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Coding Fellowship

Week 6: Introducing PHP & the Backend

But first…
Now half-way through course

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Good practice

We'll start to be strict on:

- Code is correctly indented and tidy
- ↑ = ALWAYS, even if you copied it from elsewhere
- file and folder names are consistent (avoiding spaces)
- Functions, variables, classes are consistent in style
    - CamelCase
    - kebab-case
    - snake_case

Debugging

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Developing your debugging process

- Testing often (change & test, change & test)
- Sense check what you are doing
- Writing checks in your code
- Check spelling and consistency (copy and paste is your friend)
- Take a break
- Ask others
- Google

On to PHP

Overview

Introduction to backend development, PHP basics.

Work method

Individually, on local machine

New Tools

LAMP, Vagrant, MySQL

Project

1) Build a calculator
2) Build a simple application with registration, email verification and login functionality.

Module Outline

- Basic syntax, variables, conditional logic, loops, arrays
- Forms and user data
- Building a calculator
- Databases, sessions and cookies
- Building a login system

PHP

What is it?

PHP is a server-side, dynamic scripting language.

What is it?

PHP is a server-side, dynamic scripting language.

Runs on a web server, which 'compiles' a page of HTML, as well as performing other actions.

E.g. sending email, saving files, fetching data, formatting data.

What is it?

PHP is a server-side, dynamic scripting language.

Allows for content to change each time a page is loaded.

Demo: HTML = static content

```
<p>It's 12:41:32</p>
```

time.html

Demo: JS = dynamic content on client

```
<body onload="startTime()">
   <p>It's <span id="time">time goes here</span></p>
</body>
```

time-with-javascript.html

Demo: PHP = dynamic content on server

```
<p>It's <?php echo date("H:i:s"); ?></p>
```

time.php

Summary

	Runs where?	**Runs how?**
HTML & CSS	Client (browser)	Once - static
JavaScript	Client (browser)	Continuous - Dynamic
PHP	Server	Once - dynamic

Web servers

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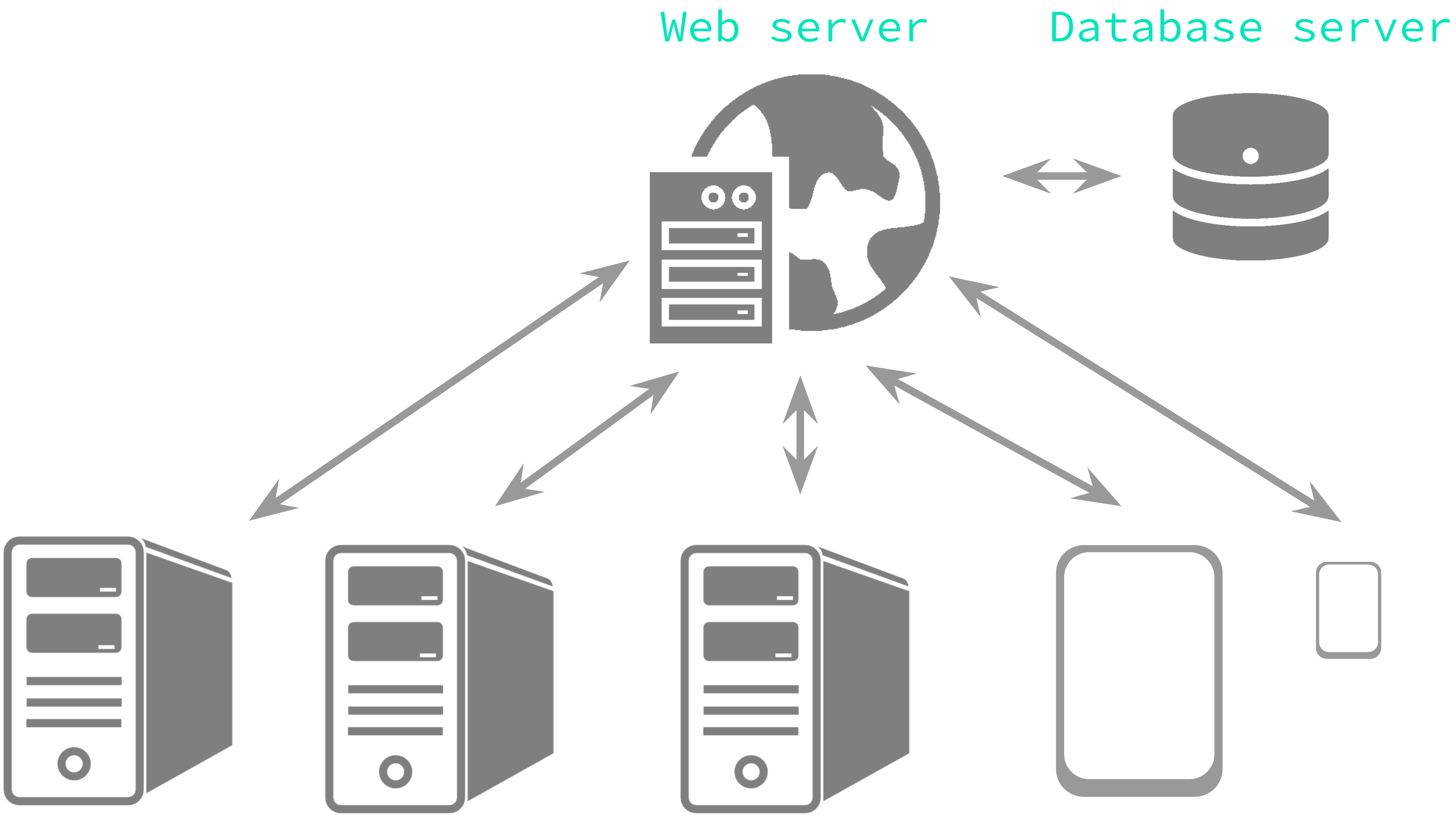
Hosting Environment

PHP needs to run server-side, so you'll need a web server to 'run' PHP scripts.

E.g. **Apache** on Linux or **IIS** on Windows (Internet Information Services)

Why the server?

Centralised infrastructure



How PHP 'compiles' a page

```
<h1>What time is it?</h1>

<p>It's

<?php

echo date("H:i:s");

?>

</p>
```

```
[Buffer]

<h1>What time is it?</h1>

<p>It's

[run code] 12:41:32

</p>

[Send]
```

Vagrant

LAMP

The most common server 'stack' in the world.

Linux operating system computer

Apache web server

MySQL database

PHP scripting language

Vagrant: somewhere to run your PHP

Vagrant is a tool to create and control **virtual machines**; which are virtual computers (guests) that **run on your computer** (hosts).

We'll build and run a virtual LAMP computer with Vagrant.

Demo

Exercise

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Getting setup with Vagrant

Check all is installed with:

```
$ vagrant -v
```

to get:

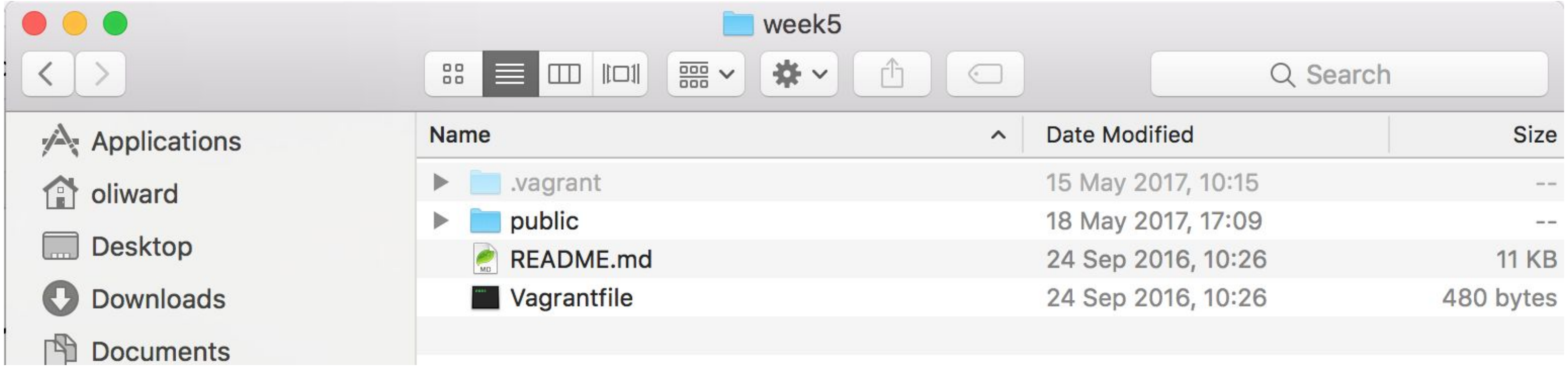
```
Vagrant 2.1.2
```

Setup a new project folder

1. Create a folder for your first PHP project in your projects folder, maybe called "week6"
2. Open cmd/terminal and navigate to this project directory with **$ cd [path to your folder]**

Create your first Vagrant box (virtual machine)

Download Scotch Box, an Ubuntu-based LAMP box, unzip, and put the files into your project folder



Name	Date Modified	Size
.vagrant	15 May 2017, 10:15	--
public	18 May 2017, 17:09	--
README.md	24 Sep 2016, 10:26	11 KB
Vagrantfile	24 Sep 2016, 10:26	480 bytes

Vagrantfile defines what machine that Vagrant will build.

public is where you will put your files (PHP, HTML, CSS)

Turn on your machine (box)

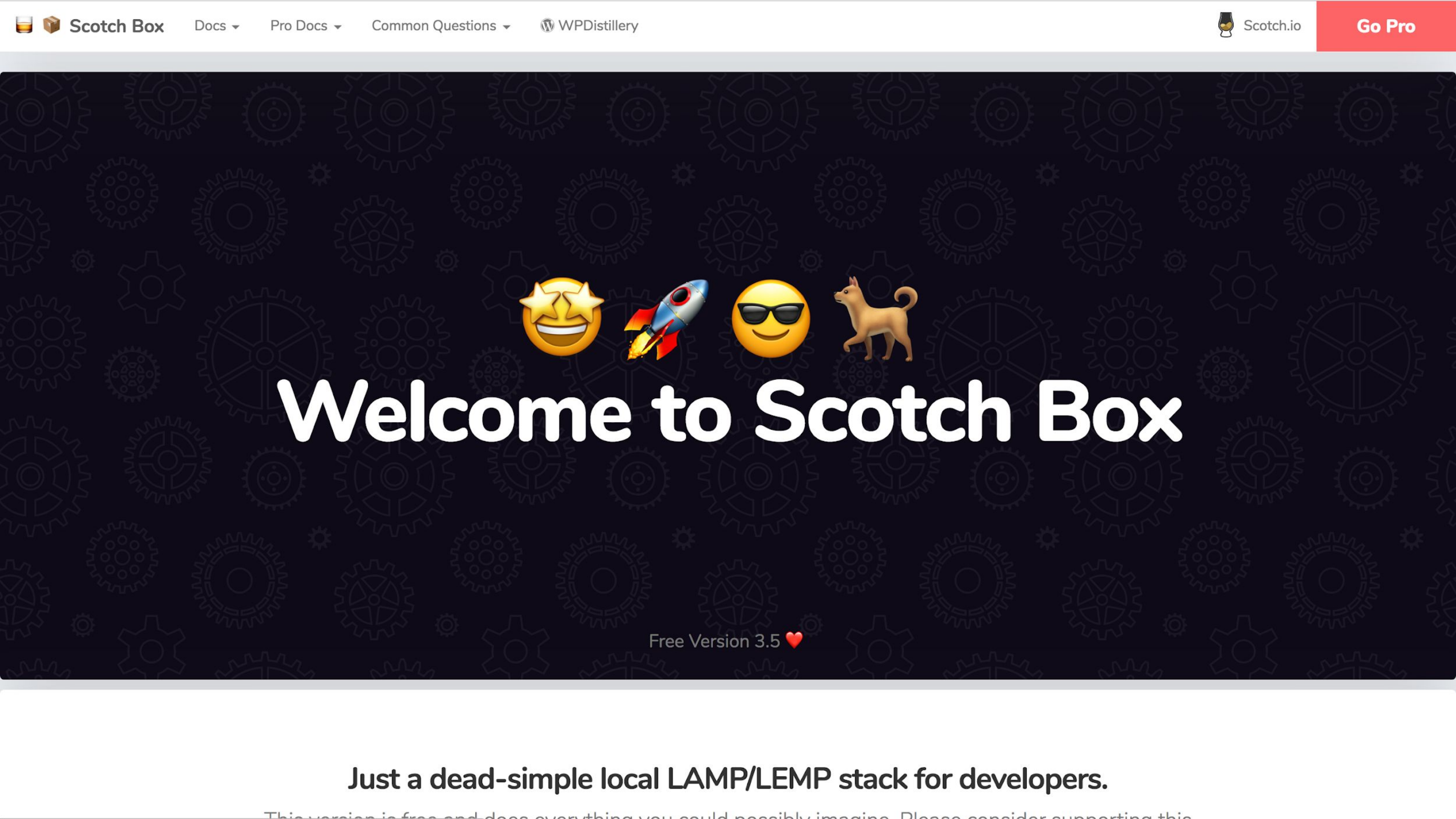
'Spin up' (turn on) your box with:

```
$ vagrant up
```

Test your box is working

1. Visit http://scotchbox

   or on Windows http://192.168.33.10/
2. Verify "Welcome to Scotch Box"



Welcome to Scotch Box

Free Version 3.5 ❤️

Just a dead-simple local LAMP/LEMP stack for developers.

