Adv Web Dev Arch
Lecture 5

Amir Amintabar, PhD

AJAX Calls

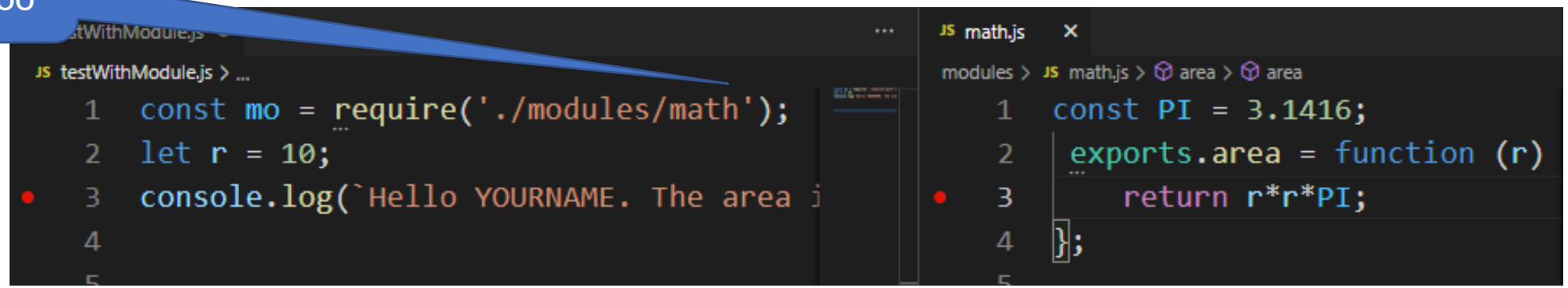
Outline (Building a Typical Web API, AJAX, intro to DB)

- Review
- - AJAX calls
  - Browser uses http methods to send request to server
- - AJAX calls demos
- - AJAX call to remote server
- --- self study for next week
- - Working with a Relational Database (CRUD)
- - Using XAMPP package installer
- - Connecting to mySQL DB using nodejs
- - Hosting Node js, MySQL on remote server

review

- Week 1: **general challenges when developing web app for various devices.** review material (over 120 slides) provided to review HTML, CSS, JS) create objects etc
- Week 2: we defined the term web app architecture, then group-discussed various architecture types in web development, learned about local storage
- Week 3: more intro to JS, timedout, order of execution, event loop, hoisting, var vs let, Anatomy of WebAPIs, intro to RESTful APIs, Microservices, GET vs POST
- Week 4: in js every function returns something nodejs modules

math.**js** Works too



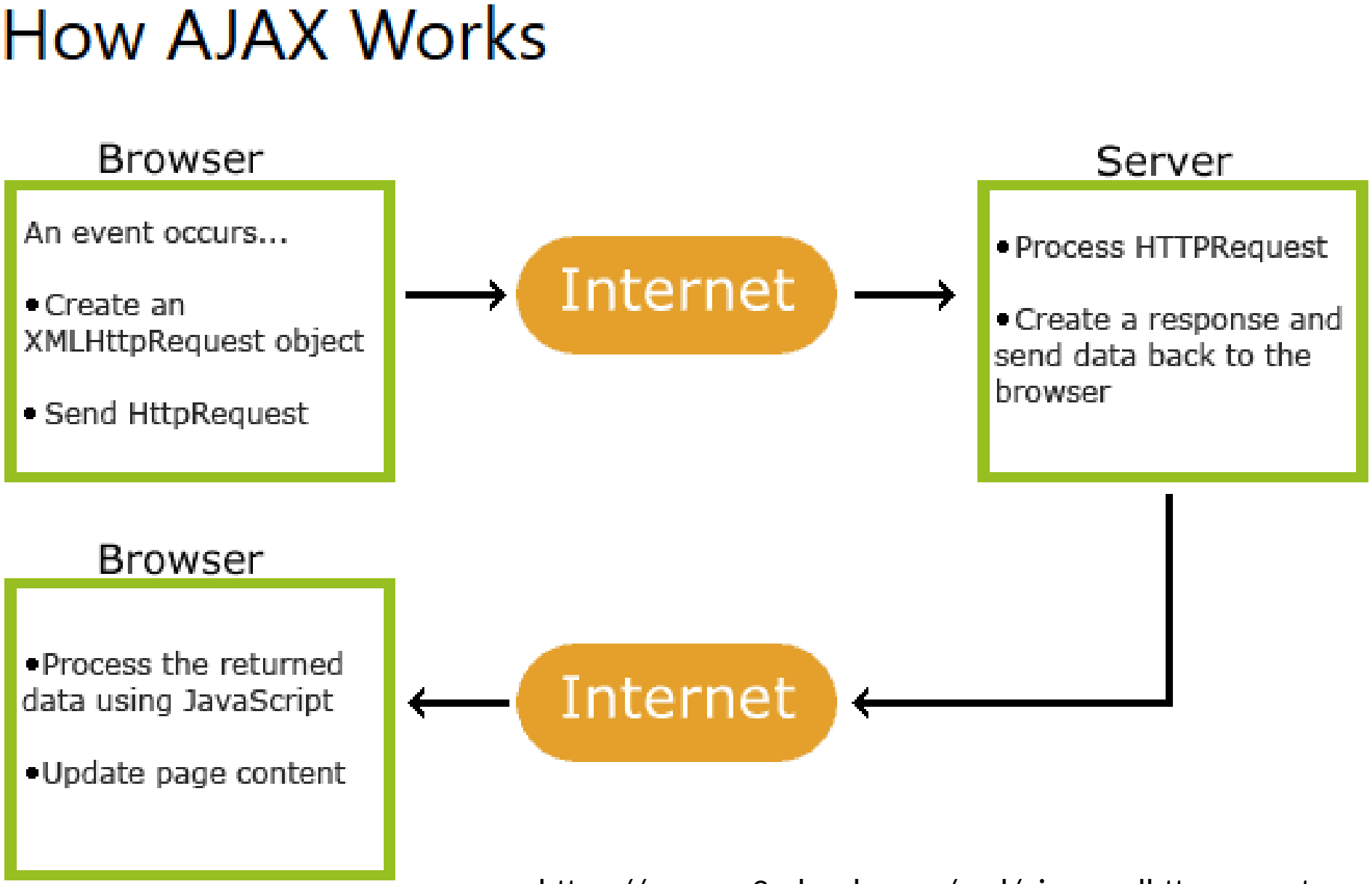
AJAX calls

So far we sent our requests to the server via the **browsers' address bar**!

What if we wanted send requests to servers from within our HMTL pages and not browser address bar?
e.g. to press a button and send something to the server?

You could do that either via forms
or
AJAX calls

- AJAX allows sending request to server



https://www.w3schools.com/xml/ajax_xmlhttprequest_create.asp

- **Here is how we do it at the client side :**
- **1- Create an XMLHttpRequest Object:**
  - (just like the way we created Date object)
  - let xhttp = new XMLHttpRequest();

- **2- specify the function that handles response :**

```
xhttp.onreadystatechange = function () {
    if (this.readyState == 4 && this.status == 200) {
        document.getElementById("demo").innerHTML =
        this.responseText;
    }
};
```

Q: Who determines what status code to return?

status of the XMLHttpRequest :
0 (UNSENT): The XHR object has been created, but open() has not been called yet.
1 (OPENED): open() has been called.
2 (HEADERS_RECEIVED): send() has been called, and the headers of the response are available.
3 (LOADING): The response is being received. As data comes in, the responseText property is updated.
4 (DONE): The operation is complete, and either the request has been successfully completed (status code 2xx) or an error occurred.

3(LOADING) code be updated multiple times to this status if the server is sending a large size of response in multiple chunks

http response type your server script returns:
200: "OK“
3xx: generally used for redirection purposes
4xx: client error (something wrong with your request
403: "Forbidden"
404: "Not Found“ etc)
5xx: server error (something wrong with the server)

- **3- Open AJAX request**
- xhttp.open(method, url, Async or sync);

  - Method type could be GET or POST etc
  - url is the url of the file we want to handle our request

- So what else is left?
- Everything is in place! We just send it and carry on (we don’t wait if we sent it asynchronously)

```
.4-xhttp.send();
```

AJAX call demos

Demo 1

sending AJAX call without any arguments !

