FROM DESKTOP TO WEB APP

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Learn:
*** algorithms**
*** thinking**

ALGORITHM

- algorithm is a description on how one specific problem will be solved
- in this material we'll use two different algorithms to solve one specific problem …
- … which is to sum figures from 1 to given number N

ALGORITHM #1: (SLOW)

- first algorithm is …
  - easy to find out
  - slow when figures are big
- big O(n)
  - linear time consumption
- set sum = 0
- go through figures from 1 to N
  - calculate sum=sum+current figure

ALGORITHM #2: (FASTER)

- second algorithm is …
  - not so obvious
  - much quicker when figures are big
- big O(1)
  - constant time consumption

- set sum = 0
- sum biggest and smallest (call it BisMa)
- multiply with integer division N/2
- add half of BisMa, if N is odd

SUMMING 1…N

Algorithm #1 *[big O(N)]*:
Loop through 1 ... N
Sum them
...

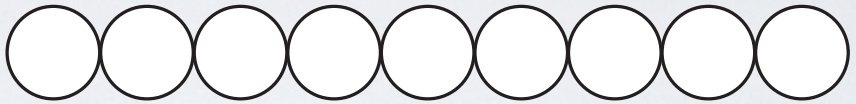
1 2 3 4

1 2 3

1 2

1

1 2 3 4 5 6 7 8 9



1+4 = 5
4:2=2
2x5=10

1 x (6/2)
1+5 = 6
5:2=2 kokonaista + 1
2x6 + (1 x (6/2))=12

(1+4 = 5
(4 div 2) x hesu+ (4 mod 2) * (hesu) = 2
2x5 =10)

Algorithm #2 *[big O(1)]*:
Smallest to be summed is **one=**1.
Biggest number to sum is **biggest.**
helpersum=one+biggest
Divide helpersum with two (**intdivpertwo**=**helpersum/2**)
Need remainder (modulus) too (**moduluspertwo**=**helpersum/2**)

IMPLEMENTATION WITH C

```
[PoliTrukki:dataStructure&algorithm karikahakkinen$ ./conut 44444
 Summing numbers from 1 to 44444 ...

 Algorithm #1: Sum is 987656790
 Time used: 0.000131

 44444 - 987656790
 Algorithm #2: Sum is 987656790
 Time used: 0.000000

[PoliTrukki:dataStructure&algorithm karikahakkinen$ ./conut 44443
 Summing numbers from 1 to 44443 ...

 Algorithm #1: Sum is 987612346
 Time used: 0.000145

 44443 - 987612346
 Algorithm #2: Sum is 987612346
 Time used: 0.000001
```

Learn:
*** programming language C**

```
#include <stdio.h>
#include <inttypes.h>
#include <errno.h>
#include <string.h>
#include <stdlib.h>
#include <time.h>

#define BASE    10

int main(int argc, char **argv){

char*   endptr;
long    tocount;
long    i;
long    sum=0;
long    hesu;
clock_t start, end;
double cpu_time_used;


if (argc<2){
    printf("%s: use: %s count\n", argv[0], argv[0]);
    exit(-1);
}

tocount = strtoimax(argv[1],&endptr,BASE);

printf ("Summing numbers from 1 to %ld ...\n\n",tocount );

start = clock();
for (i=0;i<=tocount;i++){
    sum+=i;
}
end = clock();
cpu_time_used = ((double) (end - start)) / CLOCKS_PER_SEC;

printf ("Algorithm #1: Sum is %ld\n",sum );
printf ("Time used: %lf\n\n",cpu_time_used);

start = clock();
hesu = (tocount+1) ;
sum=((tocount/2)*hesu) + ((tocount%2)*(hesu/2));
end = clock();
cpu_time_used = ((double) (end - start)) / CLOCKS_PER_SEC;
printf("%ld - %ld\n",tocount, sum);
printf ("Algorithm #2: Sum is %ld\n",sum );
printf ("Time used: %lf\n\n",cpu_time_used);
exit(0);
}
```

WEB APPLICATION ENVIRONMENT

WEB Application Environment

Php Backend

(here: calculator)