This version is free and does everything you could possibly imagine. Please consider supporting this

Making your own domain (hosts entry)

1) Edit the hosts file on your computer

```
$ sudo nano /etc/hosts
```

2) Add a new entry that resolves to the new box's IP address, e.g.:

```
192.168.33.10    oli.ward
```

3) Save and exit nano with **Ctrl+X** then type **Y** and hit **Enter**

4) Visit your new domain in your browser, e.g.

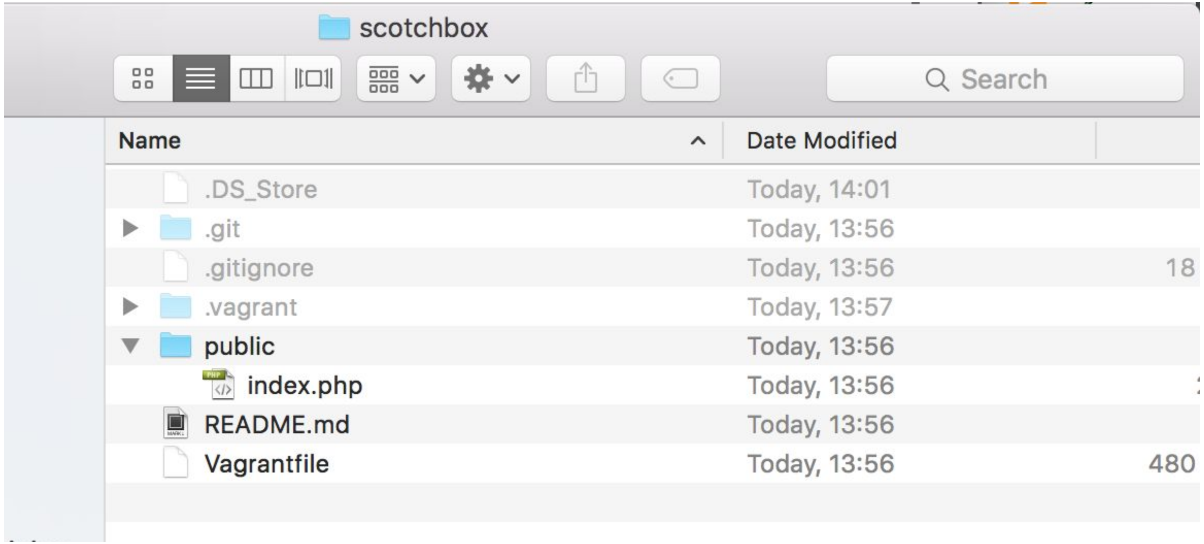
http://oli.ward/

Vagrantfile

Vagrantfile describes the machine

```
# -*- mode: ruby -*-
# vi: set ft=ruby :

Vagrant.configure("2") do |config|

    config.vm.box = "scotch/box"
    config.vm.network "private_network", ip: "192.168.33.10"
    config.vm.hostname = "scotchbox"
    config.vm.synced_folder ".", "/var/www", :mount_options =>
["dmode=777", "fmode=666"]

    # Optional NFS. Make sure to remove other synced_folder line too
    #config.vm.synced_folder ".", "/var/www", :nfs => { :mount_options =>
["dmode=777","fmode=666"] }

end
```

Start changing the files



Name	Date Modified	
.DS_Store	Today, 14:01	
.git	Today, 13:56	
.gitignore	Today, 13:56	18
.vagrant	Today, 13:57	
public	Today, 13:56	
index.php	Today, 13:56	
README.md	Today, 13:56	
Vagrantfile	Today, 13:56	480

Programming with PHP

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Basics

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Syntax

```
<?php                   'open' tag for PHP (PHP code inside is run)

// our first basic programme!   single-line comment

echo 'hello world!';        echo (print) out the statement
                            "hello world!"


?>                         'close' tag for PHP, back to
                           Unprocessed HTML
```

Syntax

```
<?php

// our first basic programme!

echo 'hello world!';


?>
```

semi-colon!!!

Short syntax

```
<?php echo 'hello world!'; ?>
```

```
<p><?php echo 'hello world!'; ?></p>
```

```
<?php echo 'hello'; echo ' world!'; ?>
```

What will the HTML output be when this page is compiled?

```
One<br />

<?php echo 'Two'; ?>

Three<br />

<?php 'Four'; ?>

Five<br />
```

```
One<br />

TwoThree<br />

Five<br />
```

What will the HTML output be when this page is compiled?

```
One<br />
<?php echo 'Two'
echo 'Three' ?>
Four<br />
Five<br />
```

```
One<br />
Parse error: syntax
error, unexpected 'echo'
(T_ECHO), expecting ','
or ';' in
/var/www/public/index.ph
p on line 3
```

Exercise

Create your first PHP file

1. use **echo** to output a string of text
2. save the file as **echo.php** file
3. 'run' the file in the browser and verify the output

Strings

String delimiters

```
<?php

echo "hello world!";

echo 'hello world!';

echo 'Steve\'s Apples';

echo "Steve's Apples";

?>
```

String concatenation

```
echo "hello"." "."world!";

echo "hello"."_"."world!";

echo "h" . "e" . "l" . "l " . "o";
```

Variables

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How PHP does variables

```php
<?php
$count = 3;
$type_of_fruit = 'apples';

echo $count; // how many?
echo ' '; // then a space
echo $type_of_fruit; // now the type of fruit
?>
```

Variable names

```
<?php

$2count = 3; // no

$count2 = 3; // yes

$type of fruit = 'apples'; // no

$type-of-fruit = 'apples'; // no

$type_of_fruit = 'apples'; // yes

$typeOfFruit = 'apples'; // yes
```

Variables in strings: a little trick

```
<?php

$type_of_fruit = 'apples';

echo 'I would like some '.$type_of_fruit.' please';

echo "I would like some $type_of_fruit please";
```

Exercise

Output your name

1. set a variable with your first name

2. set a variable with your surname

3. echo out your full name using the variables

4. save as **name.php**

Data types: strings and integers

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Strings and integers

```
$number = 3;

$text = '3';

$more_text = 'banana';
```

Maths

```
$a = 3;

$b = 4;


echo $a + $b;
```

Exercise

How many seconds in a year?

1. setup variables with number of days in year, hours in day, etc.
2. write an expression which will output the number of seconds in a year, by doing maths on your variables
3. Save as **year.php**

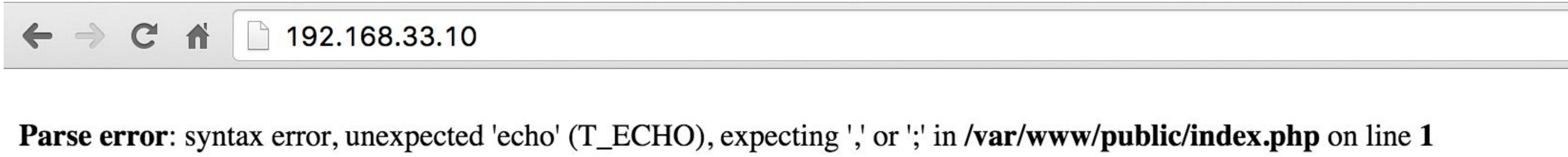
Advanced: How far to the pub?

1. Develop Me's space is at 51.4429178,-2.5693264 (lat, long)
2. The Hare pub is at 51.4411688,-2.6022332
3. Create a PHP script that works out the distance as the crow flies

Errors

Errors happen on the server

May or may not be passed to client to see



Parse error: syntax error, unexpected 'echo' (T_ECHO), expecting ',' or ';' in **/var/www/public/index.php** on line **1**

Errors may not be 'visible'

The server may not pass errors to the user.

So you'll need to access the server error log file to find them.

Error file on Scotch Box

1) SSH into your box:

```
$ vagrant ssh
```

2) Elevate to super-user (all the permissions)

```
$ sudo su -
```

3) View the end (tail) of the error log file:

```
$ tail /var/log/apache2/error.log
```

4) To get out of superuser (back to vagrant user)

```
$ exit
```

5) To get out of vagrant user (back to host machine)

```
$ exit
```

Demo

Logic / conditional statements

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If

```
if (true){
    // do this
}
```

If

```
if (false){
    // not this!
}
```

If

```
if ($today == 'Monday'){
    echo 'I hate Mondays!';
}
```

indentation

If, else

```
if (false){
    // not this!
}else{
    // yes! this!
}
```

If, else

```
if (3 == 4){
    echo 'maths is broken!';
}else{
    echo 'everything is fine';
}
```

If, elseif, else

```
if (false){
    // not this!
}elseif (false){
    // not this!
}else{
    // yes! this!
}
```

Exercise

What month is it?

1. set the numeric month of the year in a variable
2. write conditional statements (if, elseif, else) to test the month variable and give a different output for each month, e.g.

   echo "It's October";

Logical operators

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And, or

```
if ((true) or (false)){

    // do this

}


if ((true) and (false)){

    // not this!

}
```

And (&&), or (||)

```
if ((true) || (false)){
    // do this
}


if ((true) && (false)){
    // not this!
}
```

Logical operators

```
if (($today == 'Friday') && ($hour > 17)){

    echo 'Beer time!';

}
```

Comparison operators

Equals

```
if (3 == '3'){
    echo 'Threes!';
}
```

Not equals

```
if (3 != 4){
    echo 'Maths still works!';
}
```

Identical

```
if (3 === '3'){
    echo 'Not equivalent! ';
}
```

Not identical

```
if (3 !== '3'){
    echo 'Not equivalent! ';
}
```

Less than

```
if (2 < 3){

    echo 'Of course 2 is smaller!';

}
```

More than

```
if (4 > 3){

    echo 'Of course 4 is bigger!';

}
```

Yoda Conditionals

From

```
if ( true == $the_force ) {
    $victorious = you_will( $be );
}
```

```
if (value == $variable){ ...
```

Reduces mistakes

```
$number = 4;

if ($number = 3){

    echo 'Threes!';

}
```

vs.

```
if (3 = $number){    // syntax error

    echo 'Threes!';

}
```

Arrays

Arrays

Store an array of items, which have keys.

```
$days = [
                 'Monday',
                 'Tuesday',
                 'Wednesday'
              ];
```

Arrays

Store an array of items, which have keys.

```
$days = [
             0 => 'Monday',
             1 => 'Tuesday',
             2 => 'Wednesday'
          ];
```

Another array, non-numeric keys

```
$fruit = [
              'green' => 'apple',
              'yellow' => 'banana',
              'red' => 'raspberry'
              ];
echo $fruit['green']; // apple
```

Loops

Loops and arrays

```
$fruit = [
             'green' => 'apple',
             'yellow' => 'banana',
             'red' => 'raspberry'
             ];
```

Accessing values in arrays

```
echo $fruit['green'];
```

Output:

```
apple
```

Other ways to populate arrays

```
$fruit = array();

$fruit['green'] = 'apple';

$fruit['green'] = 'pear';

$fruit['yellow'] = 'banana';

$fruit['red'] = 'raspberry';
```

Foreach, getting key and value

```
foreach($fruit AS $key => $value){

    echo $value.'s are '.$key.'<br />';

}
```

Foreach, getting key and value

```
foreach($fruit AS $colour => $type_of_fruit){

    echo $type_of_fruit.'s are '.$colour.'<br />';

}
```

Foreach, getting just value

```
foreach($fruit AS $type_of_fruit){
   echo $type_of_fruit.'<br />';
}
```

Output

```
apples are green<br />

bananas are yellow<br />

raspberrys are red<br />
```

Exercise

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Where do we live?

1. create an associative array of people and places
2. loop through the array to output in format:

   "Oli lives in Bedminster"

   "Tom lives in Clifton"

   ...

Debugging

Viewing arrays – var_dump($array)

```
var_dump($fruit);

array(3) {
    ["green"]=>
    string(5) "apple"
    ["yellow"]=>
    string(6) "banana"
    ["red"]=>
    string(9) "raspberry"
}
```

Arrays in arrays

Fruit array

```
$fruit = [
             'green' => 'apple',
             'yellow' => 'banana',
             'red' => 'raspberry'
          ];
```

Output

```
apples are green<br />

bananas are yellow<br />

raspberrys are red<br />
```

Nested arrays

```
$fruit = [
              'green' => ['apple', 'apples'],
              'yellow' => ['banana', 'bananas'],
              'red' => ['raspberry', 'raspberries']
          ];
```

```
array(3) {
  ["green"]=>
  array(2) {
    [0]=>
    string(5) "apple"
    [1]=>
    string(6) "apples"
  }
  ["yellow"]=>
  array(2) {
    [0]=>
    string(6) "banana"
    [1]=>
    string(7) "bananas"
  }
  ["red"]=>
  array(2) {
    [0]=>
    string(9) "raspberry"
    [1]=>
    string(11) "raspberries"
  }
}
```

For loops

Iterative loops: for

```
for( $i = 1; $i <= 10; $i++){
    echo $i.'<br />';
}
```

Output

```
1
2
3
4
5
6
7
8
9
10
```

Exercise

Even numbers

1. create a for loop that only outputs the even numbers between 0 and 100.

Advanced: 3 other approaches

1. for the same problem, create 3 other, different versions
2. credit for how unconventional your approach is

While loops

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Research and use 'while'

1. create a while loop that only outputs the odd numbers between 0 and 100.

Switches

Switch

```
$day = 5;

switch($day){
    case 6:
        echo 'Saturday';
        break;
    case 7:
        echo 'Sunday';
        break;
    default:
        echo 'Weekday';
}
```

Switch

```
$day = 5;

switch($day){
    case 6:
    case 7:
        echo 'Weekend';
        break;
    default:
        echo 'Weekday';
}
```

Exercise

Sunrise and sunset

Create a **for loop** that goes through the hours of the day, starting at 0:00. Write a switch statement to print whether it is light or not.
E.g.
"0:00 is dark"

...