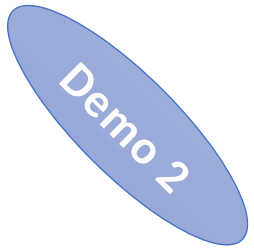
```html
<div id="demo">
    <h1>The XMLHttpRequest Object</h1>
    <button type="button" onclick="myFunc()">
        Change Content</button>
</div>
<script>
    function myFunc() {
        const xhttp = new XMLHttpRequest();
        xhttp.open("GET", "http://localhost:8888/",
            true);
        xhttp.send();
        xhttp.onreadystatechange = function () {
            console.log("hello")
        };
    }
</script>
```

Client: ajax.html

You can also type this url in the browser address bar. Since it's a Get request

Server: app.js

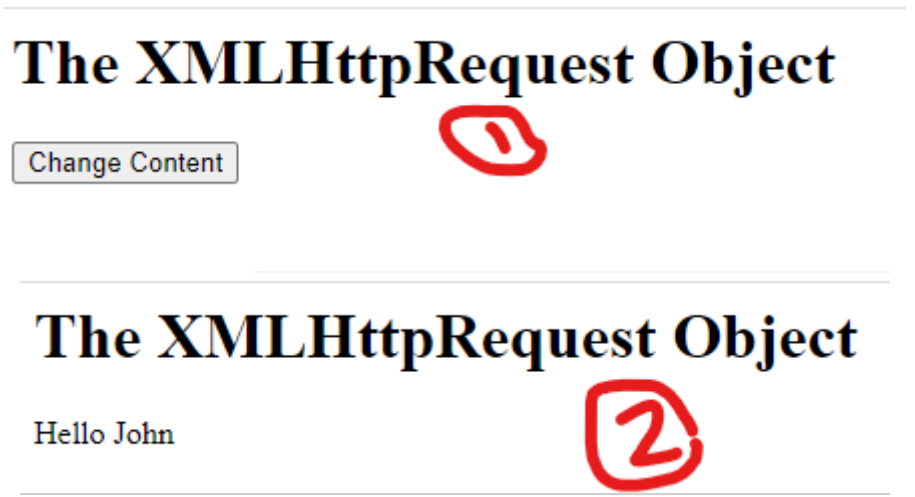
```js
const http = require('http');
http.createServer(function (req, res) {
  console.log("The server recived a request ");
  res.writeHead(200, {
    "Content-Type": "text/html",
    "Access-Control-Allow-Origin": "*"
  });
  res.end("server's response!");
}).listen(8888);
```



sending AJAX call with passing arguments !

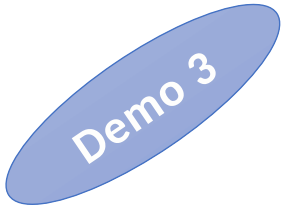
```html
<h1>The XMLHttpRequest Object</h1>
<div id="demo">
    <button type="button" onclick="myFunc()">Change Content</button>
</div>
<script>
    function myFunc() {
        const xhttp = new XMLHttpRequest();
        const str = "John";//"John&age=23"; for multiple parameters
        xhttp.open("GET", "http://localhost:8888/?name=" + str, true);
        xhttp.send();
        xhttp.onreadystatechange = function () {
            if (this.readyState == 4 && this.status == 200) {
                document.getElementById("demo").innerHTML =
                    this.responseText;
            }
        };
    }
</script>
```

Client: ajax.html




```node
let http = require('http');
let url = require('url');
http.createServer(function (req, res) {
  let q = url.parse(req.url, true);
  console.log(q.query); //returns '?name=John'
  res.writeHead(200, {"Content-Type": "text/html",
  "Access-Control-Allow-Origin": "*"});
  res.end('Hello '+q.query["name"]);
}).listen(8888);
```

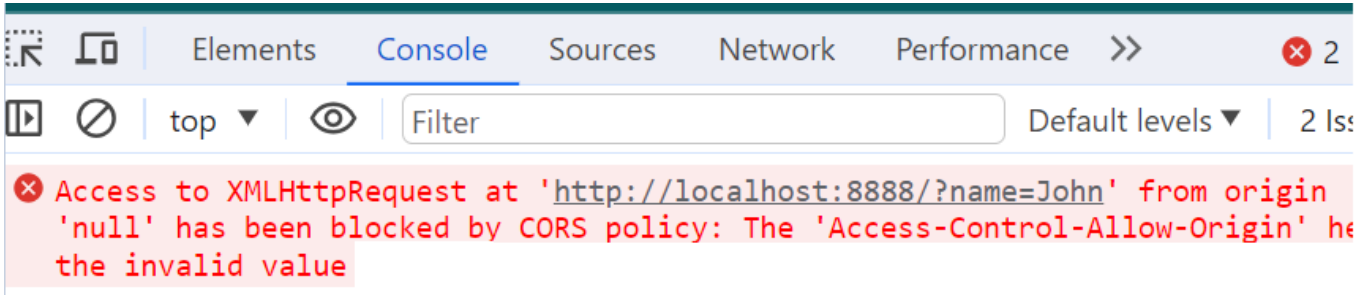
Server: app.js



AJAX call to remote server

Configuring CORS

- Who has seen a similar message?



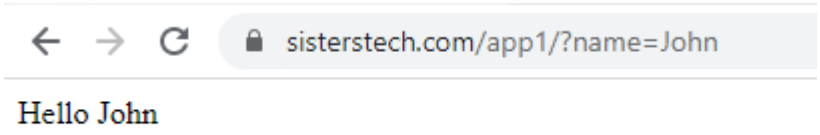
Demo 3

- Last time we tested this:

Editing: /home/sisterst/app1/app.j Encoding: utf-8 Re-open

Keyboard shortcuts

```
1  const http = require('http');
2  const url = require('url');
3  const server = http.createServer(function(req, res) {
4    const q = url.parse(req.url, true);
5    console.log(q.query); //returns the object form of '?name=John'
6    res.writeHead(200, {"Content-Type": "text/html"});
7    res.end('Hello '+q.query["name"]);
8  });
9  server.listen();
```



CORS – when a browser sends a req to a server

- CORS is a security feature **implemented in web browsers** and is **configured by the contacted server** in the response's header to the AJAX requests made via the browser[1]
- CORS (Cross-Origin Resource Sharing)
- By default[2] , web browsers enforce a security policy called "Same-Origin Policy " (SOP) means the html files containing the AJAX requests have to be hosted in the same origin[3] that also hosts the server side scripts, responding to those requests.
- browsers will block[2] the **Cross-Origin Requests** unless **the server being contacted explicitly allows** it

1: requests made mainly via AJAX, (also in most browsers via forms the url address bar).
2: expected behaviour for most browsers
3: An origin is (supposed to be) defined by the combination of domain, protocols and ports (80 is the default for HTTP, 443 for HTTPS)
4: When a web page hosted in originA needs to cross and send requests to a server in another origin, originB

Let's see how a server script configures/dictates CORS for browsers making the requests

Configure the browser CORS in your server side script!

- We now pass one more argument to the writehead () method which creates connection back to the client.
- The **"Access-Control-Allow-Origin" tells the browser** what origins can send requests to this server
- In our case we chose "*" which means **everyone!** all origins around the world Can Send request to this server
- Since we said "Access-Control-Allow-Origin": "*"

server side (node js)