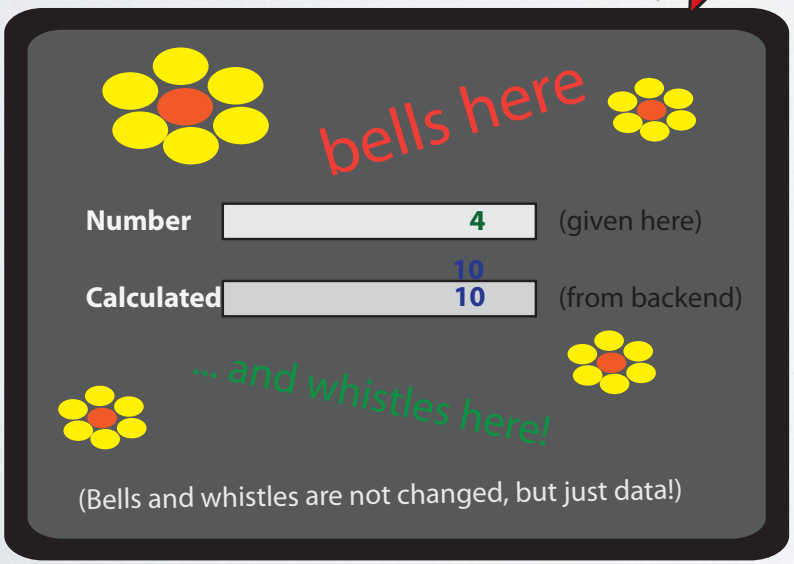
Network Data Transfers
restless API CRUD
JSON data (or XML)

GET, POST, ...
Here: input data e.g.GET -> 4

data as JSON
AJAX ... XMLHttpRequest
Calculated data as json
(alg#1 sum & time + alg#2 sum & time)

Frontend,
(html, JavaScript)

Changing data updated only



CRUD (Restless API):
* Create (POST)
* Read (GET)
* Update (PUT)
* Delete (DELETE)

Learn:
*** virtualizing + LAMP**
*** XAMPP**
*** FileSystem**
*** JavaScript, PHP, JSON**
*** DataStructures**

JSON THAT WE'LL USE

```
{"testing":
{"input":"4","output":
[{"sum":"800020000","time":
"0.000121"},
{"sum":"800020000","time":"
0.000001"}]}}
```