"8:00 is light"

...

"23:00 is dark"

Advanced: how short can you make it

How many characters can you do the previous exercise in?

Functions

Functions

Functions can be passed variables, and can do work on them.

They are ways of modularising functionality, for re-use.

Defining your function

```
function format_email($name, $email){
    $formatted = $name . ' <' . $email . '>';

    return $formatted;
}
```

Using your function

```
echo format_email('Oli Ward', 'oli@developme.training');
```

Output:

```
Oli Ward <oli@developme.training>
```

Using your function

```
$output = format_email('Oli Ward',
'oli@developme.training');

echo $output;
```

Output:

```
Oli Ward <oli@developme.training>
```

Exercise

Formatting Twitter handle

1. Create a function that takes Twitter username in any form, e.g.:

   ```
   oliward          → @oliward
   @MR_BUBBLES      → @mr_bubbles
   @hashtag%warrior → @hashtagwarrior
   ```

2. Format and return in form '@oliward' (lowercase)

   Hint: see PHP's built-in strtolower() function and str_replace()

Formatting Twitter handle (Advanced)

Also account for user inputting:

```
https://twitter.com/oliward
http://twitter.com/@oliward
https://twitter.com/oliward#home
```

Homework

1) Formatting credit card numbers

1. Create a function that takes CC numbers in any form, e.g.:

   4111222233334445

   4111 2222 3333 4444

   4111x2222x3333x4444

   4111-2222-3333-4444

   4111-2222-3333-4444-5555
2. Format and return in form '4111-2222-3333-4444'

   Hint: see PHP's built-in substr() function

2) Fizz Buzz

"Write a script that prints the numbers from 1 to 100. But for multiples of three print "Fizz" instead of the number and for the multiples of five print "Buzz". For numbers which are multiples of both three and five print "FizzBuzz""

3) Bonus

Complete PHP Fizz Buzz in fewest characters.

Forms and data

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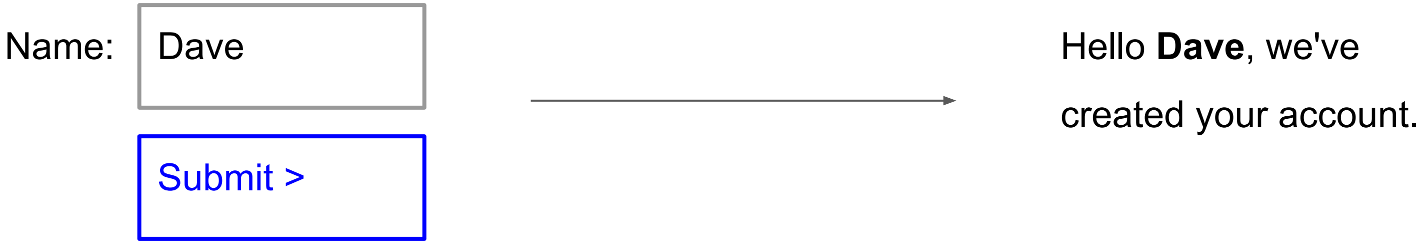
Form process

Form

Submit

Form result / data processing



Name: Dave

Submit >

Hello **Dave**, we've created your account.

Input values

Do something with values

Form process

Form

Submit

Form result / data processing

Search: bananas

Submit >

Input values

Do something with values

Form action

Defines what page will load when on submit

```
<form action="form-handler.php">
    <input type="text" name="email" />
    <input type="submit" value="Send" />
</form>
```

Example process

1. Visit contact.html
2. Fill in form
3. Submit form
4. Form data sent to server, to **form-handler.php** document
5. Server sends response to browser, visitor is now on **form-handler.php** page

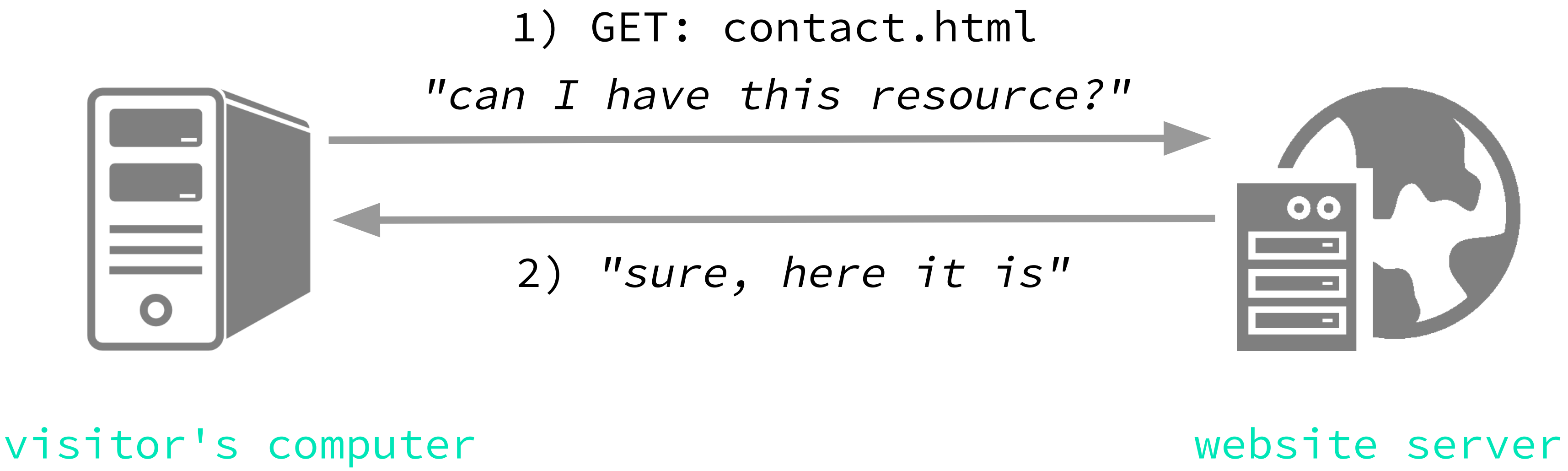
Demo

Form/HTTP methods

HTTP Request Methods: GET and POST verbs

Two most common methods for a request-response between a client and server are:

- GET - Requests data from a specified resource
- POST - Submits data to be processed by a specified resource



1) GET: contact.html

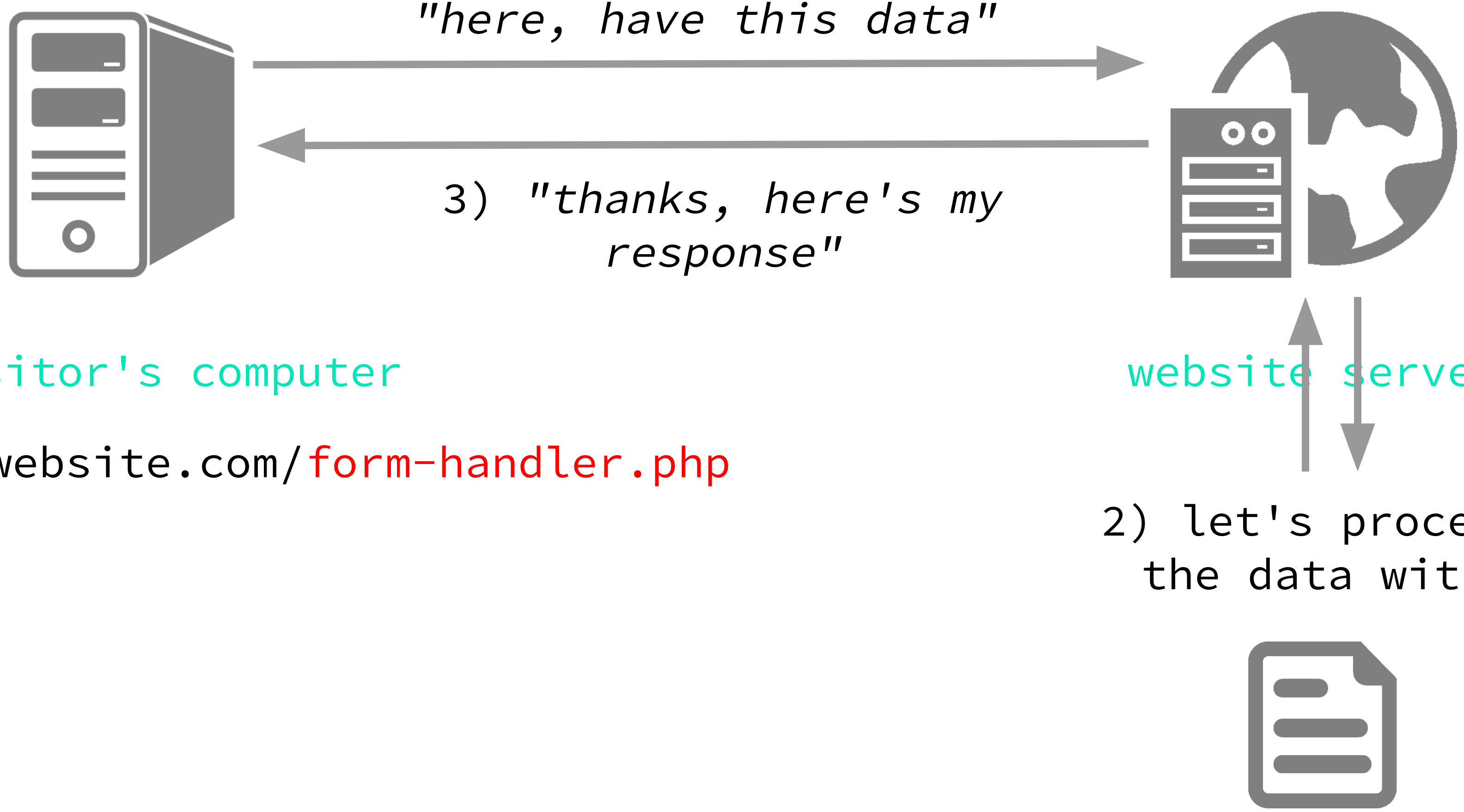
"can I have this resource?"

2) *"sure, here it is"*

visitor's computer

website server

mywebsite.com/contact.html



1) POST: form-handler.php

"here, have this data"

3) *"thanks, here's my response"*

visitor's computer

website server

mywebsite.com/form-handler.php

2) let's process the data with

form-handler.php

POST method

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HTML form with 'POST' method

```
<form action="form-handler.php" method="post">

    <input type="text" name="email" />

    <input type="submit" value="Send" />

</form>
```

Accessing the POST variables

contact.html

```
<input name="email" type="text" />
```

form-handler.php

```
<?php
echo $_POST['email'];
?>
```

Demo

GET method

HTML form with 'GET' method

```
<form action="form-handler.php" method="get">

    <input type="text" name="email" />

    <input type="submit" value="Send" />

</form>
```

Accessing the GET variables from the URL

Visit:

```
http://192.168.33.10/form-handler.php?email=oliward@gmail.com
```

query string parameter

query string parameter value

in document form-handler.php

```
echo $_GET['email'];
```

Output:

```
oliward@gmail.com
```

Demo

Which method to use?

POST

Use if:

- form collects sensitive data, e.g. online shop, creating an account, health data!
- form result/handler page doesn't need to be bookmarkable or shareable

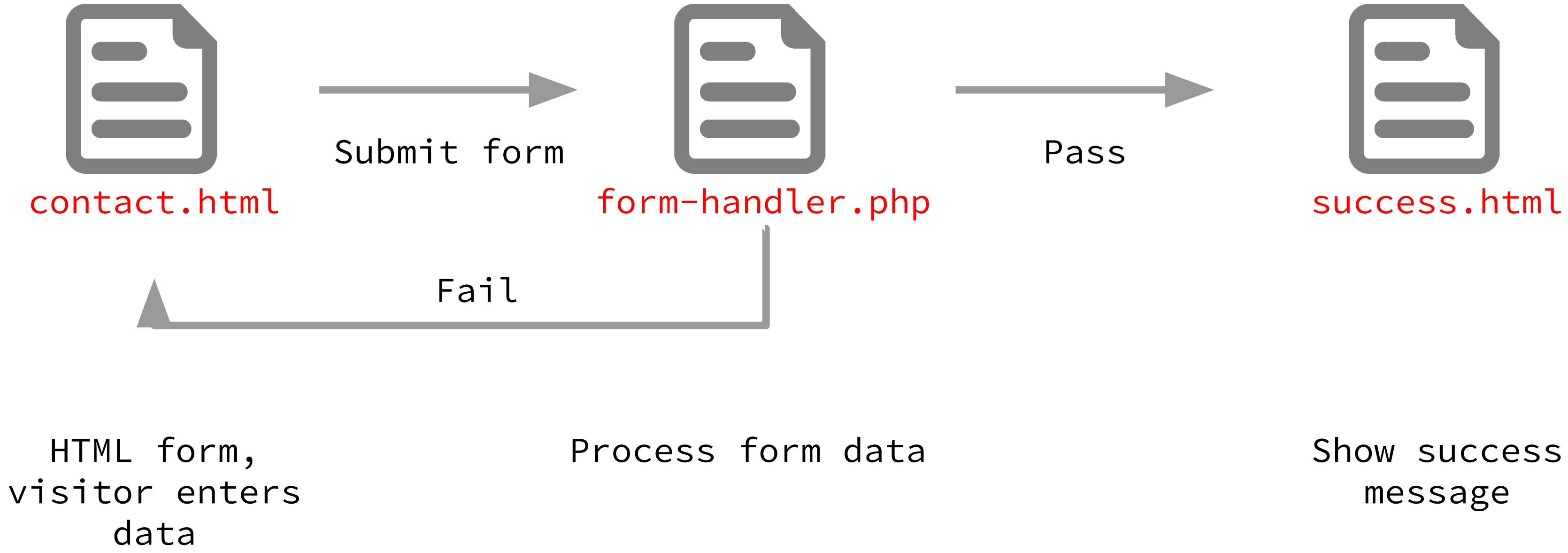
GET

Use if:

- form result page should be bookmarkable or shareable, as values form part of URL
- suitable for:
  - search results
  - filtering content

Single vs. multi page form handling

Multi page/document process



contact.html

Submit form

form-handler.php

Pass

success.html

Fail

HTML form,
visitor enters
data

Process form data

Show success
message

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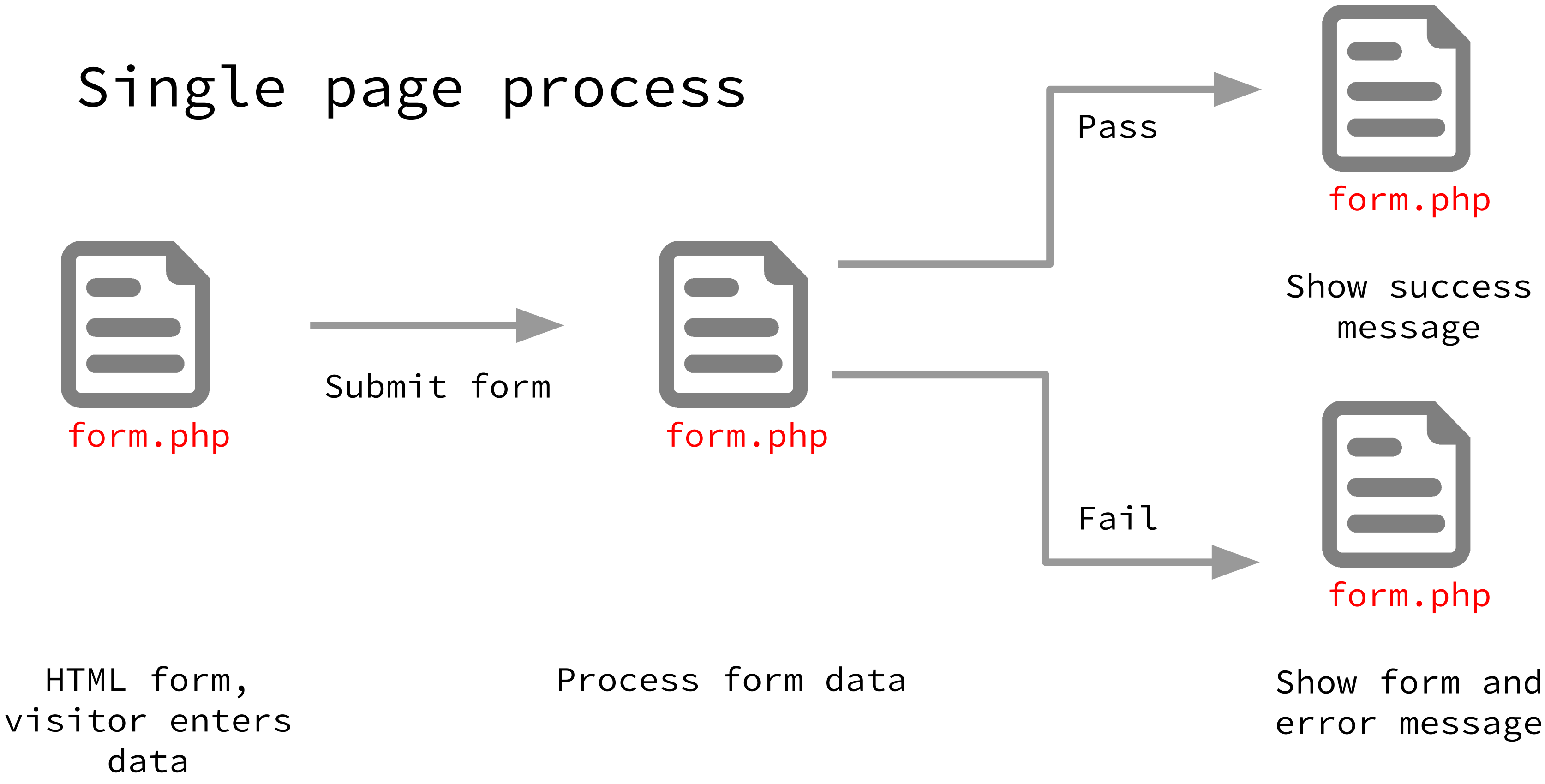
Demo

Single page process



form.php

HTML form,
visitor enters
data

Submit form

form.php

Process form data

Pass

form.php

Show success
message

Fail

form.php

Show form and
error message

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Demo

Building a calculator

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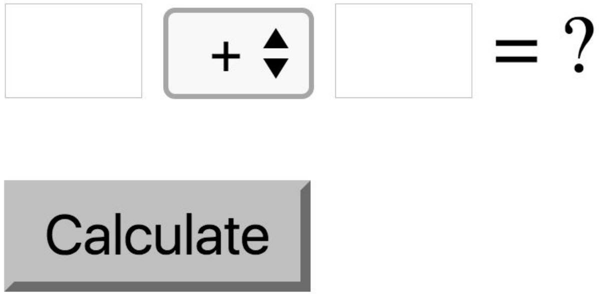
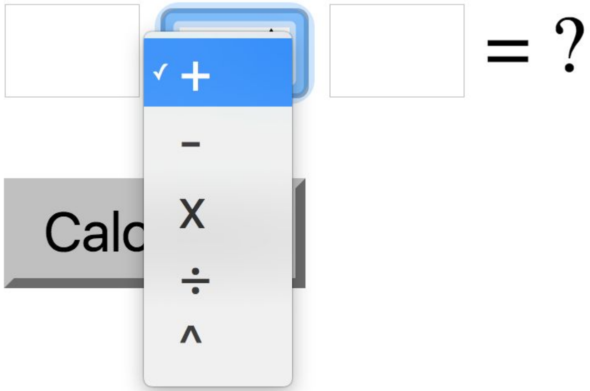
Exercise

Calculator form





Calculator document order (**single page**)

```
<?php

// work out answer here

?>

<form>

[X] + [Y] = output answer here

</form>
```

Calculator exercise steps

1. Build the form. Think about:
   - **action**
   - **method**
   - input **name**s
2. Check you can submit the form and output the values (just echo them out)
3. Start building the functionality to do different calculations

Calculator PHP steps

Need to:

1. check they've submitted the form with:
   `if ($_POST){`
2. get the numbers
3. identify the operation
4. do the maths
5. store the result
6. output the result

Calculator pro features

- Input fields are pre-filled with 0, and assume 0 if left empty
- Answer defaults to '?' before submission of form
- Input fields are repopulated with user input on submission
- Operation dropdown re-selects chosen operation
- Making it look pretty

Calculator show-off features

- a 'tape printout' feature, which remembers all the calculations you've done so far
- implement ALL the scientific operators (sin, cos, tan, √, etc…)
- allow free-form text input (e.g. **((3 + 2) * 4 + 1)**)

Introduction to databases

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Databases

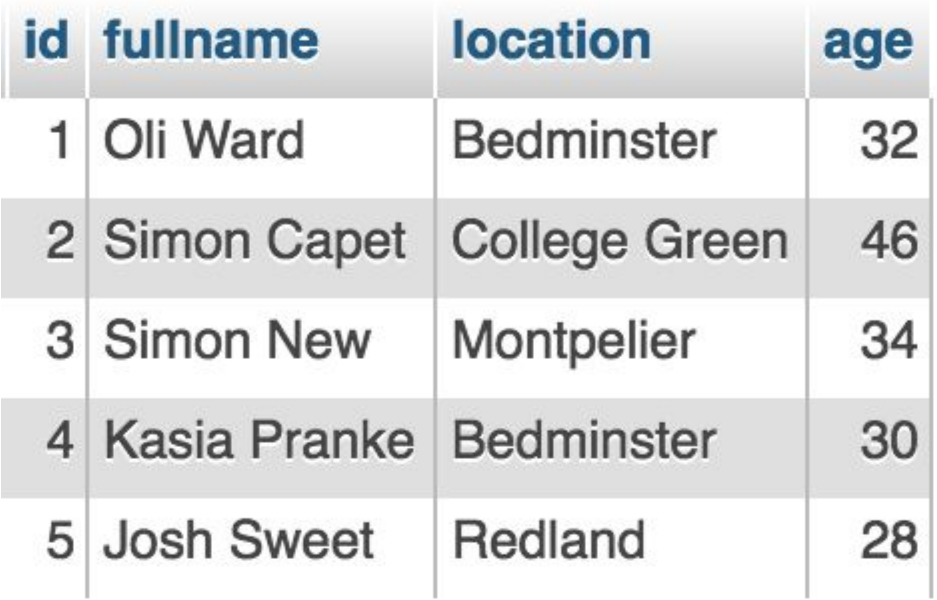
Database	like a spreadsheet document
Table	like a tab or sheet of the document

Table structure

Columns different data fields, e.g. name, age, price

Rows different entries, e.g. people, purchases, products

Table structure, example data



id	fullname	location	age
1	Oli Ward	Bedminster	32
2	Simon Capet	College Green	46
3	Simon New	Montpelier	34
4	Kasia Pranke	Bedminster	30
5	Josh Sweet	Redland	28

Accessing your database

MySQL on your vagrant box

1. SSH into your virtual server:

```
$ vagrant ssh
```

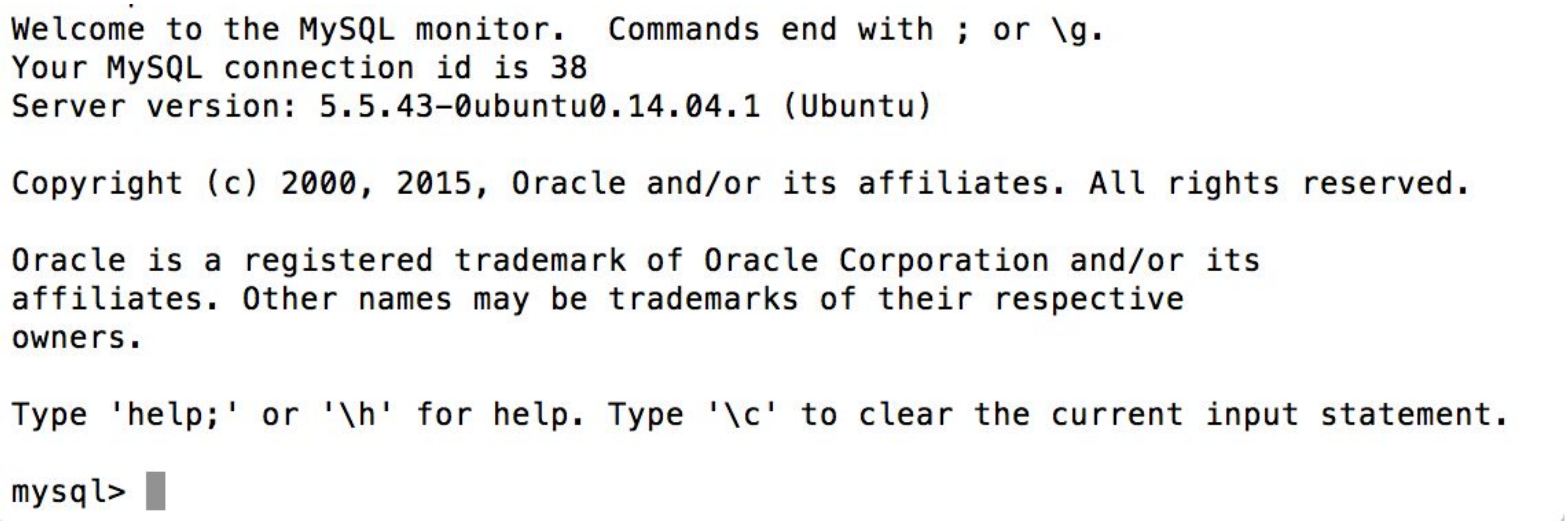
2. access MySQL with the root user account

```
$ mysql -u root -p
```

3. Password is **root**

Or, you can type:

```
$ mysql -u root -proot
```



```
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 38
Server version: 5.5.43-0ubuntu0.14.04.1 (Ubuntu)

Copyright (c) 2000, 2015, Oracle and/or its affiliates. All rights reserved.

Oracle is a registered trademark of Oracle Corporation and/or its
affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> 
```

Demo

Database queries

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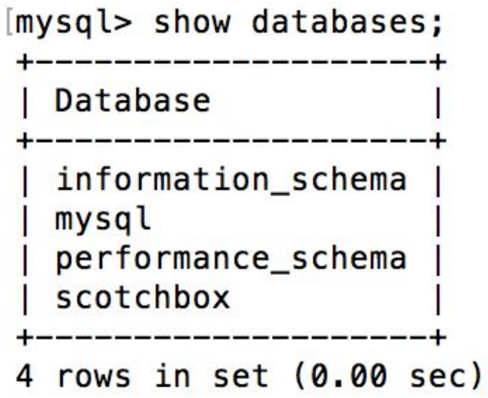
See what databases you have access to

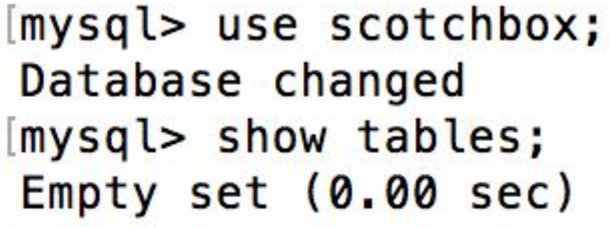
```
mysql> SHOW DATABASES;
```



```
mysql> show databases;
+--------------------+
| Database           |
+--------------------+
| information_schema |
| mysql              |
| performance_schema |
| scotchbox          |
+--------------------+
4 rows in set (0.00 sec)
```

