SOAL UTS PROJECT PRAKTIKUM REKAYASA PERANGKAT LUNAK

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UNS UNIVERSITAS SEBELAS MARET

PENTING

1. Jelaskan maksud dari setiap perintah yang dijalankan berikut source code PHP dan konsep OOP PHP **(*class, object, property* dan *method)*** dan *Test Cases* yang dibuat untuk melakukan pengujian unit/*unit testing* menggunakan PHPUnit!
2. Screenshoot setiap *result* yang dihasilkan baik ada *error, failure* maupun OK/berhasil kemudian analisalah sesuai dengan hasil yang didapatkan!
3. Deskripsikan pembagian *jobdesk* setiap anggota kelompok!
4. Hint! *perintah testing menggunakan* ***vendor\bin\phpunit*** ***lokasi file***
5. Letakkan file *class* di folder *src* dan file test di folder *tests atau* sesuai setting yang telah dibuat
6. Pastikan isi **composer.json** sebagaimana berikut

```
{
    "name": "lenovo/latihan-php-unit",
    "description": "Hanya untuk latihan composer dan unit testing dengan php unit",
    "type": "project",
    "license": "GPL",
    "authors": [
        {
            "name": "Nurul Firdaus",
            "email": "nurul.firdaus@staff.uns.ac.id"
        }
    ],
    "autoload": {
        "classmap": [
            "src/"
        ]
    },
      "require": {
        "nesbot/carbon": "^2.41"
    },
    "require-dev": {
        "phpunit/phpunit": "^9.4"
    }
}
```

Otomatis me-load file *class*
yang ada di folder src
tanpa menggunakan *use nama class;* di file test

7. Jalankan pertintah ***composer dump-autoload*** untuk mengenerate files autoload. Dengan memakai autoload, programmer tidak perlu lagi meng-*include*-kan file berisi *class* satu persatu, namun cukup dengan menginstansikan *class* dan PHP secara otomatis akan mengenali nama *class* serta mencari file yang memiliki nama yang sama dengan *class* tersebut.

8. Pastikan mengumpulkan file laporan dalam format **.pdf** dan file project dalam bentuk **.rar**

SOAL

Unit Testing menggunakan PHPUnit Assertions

Menggunakan assertion methods (ex: assertEquals())

1. Test *function/method* **testTambah()** dan *function/method* **testPengurangan()** dalam class **testoperasibilangan.php** dibawah ini. Analisa hasilnya (Jika gagal/*failures,* perbaiki code PHPnya kemudian test kembali)!

```php
<?php

use PHPUnit\Framework\TestCase;

 class testoperasibilangan extends TestCase
 {
 //test penambahan...
 public function testTambah()
 {
 $this->assertEquals(10,5+6);
 }
 //test pengurangan...
 public function testPengurangan()
 {
 $this->assertEquals(-2,5-6);
 }
 }

?>
```

2. Test *function/method* **pangkatBilangan()** pada *class* **Matematika.php** dibawah ini. Jelaskan!

   File *source code class* **Matematika.php**

```php
<?php

class Matematika
{
    /**
     * @param integer $bilanganBasic
     * @param integer $bilanganExponen
     *
     * @return integer
     */
    public static function pangkatBilangan($bilanganBasic, $bilanganExponen)
    {
        $nilaiSekarang = 1;
        for ($i = 1; $i <= $bilanganExponen; $i++) {
            $nilaiSekarang = $nilaiSekarang * $bilanganBasic;
        }
        return $nilaiSekarang;
    }
}
```

File tests **MatematikaTest.php**

```php
<?php
use PHPUnit\Framework\TestCase;
class MatematikaTest extends TestCase
{
    //Menguji pangkat bilangan positif, positif
    public function testPositifSemua()
    {
        $hasilPangkat = Matematika::pangkatBilangan(2, 3);
        $this->assertEquals(8, $hasilPangkat);
    }

    // Menguji pangkat bilangan negatif, positif
    public function testNegatifPositif()
    {
        $hasilPangkat = Matematika::pangkatBilangan(-3, 2);
        $this->assertEquals(9, $hasilPangkat);
    }

    //Menguji pangkat bilangan positif, negatif
    public function testPositifNegatif()
    {
        $hasilPangkat = Matematika::pangkatBilangan(4, -2);
        $this->assertEquals(1 / 16, $hasilPangkat);
    }

    //Menguji pangkat bilangan input tidak sesuai
    public function testInputNgawur()
    {
        $hasilPangkat = Matematika::pangkatBilangan("a", 4);
        $this->assertEquals(10, $hasilPangkat);
    }
}
?>
```