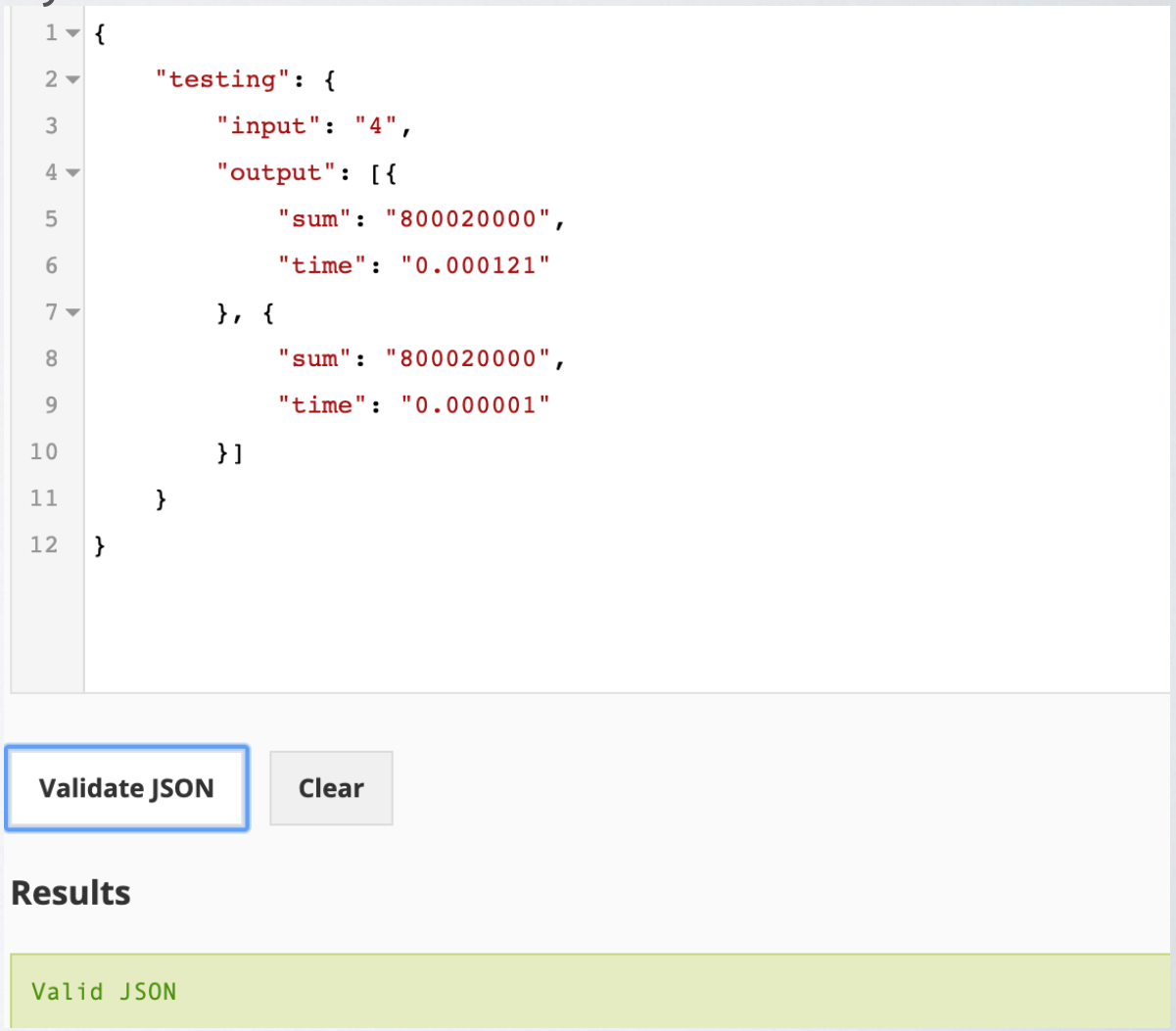
But is it *valid JSON?*

Yes, according

jsonlint.com

jsonlint.com

Learn:
*** validating JSON**



CREATING FIRST BACKEND

- It is easy to create first JSON backend by copying valid JSON to myjson.com

- then you can continue developing frontend without working, real backend

myjson.com

Learn:
*** using internet services in program development**

BUILDING OWN BACKEND #1

Learn:
*** basic html**

- it is easy to echo json to humans …

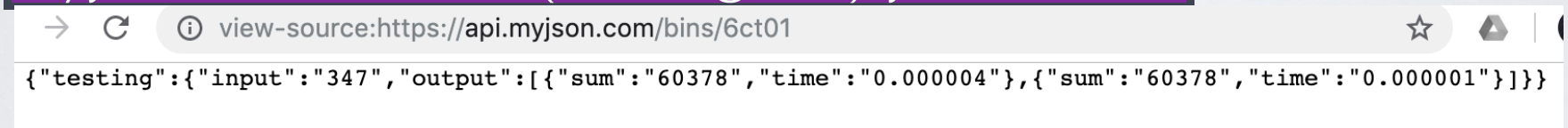
```
<!doctype html>
<html>
  <head>
    <title>This is the title of the webpage!</title>
  </head>
  <body>
    <p>{"testing":{"input":"4","output":
[{"sum":"800020000","time":"0.000121"},
{"sum":"800020000","time":"0.000001"}]}}</p>
  </body>
</html>
```

BUILDING OWN BACKEND #2

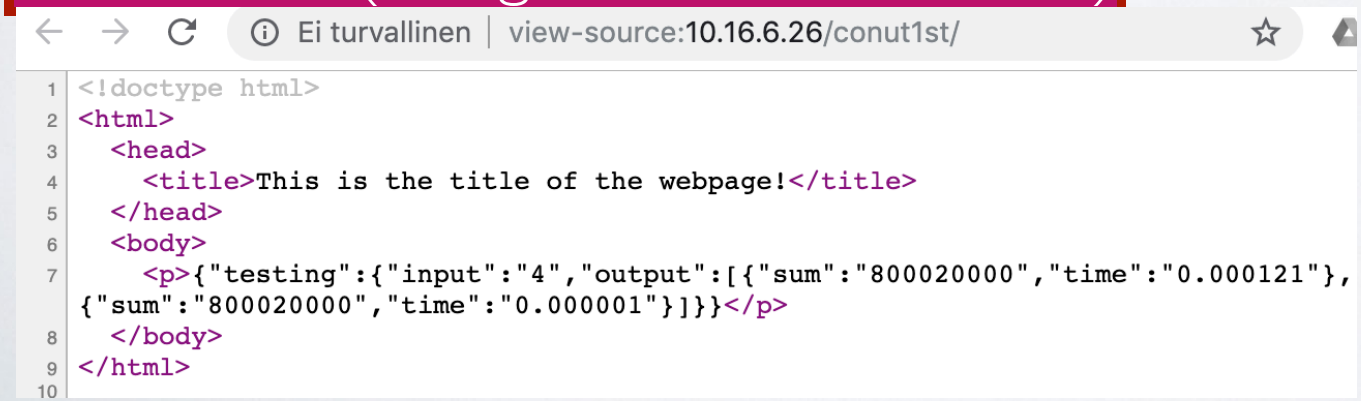
Learn:
*** using web browser developer tools**

