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# Chapter I

## Instructions

- Only this page will serve as reference: do not trust rumors.
- Watch out! This document could potentially change up to an hour before submission.
- Make sure you have the appropriate permissions on your files and directories.
- You have to follow the submission procedures for every exercise.
- 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 **Norminator** to check if your files respect the norm. TL;DR: it would be idiotic to submit a piece of work that doesn't pass **Norminator**'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.
- If `ft_putchar()` is an authorized function, we will compile your code with our `ft_putchar.c`.
- 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 your right. Otherwise, try your peer on your left.
- Your reference guide is called Google / man / the Internet / ....
- Check out the "C Piscine" part of the forum on the intranet.
- 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 II**

### **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 III

## Exercice 00 : ft\_create\_elem


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

- 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\_back


	Exercise 01
ft_list_push_back	
Turn-in directory : <i>ex01/</i>	
Files to turn in : <code>ft_list_push_back.c</code> , <code>ft_list.h</code>	
Allowed functions : <code>ft_create_elem</code>	
Notes : n/a	

- 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 V

## Exercice 02 : ft\_list\_push\_front

	Exercise 02
ft_list_push_front	
Turn-in directory : <i>ex02/</i>	
Files to turn in : <code>ft_list_push_front.c</code> , <code>ft_list.h</code>	
Allowed functions : <code>ft_create_elem</code>	
Notes : n/a	


- 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 VI

## Exercice 03 : ft\_list\_size


	Exercise 03
ft_list_size	
Turn-in directory : <i>ex03/</i>	
Files to turn in : <code>ft_list_size.c</code> , <code>ft_list.h</code>	
Allowed functions : None	
Notes : n/a	

- 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 VII

## Exercice 04 : ft\_list\_last


	Exercise 04
	ft_list_last
	Turn-in directory : <i>ex04/</i>
	Files to turn in : <i>ft_list_last.c, ft_list.h</i>
	Allowed functions : None
	Notes : n/a

- 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 VIII

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


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

- Create the function `ft_list_push_params` which creates a new list that includes command-line arguments.
- The first argument 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_params(int ac, char **av);
```

# Chapter IX

## Exercice 06 : ft\_list\_clear


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

- Create the function `ft_list_clear` which clears all links from the list.
- It'll then assign the list's pointer to null.
- Here's how it should be prototyped :

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

# Chapter X

## Exercice 07 : ft\_list\_at


	Exercice 07
ft_list_at	
Turn-in directory : <i>ex07/</i>	
Files to turn in : <b>ft_list_at.c</b> , <b>ft_list.h</b>	
Allowed functions : <b>None</b>	
Notes : <b>n/a</b>	

- Create the function `ft_list_at` which returns the Nth element of the list.
- 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> , <b>ft_list.h</b>	
Allowed functions : <b>None</b>	
Notes : <b>n/a</b>	

- Create the function **ft\_list\_reverse** which reverses the order of a list's elements. You may only use pointers related stuff.
- 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	
Notes : n/a	

- Create the function `ft_list_foreach` which applies a function given as argument to the information within each of the list's links.
- 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	
Notes : n/a	

- Create the function `ft_list_foreach_if` which applies a function given as argument to the information held in some links of the list. A reference information as well as a comparative function should allow us to select the right links of the list : those that are "equal" to the reference information.
- Here's how it should be prototyped :

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

- 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</i> , <i>ft_list.h</i>	
Allowed functions : None	
Notes : n/a	

- Create the function `ft_list_find` which returns the address of the first link, whose data is "equal" to the reference data.
- Here's how it should be prototyped :

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

# Chapter XV

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


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

- Create the function `ft_list_remove_if` which erases off the list all elements, whose data is "equal" to the reference data.
- Here's how it should be prototyped :

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

# Chapter XVI

## Exercice 13 : ft\_list\_merge


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

- 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 : <b>None</b>
	Notes : <b>n/a</b>

- Create the function `ft_list_sort` which sorts the list's contents by ascending order by comparing two links thanks to a function that can compare the data held in those two links.
- Here's how it should be prototyped :


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



La fonction `cmp` pourrait être par exemple `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	
Notes : n/a	

- Create the function `ft_list_reverse_fun` which reverses the order of the elements of the list. You may only use pointers related stuff.
- 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 : <code>ft_sorted_list_insert.c</code> , <code>ft_list.h</code>	
Allowed functions : <code>ft_create_elem</code>	
Notes : n/a	

- 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)());
```

# 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	
Notes : n/a	

- 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)());
```