



OCaml Pool - d07

Object Oriented Programming 1

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Abstract: This is the subject for d07 of the OCaml piscine. The main theme of this day is to introduce the object oriented programming style with OCaml. This first day will focus on basic interaction with the 'O' from 'O'Caml.

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Chapter I

Ocaml piscine, general rules

- Every output goes to the standard output, and will be ended by a newline, unless specified otherwise.
- The imposed filenames must be followed to the letter, as well as class names, function names and method names, etc.
- Unless otherwise explicitly stated, the keywords `open`, `for` and `while` are forbidden. Their use will be flagged as cheating, no questions asked.
- Turn-in directories are `ex00/`, `ex01/`, ..., `exn/`.
- You must read the examples thoroughly. They can contain requirements that are not obvious in the exercise's description.
- Since you are allowed to use the `OCaml` syntaxes you learned about since the beginning of the piscine, you are not allowed to use any additional syntaxes, modules and libraries unless explicitly stated otherwise.
- The exercices must be done in order. The graduation will stop at the first failed exercise. Yes, the old school way.
- Read each exercise FULLY before starting it! Really, do it.
- The compiler to use is `ocamlpt`. When you are required to turn in a function, you must also include anything necessary to compile a full executable. That executable should display some tests that prove that you've done the exercise correctly.
- Remember that the special token `";;"` is only used to end an expression in the interpreter. Thus, it must never appear in any file you turn in. Regardless, the interpreter is a powerfull ally, learn to use it at its best as soon as possible!
- The subject can be modified up to 4 hours before the final turn-in time.
- In case you're wondering, no coding style is enforced during the `OCaml` piscine. You can use any style you like, no restrictions. But remember that a code your peer-

evaluator can't read is a code he or she can't grade. As usual, big functions are a weak style.

- You will NOT be graded by a program, unless explicitly stated in the subject. Therefore, you are given a certain amount of freedom in how you choose to do the exercises. However, some piscine day might explicitly cancel this rule, and you will have to respect directions and outputs perfectly.
- Only the requested files must be turned in and thus present on the repository during the peer-evaluation.
- Even if the subject of an exercise is short, it's worth spending some time on it to be absolutely sure you understand what's expected of you, and that you did it in the best possible way.
- By Odin, by Thor! Use your brain!!!

Chapter II

Day-specific rules

- This day is pure fun. Bonus points will be allowed if you provide clever references to the Doctor Who universe.
- You are in a functional programming piscine, so your coding style **MUST** be functional (Except for the side effects for the input/output). I insist, your code **MUST** be functional, otherwise you'll have a tedious defence session.
- For each exercise of the day, you must provide sufficient material for testing during the defence session. **Every functionality that can't be tested won't be graded!**
- Don't be lazy. If something is not tested in an exercise, the defence will stop immediately.

Chapter III

Foreword : The ultimate mega gangsta chocolate butter cake

III.1 Ingredients :

- 250g of chocolate
- 250g of butter (Yeah... I know)
- 150g of sugar
- 4 eggs
- 1 big spoon of flour


III.2 Recipe :

- Melt the chocolate with the butter.
- Add sugar.
- Add eggs one by one by mixing between each one.
- Add flour progressively while mixing the whole thing
- Pour into a cake plate (or something similar)
- Put the cake plate into a larger plate with a little water in it (bain marie style)
- Put the two plates like this in the oven for 45 minutes at 180 degrees
- Put it 12 hours (Not a joke) into your refrigerator.

Done!

Chapter IV


Exercise 00: Do What I do. Hold tight and pretend it's a plan!

	Exercise 00
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Turn-in directory : <i>ex00/</i>	
Files to turn in : people.ml , main.ml , Makefile	
Allowed functions : Pervasives modules	
Remarks : n/a	

- Write a class *people* that has the following attributes :
 - A name attribute of type string.
 - An hp attribute of type int initialized to 100.
 - A `to_string` method that returns the name of the object with attributes values.
 - A `talk` method that print the following string on the standard output :
I'm [NAME]! Do you know the Doctor?
 - A method `die` which prints the following sentence on the standard output :
Aaaarghh!
 - An initializer which indicate that the object has been created (feel free to use something explicit and wise to describe it!)
- You have to simulate all the methods in the main to provide sufficient testing for the defence.

Chapter V

Exercise 01: The Name Of The Doctor!