- … but it is not ok to our frontend!

myjson.com source (this is good) json source



our source (not good, but ok starter!)



ALGORITHMS PHP IMPLEMENTED

This echoes still html page - not json as meta!

Learn:
*** php functions**

```
<!doctype html>
<html>
  <head>
    <title>This is the title of the webpage!</title>
  </head>
  <body>
    <?php
       function soslow(int $nmbrin) {
     // https://www.php.net/manual/en/function.microtime.php
     $start = microtime(true);
     $sum=0;
     for ($i=0;$i<=$nmbrin;$i++){
        $sum += $i;
     };
     $time_elapsed_secs = microtime(true) - $start;
     $time=sprintf("%f",$time_elapsed_secs);
     return ('{"sum":"'.$sum.'","time":"' . $time . '"}');
}
       function faster(int $tocount) {
               $start = microtime(true);
               $sum=0;
     $hesu = ($tocount+1) ;
     $sum=((intdiv($tocount,2))*$hesu) + (($tocount%2)*($hesu/2));
               $time_elapsed_secs = microtime(true) - $start;
               $time=sprintf("%f",$time_elapsed_secs);
               return ('{"sum":"'.$sum.'","time":"' . $time . '"}');
       }
      $in=40000000;
       $jsonStr  = '{"testing":{"input":"' . $in . '","output":[';
       $jsonStr .= soslow($in);        <- calling soslow() - returns json
       $jsonStr .= ',';
       $jsonStr .= faster($in);        <- calling faster() - returns json
       $jsonStr .= ']}}' ;
       echo '<p>' . $jsonStr . '</p>';        <- calling faster()
    ?>
  </body>
</html>
```