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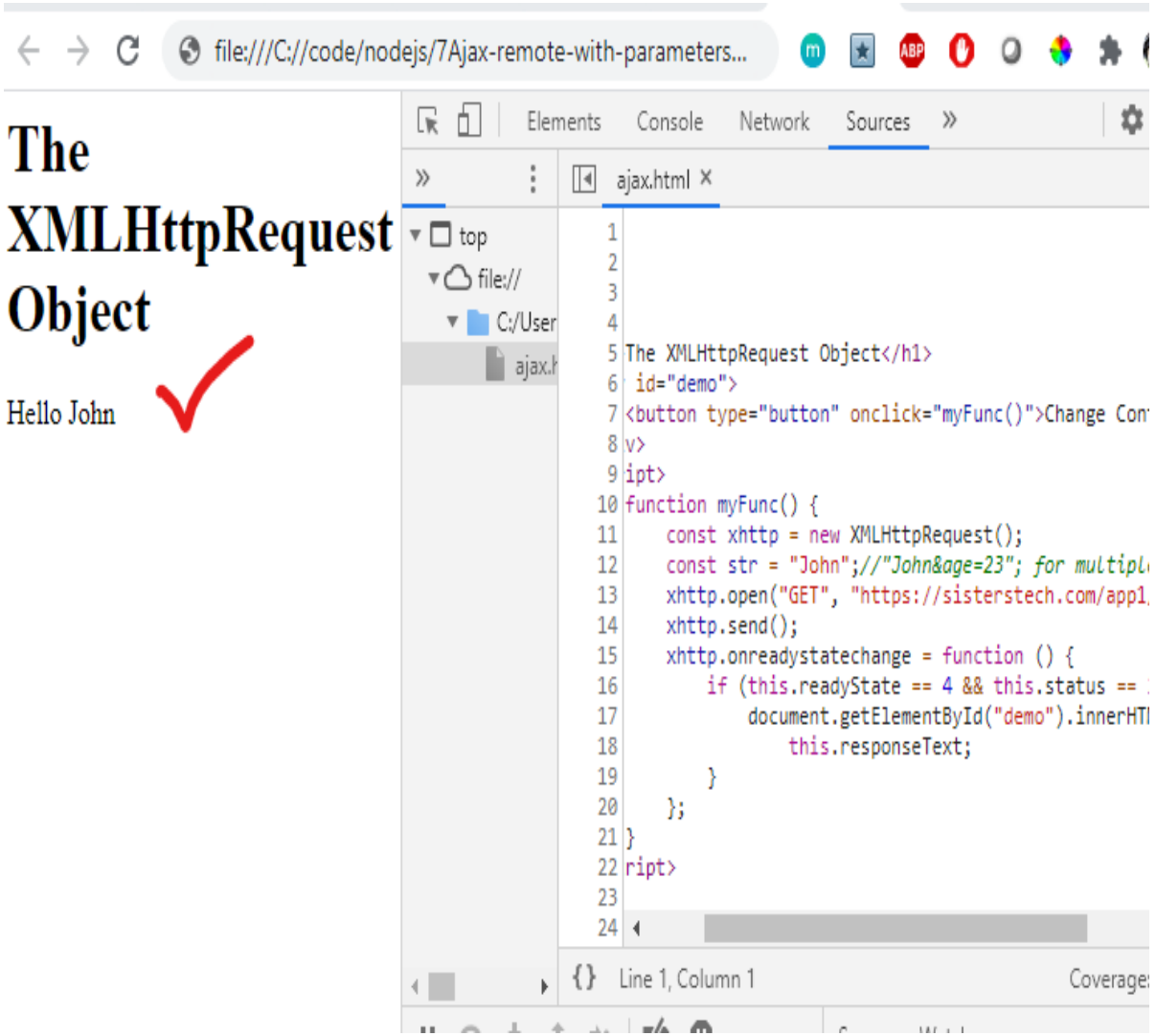
Keyboard shortcuts

```
1  const http = require('http');
2  const url = require('url');
3  const server = http.createServer(function(req, res) {
4    const q = url.parse(req.url, true);
5    console.log(q.query); //returns the object form of '?
6    res.writeHead(200, {
7      "Content-Type": "text/html",
8      "Access-Control-Allow-Origin": "*"
9    });
10   res.end('Hello '+q.query["name"]);
11 });
12 server.listen();
13
```

Client side (HTML Javascript)



Q: What do these two do?

Access-Control-Allow-Methods

Access-Control-Allow-Headers

Q: What is a **Preflight Request** and how is it relevant to the http method OPTIONS

Q: How the http method OPTIONS should be implemented at the server side (what should the server return upon an OPTIONS request?

- Q: Can we send requests to any url and expect respond using Postman regardless of the CORST setting ?

- This statement has been generated by chatGPT 3.5.
  “CORS allows for secure communication between web applications hosted on different domains while still maintaining control over which domains have access. ”
- Q: what seems to be wrong with the above statement?

Demo 4

Ajax call using
POST

POST client side

```
3   <head>
4       <script>
5           function sendRequest() {
6               const name = document.getElementById("name").value;
7               const xhr = new XMLHttpRequest();
8               xhr.open("POST", "http://localhost:3000");
9               xhr.send("name=" + name);
10              xhr.onload = function () {
11                  let response = xhr.responseText;
12                  document.getElementById("result").innerHTML = response;
13              };
14          }
15      </script>
16  </head>
17
18  <body>
19      <input type="text" id="name" placeholder="Enter your name">
20      <button onclick="sendRequest()">Send Request</button>
21      <div id="result"></div>
22  </body>
```

For POST, the query string sits in the body of the request

POST server side

- See how data is
- extracted from the
- POST request ***in chunks***

```
const http = require("http");
const server = http.createServer(function(req, res) {
  // check if the request method is POST
  if (req.method === "POST") {
    if (req.headers["access-control-request-method"]) {
      res.setHeader("Access-Control-Allow-Origin", "*");
      res.setHeader("Access-Control-Allow-Methods", "POST");
      res.end();
    } else {
      let query = "";
      req.on("data", function(chunk) {
        query += chunk;
      });
      req.on("end", function() {
        let params = new URLSearchParams(query);
        let name = params.get("name");
        res.setHeader("Content-Type", "text/plain");
        res.setHeader("Access-Control-Allow-Origin", "*");
        res.write("Hello " + name);
        res.end();
      });
    }
  }
});
// listen on port 3000
server.listen(3000, function() {
  console.log("Server is running on port 3000");
});
```

Demo 4

Ajax call using both POST and GET methods

Client side: POST and GET (ajaxPostGet.html)

- Some variable initializations

ajaxPostGet.html > html > body > script

```
1  <html>
2  <head>
3  </head>
4  <body>
5      <h1>The XMLHttpRequest Object</h1>
6      <button type="button" onclick="post()">POST</button>
7      <button type="button" onclick="getAll()">GET</button>
8
9      <div id="demo">
10         no response yet!
11     </div>
12     <script>
13         const xhttp = new XMLHttpRequest();
14         const endPointRoot = "http://localhost:8888/API/v1/";
15         let params = "?name=John&age=23";// or a json string
16         let resource = "patients/";
```

Client side: POST and GET (ajaxPostGet.html)

- The 'application/x-www-form-urlencoded'
- content type describes form data that is
- sent in a single block in the HTTP message body

- A header is a piece of information about the data sent via HTTP request. It tells the server receiving the request what type of data is enclosed, its formatting, the language used. (If you remember, The server also puts something similar in the head part of the response)
- More than one header can be put on a HTTP request; each in a 'name' and a 'value' pair

```
17    /** send() accepts an optional parameter which lets you specify the request's body;
18   this is primarily used for requests such as POST, PUT. If the request method is GET
19    or HEAD, the body parameter is ignored and the request body is set to null.
20    **/
21        function post() {
22            xhttp.open("POST", endPointRoot + resource, true);
23            xhttp.setRequestHeader("Content-type", "application/x-www-form-urlencoded");
24            xhttp.send(params);
25            xhttp.onreadystatechange = function () {
26                if (this.readyState == 4 && this.status == 200) {
27                    document.getElementById("demo").innerHTML =
28                        this.responseText;
29                }
30            };
31        }
32        function getAll() {
33            const url = endPointRoot + resource + params;
34            xhttp.open("GET", url, true);
35            xhttp.send();
36            xhttp.onreadystatechange = function () {
37                if (this.readyState == 4 && this.status == 200) {
38                    document.getElementById("demo").innerHTML =
39                        this.responseText;
40                }
41            };
42        }
```

For POST, the query sits in the body of the request

Server side: POST and GET (serverPostGet.js)

- Note the differences between handling a GET request and a POST request
- See how data is extracted from the POST request ***in chunks***

serverPostGet.js > http.createServer() callback

```
const http = require('http'); const url = require('url');
const GET = 'GET'; const POST = 'POST';
const endPointRoot = "/API/v1/";
http.createServer(function (req, res) {
    res.writeHead(200, {
        "Content-Type": "text/html",
        //all origions can send request to this server
        // is this really a good practice?
        "Access-Control-Allow-Origin": "*",
        "Access-Control-Allow-Methods": "*"
    });
    console.log(req.headers);
    if (req.method === GET) {
        const q = url.parse(req.url, true);
        // here you fetch some data from DB
        res. end(`Hello  ${q.query["name"]}.
        GET all request is recvied!`);
    }
    if (req.method === POST && req.url === endPointRoot + 'patients/') {
        let body = "";
        /* req.on('data' gets called when something has been read
        from the stream */
        req.on('data', function (chunk) {
            if (chunk != null) {// you need to check this if
                body += chunk;// data may come in multiple chunks
            }
        });
        /*req.on('end' gets called when stream has ended
        ( all data from cleint has arrived to server)*/
        req.on('end', function () {
            let q = url. parse(body, true);
            res.end(`Hello: ${q.query.name}, we got your POST request`);
        });
    }
}
).listen(8888);
```

In the context of HTTP methods and Cross-Origin Resource Sharing (CORS), what is a "preflight request,“?

- Disclaimer: It’s the students' responsibility to write their own code.
- Codes provided in lecture notes are just samples to get students a head start .

Working with a Relational Database

Content from this point onward are to be self studied for the next week . . .

