CS1050 – Lab 12

Fall 2021

Concepts to Practice

- Structures
- Arrays of structures
- Sorting

Submission Information

Submit this assignment by following the instructions given by your TA. SUBMIT ONLY the .c file (no a.out or executable file is required). All of the lab assignments must be submitted before the end of the lab using the lab code given by the TA.

Use the following submit command:

```
mucs submit <class> <assignment > <filename>
```

For example:

```
mucs submit 1050 lab12 lab12.c
```

Description

For the lab assignment, your program will be given a command-line argument specifying the name of the file to read in, an optional second argument specifying a field by which to sort (discussed below), and (for honors students only) an optional third argument specifying ascending or descending order. We provide two possible input files that are similar to your prelab's input file. Each line in the file represents a movie. The data in each movie is:

- Title
- Gross Revenue (adjusted for inflation to 2019 dollars)
- Year

You are to read in the movies and output them depending on the sorting parameter given on the command-line. If no sorting parameter is given, you should sort them alphabetically by title.

Additional for honors students

If the optional order argument is specified, you will use it to determine whether to sort either ascending or descending. If no optional order argument is specified, you should assume ascending order. If the sorting field (2nd argument) is not specified, there can be no order argument (3rd argument).

Possible values of arguments:

- Filename – 1st argument – required
- Sort field – 2nd argument – optional. Must be "Title", "Gross", or "Year" (otherwise this is an error)
- **Honors Only**: Sort order – 3rd argument – optional (and only if 2nd argument specified). Must be "Ascending" or "Descending"

The first thing you need to do is get the data for this lab. To get started on this lab, type the following while logged in to tc.rnet.missouri.edu:

```
cs1050start lab12
```

BONUS

For bonus points, determine the number of movies in the file and then dynamically allocate your array of structures rather than hard coding the max number of movies up front. This would allow your program to work with larger files of data.

Non-honors Sample Output

Example 1

```
jimr@JimRXPS13:~/CS1050/FS2021/labs/lab12$ ./a.out
./a.out filename [sort_field]
         - sort_field must be one of "Title", "Gross", or "Year" if specified.
```

Example 2

```
jimr@JimRXPS13:~/CS1050/FS2021/labs/lab12$ ./a.out asdfadsfkjasdfalsdf
*** Error: Cannot open file asdfadsfkjasdfalsdf
```

Example 3

```
jimr@JimRXPS13:~/CS1050/FS2021/labs/lab12$ ./a.out movies.dat
Sorted movies:
                                             Title                Gross                 Year
                                            Avatar           3263000000                 2009
                                 Avengers:_Endgame           2798000000                 2019
                            Avengers:_Infinity_War           2050000000                 2018
                                    Doctor_Zhivago           2238000000                 1965
                        E.T._the_Extra-Terrestrial           2493000000                 1982
                                Gone_with_the_Wind           3713000000                 1939
                                              Jaws           2100000000                 1975
                                     Jurassic_Park           2100000000                 1993
                                        Snow_White           2150000000                 1937
                                         Star_Wars           3049000000                 1977
                      Star_Wars:_The_Force_Awakens           2206000000                 2015
                                      The_Exorcist           2000000000                 1973
                                The_Sound_of_Music           2554000000                 1965
                              The_Ten_Commandments           2361000000                 1956
                                           Titanic           3087000000                 1997
```

Example 4

```
jimr@JimRXPS13:~/CS1050/FS2021/labs/lab12$ ./a.out movies.dat asdf
./a.out filename [sort_field]
         - sort_field must be one of "Title", "Gross", or "Year" if specified.
```

Example 5

```
jimr@JimRXPS13:~/CS1050/FS2021/labs/lab12$ ./a.out movies.dat Gross
Sorted movies:
                                             Title                Gross                 Year
                                      The_Exorcist           2000000000                 1973
                            Avengers:_Infinity_War           2050000000                 2018
                                     Jurassic_Park           2100000000                 1993
                                              Jaws           2100000000                 1975
                                        Snow_White           2150000000                 1937
                      Star_Wars:_The_Force_Awakens           2206000000                 2015
                                    Doctor_Zhivago           2238000000                 1965
                              The_Ten_Commandments           2361000000                 1956
                        E.T._the_Extra-Terrestrial           2493000000                 1982
                                The_Sound_of_Music           2554000000                 1965
                                 Avengers:_Endgame           2798000000                 2019
                                         Star_Wars           3049000000                 1977
                                           Titanic           3087000000                 1997
                                            Avatar           3263000000                 2009
                                Gone_with_the_Wind           3713000000                 1939
```

