



C Piscine

C 12

*Summary: This document is the subject for the module C 12 of the C Piscine @ 42.*

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# **Chapter I**

## **Foreword**

SPOILER ALERT  
DON'T READ THE NEXT PAGE

## You've been warned.

- In Star Wars, Dark Vador is Luke's Father.
- In The Usual Suspects, Verbal is Keyser Soze.
- In Fight Club, Tyler Durden and the narrator are the same person.
- In Sixth Sens, Bruce Willis is dead since the beginning.
- In The others, the inhabitants of the house are ghosts and vice-versa.
- In Bambi, Bambi's mother dies.
- In The Village, monsters are the villagers and the movie actually takes place in our time.
- In Harry Potter, Dumbledore dies.
- In Planet of apes, the movie takes place on earth.
- In Game of thrones, Robb Stark and Joffrey Baratheon die on their wedding day.
- In Twilight, Vampires shine under the sun.
- In Stargate SG-1, Season 1, Episode 18, O'Neill and Carter are in Antartica.
- In The Dark Knight Rises, Miranda Tate is Talia Al'Gul.
- In Super Mario Bros, The princess is in another castle.

# Chapter II

## Instructions

- Only this page will serve as reference: do not trust rumors.
- Watch out! This document could potentially change before submission.
- Make sure you have the appropriate permissions on your files and directories.
- You have to follow the submission procedures for all your exercises.
- Your exercises will be checked and graded by your fellow classmates.
- On top of that, your exercises will be checked and graded by a program called Moulinette.
- Moulinette is very meticulous and strict in its evaluation of your work. It is entirely automated and there is no way to negotiate with it. So if you want to avoid bad surprises, be as thorough as possible.
- Moulinette is not very open-minded. It won't try and understand your code if it doesn't respect the Norm. Moulinette relies on a program called `norminette` to check if your files respect the norm. TL;DR: it would be idiotic to submit a piece of work that doesn't pass `norminette`'s check.
- These exercises are carefully laid out by order of difficulty - from easiest to hardest. We **will not** take into account a successfully completed harder exercise if an easier one is not perfectly functional.
- Using a forbidden function is considered cheating. Cheaters get **-42**, and this grade is non-negotiable.
- You'll only have to submit a `main()` function if we ask for a program.
- Moulinette compiles with these flags: `-Wall -Wextra -Werror`, and uses `gcc`.
- If your program doesn't compile, you'll get 0.
- You cannot leave any additional file in your directory than those specified in the subject.
- Got a question? Ask your peer on the right. Otherwise, try your peer on the left.


- Your reference guide is called `Google / man / the Internet / ....`
- Check out the "C Piscine" part of the forum on the intranet, or the slack Piscine.
- Examine the examples thoroughly. They could very well call for details that are not explicitly mentioned in the subject...
- By Odin, by Thor ! Use your brain !!!
- For the following exercises, you have to use the following structure :

```
typedef struct          s_list
{
    struct s_list      *next;
    void               *data;
}                      t_list;
```

- You'll have to include this structure in a file `ft_list.h` and submit it for each exercise.
- From exercise 01 onward, we'll use our `ft_create_elem`, so make arrangements (it could be useful to have its prototype in a file `ft_list.h...`).

# Chapter III

## Exercice 00 : ft\_create\_elem


|   |             |
|---|-------------|
|  | Exercise 00 |
| ft_create_elem  |             |
| Turn-in directory : <i>ex00/</i>  |             |
| Files to turn in : <code>ft_create_elem.c</code> , <code>ft_list.h</code>         |             |
| Allowed functions : <code>malloc</code>   |             |

- Create the function `ft_create_elem` which creates a new element of `t_list` type.
- It should assign `data` to the given argument and `next` to `NULL`.
- Here's how it should be prototyped :

```
t_list      *ft_create_elem(void *data);
```