CRUD

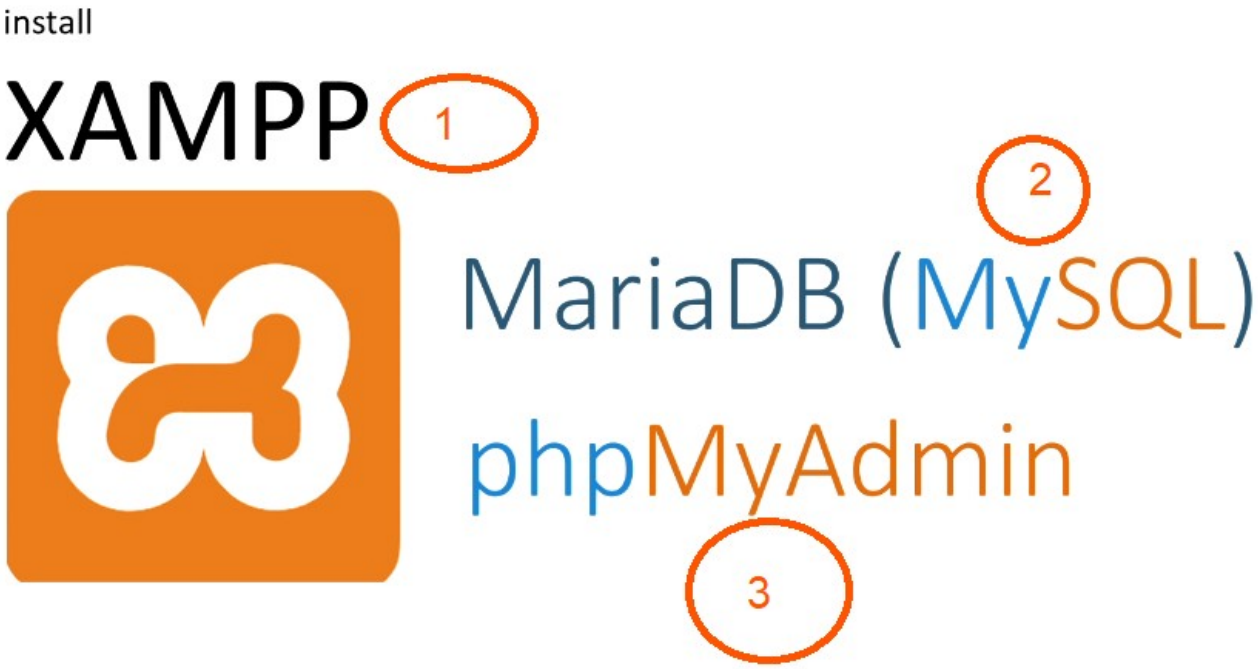
- This week we will discuss how to connect node js to a relational DB such as MySQL server (the free open source version is called MarinaDB)
- We will learn how to run SQL queries which can be used to
- **C**reate a table or DB
- **R**ead from a DB
- **U**pdate records on a DB
- **D**elete a record or Drop a table
- All of this operation with DB all referred as CRUD in brief
- In this lecture we focus on the node js part mostly assuming writing SQL statement is covered in your term 2 DB course

Introduction

to Connecting to DB using node js on your **PC**

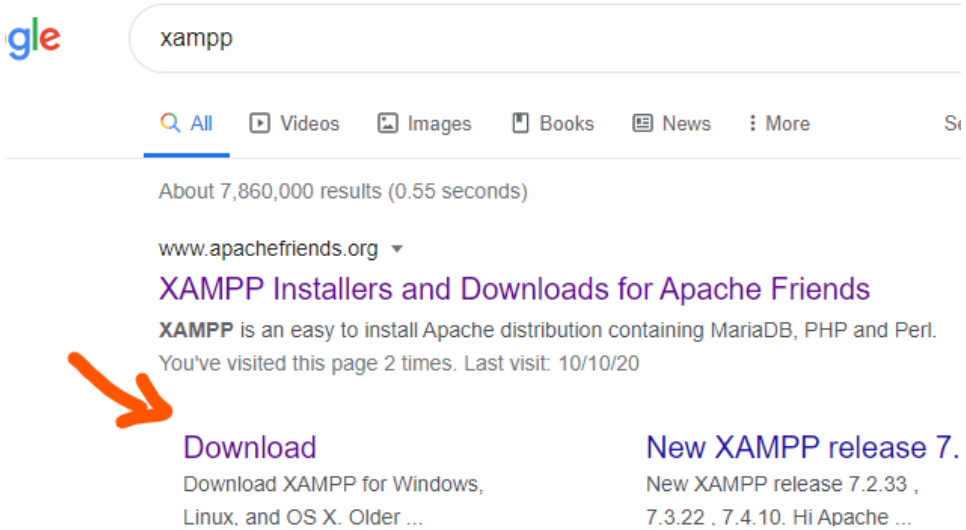
Using XAMPP package installer

- You need a DB engine that runs SQL statements for you
- And a DB administrative tool like an editor on which you could write your SQL statements and see result visually
- 1- XAMPP installs both
- 2- The DB engine (mySQL)
- 3- And DB admin tool (phpMyAdmin)
-

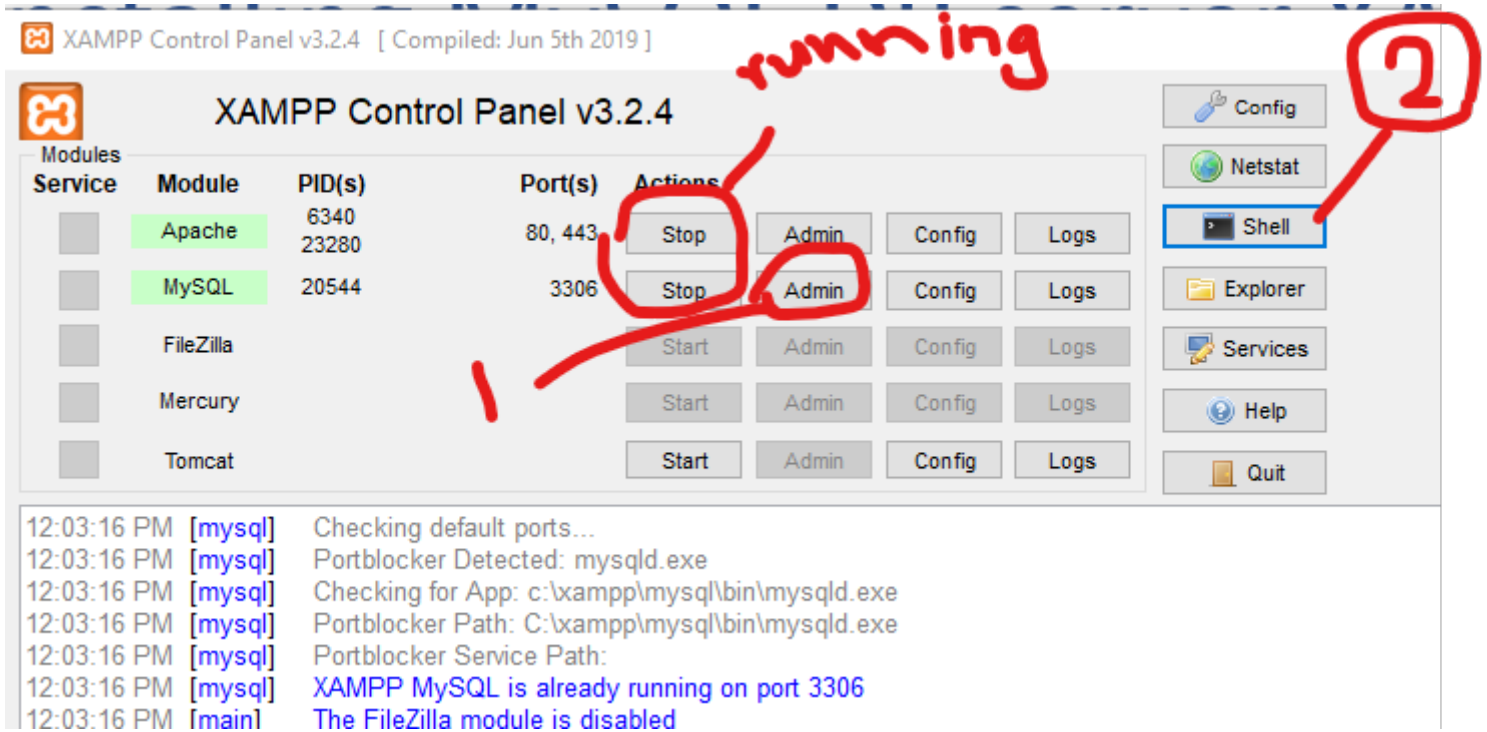


Setting up DB server on your PC

- We need to install mySQL DB server. It's a relational DB engine which runs our SQL queries
- As well we need phpMyAdmin which is a web based database administrative tool. It is web based therefore you can use it remotely or share a datable with your partner
- phpMyAdmin needs PHP engine to run
- XAMPP is an application package installer that installs all of those for us

