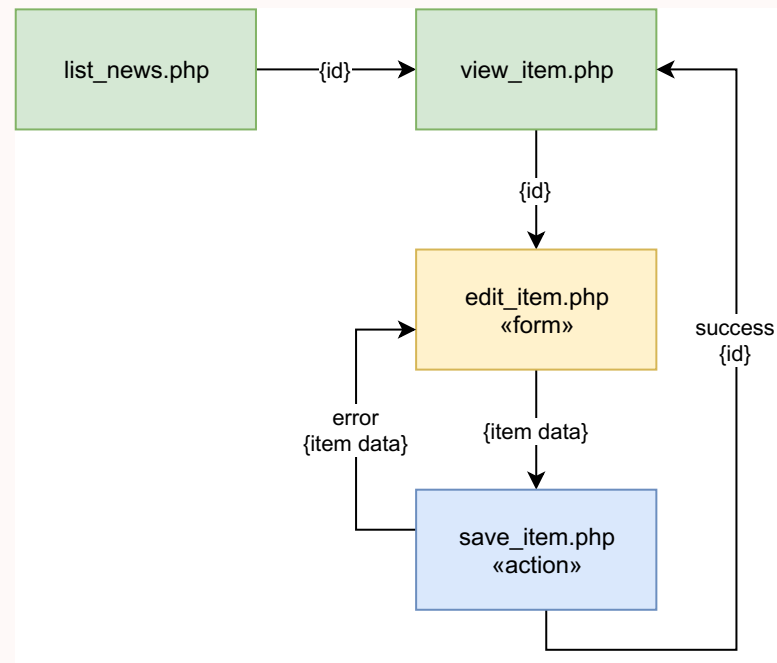


Separate Actions from Views

Never mix scripts that show data with scripts that change data:

- **list_news.php**
 - Shows all news.
 - Has links to each one of the news items **view_item.php**.
- **view_item.php**
 - Shows one news item and its comments.
 - Receives the id of the item.
 - Link to **edit_item.php**.
- **edit_item.php**
 - Shows a form that allows the user to edit a news item.
 - Submits to **save_item.php**.
- **save_item.php**
 - Receives the new data for the news item.
 - Saves it in the database and redirects to **view_item.php**.

Separate Actions from Views



Extra Stuff

- Functions: [Dates](#), [Image Processing](#)
- Charts: [jpGraph](#), [pChart](#)
- Extensions: [SPL](#)
- Libraries: [Pear](#)
- Template Engines: [Smarty](#)
- Frameworks: [CodeIgniter](#), [CakePHP](#), [Symfony](#), [Zend](#), [Laravel](#), ...