# Chapter IV

## Exercice 01 : ft\_list\_push\_front

|   |             |
|---|-------------|
|  | Exercise 01 |
| ft_list_push_front  |             |
| Turn-in directory : <i>ex01/</i>  |             |
| Files to turn in : <i>ft_list_push_front.c</i> , <i>ft_list.h</i>                 |             |
| Allowed functions : <i>ft_create_elem</i>   |             |


- Create the function `ft_list_push_front` which adds a new element of type `t_list` to the beginning of the list.
- It should assign `data` to the given argument.
- If necessary, it'll update the pointer at the beginning of the list.
- Here's how it should be prototyped :

```
void      ft_list_push_front(t_list **begin_list, void *data);
```



# Chapter V

## Exercice 02 : ft\_list\_size


|   |             |
|---|-------------|
|  | Exercise 02 |
| ft_list_size  |             |
| Turn-in directory : <i>ex02/</i>  |             |
| Files to turn in : <code>ft_list_size.c</code> , <code>ft_list.h</code>           |             |
| Allowed functions : None  |             |

- Create the function `ft_list_size` which returns the number of elements in the list.
- Here's how it should be prototyped :

```
int ft_list_size(t_list *begin_list);
```

# Chapter VI

## Exercice 03 : ft\_list\_last


|   |             |
|---|-------------|
|  | Exercise 03 |
| ft_list_last  |             |
| Turn-in directory : <i>ex03/</i>  |             |
| Files to turn in : <i>ft_list_last.c, ft_list.h</i>                               |             |
| Allowed functions : None  |             |

- Create the function `ft_list_last` which returns the last element of the list.
- Here's how it should be prototyped :

```
t_list *ft_list_last(t_list *begin_list);
```

# Chapter VII

## Exercice 04 : ft\_list\_push\_back


|   |             |
|---|-------------|
|  | Exercise 04 |
| ft_list_push_back   |             |
| Turn-in directory : <i>ex04/</i>  |             |
| Files to turn in : <code>ft_list_push_back.c</code> , <code>ft_list.h</code>      |             |
| Allowed functions : <code>ft_create_elem</code>                                   |             |

- Create the function `ft_list_push_back` which adds a new element of `t_list` type at the end of the list.
- It should assign `data` to the given argument.
- If necessary, it'll update the pointer at the beginning of the list.
- Here's how it should be prototyped :

```
void      ft_list_push_back(t_list **begin_list, void *data);
```

# Chapter VIII

## Exercice 05 : ft\_list\_push\_strs


|   |             |
|---|-------------|
|  | Exercise 05 |
| ft_list_push_strs   |             |
| Turn-in directory : <i>ex05/</i>  |             |
| Files to turn in : <code>ft_list_push_strs.c</code> , <code>ft_list.h</code>      |             |
| Allowed functions : <code>ft_create_elem</code>                                   |             |

- Create the function `ft_list_push_strs` which creates a new list that includes all the string pointed by the element in `strs`.
- `size` is the size of `strs`
- The first element should be at the end of the list.
- The first link's address in the list is returned.
- Here's how it should be prototyped :

```
t_list *ft_list_push_strs(int size, char **strs);
```

# Chapter IX

## Exercice 06 : ft\_list\_clear


|   |               |
|---|---------------|
|  | Exercise 06   |
|   | ft_list_clear |
| Turn-in directory : <i>ex06/</i>  |               |
| Files to turn in : <i>ft_list_clear.c, ft_list.h</i>                              |               |
| Allowed functions : <i>free</i>   |               |

- Create the function `ft_list_clear` which remove and free all links from the list.
- `free_fct` to free each data
- Here's how it should be prototyped :

```
void ft_list_clear(t_list *begin_list, void (*free_fct)(void *));
```

# Chapter X

## Exercice 07 : ft\_list\_at


|   |             |
|---|-------------|
|  | Exercise 07 |
| ft_list_at  |             |
| Turn-in directory : <i>ex07/</i>  |             |
| Files to turn in : <i>ft_list_at.c, ft_list.h</i>                                 |             |
| Allowed functions : None  |             |