ALGORITHMS ... PHP IMPLEMENTED - JSON BACKEND

echoes JSON

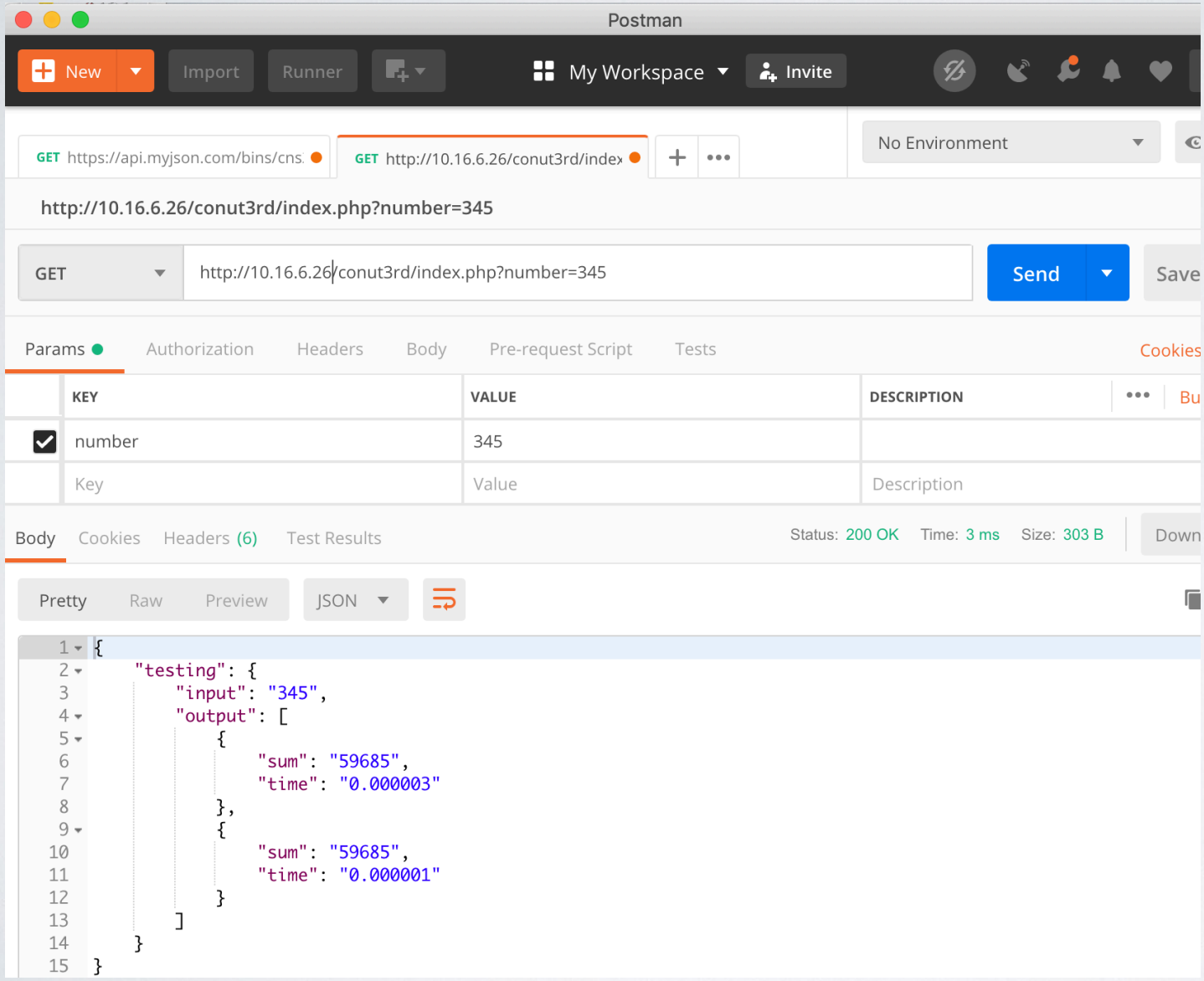
json as content-type

Learn:
*** www content-types**

```
<?php

// https://alexwebdevelop.com/php-json-backend/

 function soslow(int $nmbrin) {
  // https://www.php.net/manual/en/function.microtime.php
  $start = microtime(true);
  $sum=0;
  for ($i=0;$i<=$nmbrin;$i++){
    $sum += $i;
  };
  $time_elapsed_secs = microtime(true) - $start;
  $time=sprintf("%f",$time_elapsed_secs);
  return ('{"sum":"'.$sum.'","time":"' . $time . '"}');
  }

  function faster(int $tocount) {
    $start = microtime(true);
    $sum=0;
    $hesu = ($tocount+1) ;
// PHP integer division intdiv()-> https://secure.php.net/manual/en/function.intdiv.php
    $sum=((intdiv($tocount,2))*$hesu) + (($tocount%2)*(intdiv($hesu,2)));
    $time_elapsed_secs = microtime(true) - $start;
    $time=sprintf("%f",$time_elapsed_secs);
    return ('{"sum":"'.$sum.'","time":"' . $time . '"}');
  }

  https://www.w3schools.com/php/php_superglobals.asp
  echo 'given number was -> ' . $_GET['number'] ;
$in=$_GET['number'];

  $jsonStr  = '{"testing":{"input":"' . $in . '","output":[';
  $jsonStr .= soslow($in);
  $jsonStr .= ',';
  $jsonStr .= faster($in);
  $jsonStr .= ']}}' ;

    header('Content-Type: application/json');  //json backend header
  echo $jsonStr;
?>
```