Example 6

```
jimr@JimRXPS13:~/CS1050/FS2021/labs/lab12$ ./a.out movies.dat Year
Sorted movies:
                                             Title                Gross                 Year
                                        Snow_White           2150000000                 1937
                                Gone_with_the_Wind           3713000000                 1939
                              The_Ten_Commandments           2361000000                 1956
                                The_Sound_of_Music           2554000000                 1965
                                    Doctor_Zhivago           2238000000                 1965
                                      The_Exorcist           2000000000                 1973
                                              Jaws           2100000000                 1975
                                         Star_Wars           3049000000                 1977
                        E.T._the_Extra-Terrestrial           2493000000                 1982
                                     Jurassic_Park           2100000000                 1993
                                           Titanic           3087000000                 1997
                                            Avatar           3263000000                 2009
                      Star_Wars:_The_Force_Awakens           2206000000                 2015
                            Avengers:_Infinity_War           2050000000                 2018
                                 Avengers:_Endgame           2798000000                 2019
```

Example 7

```
jimr@JimRXPS13:~/CS1050/FS2021/labs/lab12$ ./a.out moremovies.dat Year
Sorted movies:
                                             Title                Gross                 Year
                                        Snow_White           2150000000                 1937
                                Gone_with_the_Wind           3713000000                 1939
                                        Cinderella           1575000000                 1950
                              The_Ten_Commandments           2361000000                 1956
                                           Ben-Hur           1800000000                 1959
                                    101_Dalmations           1950000000                 1961
                                The_Sound_of_Music           2554000000                 1965
                                    Doctor_Zhivago           2238000000                 1965
                                   The_Jungle_Book           1800000000                 1967
                                      The_Exorcist           2000000000                 1973
                                              Jaws           2100000000                 1975
                                         Star_Wars           3049000000                 1977
                Star_Wars:_The_Empire_Strikes_Back           1740000000                 1980
                        E.T._the_Extra-Terrestrial           2493000000                 1982
                                     Jurassic_Park           2100000000                 1993
                                     The_Lion_King           1900000000                 1994
                                  Independence_Day           1740000000                 1996
                                           Titanic           3087000000                 1997
                     Star_Wars:_The_Phantom_Menace           1800000000                 1999
          Harry_Potter_and_the_Philosopher's_Stone           1600000000                 2001
     The_Lord_of_the_Rings:_The_Return_of_the_King           1750000000                 2003
                                            Avatar           3263000000                 2009
      Harry_Potter_and_the_Deathly_Hallows:_Part_2           1550000000                 2011
                                 Avengers_Assemble           1750000000                 2012
                      Star_Wars:_The_Force_Awakens           2206000000                 2015
                                    Jurassic_World           1850000000                 2015
                                  Fast_&_Furious_7           1650000000                 2015
                            Avengers:_Infinity_War           2050000000                 2018
                                 Avengers:_Endgame           2798000000                 2019
                                     The_Lion_King           1725000000                 2019
```

Honors Sample Output

Example 1

```
jimr@JimRXPS13:~/CS1050/FS2021/labs/lab12$ ./a.out
./a.out filename [sort_field [sort_order]]
         - sort_field must be one of "Title", "Gross", or "Year" if specified.
         - sort_order must be one of "Ascending" or "Descending" if specified.
```

Example 2

```
jimr@JimRXPS13:~/CS1050/FS2021/labs/lab12$ ./a.out asdfasdflakjsdflkasjdf
*** Error: Cannot open file asdfasdflakjsdflkasjdf
```

Example 3

```
jimr@JimRXPS13:~/CS1050/FS2021/labs/lab12$ ./a.out movies.dat
Sorted movies:
                                             Title                Gross                 Year
                                            Avatar           3263000000                 2009
                                 Avengers:_Endgame           2798000000                 2019
                            Avengers:_Infinity_War           2050000000                 2018
                                    Doctor_Zhivago           2238000000                 1965
                        E.T._the_Extra-Terrestrial           2493000000                 1982
                                Gone_with_the_Wind           3713000000                 1939
                                              Jaws           2100000000                 1975
                                     Jurassic_Park           2100000000                 1993
                                        Snow_White           2150000000                 1937
                                         Star_Wars           3049000000                 1977
                      Star_Wars:_The_Force_Awakens           2206000000                 2015
                                      The_Exorcist           2000000000                 1973
                                The_Sound_of_Music           2554000000                 1965
                              The_Ten_Commandments           2361000000                 1956
                                           Titanic           3087000000                 1997
```