Use 'scotchbox' and see the tables

```
mysql> USE `scotchbox`;

mysql> SHOW TABLES;
```



```
[mysql> use scotchbox;
Database changed
[mysql> show tables;
Empty set (0.00 sec)
```

Creating tables

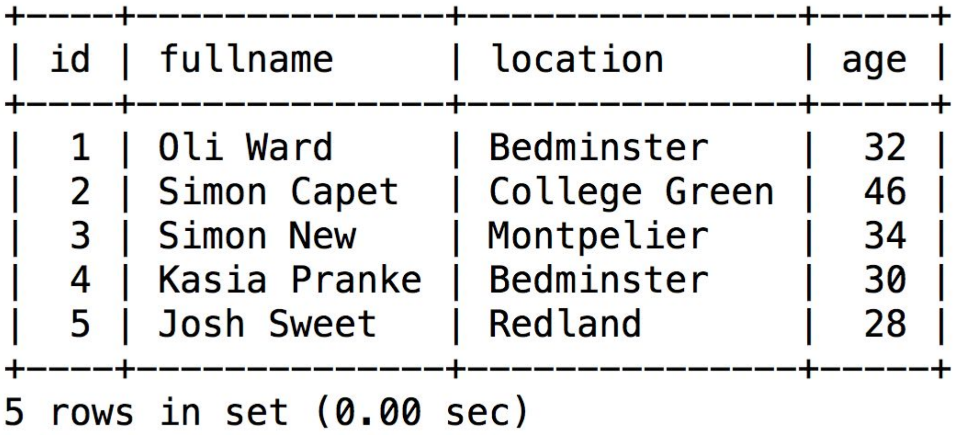
```
CREATE TABLE `test` (
  `id` int(11) NOT NULL AUTO_INCREMENT,
  `fullname` varchar(255) NOT NULL,
  `location` varchar(255) NOT NULL,
  `age` int(11) NOT NULL,
  PRIMARY KEY (`id`)
) ENGINE=InnoDB  DEFAULT CHARSET=latin1
AUTO_INCREMENT=1 ;
```

Populating table with data

```
INSERT INTO `test` (`id`, `fullname`, `location`,
`age`) VALUES
(1, 'Oli Ward', 'Bedminster', 32),
(2, 'Simon Capet', 'College Green', 46),
(3, 'Simon New', 'Montpelier', 34),
(4, 'Kasia Pranke', 'Bedminster', 30),
(5, 'Josh Sweet', 'Redland', 28);
```

Fetch (select) data

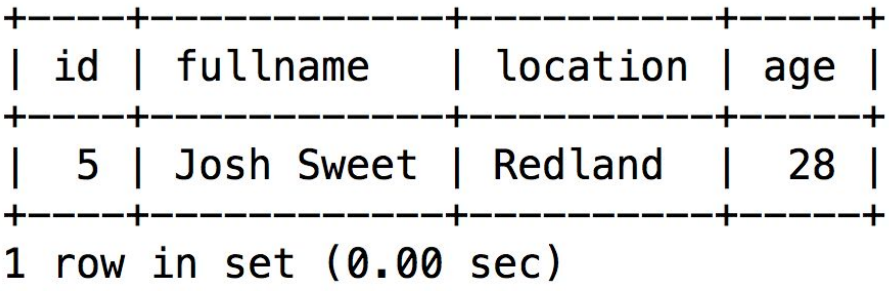
SELECT * FROM `test`;



```
+----+--------------+---------------+-----+
| id | fullname     | location      | age |
+----+--------------+---------------+-----+
|  1 | Oli Ward     | Bedminster    |  32 |
|  2 | Simon Capet  | College Green |  46 |
|  3 | Simon New    | Montpelier    |  34 |
|  4 | Kasia Pranke | Bedminster    |  30 |
|  5 | Josh Sweet   | Redland       |  28 |
+----+--------------+---------------+-----+
5 rows in set (0.00 sec)
```

Fetch (select) data based on a condition

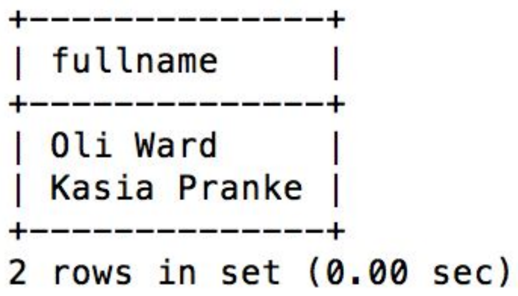
```
SELECT * FROM `test` WHERE `age` < 30;
```



```
+----+-------------+-----------+------+
| id | fullname    | location  | age  |
+----+-------------+-----------+------+
|  5 | Josh Sweet  | Redland   |   28 |
+----+-------------+-----------+------+
1 row in set (0.00 sec)
```

Fetch (select) data based on a condition

```
SELECT * FROM `test` WHERE `location` =
'Bedminster';
```



```
+---------------+
| fullname      |
+---------------+
| Oli Ward      |
| Kasia Pranke  |
+---------------+
2 rows in set (0.00 sec)
```

Exit MySQL

```
mysql> exit
```

Exercise

Populate your database

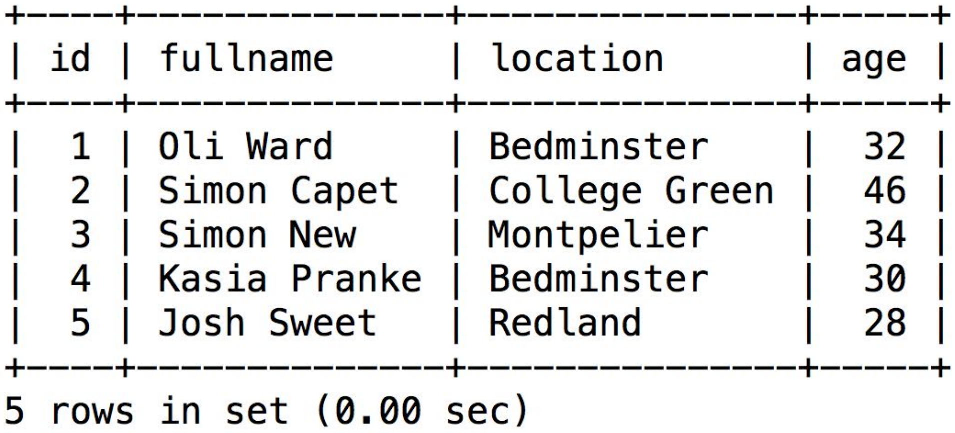
1. SSH into your box, log into MySQL, and set to use `scotchbox` database
2. Download SQL for test table
3. Copy and paste SQL into MySQL prompt
4. Hit 'Enter'
5. Verify tables with:

   ```
   mysql> SHOW TABLES;
   ```

Fetch data using a SELECT query

Example:

SELECT * FROM `table name`;

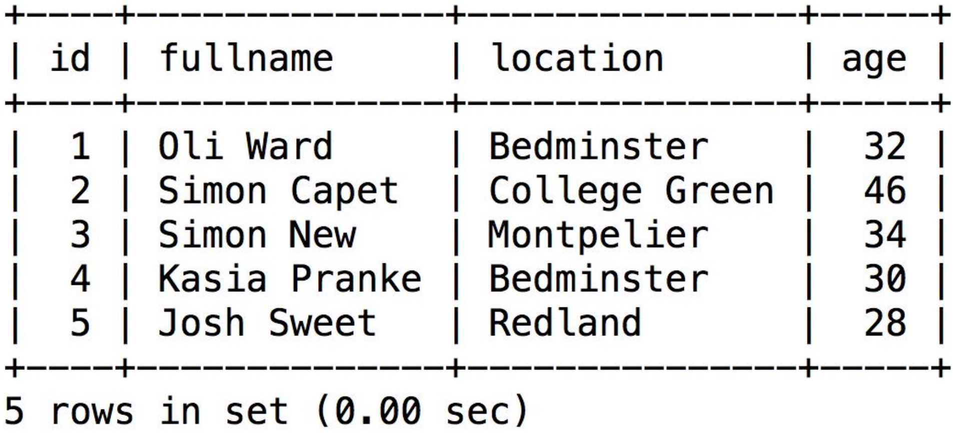


```
+----+--------------+---------------+-----+
| id | fullname     | location      | age |
+----+--------------+---------------+-----+
|  1 | Oli Ward     | Bedminster    |  32 |
|  2 | Simon Capet  | College Green |  46 |
|  3 | Simon New    | Montpelier    |  34 |
|  4 | Kasia Pranke | Bedminster    |  30 |
|  5 | Josh Sweet   | Redland       |  28 |
+----+--------------+---------------+-----+
5 rows in set (0.00 sec)
```

Fetch just the name field using a SELECT query

Example:

SELECT `field name` FROM `table name`;

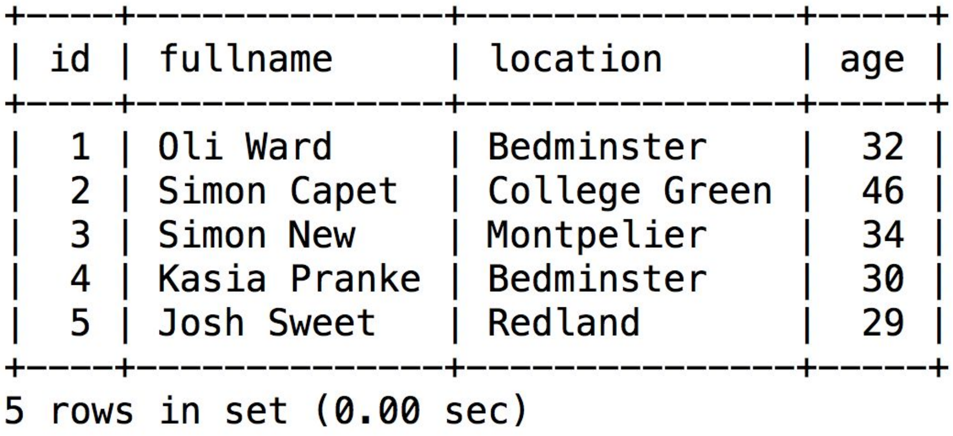


```
+----+--------------+---------------+-----+
| id | fullname     | location      | age |
+----+--------------+---------------+-----+
|  1 | Oli Ward     | Bedminster    |  32 |
|  2 | Simon Capet  | College Green |  46 |
|  3 | Simon New    | Montpelier    |  34 |
|  4 | Kasia Pranke | Bedminster    |  30 |
|  5 | Josh Sweet   | Redland       |  28 |
+----+--------------+---------------+-----+
5 rows in set (0.00 sec)
```

Update Josh's age with UPDATE SQL query

Example:

```
UPDATE `table name` SET `field name` = 'value'
(WHERE `field name` = 'value');
```

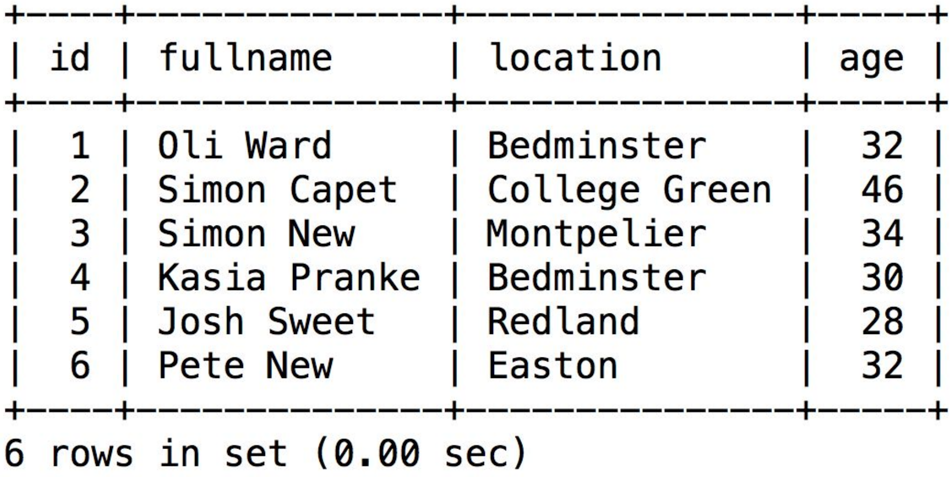


```
+----+--------------+----------------+-----+
| id | fullname     | location       | age |
+----+--------------+----------------+-----+
|  1 | Oli Ward     | Bedminster     |  32 |
|  2 | Simon Capet  | College Green  |  46 |
|  3 | Simon New    | Montpelier     |  34 |
|  4 | Kasia Pranke | Bedminster     |  30 |
|  5 | Josh Sweet   | Redland        |  29 |
+----+--------------+----------------+-----+
5 rows in set (0.00 sec)
```

Add more data for Pete using INSERT query

Example:

```
INSERT INTO `table name` (`field name`, `field name`,
`field name`) VALUES ('value', 'value', 'value');
```



```
+----+---------------+----------------+-----+
| id | fullname      | location       | age |
+----+---------------+----------------+-----+
|  1 | Oli Ward      | Bedminster     |  32 |
|  2 | Simon Capet   | College Green  |  46 |
|  3 | Simon New     | Montpelier     |  34 |
|  4 | Kasia Pranke  | Bedminster     |  30 |
|  5 | Josh Sweet    | Redland        |  28 |
|  6 | Pete New      | Easton         |  32 |
+----+---------------+----------------+-----+
6 rows in set (0.00 sec)
```