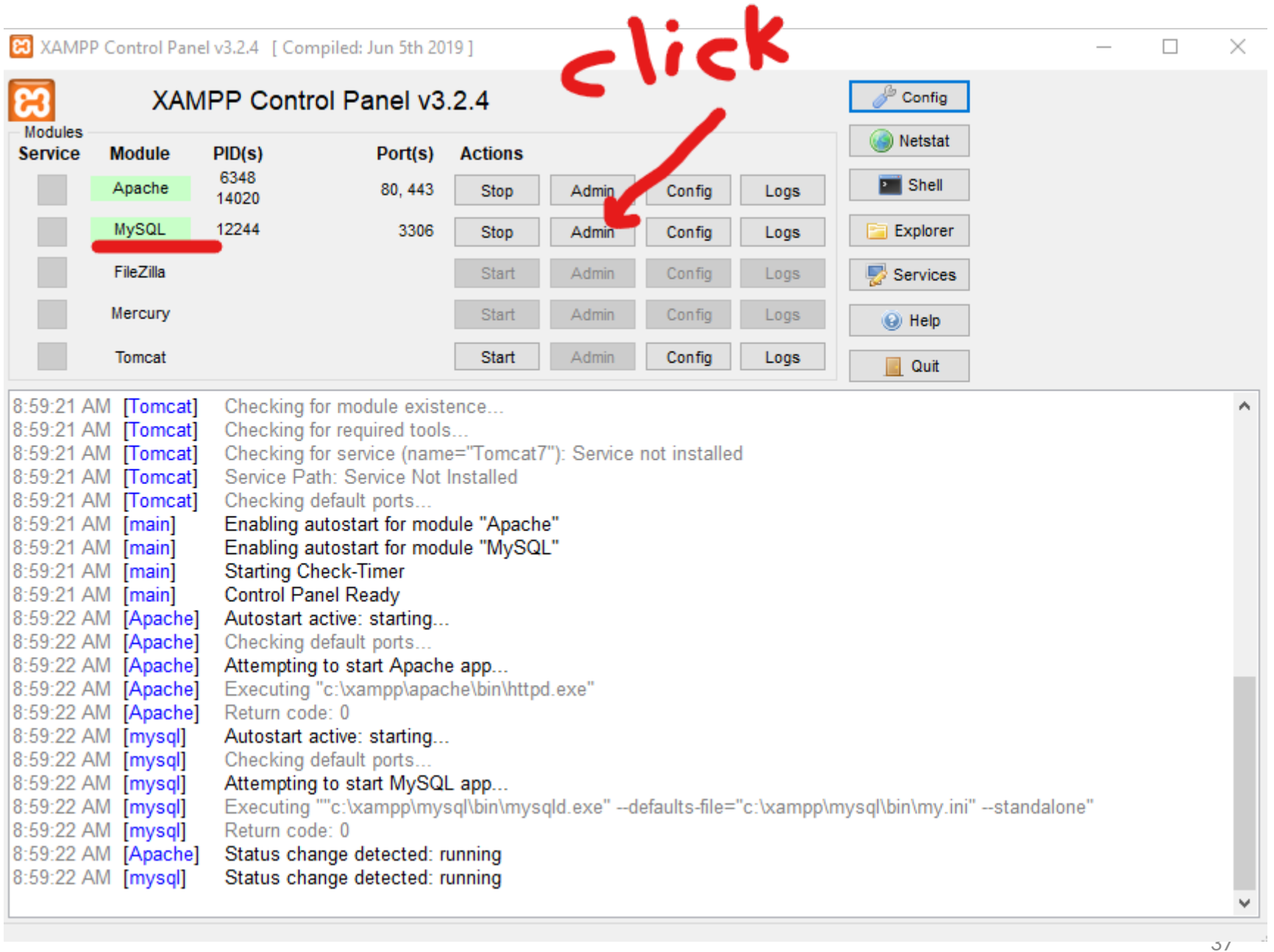


- 1: clicking on admin will take you to phpMyAdmin
- 2- Clicking on shell will take you to the mySQL command line

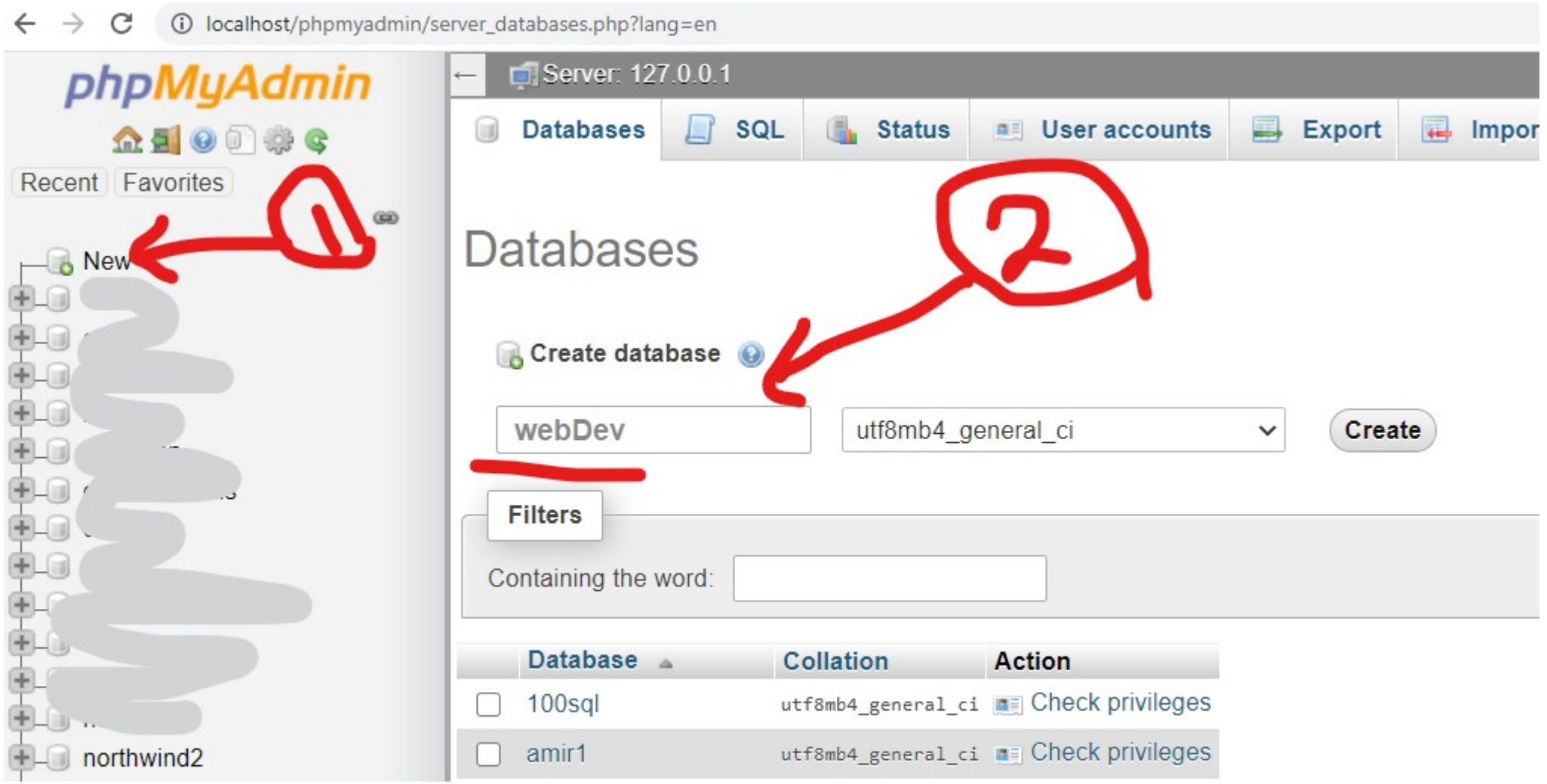


2- goto phpMyAdmin and to create a DB and a table

- Clicking on that link Loads
- http://localhost/phpmyadmin/
- (Make sure MySQL is running on XAMPP)