- Create the function `ft_list_at` which returns the Nth element of the list, knowing that the first element of the list is when `nbr` equal 0.
- In case of error, it should return a null pointer.
- Here's how it should be prototyped :

```
t_list *ft_list_at(t_list *begin_list, unsigned int nbr);
```

# Chapter XI

## Exercice 08 : ft\_list\_reverse


|   |                 |
|---|-----------------|
|  | Exercise 08     |
|   | ft_list_reverse |
| Turn-in directory : <i>ex08/</i>  |                 |
| Files to turn in : <b>ft_list_reverse.c</b>                                       |                 |
| Allowed functions : <b>None</b>   |                 |

- Create the function **ft\_list\_reverse** which reverses the order of a list's elements. The value of each element must remain the same.
- Beware in that function we will use our own **ft\_list.h**
- Here's how it should be prototyped :

```
void ft_list_reverse(t_list **begin_list);
```

# Chapter XII

## Exercice 09 : ft\_list\_foreach

|   |             |
|---|-------------|
|  | Exercise 09 |
| ft_list_foreach   |             |
| Turn-in directory : <i>ex09/</i>  |             |
| Files to turn in : <i>ft_list_foreach.c, ft_list.h</i>                            |             |
| Allowed functions : None  |             |

- Create the function `ft_list_foreach` which applies the function given as argument to each of the list's elements.
- `f` should be apply with the same order as the list
- Here's how it should be prototyped :

```
void ft_list_foreach(t_list *begin_list, void (*f)(void *));
```


- The function pointed by `f` will be used as follows :

```
(*f)(list_ptr->data);
```



# Chapter XIII

## Exercice 10 : ft\_list\_foreach\_if

|   |             |
|---|-------------|
|  | Exercise 10 |
| ft_list_foreach_if  |             |
| Turn-in directory : <i>ex10/</i>  |             |
| Files to turn in : <i>ft_list_foreach_if.c, ft_list.h</i>                         |             |
| Allowed functions : None  |             |

- Create the function `ft_list_foreach_if` which applies the function given as argument to some of the list's elements.
- Only apply the function to the elements when `cmp` with `data_ref`, `cmp` returns 0
- `f` should be apply with the same order as the list
- Here's how it should be prototyped :

```
void ft_list_foreach_if(t_list *begin_list, void (*f)(void *), void  
*data_ref, int (*cmp)())
```

- Functions pointed by `f` and by `cmp` will be used as follows :


```
(*f)(list_ptr->data);  
(*cmp)(list_ptr->data, data_ref);
```



For example, the function `cmp` could be `ft_strcmp...`

# Chapter XIV

## Exercice 11 : ft\_list\_find

|   |             |
|---|-------------|
|  | Exercise 11 |
| ft_list_find  |             |
| Turn-in directory : <i>ex11/</i>  |             |
| Files to turn in : <i>ft_list_find.c, ft_list.h</i>                               |             |
| Allowed functions : None  |             |

- Create the function `ft_list_find` which returns the address of the first element's data compared to `data_ref` with `cmp` makes `cmp` to return 0.
- Here's how it should be prototyped :


```
t_list *ft_list_find(t_list *begin_list, void *data_ref, int (*cmp)());
```

- Function pointed by `cmp` will be used as follows :

```
(*cmp)(list_ptr->data, data_ref);
```

# Chapter XV

## Exercice 12 : ft\_list\_remove\_if

|   |             |
|---|-------------|
|  | Exercise 12 |
| ft_list_remove_if   |             |
| Turn-in directory : <i>ex12/</i>  |             |
| Files to turn in : <i>ft_list_remove_if.c, ft_list.h</i>                          |             |
| Allowed functions : <i>free</i>   |             |

- Create the function `ft_list_remove_if` which erases off the list all elements whose data compared to `data_ref` with `cmp` makes `cmp` to return 0.
- The data from an element that should be erase, should be freed using `free_fct`
- Here's how it should be prototyped :


```
void ft_list_remove_if(t_list **begin_list, void *data_ref, int (*cmp)(), void (*free_fct)(void *))
```

