

# Technical Assessment

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## Instruction

1. The answer for each question must be prepared in separated documents and grouped into a folder, which is labelled based on the test number.
2. You are required to **submit the folder in .zip, .rar, or .tar.gz** formats. The example folder structure as follows:

```
YOUR_NAME
  >>> 1
      >>> answer.txt
  >>> 2
      >>> answer.py
  >>> 3
      >>> answer.cpp
      >>> answer.hpp
      >>> makefile
      >>> readme.md
  >>> ...
```

3. Please provide the complete source code and the instruction to build and run the source code (if any) for questions that require you to program.
4. Submit your answers by **replying this email**.
5. You have **three (3) days** to complete the test, please submit your answer within the time limit. Any late submission will not be considered.
6. Please do not worry if you could not finish all the questions. Our selection process will not based on the quantity of the question you can answer. Nonetheless, it is based on the quality of the answer you given. So, please choose the questions that you think you are good at.
7. All the best.

## #1 (Answer in html and css)

You need to create a *1x4 flexible grid*, that is, there is 1 row and 4 columns. The width of each column is *25%* of the window size. This width must be maintained even if the page is resized. Also make sure that each cell of the grid can contain another *1x4 flexible grid*. The border of the grid must be *1px black*.

Perform the following operations based on the value of window size:

- If the window size is less than *720px*, then the *1x4 flexible grid* becomes a *2x2 grid*, that is, the 3rd and 4th columns slide down onto the 2nd row.
- If the window size is less than *360px*, then the *1x4 flexible grid* becomes *4x1 grid*, that is, each column slides under the one before it. The 2nd column slides under the 1st, the 3rd slides under the 2nd, and the 4th slides under the 3rd.

## #2

Suppose you have a dataset which contains a bunch of car images. There are 15,000 pictures of Avansha and 13,000 pictures of Xenhia in the dataset which all are already been labeled. Your task is to train a model that can classify a new input image into those two different brand. Explain:

- How would you split the dataset?
- What kind of classifier would you use to solve such problem? and why?
- Suppose you have successfully trained a model with a good accuracy on your training data. Unfortunately, your model is not performing well when you tested it with a new image. What are the possible causes of that problem? How would you solve it?

## #3 (Answer in C++)

Modify the following program, so that it can produce an output as expected below:

```
const int row = 12;
const int col = 32;
const int mid = 16;

for (int i = 0; i < row; i++) {
    for (int j = col; j > 0; j--) {
        char a = '*';

        if (j >= mid - 9 && j <= mid + 10) a = ' ';
        if (j >= mid - 4 && j <= mid + 5) a = '*';

        std::cout << a;
    }

    std::cout << std::endl;
}
```

Expected output:

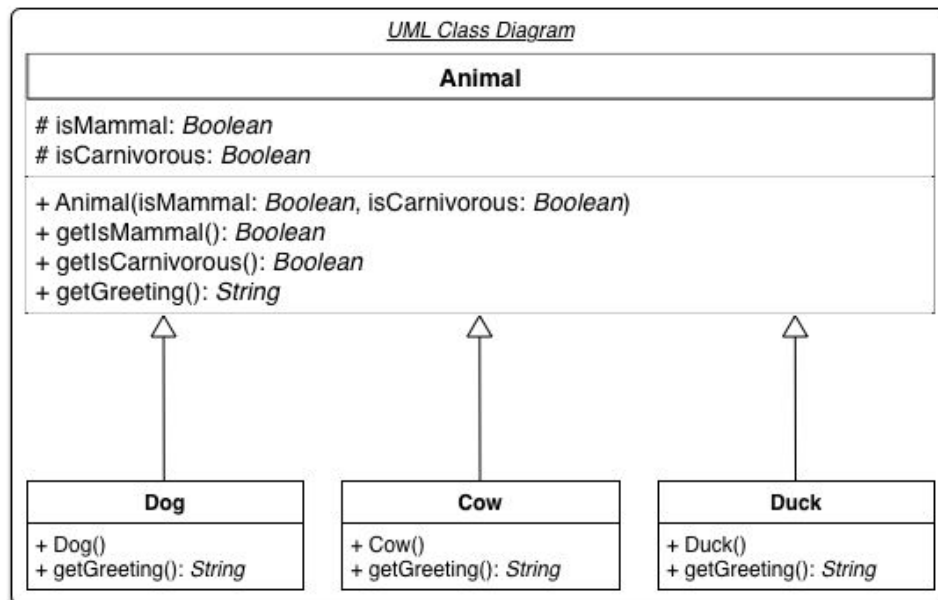
```
* * * * *
* * * * *      * * * * *
* * * * *          * * * * *
* * * * *              * * * * *
* * * * *          * * * * *              * * * * *
* * * * *              * * * * *      * * * * *
* * * * *          * * * * *      * * * * *
* * * * *              * * * * *      * * * * *
* * * * *          * * * * *      * * * * *
* * * * *              * * * * *      * * * * *
* * * * *          * * * * *      * * * * *
* * * * *              * * * * *      * * * * *
* * * * *          * * * * *      * * * * *
* * * * *              * * * * *      * * * * *
```