	Exercise 01
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Turn-in directory : <i>ex01/</i>	
Files to turn in : <i>doctor.ml, people.ml, main.ml, Makefile</i>	
Allowed functions : <i>Pervasives</i> modules	
Remarks : <i>n/a</i>	


- Write a class *doctor* that has the following attributes :
 - A name attribute of type string.
 - An age attribute of type int.
 - A sidekick attribute of type *people*
 - An hp attribute of type int initialized to 100.
 - A *to_string* method that returns the name of the object with attributes values.
 - A *talk* method that print the following string on the standard output :
Hi! I'm the Doctor!
 - An initializer which indicate that the object has been created (feel free to use something explicit and wise to describe it!)
 - A method *travel_in_time* which takes two arguments of type int : *start* and *arrival* and changes the age of the doctor logically (Think before coding some weird arithmetics... Please...). This method also draw a TARDIS on the standard output. (If you don't know what a TARDIS is, google it!)
 - A method *use_sonic_screwdriver* which prints the following sentence on the standard output : *Whiiiiwhiiwhiii Whiiiiwhiiwhiii Whiiiiwhiiwhiii*

- A private method regenerate that sets the hp of the doctor to 100 (the maximum)
- You have to simulate all the methods in the main to provide sufficient testing for the defence.



Chapter VI

Exercise 02: You are a good Daaaaaalek!


	Exercise 02
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Turn-in directory : <i>ex02/</i>	
Files to turn in : <i>dalek.ml, doctor.ml, people.ml, main.ml, Makefile</i>	
Allowed functions : <i>Pervasives, String and Random</i> modules	
Remarks : <i>n/a</i>	

- Write a class *dalek* that has the following attributes :
 - A name attribute of type string randomly generated with the format : *DalekXXX* with XXX is a random set of chars (DalekSec for example).
 - An hp attribute of type int initialized to 100.
 - A shield attribute of type bool mutable, initialized to true and change it's value each time the exterminate method is used.
 - A to_string method that returns the name of the object with attributes values.
 - A talk method that randomly prints one of the following strings on the standard output :
 - * *Explain! Explain!*
 - * *Exterminate! Exterminate!*
 - * *I obey!*
 - * *You are the Doctor! You are the enemy of the Daleks!*
 - A method exterminate which takes an argument of type people object and kill it instantly.

- A method die which prints the following sentence on the standard output :
Emergency Temporal Shift!
- You have to simulate a battle between the doctor, a dalek and a human in the main to provide sufficient testing for the defence. Also feel free to add any setter that you want.

Chapter VII


Exercise 03: The Day of The Doctor!

	Exercise 03
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Turn-in directory : <i>ex03/</i>	
Files to turn in : <code>army.ml</code> , <code>dalek.ml</code> , <code>doctor.ml</code> , <code>people.ml</code> , <code>main.ml</code> , <code>Makefile</code>	
Allowed functions : <code>Pervasives</code> and <code>List</code> modules	
Remarks : n/a	

- Write a parameterized class *army* that has the following attributes :
 - A member attribute of type 'a list which contains a list of instance of one of the 3 previous classes.
 - An add method that adds an instance ot the list (front or back).
 - A delete method that removes the head of the list member. (front or back)
- You have to simulate a construction and a destruction of an army of each type in the main to provide sufficient testing for the defence.

Chapter VIII

Exercise 04: The Time War!

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Turn-in directory : <i>ex04/</i>	
Files to turn in : <i>galifrey.ml</i> , <i>army.ml</i> , <i>dalek.ml</i> , <i>doctor.ml</i> , <i>people.ml</i> , <i>main.ml</i> , <i>Makefile</i>	
Allowed functions : Everything functional (so no while, for, Array etc...)	
Remarks : n/a	



- Write a class *galifrey* that has the following attributes :
 - A member attribute of type dalek list which contains a list of instance of dalek type.
 - A member attribute of type doctor list which contains a list of instance of doctor type.
 - A member attribute of type people list which contains a list of instance of people type.
 - A *do_time_war* method that launch the greatest battle in time and space. You will need to add more methods to handle correct behaviour. For example

one to select one of the attack of an instance or another to check if there is any object of a list that is still alive. Feel free to add any method that seems necessary.

- You have to simulate a time war in the main to provide sufficient testing for the defence.