Dari keempat method yang ditest, kenapa hasilnya ada 1 *error* dan 1 *failure* ? Analisa kenapa **$hasilPangkat** pada *function/method* **testInputNgawur()** hasilnya error dan pada *function/method* **testPositifNegatif()** hasilnya gagal ?

```
D:\#Semester Ganjil 2020\Bahan Ajar\Praktikum RPL\latihan-php-unit>vendor\bin\phpunit tests\MatematikaTest.php
PHPUnit 9.4.2 by Sebastian Bergmann and contributors.

Runtime:       PHP 7.4.10
Configuration: D:\#Semester Ganjil 2020\Bahan Ajar\Praktikum RPL\latihan-php-unit\phpunit.xml

..FE                                                                4 / 4 (100%)

Time: 00:00.089, Memory: 6.00 MB

There was 1 error:

1) MatematikaTest::testInputNgawur
A non-numeric value encountered

D:\#Semester Ganjil 2020\Bahan Ajar\Praktikum RPL\latihan-php-unit\src\Matematika.php:16
D:\#Semester Ganjil 2020\Bahan Ajar\Praktikum RPL\latihan-php-unit\tests\MatematikaTest.php:50

--

There was 1 failure:

1) MatematikaTest::testPositifNegatif
Failed asserting that 1 matches expected 0.0625.

D:\#Semester Ganjil 2020\Bahan Ajar\Praktikum RPL\latihan-php-unit\tests\MatematikaTest.php:40

ERRORS!
Tests: 4, Assertions: 3, Errors: 1, Failures: 1.

D:\#Semester Ganjil 2020\Bahan Ajar\Praktikum RPL\latihan-php-unit>
```

3. Buat class **file.php** dan file test **ClassTest.php** sebagaimana berikut:

   File *source code class* **file.php**

```php
<?php

$url = 'http://mediabisnisonline.com';

function create_link($url){

}

create_link($url);
```

   File tests **ClassTest.php**

```php
<?php
use PHPUnit\Framework\TestCase;

class TestClass extends TestCase
{
        public function testFile()
        {
                ob_start();
                include 'src\file.php';
                $content = ob_get_contents();
                ob_end_clean();
                $this->assertEquals('<a href="http://mediabisnisonline.com">Klik link ini</a>', $content);
        }
}
?>
```

assertEquals() *berfungsi untuk menyatakan apakah argumen pertama sama dengan argumen kedua. Fungsi ini digunakan untuk membandingkan dan nilainya antara kedua argumen* ***harus sama****. Jika tidak, maka hasil testnya gagal/failures serta dijelaskan penyebab gagalnya sebagaimana gambar dibawah ini.*

```
D:\#Semester Ganjil 2020\Bahan Ajar\Praktikum RPL\latihan-php-unit>vendor\bin\phpunit tests\TestClass.php
PHPUnit 9.4.2 by Sebastian Bergmann and contributors.

Runtime:       PHP 7.4.10
Configuration: D:\#Semester Ganjil 2020\Bahan Ajar\Praktikum RPL\latihan-php-unit\phpunit.xml

F                                                                   1 / 1 (100%)

Time: 00:00.050, Memory: 6.00 MB

There was 1 failure:

1) TestClass::testFile
Failed asserting that two strings are equal.
--- Expected
+++ Actual
@@ @@
-'<a href="http://mediabisnisonline.com">Klik link ini</a>'
+''

D:\#Semester Ganjil 2020\Bahan Ajar\Praktikum RPL\latihan-php-unit\tests\TestClass.php:12

FAILURES!
Tests: 1, Assertions: 1, Failures: 1.
```

Jelaskan mana argument pertama dan argument kedua! Bandingkan kenapa berbeda! Kemudian perbaiki code **file.php** sebagaimana berikut dan test kembali. Analisa hasilnya!

TestClass.php | file.php

```php
<?php

$url = 'http://mediabisnisonline.com';

function create_link($url){
  echo '<a href="'.$url.'">Klik link ini</a>';
}

create_link($url);

/*
<?php

$url = 'http://mediabisnisonline.com';

function create_link($url){

}

create_link($url);
*/
```

4. Buat class **Employee.php** dan file test-nya

Employee.php | EmployeeTest.php

```php
<?php

class Employee
{
    private $id;
    private $name;
    private $basicSalary;

    public function __construct($id, $name, $basicSalary)
    {
        $this->id = $id;
        $this->name = $name;
        $this->basicSalary = $basicSalary;
    }

    public function getId()
    {
        return $this->id;
    }

    public function getName()
    {
        return $this->name;
    }

    public function getBasicSalary()
    {
        return $this->basicSalary;
    }
}
```

File tests **EmployeeTest.php**

Employee.php | EmployeeTest.php

```php
<?php

use PHPUnit\Framework\TestCase;

class EmployeeTest extends TestCase
{
    /** @test */
    public function shouldCreateObject()
    {
        $id = 1;
        $name = 'John Smith';
        $basicSalary = 1000000;

        $obj = new Employee(
            $id,
            $name,
            $basicSalary
        );

        $this->assertEquals($id, $obj->getId());
        $this->assertEquals($name, $obj->getName());
        $this->assertEquals($basicSalary, $obj->getBasicSalary());
    }
}
```

Jelaskan hasilnya kenapa ada **3 assertions** yang berhasil dalam **sebuah test**! Sebutkan!