#### #4 (Answer in C++ / Python)

In this challenge, you will be asked to build on an abstract class and initialize an instance of each class with a variable. Your code should do the following:

1. Declares an abstract class named `Animal` with the implementations for `getIsMammal()` and `getIsCarnivorous()` methods, as well as an abstract method named `getGreeting()`.
2. Creates `Dog`, `Cow`, and `Duck` objects.
3. Calls the `getIsMammal()`, `getIsCarnivorous()`, and `getGreeting()` methods on each of these respective objects.

Consider the following UML diagram:



A UML diagram of `Animal`, `Dog`, `Cow`, and `Duck` classes.

Recall that `-` denotes private, `+` denotes public, and `#` denotes protected.

Implement the following:

1. Three classes named `Dog`, `Cow`, and `Duck` that inherit from the `Animal` class.
2. No-argument constructors for each class that initialize the instance variables inherited from the superclass.
3. Each class must implement the `getGreeting()` method:
  - For a `Dog` object, this must return the string `ruff`.
  - For a `Cow` object, this must return the string `moo`.
  - For a `Duck` object, this must return the string `quack`.

Example `getGreeting()` output of `Dog`, `Cow` and `Duck` instance:

A dog says 'ruff', is carnivorous, and is a mammal.

A cow says 'moo', is not carnivorous, and is a mammal.

A duck says 'quack', is not carnivorous, and is not a mammal.

## #5 (Answer in shell script)

Filename: **example.txt**

Content:

```
/home/path/to/folder1/in-folder1/1.txt
/home/path/to/folder1/in-folder1/2.txt
/home/path/to/folder1/in-folder1/3.txt
/home/path/to/folder1/in-folder1/4.txt
/home/path/to/folder1/in-folder1/5.txt
```

Change the content of **example.txt**, with a single line **sed** command to:

```
/home/path/to/folder2/1.txt
/home/path/to/folder2/2.txt
/home/path/to/folder2/3.txt
/home/path/to/folder2/4.txt
/home/path/to/folder2/5.txt
```

## #6 (Answer in shell script)

MySQL host: 192.168.1.232

MySQL username: donkey

MySQL password: donkey123

MySQL db: db\_donkeys

Given the information above, please create a simple backup script on POSIX environment for **db\_donkeys**, and save 5 latest backup (1 backup file / day) to a location of your choice. Schedule a task to run the script on background every 01:00 AM.

## #7

Given the output of a neural network's activation function is -0.05. Between these activation functions:

- Sigmoid
- Tanh
- ReLu

What is the possible *activation function* used to get that output? Give the reason!

## #8

Determine the output vector of a softmax activation function if the input vector is (1, 4, 5, 2)!

## #9 (Answer in html, css, javascript)

Please give an explanation about each step of the machine learning workflow pictured above. Create an *image preview tool* that can be used to preview images, with the following preferred methods:

- *Drag and Drop*: The image is dragged from the computer and dropped on the previewer.
- *Image Link*: The image link is provided.