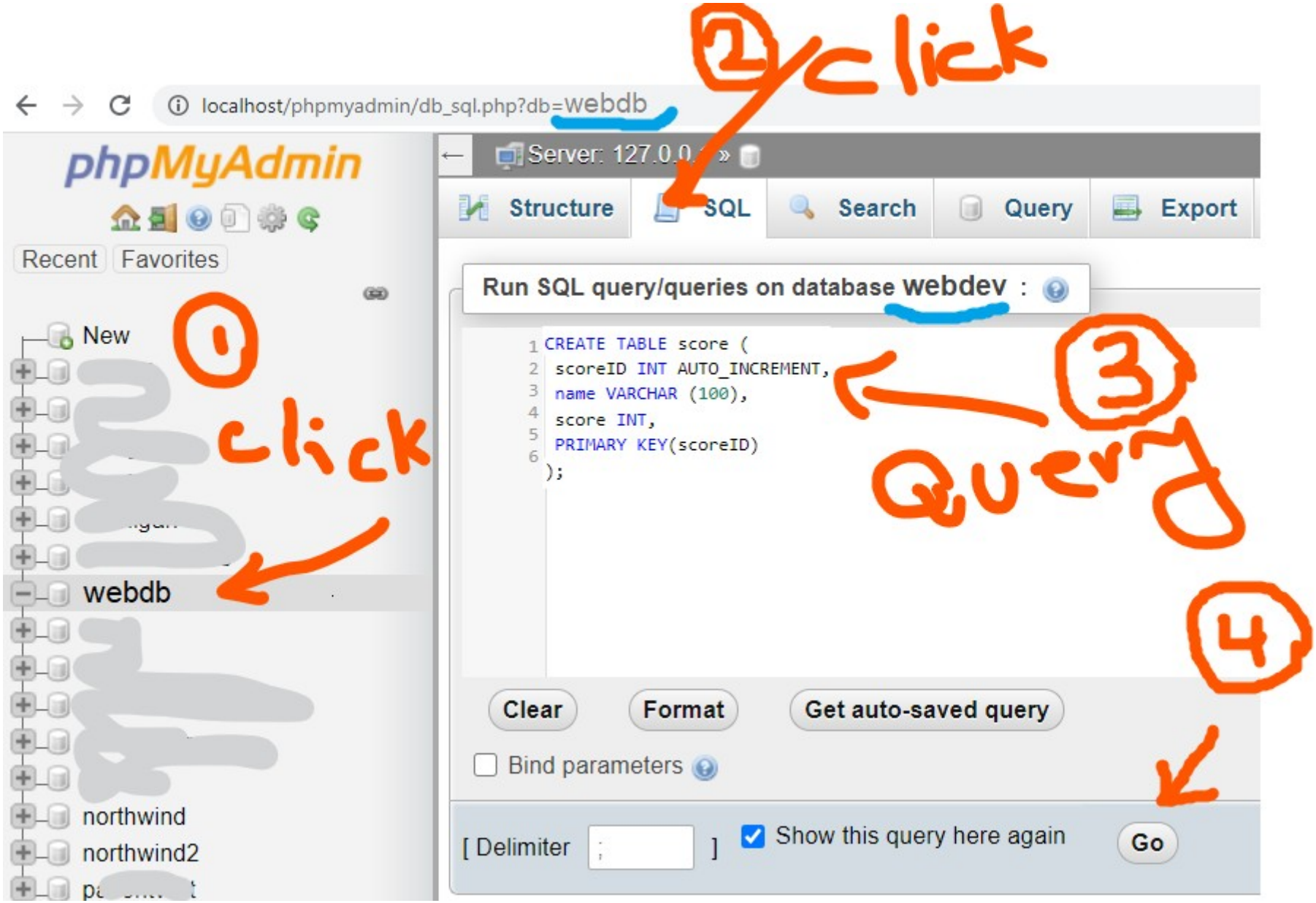
3- create a DB in phpmyadmin



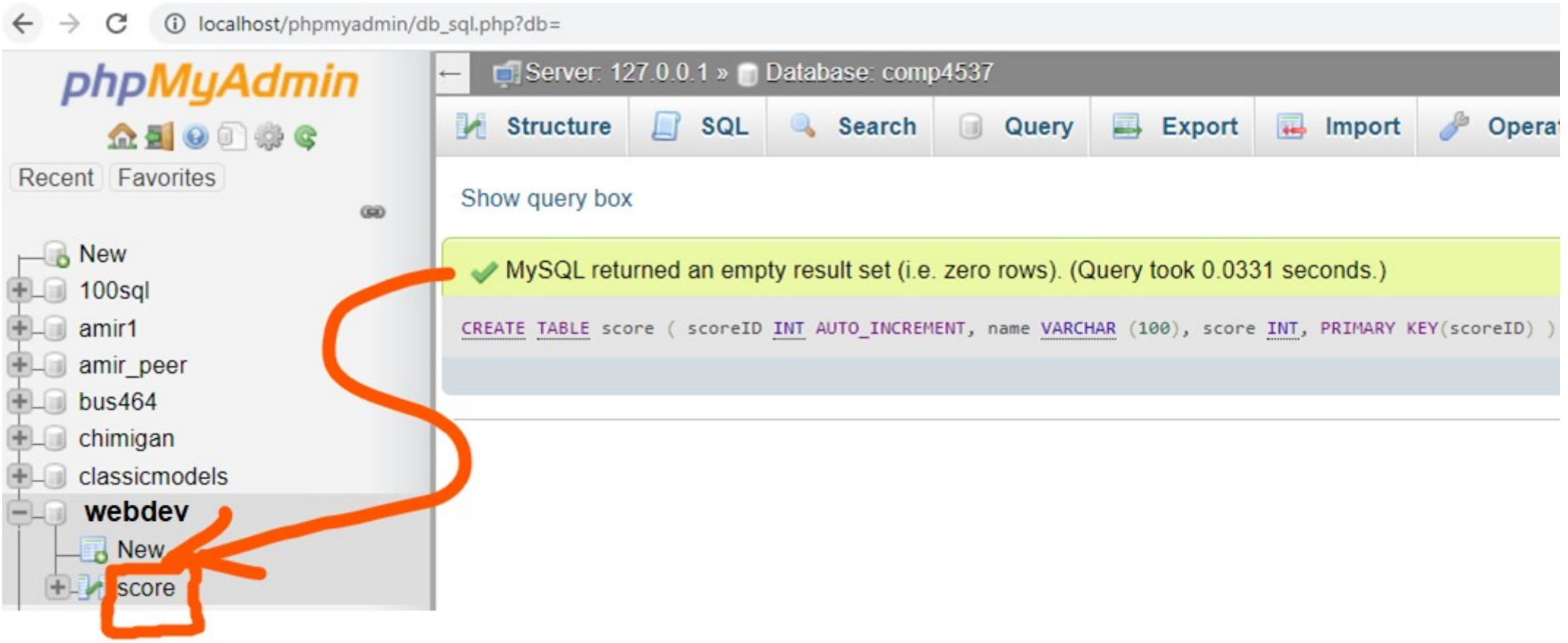
4- create a table in that DB to store scores

```
CREATE TABLE score (
 scoreID INT AUTO_INCREMENT,
 name VARCHAR (100),
 score INT,
 PRIMARY KEY(scoreID)
);
```

- Note: It is ok to have column names with the same name as the table name, both are score
- the Now our DB is ready!



5- notice the confirmation message on creation of table

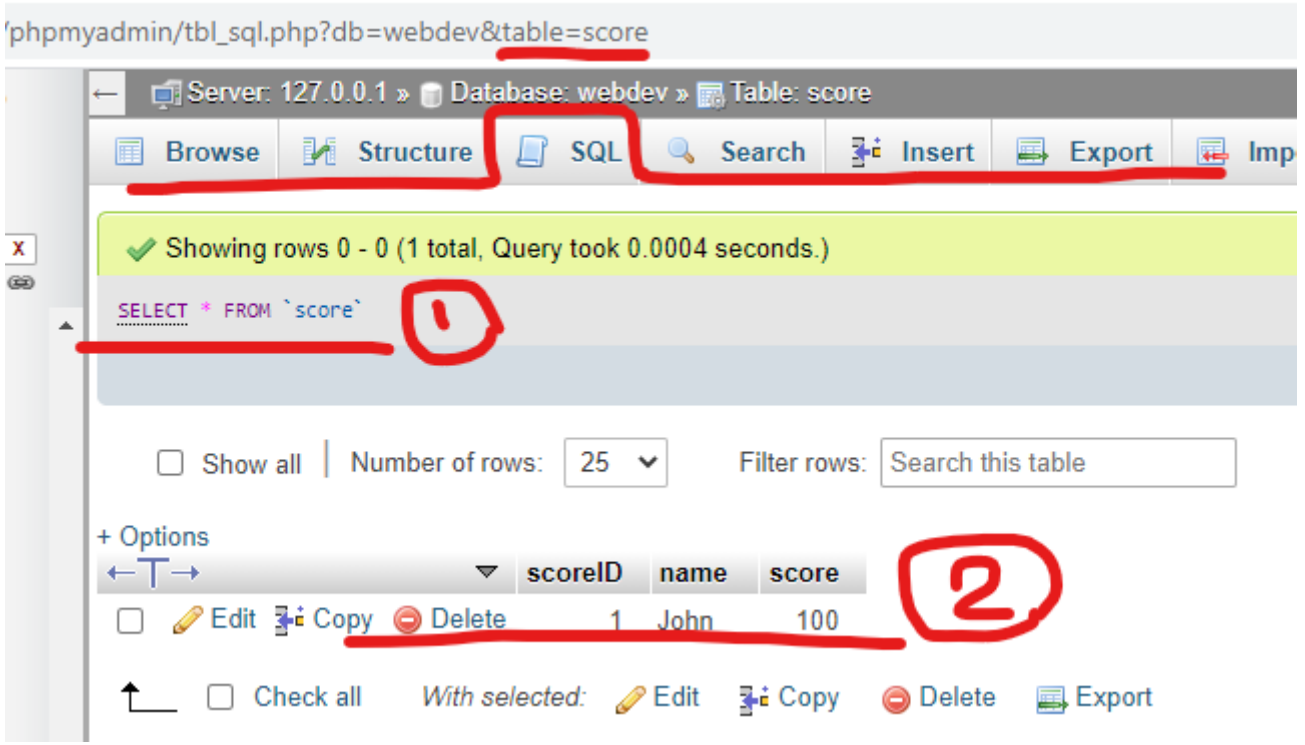


6- run few SQL statements on table you have created

0- make sure you have selected the DB you have created to run the SQL query on that