TESTING BACKEND

Learn:
*** Postman**
*** curl**



FIRST FRONTEND

Learn:
* **basic JavaScript**
* **AJAX**
* **URLs and URIs**
* **GETs, PUTs, ...**
* **CRUD principles (RESTless API)**

```
<!DOCTYPE html>
<html>
<body>

<h2>The XMLHttpRequest Object</h2>

<button type="button" onclick="loadDoc()">Request data (4 in this example)</button>

<p id="demo"></p>

<script>
function loadDoc() {
  var xhttp = new XMLHttpRequest();
  xhttp.onreadystatechange = function() {
    if (this.readyState == 4 && this.status == 200) {
      document.getElementById("demo").innerHTML = this.responseText;
    }
  };
  xhttp.open("GET", "http://192.168.100.15/conut3rd/index.php?number=4", true);
  xhttp.send();
}
</script>

</body>
</html>
```

SECOND FRONTEND

```
<!DOCTYPE html>
<html>
<head>
    <meta http-equiv="Content-Type" content="text/html; charset=utf-8"/>
</head>
<body>
  <h2>The XMLHttpRequest Object</h2>
  <input id="number">
  <button type="button" onclick="loadDoc()">Request data</button>
  <p id=”demo">Enter positive integer into field above!</p>

  <script>
    function loadDoc() {
      numberValue = document.getElementById("number").value;
      URL="http://192.168.100.15/conut3rd/index.php?number="+numberValue
      var xhttp = new XMLHttpRequest();
      xhttp.onreadystatechange = function() {
        if (this.readyState == 4 && this.status == 200) {
          document.getElementById("demo").innerHTML = this.responseText;
        }
      };
      xhttp.open("GET", URL, true);
      xhttp.send();
    }
  </script>

</body>
</html>
```

Learn:
*** basic JavaScript**
*** AJAX**

THIRD FRONTEND

```
<!DOCTYPE html>
<html>
<head>
    <meta http-equiv="Content-Type" content="text/html; charset=utf-8"/>
</head>
<body>
  <h2>The XMLHttpRequest Object
</h2>
  <input id="number">
  <button type="button" onclick="loadDoc()">Request data</button>
  <p id="demo">Enter positive integer into field above!</p>

  <script>
    function loadDoc() {
      numberValue = document.getElementById("number").value;
      URL="http://10.16.6.26/conut3rd/index.php?number="+numberValue;
      var XHR = new XMLHttpRequest();
      XHR.onreadystatechange = function() {
        if (this.readyState == 4 && this.status == 200) {
          let jsonobj = JSON.parse(this.responseText);
          let outPutText="With input data "+jsonobj.testing.input+":<br><br>"+
           "Algorithm #1 gives result "+jsonobj.testing.output[0].sum +
           " in time "+jsonobj.testing.output[0].time+".<br><br>"+
           "Algorithm #2 gives result "+jsonobj.testing.output[1].sum +
           " in time "+jsonobj.testing.output[1].time + "<br><br>";
     document.getElementById("demo").innerHTML = outPutText;
        }
      };
      XHR.open("GET", URL, true);
      XHR.send();
    }
  </script>

</body>
</html>
```