Example 4

```
jimr@JimRXPS13:~/CS1050/FS2021/labs/lab12$ ./a.out movies.dat asdf
./a.out filename [sort_field [sort_order]]
         - sort_field must be one of "Title", "Gross", or "Year" if specified.
         - sort_order must be one of "Ascending" or "Descending" if specified.
```

Example 5

```
jimr@JimRXPS13:~/CS1050/FS2021/labs/lab12$ ./a.out movies.dat Gross
Sorted movies:
                                             Title                Gross                 Year
                                      The_Exorcist           2000000000                 1973
                            Avengers:_Infinity_War           2050000000                 2018
                                     Jurassic_Park           2100000000                 1993
                                              Jaws           2100000000                 1975
                                        Snow_White           2150000000                 1937
                      Star_Wars:_The_Force_Awakens           2206000000                 2015
                                    Doctor_Zhivago           2238000000                 1965
                              The_Ten_Commandments           2361000000                 1956
                        E.T._the_Extra-Terrestrial           2493000000                 1982
                                The_Sound_of_Music           2554000000                 1965
                                 Avengers:_Endgame           2798000000                 2019
                                         Star_Wars           3049000000                 1977
                                           Titanic           3087000000                 1997
                                            Avatar           3263000000                 2009
                                Gone_with_the_Wind           3713000000                 1939
```

Example 6

```
jimr@JimRXPS13:~/CS1050/FS2021/labs/lab12$ ./a.out movies.dat Year
Sorted movies:
                                             Title                Gross                 Year
                                        Snow_White           2150000000                 1937
                                Gone_with_the_Wind           3713000000                 1939
                              The_Ten_Commandments           2361000000                 1956
                                The_Sound_of_Music           2554000000                 1965
                                    Doctor_Zhivago           2238000000                 1965
                                      The_Exorcist           2000000000                 1973
                                              Jaws           2100000000                 1975
                                         Star_Wars           3049000000                 1977
                        E.T._the_Extra-Terrestrial           2493000000                 1982
                                     Jurassic_Park           2100000000                 1993
                                           Titanic           3087000000                 1997
                                            Avatar           3263000000                 2009
                      Star_Wars:_The_Force_Awakens           2206000000                 2015
                            Avengers:_Infinity_War           2050000000                 2018
                                 Avengers:_Endgame           2798000000                 2019
```

Example 7

```
jimr@JimRXPS13:~/CS1050/FS2021/labs/lab12$ ./a.out moremovies.dat Year
Sorted movies:
                                             Title                Gross                 Year
                                        Snow_White           2150000000                 1937
                                Gone_with_the_Wind           3713000000                 1939
                                        Cinderella           1575000000                 1950
                              The_Ten_Commandments           2361000000                 1956
                                           Ben-Hur           1800000000                 1959
                                    101_Dalmations           1950000000                 1961
                                The_Sound_of_Music           2554000000                 1965
                                    Doctor_Zhivago           2238000000                 1965
                                   The_Jungle_Book           1800000000                 1967
                                      The_Exorcist           2000000000                 1973
                                              Jaws           2100000000                 1975
                                         Star_Wars           3049000000                 1977
                Star_Wars:_The_Empire_Strikes_Back           1740000000                 1980
                        E.T._the_Extra-Terrestrial           2493000000                 1982
                                     Jurassic_Park           2100000000                 1993
                                     The_Lion_King           1900000000                 1994
                                  Independence_Day           1740000000                 1996
                                           Titanic           3087000000                 1997
                     Star_Wars:_The_Phantom_Menace           1800000000                 1999
          Harry_Potter_and_the_Philosopher's_Stone           1600000000                 2001
     The_Lord_of_the_Rings:_The_Return_of_the_King           1750000000                 2003
                                            Avatar           3263000000                 2009
      Harry_Potter_and_the_Deathly_Hallows:_Part_2           1550000000                 2011
                                 Avengers_Assemble           1750000000                 2012
                      Star_Wars:_The_Force_Awakens           2206000000                 2015
                                    Jurassic_World           1850000000                 2015
                                  Fast_&_Furious_7           1650000000                 2015
                            Avengers:_Infinity_War           2050000000                 2018
                                 Avengers:_Endgame           2798000000                 2019
                                     The_Lion_King           1725000000                 2019
```

Example 8

```
jimr@JimRXPS13:~/CS1050/FS2021/labs/lab12$ ./a.out moremovies.dat Gross asdfadsf
./a.out filename [sort_field [sort_order]]
         - sort_field must be one of "Title", "Gross", or "Year" if specified.
         - sort_order must be one of "Ascending" or "Descending" if specified.
```

