

## CMPT125, Fall 2022

Lab exam - 1:30pm-2:20pm

Thursday, November 10, 2022

You need to implement the functions in ***labexam.c***.

Submit only the **.c** file to Coursys

Coursys Assignment - **Lab Exam D107-D108 13:30-14:20.**

You have 50 minutes to solve all 3 problems.

The maximal score is 20 points.

The exam will be graded both **automatically** and by **reading your code**.

You can run your code using

```
>> make
```

```
>> ./run_test
```

**Correctness:** Make sure that your code compiles without warnings/errors, and works as expected.

**Readability:** Your code should be readable. Add comments wherever necessary. If needed, write helper functions to break the code into small, readable chunks.

**Compilation:** Your code **MUST** compile in CSIL with the Makefile provided. If the code does not compile in CSIL, the grade on the assignment is 0 (zero). Even if you can't solve a problem, make sure it compiles.

**Helper functions:** If necessary, you may add helper functions to the .c file.

**main() function:** do not add main(). Adding main() will cause compilation errors, as the main() function is already in the test file.

**Using printf()/scanf():** Your function should not have any unnecessary printf() statements. They may interfere with the automatic graders.

**Warnings:** Warnings during compilation will reduce points. More importantly, they indicate that something is probably wrong with the code.

**Testing:** An example of a test file is included.

Your code will be tested using the provided tests as well as additional tests.

You are *strongly encouraged to write more tests* to check your solution is correct, but you don't need to submit them.

### Question 1 [7 points]

Write a function that gets a string consisting of lowercase letters, and sorts the chars in the string. For example,

- If `str = "axbycz"`, then after applying the function `str` will become `"abcxyz"`.
- If `str = "qwerty"`, then after applying the function `str` will become `"eqrtwy"`.
- If `str = "hello"`, then after applying the function `str` will become `"ehllo"`.

You may assume the string consists of lowercase letters only

```
// the function gets a string consisting of Lower case Letters  
// and sorts the chars in the string  
void sort_string(char* str);
```

### Question 2 [6 points]

Write a function that gets an array of ints of length  $n > 0$ , and a predicate `pred`. It applies `pred` on each element. If `pred(ar[i])` is true, it remains unchanged, and if `pred(ar[i])` is false, then it is changed to zero. The function returns the number of changed entries. For example:

- Suppose we have `ar = [1,2,0,3,8,7]`, and the predicate is `is_even(int x)`
- When applying `filter_to_zero(ar, 6, is_even)`, `ar` becomes `[0,2,0,0,8,0]`, and the function returns 3.

```
// the function gets an array of ints of length n, and a predicate  
// for each entry a[i]: if pred(ar[i]) is true, it remains unchanged  
// and if pred(ar[i]) is false, then it is changed to zero  
// the function returns the number of changed entries  
int filter_to_zero(int* ar, int n, bool(*pred)(int));
```

### Question 3 [7 points]

Write a function that gets a queue of ints, removes the last element from the queue, and returns it. You may assume the queue is not empty.

See the file `lib/queue.h` for the functions you can use.

```
// gets a queue of ints  
// it removes from the queue the last element, and returns it  
// assumption: q is not empty  
int queue_remove_Last(queue_t* q);
```