parse JSON string ->JS object…

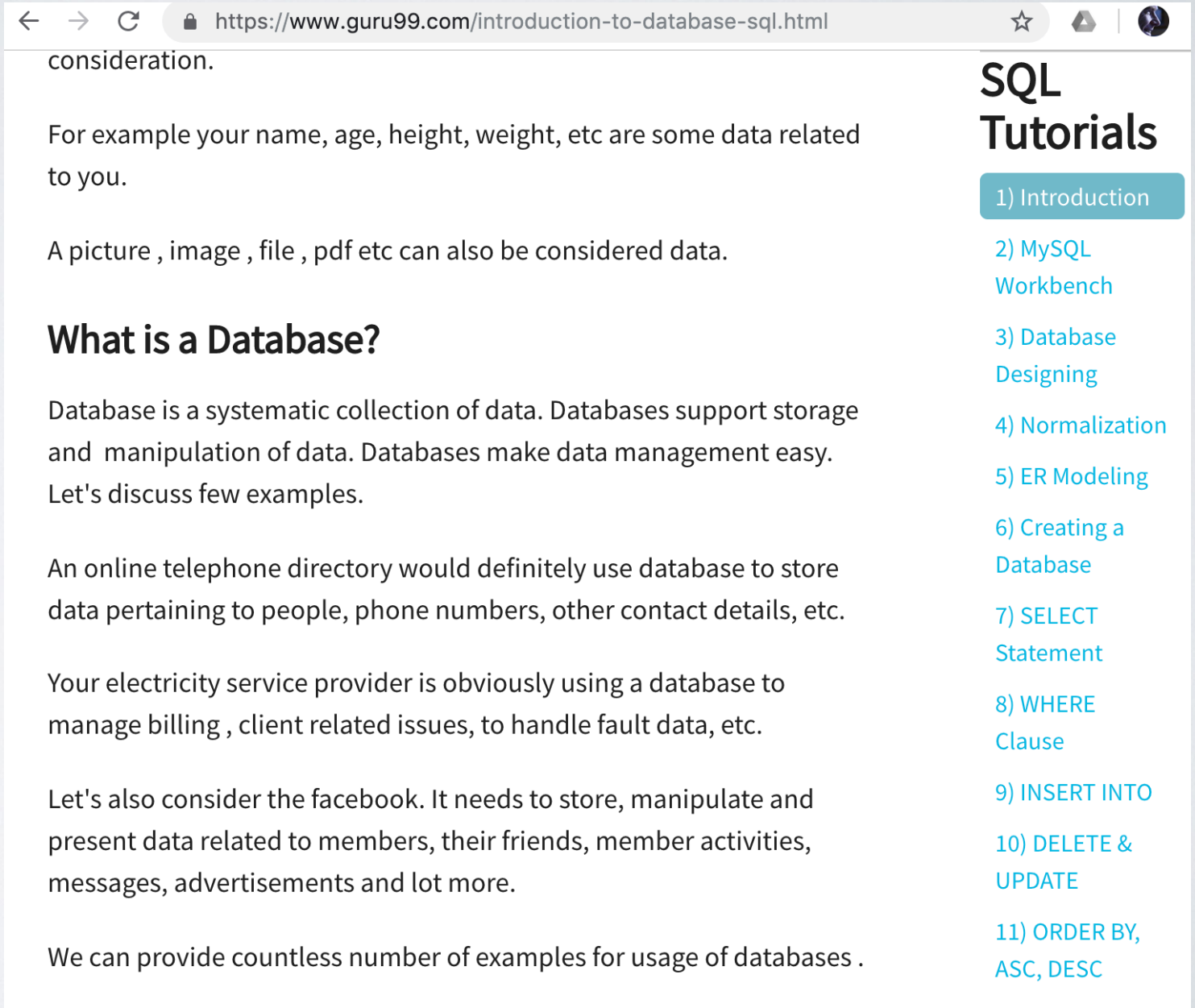
… and use it

Learn:
*** objects principles**
*** OOP principles**
*** JSON parsing in JavaScript**
*** JavaScript objects**