## #10 (Answer in javascript)

Modify `foo1` function, so that it can produce an output as expected below:

```
function foo1(d) {
  foo2(d++);
  console.log("Called on last index " + d);
}

function foo2(d, cb) {
  console.log("This is foo2", d);
  (function() {
    if (typeof cb == "function") {
      cb();
      return;
    }
    foo1(d);
  })();
}

foo1(0);
```

### Expected Result:

```
This is foo2 1
This is foo2 2
This is foo2 3
This is foo2 4
This is foo2 5
This is foo2 6
This is foo2 7
This is foo2 8
This is foo2 9
Called on last index 10
```

Notes: Please do not modify `foo2` function.

### #11 (Answer in C++ / Python)

Tour de Singkarak is annual professional road bicycle racing. A group of cyclist will race for about a week throughout West Sumatra. During the tour, the participants will race over inland cities in several stages. The winning cyclist for that day will be crowned as the winner of that stage. Their times will be accumulated from stage to stage. The leader of the accumulated time is the overall leader of the tour and will be wearing the famous yellow jersey the following day. The participant who gets the yellow jersey after the race ends in the final stage, will be the overall champion of Tour de Singkarak.

Assume there are six stages throughout the event. Following is the example of the race result of five highest participants for the first stage from Padang to Pariaman. (Note: Padang and Pariaman is the first stage where Tour de Singkarak 2010 started).

Participant	Padang to Pariaman (Stage 1)
Ghader	1h 30m 55s
Amir	1h 28m 44s
Oscar	1h 34m 38s
<b>Arvin</b>	<b>1h 28m 36s</b>
Khalil	1h 32m 22s

This means, Arvin is the first stage winner and currently the overall leader. Thus, he will be wearing the yellow jersey at the second stage. After the second stage, the result will be updated as follows:

Participant	Padang to Pariaman (Stage 1)	Pariaman to Bukittinggi (Stage 2)	Overall Time
Ghader	1h 30m 55s	1h 20m 39s	2h 51m 34s
Amir	1h 28m 44s	1h 22m 51s	2h 51m 35s
Oscar	1h 34m 38s	1h 22m 15s	2h 56m 53s
<b>Arvin</b>	<b>1h 28m 36s</b>	<b>1h 20m 50s</b>	<b>2h 49m 26s</b>
Khalil	1h 32m 22s	1h 21m 37s	2h 53m 59s

Write the program in an Object Oriented Paradigm (OOP). The program specification as follows:

- Define a `class` that is reusable for any other incoming events of bicycle tour racing.
- The `class` should have a constructor that receives total stages and total participants as its parameters.
- After `class` is constructed, a function to set the distance (in kilometers) for each stages has to be called.
- The list of participants' name is loaded from a text file. Then assign an ID number for each registered participants. Please provide at least five (5) participants as an example.

```
Amir
Arvin
Ghader
.
.
.
```

- Provide a function to record the time taken in each stages for the participants by selecting them based on their ID numbers.
- Finally, provide a function to generate a text file which shows the participants' rank from the highest until the lowest. Please show the overall time taken and the average speed of the participants alongside their names. For example:

```
1. Arvin 2h 49m 26s 15.3km/h
2. Ghader 2h 51m 34s 15.1km/h
3. Amir 2h 51m 35s 15.1km/h
.
.
.
```

## #12

```
Volume Group = vg_nodeflux  
Logical Volume = lv_home  
lv_home → /home
```

Please explain the steps to create new LVM on a newly attached 10 TB HDD, and use the new volume to extend `/home` partition based on informations above.

## #13

Create an installation script to install FTP server and it's configuration as followed:

```
FTP root folder = /home/$USER/ftp  
USER1 = nodeflux ; Permission = full access  
USER2 = donkey ; Permission = read only, on USER1 root folder  
USER3 = gandalf ; Permission = block access to FTP
```

## #14



Please give an explanation about each step of the machine learning workflow pictured above!