Example 9

```
jimr@JimRXPS13:~/CS1050/FS2021/labs/lab12$ ./a.out moremovies.dat Gross Descending
Sorted movies:
                                             Title                 Gross                 Year
                                Gone_with_the_Wind            3713000000                 1939
                                            Avatar            3263000000                 2009
                                           Titanic            3087000000                 1997
                                         Star_Wars            3049000000                 1977
                                 Avengers:_Endgame            2798000000                 2019
                                The_Sound_of_Music            2554000000                 1965
                        E.T._the_Extra-Terrestrial            2493000000                 1982
                              The_Ten_Commandments            2361000000                 1956
                                    Doctor_Zhivago            2238000000                 1965
                      Star_Wars:_The_Force_Awakens            2206000000                 2015
                                        Snow_White            2150000000                 1937
                                     Jurassic_Park            2100000000                 1993
                                              Jaws            2100000000                 1975
                            Avengers:_Infinity_War            2050000000                 2018
                                      The_Exorcist            2000000000                 1973
                                    101_Dalmations            1950000000                 1961
                                     The_Lion_King            1900000000                 1994
                                    Jurassic_World            1850000000                 2015
                                   The_Jungle_Book            1800000000                 1967
                     Star_Wars:_The_Phantom_Menace            1800000000                 1999
                                           Ben-Hur            1800000000                 1959
                                 Avengers_Assemble            1750000000                 2012
     The_Lord_of_the_Rings:_The_Return_of_the_King            1750000000                 2003
                Star_Wars:_The_Empire_Strikes_Back            1740000000                 1980
                                  Independence_Day            1740000000                 1996
                                     The_Lion_King            1725000000                 2019
                                  Fast_&_Furious_7            1650000000                 2015
          Harry_Potter_and_the_Philosopher's_Stone            1600000000                 2001
                                        Cinderella            1575000000                 1950
      Harry_Potter_and_the_Deathly_Hallows:_Part_2            1550000000                 2011
```

Example 10

```
jimr@JimRXPS13:~/CS1050/FS2021/labs/lab12$ ./a.out movies.dat Year Ascending
Sorted movies:
                                             Title                 Gross                 Year
                                        Snow_White            2150000000                 1937
                                Gone_with_the_Wind            3713000000                 1939
                              The_Ten_Commandments            2361000000                 1956
                                The_Sound_of_Music            2554000000                 1965
                                    Doctor_Zhivago            2238000000                 1965
                                      The_Exorcist            2000000000                 1973
                                              Jaws            2100000000                 1975
                                         Star_Wars            3049000000                 1977
                        E.T._the_Extra-Terrestrial            2493000000                 1982
                                     Jurassic_Park            2100000000                 1993
                                           Titanic            3087000000                 1997
                                            Avatar            3263000000                 2009
                      Star_Wars:_The_Force_Awakens            2206000000                 2015
                            Avengers:_Infinity_War            2050000000                 2018
                                 Avengers:_Endgame            2798000000                 2019
```

Guidelines for Grading Lab 12
40 Points Possible (+5 bonus points)

General

If your program does not compile or produce any input/output (I/O) because most of the source code is commented out then your lab will receive a grade of ZERO POINTS. Further, if your program does not actually follow the specifications, but merely prints out lines that make it appear to follow the specifications, you will receive a grade of ZERO POINTS. For partial credit your C program must not only compile but also produce some valid I/O that meets the lab specifications.

You program is expected to have a comment header at the top that includes your name, pawprint, the course you are taking, and the lab that you are solved (e.g., “Lab 12”). Your code should be nicely indented. You may not use global variables. **You will lose up to 10 points if you do not meet these basic requirements**.

Non-honors

5 points: Your code error-checks that the specified file can be opened and read.
5 points: Your code properly closes opened files in all cases.
5 points: Your code error-checks that the optional sorting field argument is one of the legal values.
15 points: Your code sorts by the correct field.
10 points: Your output closely matches the example output.

Honors

5 points: Your code error-checks that the specified file can be opened and read.
5 points: Your code properly closes opened files in all cases.
5 points: Your code error-checks that the optional sorting field argument is one of the legal values.
5 points: Your code error-checks that the optional sorting order argument is one of the legal values.
5 points: Your code sorts by the correct field.
5 points: Your code sorts in the correct direction (ascending or descending)
10 points: Your output closely matches the example output.

BONUS (5 points)

5 points: You dynamically allocate an array of structures used to hold the movies, based on the exact number of records in the file. To get these bonus points, you must **programmatically** determine how many records are in the file before allocating memory.