- Function pointed by `cmp` and by `free_fct` will be used as follows :

```
(*cmp)(list_ptr->data, data_ref);  
(*free_fct)(list_ptr->data);
```

# Chapter XVI

## Exercice 13 : ft\_list\_merge


|   |             |
|---|-------------|
|  | Exercise 13 |
| ft_list_merge   |             |
| Turn-in directory : <i>ex13/</i>  |             |
| Files to turn in : <i>ft_list_merge.c, ft_list.h</i>                              |             |
| Allowed functions : None  |             |

- Create the function `ft_list_merge` which places elements of a list `begin2` at the end of an other list `begin1`.
- Element creation is not authorised.
- Here's how it should be prototyped :

```
void ft_list_merge(t_list **begin_list1, t_list *begin_list2);
```

# Chapter XVII

## Exercice 14 : ft\_list\_sort

|   |   |
|---|---|
|  | Exercise 14   |
|   | ft_list_sort  |
|   | Turn-in directory : <i>ex14/</i>                    |
|   | Files to turn in : <i>ft_list_sort.c, ft_list.h</i> |
|   | Allowed functions : None                            |

- Create the function `ft_list_sort` which sorts the list's elements by ascending order by comparing two elements by comparing their data with a function.
- Here's how it should be prototyped :

```
void ft_list_sort(t_list **begin_list, int (*cmp)());
```

- Function pointed by `cmp` will be used as follows :


```
(*cmp)(list_ptr->data, list_other_ptr->data);
```



`cmp` could be for instance `ft_strcmp`.

# Chapter XVIII

## Exercice 15 : ft\_list\_reverse\_fun


|   |             |
|---|-------------|
|  | Exercise 15 |
| ft_list_reverse_fun   |             |
| Turn-in directory : <i>ex15/</i>  |             |
| Files to turn in : <code>ft_list_reverse_fun.c</code> , <code>ft_list.h</code>    |             |
| Allowed functions : None  |             |

- Create the function `ft_list_reverse_fun` which reverses the order of the elements of the list.
- Here's how it should be prototyped :

```
void ft_list_reverse_fun(t_list *begin_list);
```

# Chapter XIX

## Exercice 16 : ft\_sorted\_list\_insert

|   |             |
|---|-------------|
|  | Exercise 16 |
| ft_sorted_list_insert   |             |
| Turn-in directory : <i>ex16/</i>  |             |
| Files to turn in : <i>ft_sorted_list_insert.c, ft_list.h</i>                      |             |
| Allowed functions : <i>ft_create_elem</i>   |             |

- Create the function `ft_sorted_list_insert` which creates a new element and inserts it into a list sorted so that it remains sorted in ascending order.
- Here's how it should be prototyped :


```
void ft_sorted_list_insert(t_list **begin_list, void *data, int (*cmp)());
```

- Function pointed by `cmp` will be used as follows :

```
(*cmp)(list_ptr->data, list_other_ptr->data);
```

# Chapter XX

## Exercice 17 : ft\_sorted\_list\_merge

|   |             |
|---|-------------|
|  | Exercise 17 |
| ft_sorted_list_merge  |             |
| Turn-in directory : <i>ex17/</i>  |             |
| Files to turn in : <code>ft_sorted_list_merge.c</code> , <code>ft_list.h</code>   |             |
| Allowed functions : None  |             |

- Create the function `ft_sorted_list_merge` which integrates the elements of a sorted list `begin2` in another sorted list `begin1`, so that `begin1` remains sorted by ascending order.
- Here's how it should be prototyped :

```
void ft_sorted_list_merge(t_list **begin_list1, t_list *begin_list2, int (*cmp)());
```

- Function pointed by `cmp` will be used as follows :

```
(*cmp)(list_ptr->data, list_other_ptr->data);
```