1- type down your query at SQL tab

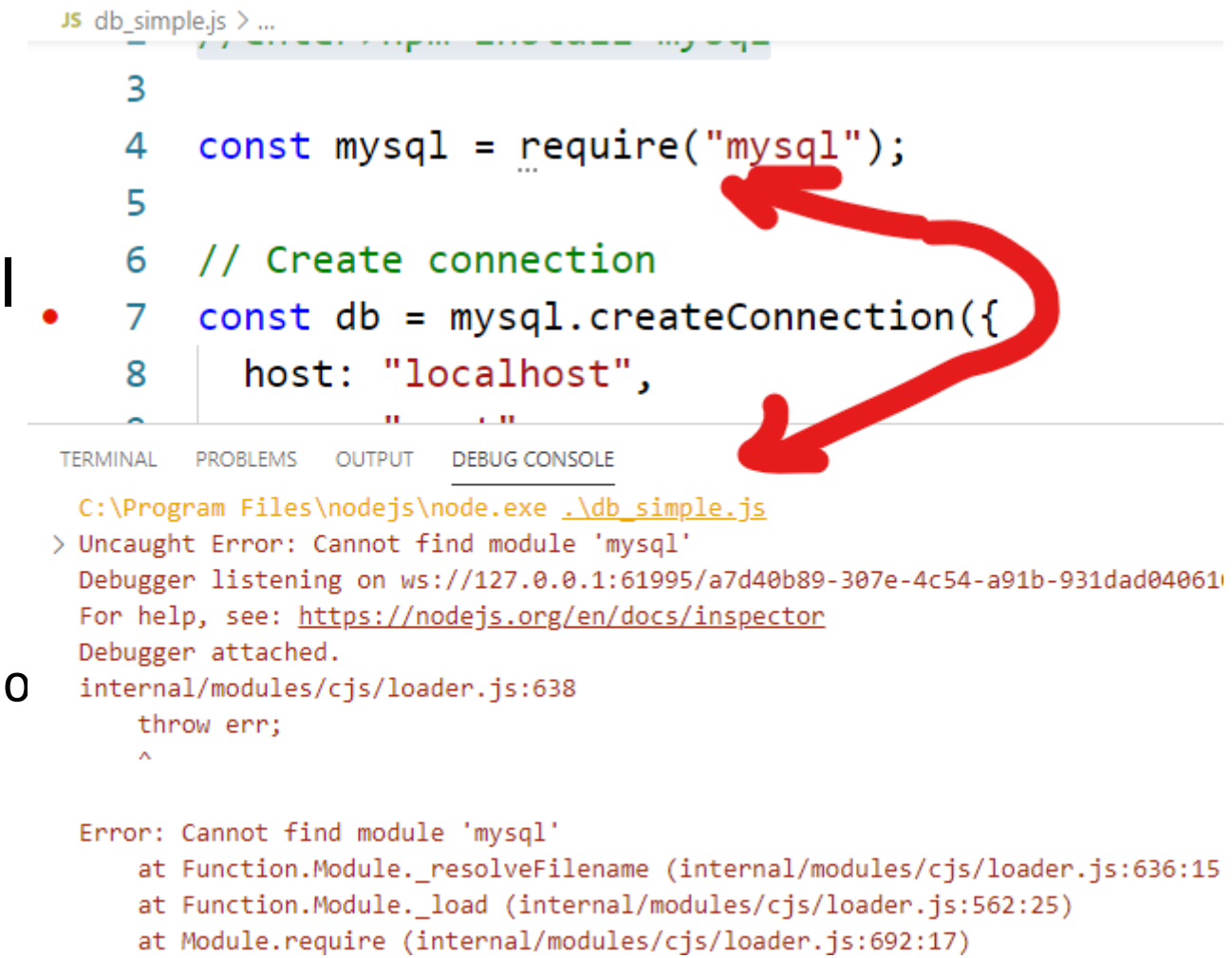
2- press GO button and the result of your query appears!



Connecting to mySQL DB using nodejs

7. Connect with DB using node js

- Turns out, mysql is an external module and needs to be installed
- Here is how to
- 1 at command prompt switch to the current directory of this file
- 2 enter >npm install mysql



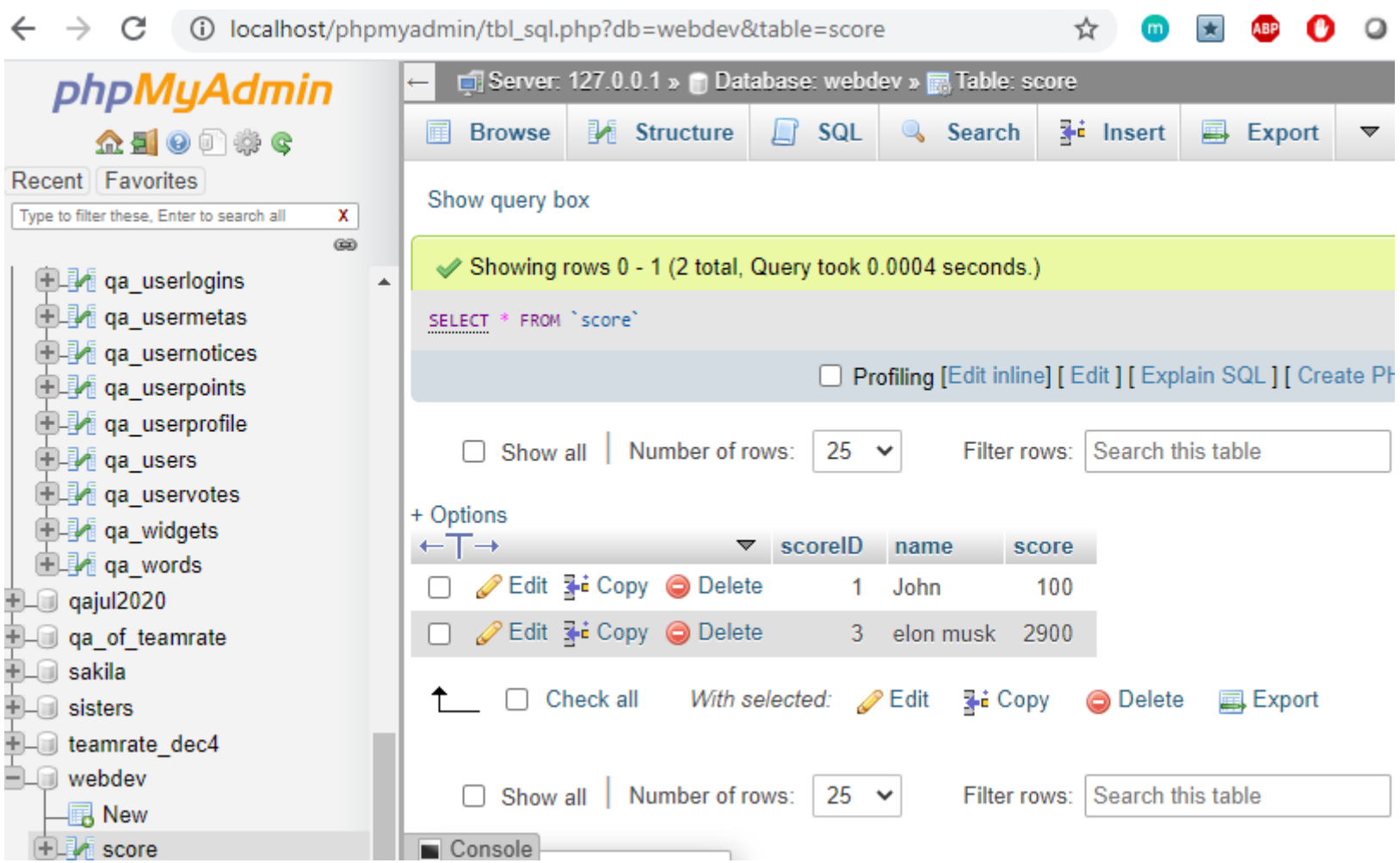

```
+ mysql@2.18.1
added 11 packages from 15 contributors and audited 11 packages in 1.094s
found 0 vulnerabilities
```

- First create a myslq object
- Then connect
- And run a SQL statement

```
// at command prompt switch to the current directory of this file
//enter>npm install mysql
const mysql = require("mysql");
// Create connection
const con = mysql.createConnection({
  host: "localhost",
  user: "root",
  password: "",
  database: "webdev"
});
// Connect to MySQL to run SQL query
con.connect(function(err) {
    if (err) throw err;
    console.log("Connected!");
    let sql = "INSERT INTO score(name, score) values ('elon musk', 2900)
    con.query(sql, function (err, result) {
      if (err) throw err;
      console.log("1 record inserted");
    });
  });
```

Check your table to verify the SQL ran successfully on node

- As you can see
- The score of
- elon musk was entered in our table
- Successfully!