DATABASE

What is data, database, DBMS

https://www.guru99.com/introduction-to-database-sql.html



LEARNING SQL

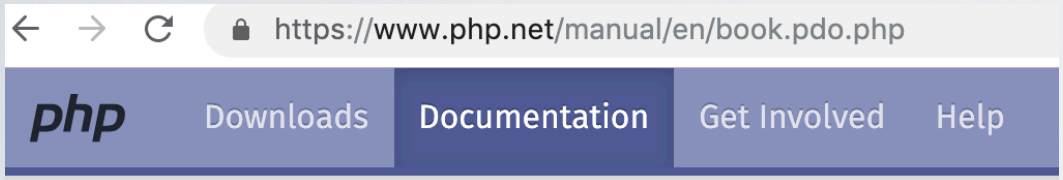
www.sqlcourse.com

www.sqlcourse2.com

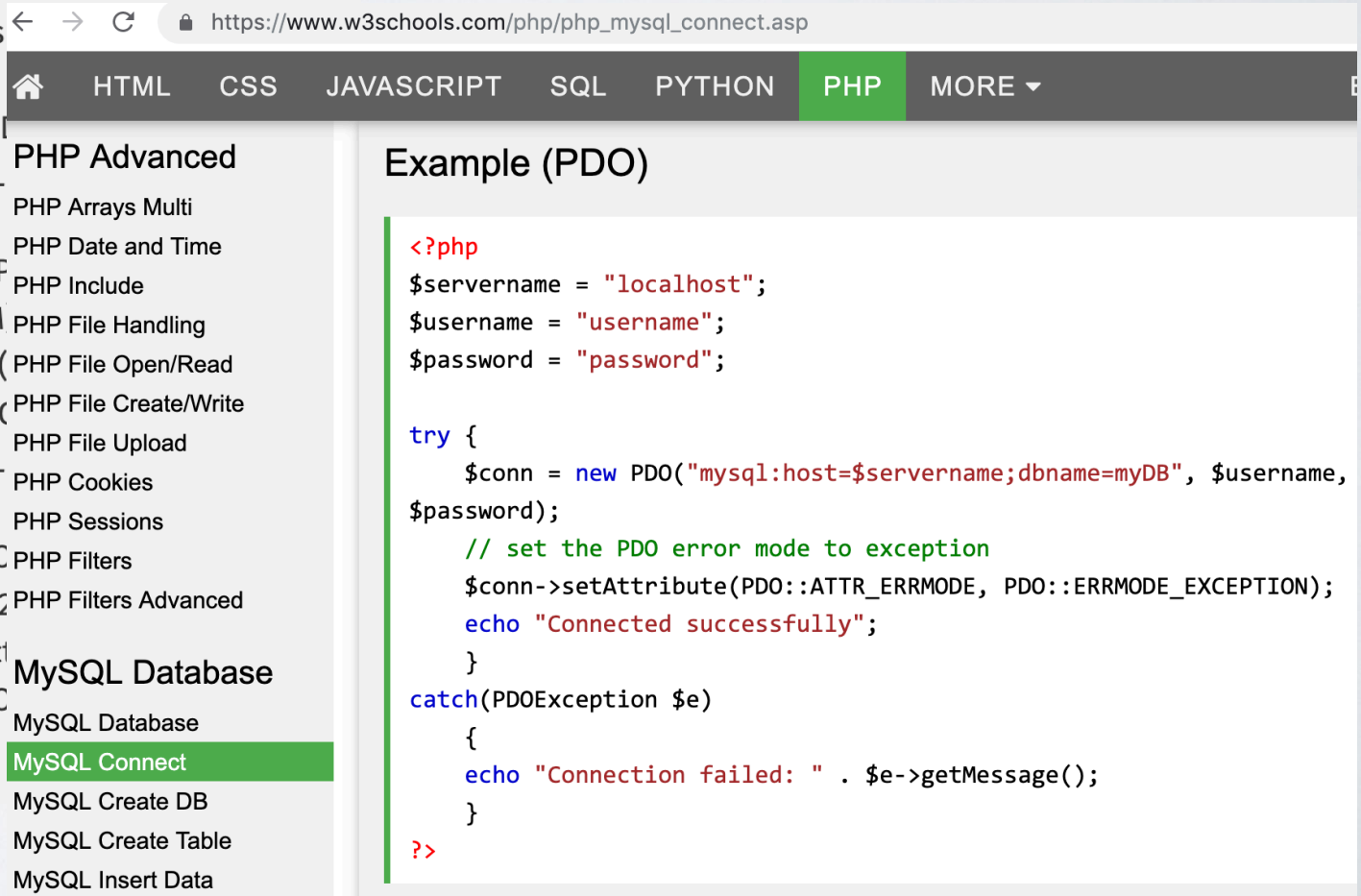
PHP CONNECTION TO SQL DATABASE

https://www.w3schools.com/php/php_mysql_connect.asp

https://www.php.net/manual/en/book.pdo.php



- PDOException — The PDOException class
- PDO Drivers
  - CUBRID (PDO) — CUBRID Functions (PI
  - MS SQL Server (PDO) — Microsoft SQL Functions (PDO_DBLIB)
  - Firebird (PDO) — Firebird Functions (F
  - IBM (PDO) — IBM Functions (PDO_IBM
  - Informix (PDO) — Informix Functions (
  - MySQL (PDO) — MySQL Functions (PDO
  - MS SQL Server (PDO) — Microsoft SQL (PDO_SQLSRV)
  - Oracle (PDO) — Oracle Functions (PDO
  - ODBC and DB2 (PDO) — ODBC and DB2
  - PostgreSQL (PDO) — PostgreSQL Funct
  - SQLite (PDO) — SQLite Functions (PDO
  - 4D (PDO) — 4D Functions (PDO_4D)



PHP PDO SELECT

https://www.w3schools.com/php/php_mysql_select.asp