SQL rules

"Special" words written in uppercase

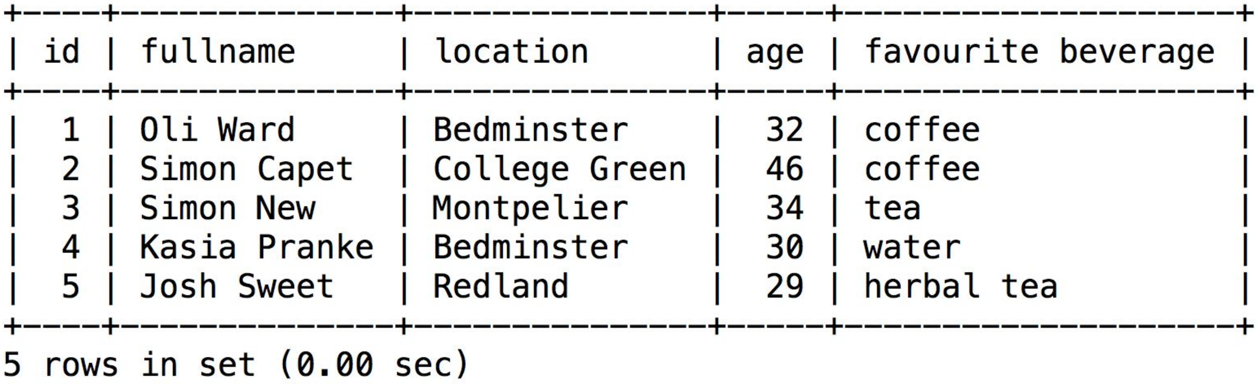
```
USE DATABASE ...;

SELECT * FROM ...;

CREATE TABLE ...;
```

Quotes and backticks

```
`table name`

`field name`

'string value'

"string value"
```

Exercise

Add a new column for 'favourite beverage' and populate with data



```
+----+--------------+---------------+-----+--------------------+
| id | fullname     | location      | age | favourite beverage |
+----+--------------+---------------+-----+--------------------+
|  1 | Oli Ward     | Bedminster    |  32 | coffee             |
|  2 | Simon Capet  | College Green |  46 | coffee             |
|  3 | Simon New    | Montpelier    |  34 | tea                |
|  4 | Kasia Pranke | Bedminster    |  30 | water              |
|  5 | Josh Sweet   | Redland       |  29 | herbal tea         |
+----+--------------+---------------+-----+--------------------+
5 rows in set (0.00 sec)
```

2) Add a new column for 'last updated'

The single column should store the date and time the row was last updated (make these times up!).

There are various data types that are suitable for storing dates and times, so do a bit of research.

3) Create a search query

Find a way of returning just the rows that have `fullname` starting with 'Simon'.

4) Totaling up columns

Find the total age from the rows that have a "t" in the location.

Optional Extra:

1. Make another table to store information about pets owned by the people in our `test` table.
2. Include an `id` field for the pet's id, but also an `owner id` field to relate it back to the people that own them.
3. Add some data (pets) for each person.
4. Try writing some SELECT queries to get a person and their pets in a single query. (Hint: see JOINs)

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Building a login system

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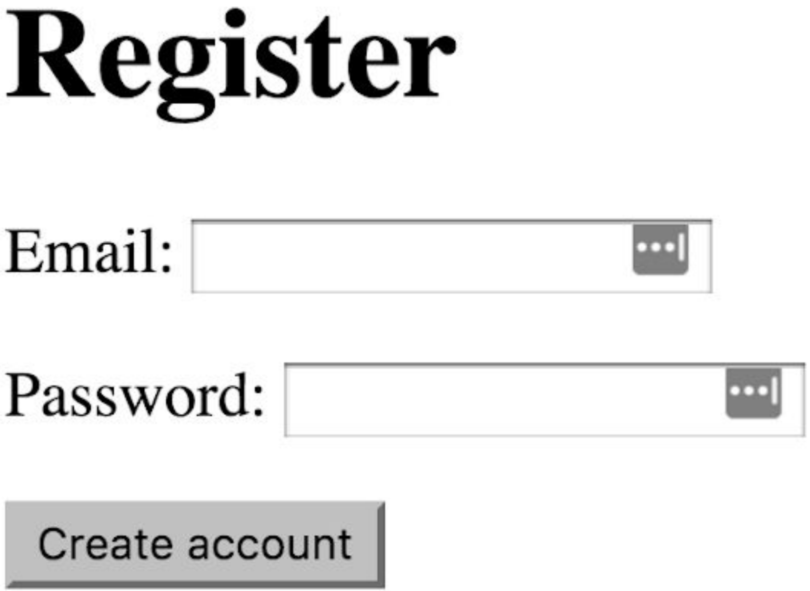
Common account sign up process

1. Register with email and password
2. Verification email sent (best email validation method!)
3. Click link to activate account
4. Login
5. Profit

register.php

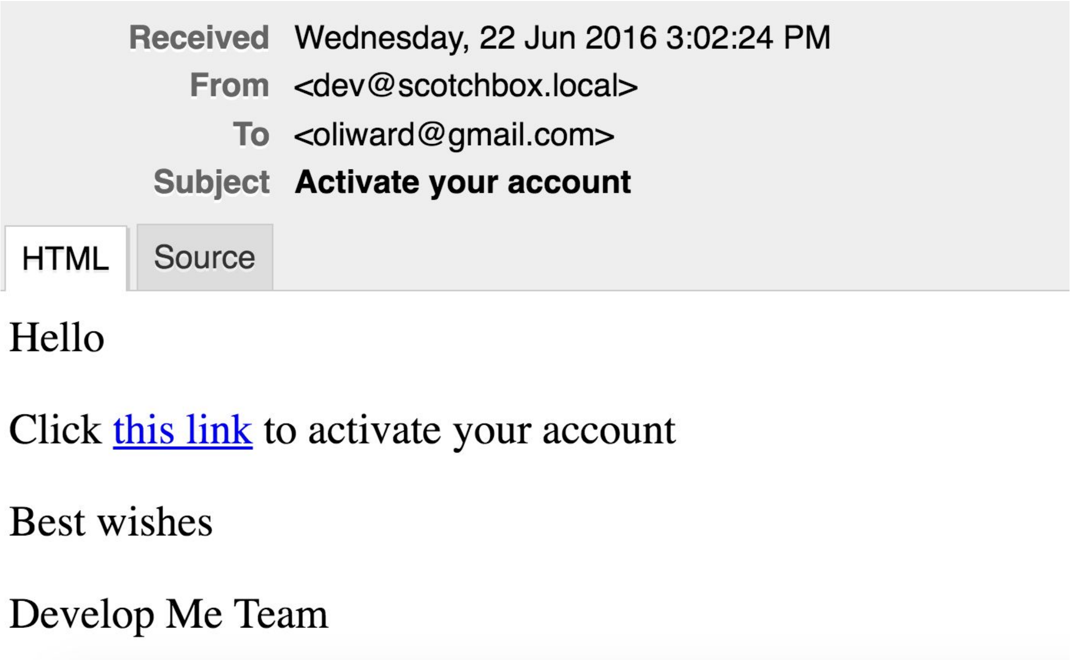


Register

Email:

Password:

Email verification



Received Wednesday, 22 Jun 2016 3:02:24 PM
From <dev@scotchbox.local>
To <oliward@gmail.com>
Subject **Activate your account**

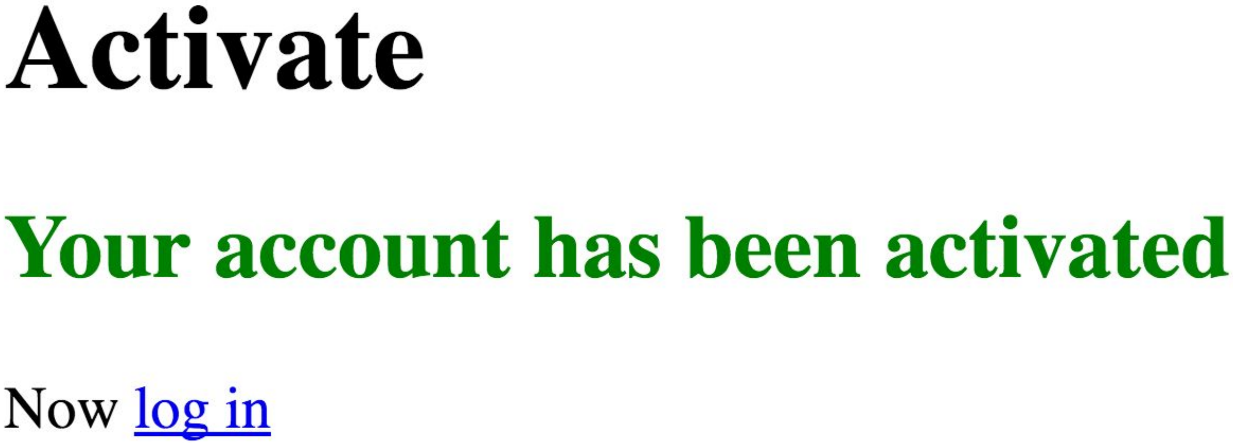
Hello

Click this link to activate your account

Best wishes

Develop Me Team

```
activate.php?code={unique activation code}
```

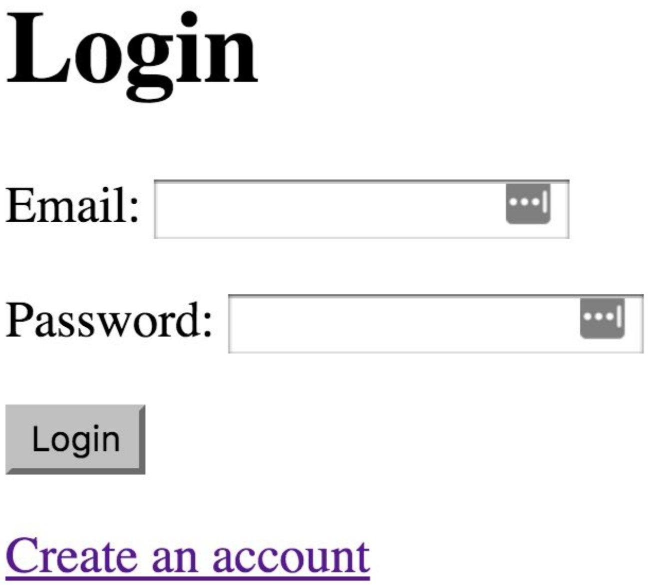


Activate

Your account has been activated

Now log in

index.php

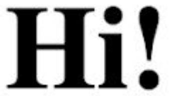


Login

Email:

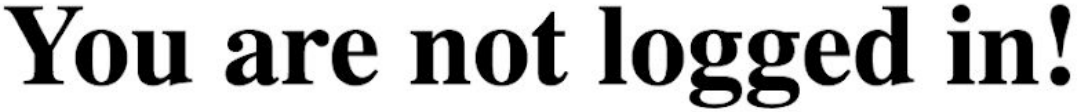
Password:

account.php – when logged in



Hi!

account.php – when logged NOT in



You are not logged in!

Registration handling

What steps do we need on our registration page

Think about the calculator, what steps do we need to code for the registration to work?

Exercise

Live coding

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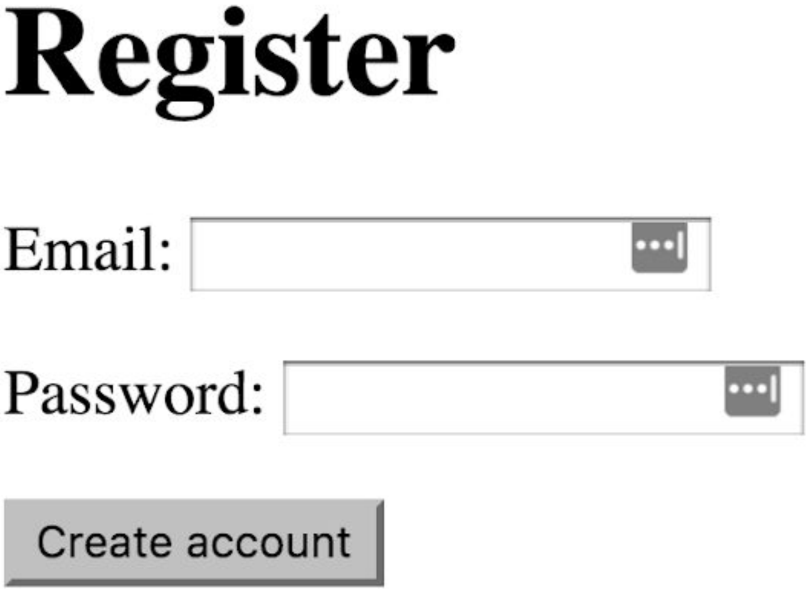
register.php



1. Form
2. PHP form handling
3. Check user input
4. Create an activation code
5. Save in database
6. Send email
7. Success message

Database transactions with PHP

Connecting to the database

Step 1: Connecting to a database

```
$db_server = "localhost";
$db_username = "root";
$db_password = "root";
$db_database = "scotchbox";

// Create connection
$db_connection = new mysqli($db_server, $db_username, $db_password,
$db_database);
```

Step 2: Test connection to the database

```
// Check connection
if ($db_connection->connect_error) {
    die("Connection failed: " . $db_connection->connect_error);
}
```

Sanitising user input

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Step 1: make user data safe

```
$clean_email = mysqli_real_escape_string($db_connection, $email);

$clean_password = mysqli_real_escape_string($db_connection, $password);

$clean_activation_code = mysqli_real_escape_string($db_connection,
$activation_code);
```