Hosting Node js, MySQL on remote server

7

Please watch this video
Hosting nodejs MySql remotely CPanel Shared Hosting.mp4

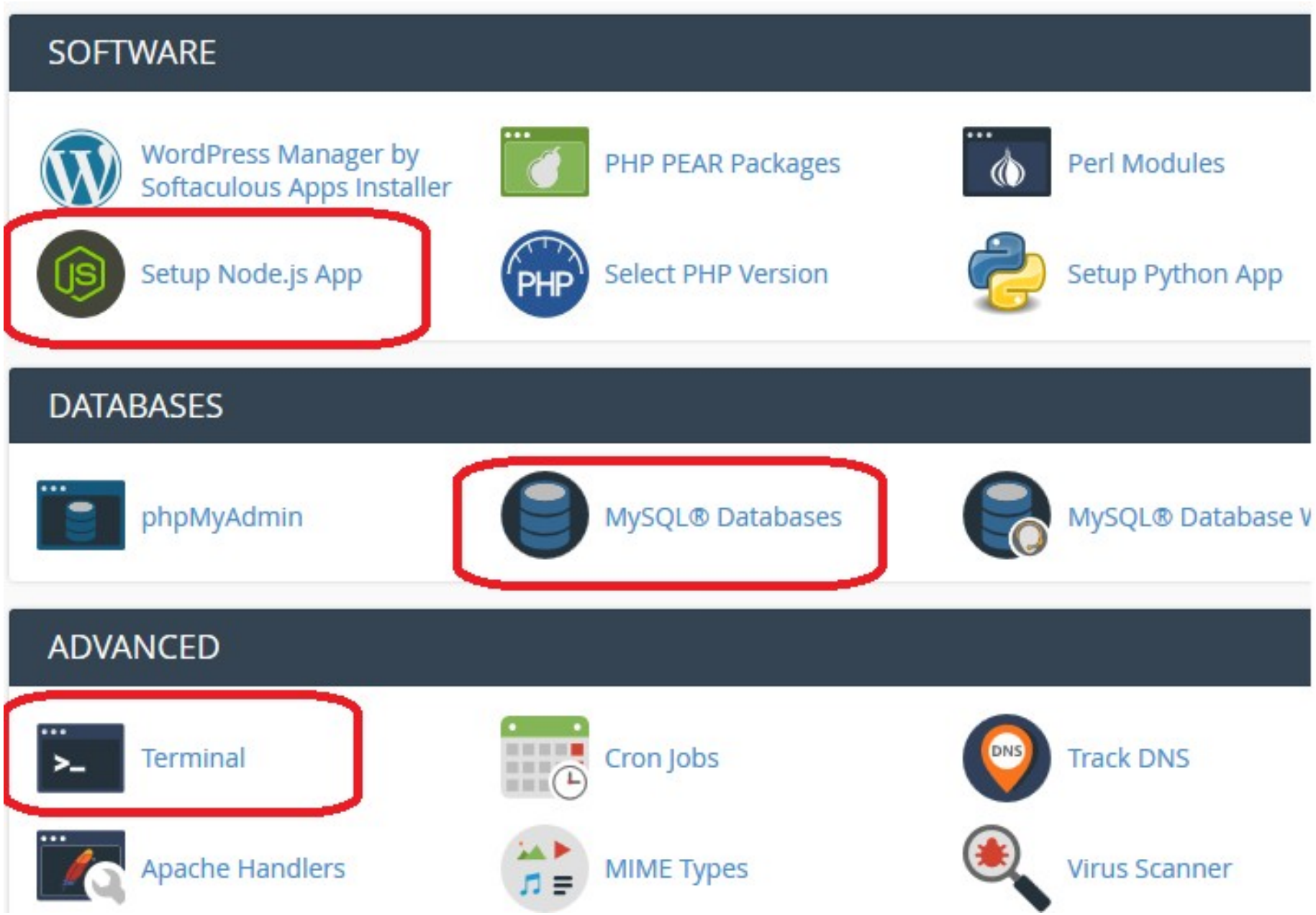
Beginner 'sguid

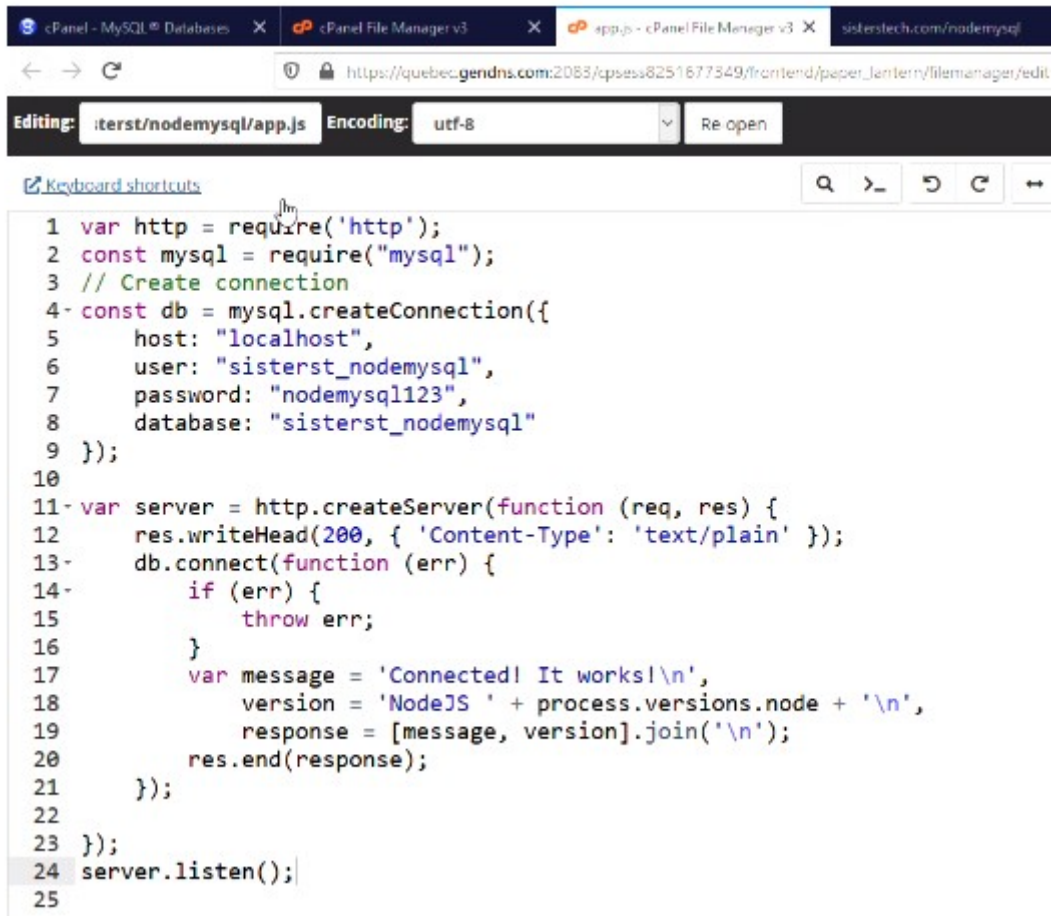
Node js + MySQL

cPanel

remote server

How to host nodejs MySQL in share hosting accounts




cPanel - MySQL® Databases
cPanel File Manager v3
app.js - cPanel File Manager v3
sisterstech.com/nodemysql
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iterst/nodemysql/app.js
Encoding:
utf-8
Re open
Keyboard shortcuts
1 var http = require('http');
2 const mysql = require("mysql");
3 // Create connection
4 const db = mysql.createConnection({
5 host: "localhost",
6 user: "sisterst_nodemysql",
7 password: "nodemysql123",
8 database: "sisterst_nodemysql"
9 });
10
11 var server = http.createServer(function (req, res) {
12 res.writeHead(200, { 'Content-Type': 'text/plain' });
13 db.connect(function (err) {
14 if (err) {
15 throw err;
16 }
17 var message = 'Connected! It works!\n',
18 version = 'NodeJS ' + process.versions.node + '\n',
19 response = [message, version].join('\n');
20 res.end(response);
21 });
22
23 });
24 server.listen();
25

source

- chatGPT 3.5 used to generate partial code for this set