Coba ganti isi method **$name = 'John Smith';** dengan **$name = John Smith (tanpa '');**

Analisa hasilnya!

Unit Testing menggunakan PHPUnit TestDox

*The **--testdox** option produces a nicer output, with checkboxes ([✓]), where an unchecked box ([✗]) means the test failed.*

Symbol	Color	Meaning
✔	green	test passed
✗	red	assertion failed
✗	yellow	PHPUnit error or warning
Ø	yellow	incomplete test
☢	yellow	risky test
→	yellow	skipped test

5. Buatlah class **Average.php** dan file test-nya **AverageTest.php**, kemudian test menggunakan PHPUnit TestDox. Jelaskan hasilnya!

   File class **Average.php**

```php
<?php
class Average
{
    /**
     * Calculate the mean average
     * @param array $numbers Array of numbers
     * @return float Mean average
     */
    public function mean(array $numbers)
    {
        return array_sum($numbers) / count($numbers);
    }

    /**
     * Calculate the median average
     * @param array $numbers Array of numbers
     * @return float Median average
     */
    public function median(array $numbers)
    {
        sort($numbers);
        $size = count($numbers);
        if ($size % 2) {
            return $numbers[$size / 2];
        } else {
            return $this->mean(
                array_slice($numbers, ($size / 2) - 1, 2)
            );
        }
    }
}
```

   File tests **AverageTest.php**

```php
<?php

use PHPUnit\Framework\TestCase;

class AverageTest extends TestCase
{
    protected $Average;

    public function setUp() : void
    {
        $this->Average = new Average();
    }

    public function testCalculationOfMean()
    {
        $numbers = [3, 7, 6, 1, 5];
        $this->assertEquals(4.4, $this->Average->mean($numbers));
    }

    public function testCalculationOfMedian()
    {
        $numbers = [3, 7, 6, 1, 5];
        $this->assertEquals(5, $this->Average->median($numbers));
    }
}
```

```
D:\#Semester Ganjil 2020\Bahan Ajar\Praktikum RPL\latihan-php-unit>vendor\bin\phpunit --testdox tests\AverageTest.php
PHPUnit 9.4.2 by Sebastian Bergmann and contributors.

Runtime:       PHP 7.4.10
Configuration: D:\#Semester Ganjil 2020\Bahan Ajar\Praktikum RPL\latihan-php-unit\phpunit.xml

Average
 ✓ Calculation of mean  13 ms
 ✓ Calculation of median  1 ms

Time: 00:00.090, Memory: 6.00 MB

OK (2 tests, 2 assertions)
```

Analisa hasil testing berikut ini apabila hasil mean diubah dari **4.4** menjadi **4!**

```
D:\#Semester Ganjil 2020\Bahan Ajar\Praktikum RPL\latihan-php-unit>vendor\bin\phpunit --testdox tests\AverageTest.php
PHPUnit 9.4.2 by Sebastian Bergmann and contributors.

Runtime:       PHP 7.4.10
Configuration: D:\#Semester Ganjil 2020\Bahan Ajar\Praktikum RPL\latihan-php-unit\phpunit.xml

Average
 ✗ Calculation of mean  33 ms
   ┐
   ├ Failed asserting that 4.4 matches expected 4.
   │
   │ D:\#Semester Ganjil 2020\Bahan Ajar\Praktikum RPL\latihan-php-unit\tests\AverageTest.php:17
   ┴

 ✓ Calculation of median  2 ms

Time: 00:00.238, Memory: 6.00 MB

Summary of non-successful tests:

Average
 ✗ Calculation of mean  33 ms
   ┐
   ├ Failed asserting that 4.4 matches expected 4.
   │
   │ D:\#Semester Ganjil 2020\Bahan Ajar\Praktikum RPL\latihan-php-unit\tests\AverageTest.php:17
   ┴

FAILURES!
Tests: 2, Assertions: 2, Failures: 1.
```

Analisa hasil testing apabila median **$numbers** diubah menjadi **[3, 7, 6, 1, 9],** kemudian ubah isi **$numbers** sesuai dengan hasil testing tanpa merubah hasil median **[5]** !

Writing Tests for PHPUnit (Exceptions and Errors)

PHPUnit has a nice way of testing exceptions, using the **exceptException()** method