Writing database data

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Step 1: build an **INSERT** query

```
$query = "INSERT INTO users (email, password) VALUES
('$clean_email', '$clean_password');";
```

Step 2: run a query through your connection

```
$result = mysqli_query($db_connection, $query);
```

Step 3: checking the query ran okay

```
if ($result){
    // query ran okay
    if (mysqli_affected_rows($db_connection) == 1){
        // and we changed 1 or more rows of data
    }else{
        // Uh oh, something went wrong
    }
}else{
    // Uh oh, query didn't run! A problem with the query
}
```

For reference: how to get **id** of the new row

```
if (mysqli_affected_rows($db_connection) > 0){

    echo 'New record ID is '.mysqli_insert_id($db_connection);

}
```

Reading database data

For reference

You'll need to be able to read data from the database in your activation page

Step 1: build a **SELECT** query

```
$query = 'SELECT * FROM test';
```

Step 2: run the query

```
$result = mysqli_query($db_connection, $query);
```

MySQL result object

```
var_dump($result);

object(mysqli_result)#2 (5) {
  ["current_field"]=>
  int(0)
  ["field_count"]=>
  int(4)
  ["lengths"]=>
  NULL
  ["num_rows"]=>
  int(6)
  ["type"]=>
  int(0)
}
```

Step 3: accessing the result data

```
if (mysqli_num_rows($result) > 0){

    while($row = mysqli_fetch_assoc($result)){

        var_dump($row);

    }

}
```

Row data

```
array(4) {
  ["id"]=>
  string(1) "1"
  ["fullname"]=>
  string(8) "Oli Ward"
  ["location"]=>
  string(10) "Bedminster"
  ["age"]=>
  string(2) "32"
}
array(4) {
  ["id"]=>
  string(1) "2"
  ["fullname"]=>
  string(11) "Simon Capet"
  ["location"]=>
  string(13) "College Green"
  ["age"]=>
  string(2) "46"
}
```

Step 4: outputting row data

```
if (mysqli_num_rows($result) > 0){

    while($row = mysqli_fetch_assoc($result)){

        echo $row['fullname'].' lives in '.$row['location'];

        echo '<br />';

    }

}
```

Securely storing passwords

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Saving hashed passwords

```
$password = 'letmein';

$hashed_password = password_hash($password, PASSWORD_DEFAULT);

// $2y$10$vM29l9nq7wS1V9r7hrWdYOCRxTd8tuNMkwf0ZQE63j3sKfel7GucK

INSERT INTO users
                (email, password)
            VALUES
                ('oli@oli.com',
'$2y$10$vM29l9nq7wS1V9r7hrWdYOCRxTd8tuNMkwf0ZQE63j3sKfel7GucK');
```

Saving the hashed password

password_hash() function produces 60 character hash.

Need 60 characters to store in database*

* although beware http://php.net/manual/en/function.password-hash.php:

> Note that this constant is designed to change over time as new and stronger algorithms are added to PHP. For that reason, the length of the result from using this identifier can change over time. Therefore, it is recommended to store the result in a database column that can expand beyond 60 characters (255 characters would be a good choice).

Checking passwords

If we've hashed password (one way) and stored that in database, how do we know if the given password is correct in future?

With **password_verify()** PHP function.

Checking passwords

So, if we have this stored in database:

```
$2y$10$vM29l9nq7wS1V9r7hrWdYOCRxTd8tuNMkwf0ZQE63j3sKfel7GucK
```

```
$password = $_POST['password']; // = wrongpassword
if (password_verify($password, $row['password'])){ // false
```

```
$password = $_POST['password']; // = letmein
if (password_verify($password, $row['password'])){ // true
```

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Sending email

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PHP's send email function (basic)

```
mail($to_email, $subject, $message);
```

Setting email headers

Headers can optionally be passed to the mail() function to set other attributes.

For example to allow HTML email, set a reply-to address, set the from address, CC or BCC people, etc.

You can use them like this:

```
$headers = "From: Dev Me <team@example.com>\r\n";
$headers .= "Reply-To: Help <help@example.com>\r\n";
$headers .= "MIME-Version: 1.0\r\n";
$headers .= "Content-Type: text/html;\r\n";

mail($to_email, $subject, $message, $headers);
```

MailHog on Scotch Box

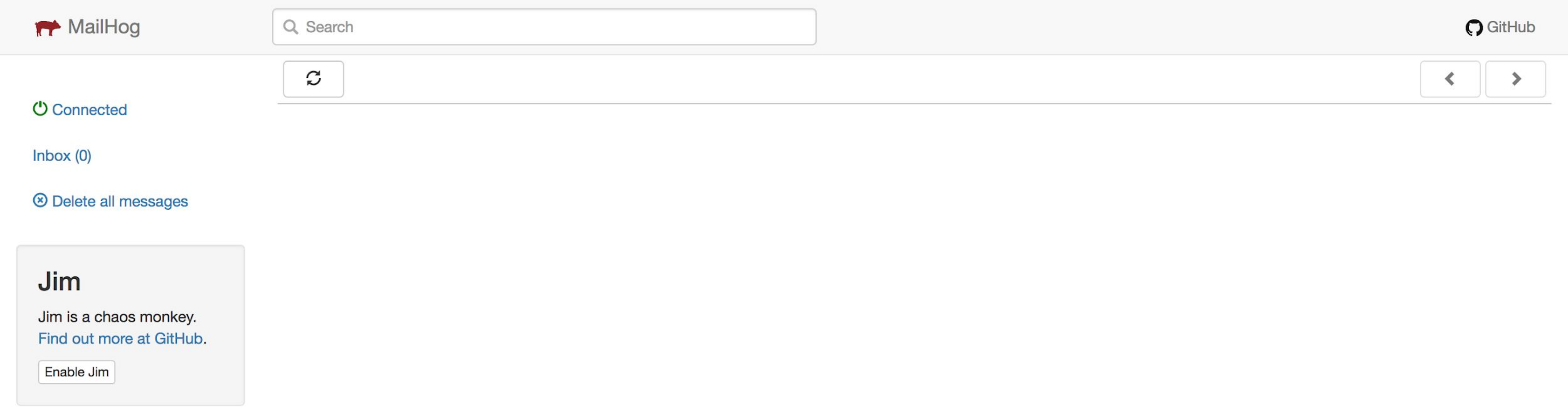
Sending email, especially from a local server, is tricky.

For ease we'll pick up the email on the server instead of sending to an email address.

To see your email inbox visit:
http://192.168.33.10:8025

Or

http://scotchbox:8025



Jim

Jim is a chaos monkey.
Find out more at GitHub.

Common procedural PHP structures

```
<?php
// set initial variables

if (form was submitted){
    // check user input

    if (user input okay){
        // do database stuff
        if (database updated){
            send email
        }
    }
}
if (success){ ?>
    Well done!
<?php }else{ ?>
    <form></form>
<?php } ?>
```

Sessions and cookies

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Storing state

How do we know someone is logged in or not?

We can store data in:

Sessions
data destroyed when browser is closed

Cookies
data saved until deleted by user, or they expire

To use sessions you need to start sessions

```
<?php
session_start(); // start session


$_SESSION['logged_in'] = 'YES'; // use session
```

Setting and accessing session data

```
if ($inputted_password == $password_from_database){

    $_SESSION['logged_in'] = 'YES';

}

if (isset($_SESSION['logged_in'])){
    if ('YES' == $_SESSION['logged_in']){
        echo 'Welcome to your account!';
    }

}
```

Setting and accessing cookie data

```
setcookie ( $name, $value, $expire);


setcookie ( 'logged_in', 'YES', time()+3600);


if ('YES' == $_COOKIE['logged_in']){
    echo 'Welcome to your account!';
}
```

Option extra challenges

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Registration extras

Registration

- Check password strength at registration (greater than 8 characters, must have a letter, number and symbol)
- Check email passes basic validation at registration (use **filter_var()**)
- Check you don't already have that email in your database with an activated account (think about a further check you might want to add to the activation page)

Login page

- Check the user isn't already logged in before showing them the form
- Either redirect them or prompt them to go straight to the account page

Logout page

- Create a page where people can logout, destroying the session or cookie

Forgotten password

- Implement a forgotten password page
- This page should allow people to give their email address and we send them a password reset link (including a unique code) if we find it in the database
- The reset link brings them back to a reset page where they can choose a new password

My account

- Implement an "update your details" page where people can change their password when logged in

Improving the system

- Collect more data from the use, e.g. their name, so we can great them "Hello Dave…" when they arrive on the account page
- Consider: how will we know which user they are after they've logged in?
- Implement **password_hash()** on registration page and **password_verify()** on login page, instead of storing plaintext passwords

Password security

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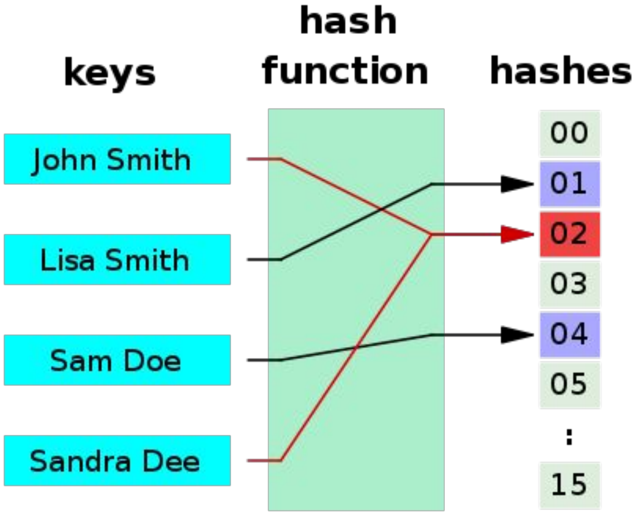
Hashing

Hash functions are 'one-way' transformation of data to data of a fixed size.



PHP hash functions

```
echo md5('letmein'); // 0d107d09f5bbe40cade3de5c71e9e9b7

echo md5('somethingelse'); // 79526cea4dd176949019b2e7dcfe1f8d

echo hash('sha256', 'letmein'); //
34ca062314edaa193e03f318ae20ae134274b358
```

Hashing of data larger than output → collision

```
echo md5('It was the best of times, it was the worst of times, it was the age of
wisdom, it was the age of foolishness, it was the epoch of belief, it was the epoch of
incredulity, it was the season of Light, it was the season of Darkness, it was the
spring of hope, it was the winter of despair, we had everything before us, we had
nothing before us, we were all going direct to Heaven, we were all going direct the
other way – in short, the period was so far like the present period, that some of its
noisiest authorities insisted on its being received, for good or for evil, in the
superlative degree of comparison only.');
```

→ 2f7fbc15df493551692711f6fe30d544

1,532,495,540,865,900,000,000,000,000,000,000,000,000,000,000,000,000,000 outputs

Saving hashed passwords

```
$password = 'letmein';

$hashed_password = password_hash($password, PASSWORD_DEFAULT);

// $2y$10$vM29l9nq7wS1V9r7hrWdYOCRxTd8tuNMkwf0ZQE63j3sKfel7GucK

INSERT INTO users
                (email, password)
            VALUES
                ('oli@oli.com',
'$2y$10$vM29l9nq7wS1V9r7hrWdYOCRxTd8tuNMkwf0ZQE63j3sKfel7GucK');
```

Checking passwords

If we've hashed password (one way) and stored that in database, how do we know if the given password is correct in future?

With **password_verify()** PHP function.

Checking passwords

So, if we have this stored in database:

```
$2y$10$vM29l9nq7wS1V9r7hrWdYOCRxTd8tuNMkwf0ZQE63j3sKfel7GucK
```

```
$password = $_POST['password']; // = wrongpassword
if (password_verify($password, $row['password'])){ // false
```

```
$password = $_POST['password']; // = letmein
if (password_verify($password, $row['password'])){ // true
```

Why is that useful? What if we get hacked?

Username: oli@oli.com

Password: 0d107d09f5bbe40cade3de5c71e9e9b7

Try to log in with these details.

```
$_POST['password'] =
'$2y$10$vM29l9nq7wS1V9r7hrWdYOCRxTd8tuNMkwf0ZQE63j3sKfel7GucK';

echo password_hash($password, PASSWORD_DEFAULT);
→ 95689b85b58c9f2613ef6fd4494c6e3f
```

Hash functions are one-way right?

Right?

Rainbow tables

a	→	0cc175b9c0f1b6a831c399e269772661
b	→	92eb5ffee6ae2fec3ad71c777531578f
c	→	4a8a08f09d37b73795649038408b5f33
d	→	8277e0910d750195b448797616e091ad
aa	→	4124bc0a9335c27f086f24ba207a4912
ab	→	187ef4436122d1cc2f40dc2b92f0eba0
ac	→	e2075474294983e013ee4dd2201c7a73
ad	→	523af537946b79c4f8369ed39ba78605

4124bc0a9335c27f086f24ba207a4912 → aa

1-10 characters (a-z, 0-9) = 316 GB!!!!

Hashing and salting

Add salt to a password, hash that:

```
$password = 'letmein';

$salt = 'RaNd0m!';

$salted_password = md5($password.$salt);
```

Requires hacker to create a rainbow table for every possible password + your salt.

1-10 characters (a-b, 0-9) = 316 GB!!!!

Vagrant hostsupdater without password

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Mac only (sorry)

Run **sudo nano /etc/sudoers.d/vagrant_hostsupdater**

Enter your password

Paste in this text:

```
# Allow passwordless startup of Vagrant with
vagrant-hostsupdater.
Cmnd_Alias VAGRANT_HOSTS_ADD = /bin/sh -c echo "*" >> /etc/hosts
Cmnd_Alias VAGRANT_HOSTS_REMOVE = /usr/bin/sed -i -e /*/ d
/etc/hosts
%admin ALL=(root) NOPASSWD: VAGRANT_HOSTS_ADD,
VAGRANT_HOSTS_REMOVE
```

Then **Ctrl+X** then **y** then **[Enter]** to save changes

Quiz

1) Spot the 13 mistakes

```
<? php
for($I = 1; $I <= 1000; $l++;){
        echo '$I<br />';
}

while($x < 31){
        echo 'Today is the '.$x.'th of June<br/>';
}

echo 'Apple'."<br />";
echo 'Pear',"<br />";
echo "Banana".'<br />' // more fruit ;


if (1==1){
        echo "Maths appears to be working<br />';

        if (2==2){
                echo 'Maths still appears to be working<br />';
        }else{
                echo 'Oh no! Maths is broken!';

}

if (3==3)
        echo 'Yep, maths is still working<br />';

$query = "SELECT FROM users WHERE first_name = 'Oli' AND last_name = 'Ward";
$result = mysqli_query(query);
```

2) Fix these string concatenations

```
$class1 = 'bob';
$class2 = 'sue';
echo '<p><span class="$class1 $class2">"Hello." she said</span></p>";


$protocol = 'https';
$domain = 'developme';
$tld = 'training';
echo "<a href=""".$protocol.'://'$domain.'.'$tld\">Click here!</a>";


$email = 'oliward@gmail.com';
$hashed_and_salted_password = 'i3289';
$salt = 'k3i2o';
$activation_code = "kjk39";
$query = 'INSERT INTO `users` ('email', 'password', 'salt',
'activation_code') VALUES ("$email", '.$hashed_and_salted_password.'",
"'.$salt.'', `$activation_code`);";
```

3) Database functions in PHP

What do these functions do?

mysqli_query()

mysqli_fetch_assoc()

mysqli_num_rows()

mysqli_affected_rows()

mysqli_insert_id()

4) Database queries in PHP

What is **$result** and **$row** in this example? What do they contain if the query in **$query** returns some rows of data?

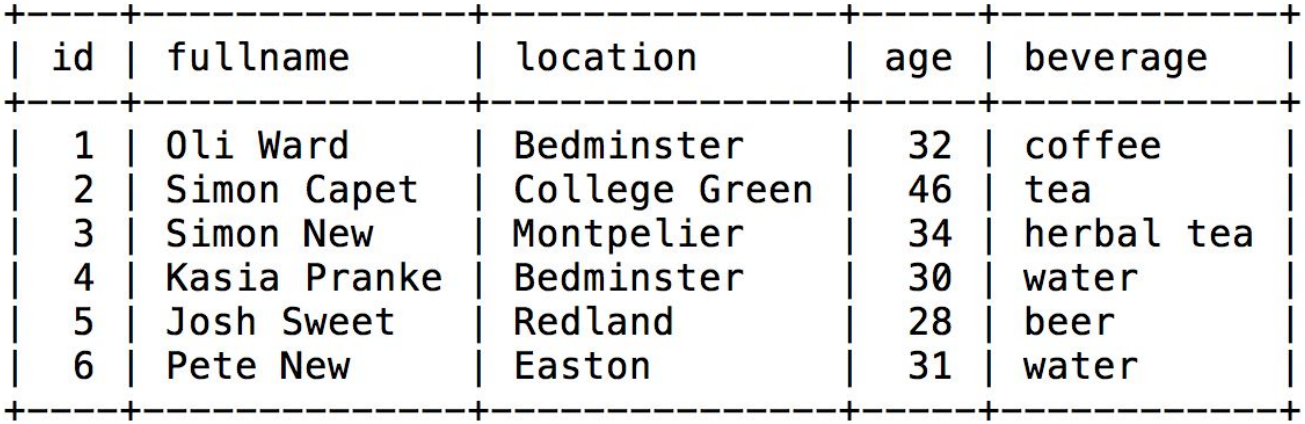
```
$query = "SELECT * FROM users;";

$result = mysqli_query($mysql_connection, $query);

$row = mysqli_fetch_assoc($result);
```

5) SQL

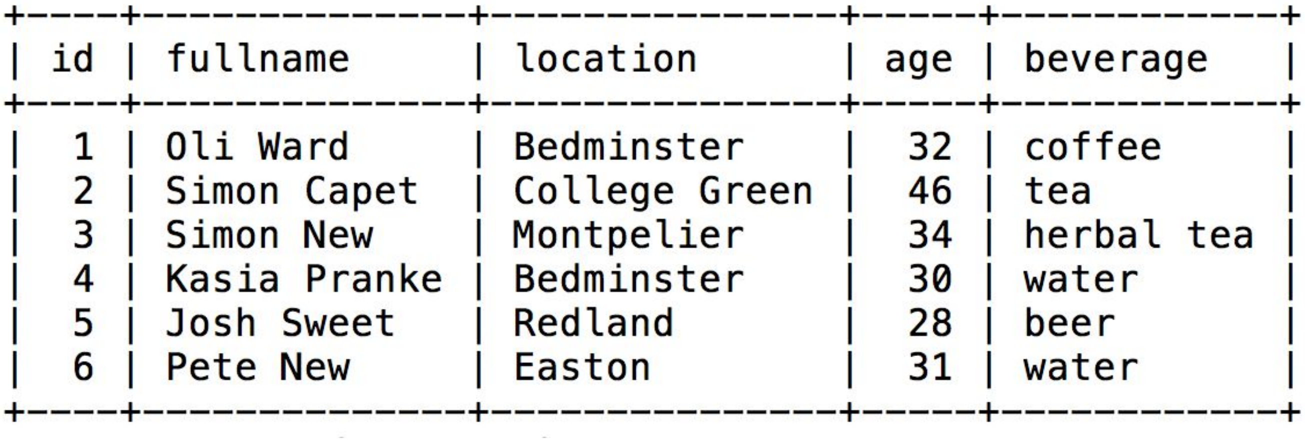
Write an SQL query, to be run on mysql prompt, that finds all the names of people who live in Bedminster and like water from the table **users;**



```
+----+--------------+---------------+-----+-------------+
| id | fullname     | location      | age | beverage    |
+----+--------------+---------------+-----+-------------+
|  1 | Oli Ward     | Bedminster    |  32 | coffee      |
|  2 | Simon Capet  | College Green |  46 | tea         |
|  3 | Simon New    | Montpelier    |  34 | herbal tea  |
|  4 | Kasia Pranke | Bedminster    |  30 | water       |
|  5 | Josh Sweet   | Redland       |  28 | beer        |
|  6 | Pete New     | Easton        |  31 | water       |
+----+--------------+---------------+-----+-------------+
```

6) SQL

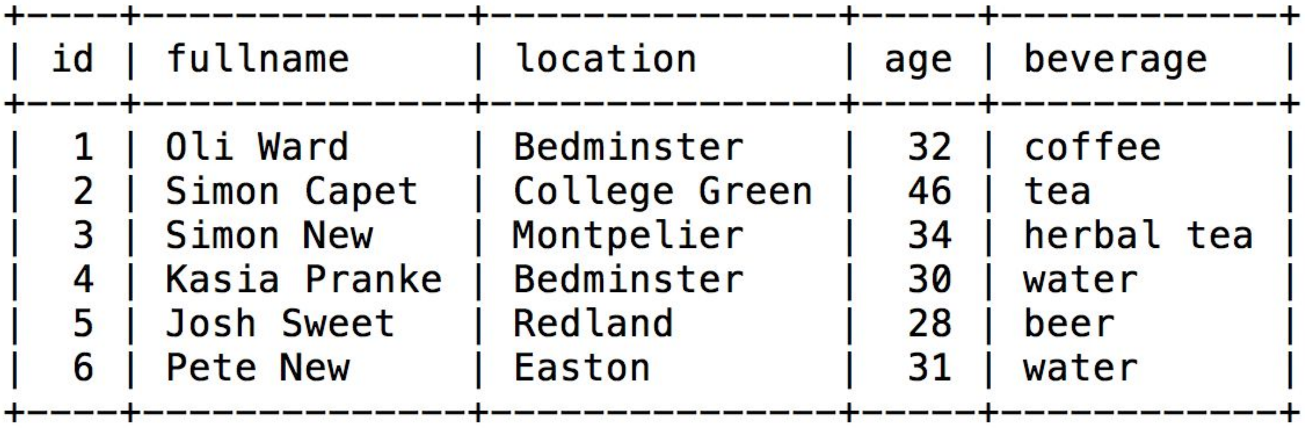
Write an SQL query that finds where people live whose favourite beverage ISN'T water and are over 29 from the table **users**;



```
+----+--------------+---------------+-----+------------+
| id | fullname     | location      | age | beverage   |
+----+--------------+---------------+-----+------------+
|  1 | Oli Ward     | Bedminster    |  32 | coffee     |
|  2 | Simon Capet  | College Green |  46 | tea        |
|  3 | Simon New    | Montpelier    |  34 | herbal tea |
|  4 | Kasia Pranke | Bedminster    |  30 | water      |
|  5 | Josh Sweet   | Redland       |  28 | beer       |
|  6 | Pete New     | Easton        |  31 | water      |
+----+--------------+---------------+-----+------------+
```

7) SQL

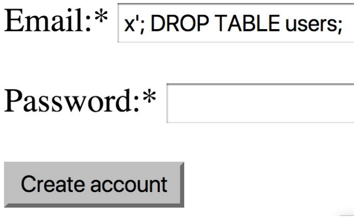
Write an SQL query that finds the total age of people who have an 's' or a 'O' in their name;



```
+----+---------------+-----------------+-----+-------------+
| id | fullname      | location        | age | beverage    |
+----+---------------+-----------------+-----+-------------+
|  1 | Oli Ward      | Bedminster      |  32 | coffee      |
|  2 | Simon Capet   | College Green   |  46 | tea         |
|  3 | Simon New     | Montpelier      |  34 | herbal tea  |
|  4 | Kasia Pranke  | Bedminster      |  30 | water       |
|  5 | Josh Sweet    | Redland         |  28 | beer        |
|  6 | Pete New      | Easton          |  31 | water       |
+----+---------------+-----------------+-----+-------------+
```

8) SQL injection

What would happen if I submitted this form?:



Email:* x'; DROP TABLE users;

Password:*

With this PHP?

```
$email = $_POST['email'];

$query = "SELECT * FROM users WHERE email = '$email';";

$result = mysqli_multi_query($mysql_connection, $query);
```

9) Command line awareness

For each describe "where" I am, and what commands I ran to get there:

1. **`Bill-MacBook:home mac$`**
2. **`vagrant@scotchbox:~$`**
3. **`root@scotchbox:/var$`**
4. **`mysql >`**

10) (optional) bonus string concatenations

```
<?php
$class['paragraph"] = 'content';
$intro = 'hello';
$line1 = 'This is line 1';
$line2 = 'This is line 2';
echo "<p>".$intro"<br>
$line1.'.</p>'.
<p class="$class['paragraph"].'">$line2</p>'; ?>
<script type="text/javascript">
jQuery(document).ready(function(){
     var line1 = [<?php
     $first = true;
     for($i=1;$i < 10;$i++){
          if ($first){
               $first = false;
          }else{
               echo ', ';
          }
          echo '[';
          echo "'".date("Y-m-d", strtotime('2016-10-".$i))". 1:00AM"';
          echo ']';
     } ?>];
});
</script>
```

Thank you.

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Learning for a digital world™

3) Database functions in PHP

What do these functions do?

```
mysqli_query() // runs a query on a database
mysqli_fetch_assoc() // turn a row of the resultset
into an associative array where the key is the
field name and the value is the field value for
that record/row
mysqli_num_rows() // when reading data
mysqli_affected_rows() // when writing data
mysqli_insert_id() // when inserting a new row,
```

1) Spot the 13 mistakes

```
<? php
for($I = 1; $I <= 1000; $l++;){
        echo '$I<br />';
}

while($x < 31){ - not set and not incremented
        echo 'Today is the '.$x.'th of June<br/>';
}

echo 'Apple'."<br />";
echo 'Pear',"<br />";
echo "Banana".'<br />' // more fruit ;


if (1==1){
        echo "Maths appears to be working<br />';

        if (2==2){
                echo 'Maths still appears to be working<br />';
        }else{
                echo 'Oh no! Maths is broken!';

}

if (3==3)
        echo 'Yep, maths is still working<br />';

$query = "SELECT FROM users WHERE first_name = 'Oli' AND last_name = 'Ward";
$result = mysqli_query(query); - no connection, needs to be $query
```

2) Fix these string concatenations

```
$class1 = 'bob';
$class2 = 'sue';
echo '<p><span class="'.$class1.' '.$class2.'">&quot;Hello.&quot; she
said</span></p>';

// output: <p><span class="bob sue">&quot;Hello.&quot; she said</span></p>

$protocol = 'https';
$domain = 'developme';
$tld = 'training';
echo '<a href="'.$protocol.'://'.$domain.'.'.$tld.'">Click here!</a>';

// output: <a href="https://developme.training">Click here!</a>

$email = 'oliward@gmail.com';
$hashed_and_salted_password = 'i3289';
$salt = 'k3i2o';
$activation_code = "kjk39";
$query = "INSERT INTO `users` (`email`, `password`, `salt`, `activation_code`)
VALUES ('$email', '$hashed_and_salted_password', '$salt',
'$activation_code');";
```

4) Database queries in PHP

What is **$result** and **$row** in this example? What do they contain if the query returned data?

```
// run SQL query in $query, $result is populated
with the result of the query, did it run or not
(true or false)

$result = mysqli_query($mysql_connection, $query);

// access each row of data, in the resultset that
resulted from the query above (if there is any
data)
```