A. Write the following utility functions:

a. Write a function, *MaxMin*, that finds the maximum, minimum, and their respective locations in a given array:

```
void MaxMin(Type const *arr, const int& n, Type& max, Type& min, int& maxIndx,
int& minIndx); //Type can be either int or double
```

An array, which may or may not be sorted, is passed into the function through parameter "arr". The maximum and minimum are passed back to the caller through parameters "max" and "min", their location in the array is passed back through maxIndx and minIndx respectively.

You need to implement *MaxMin* function for both int array and double array.

b. Write a function that calculates the stock returns for a given historical stock price series:

```
void generateReturns(double const *prices, const int& n, double *returns);
```

the resulting price return series is an array of length $n - 1$

c. Write a function that calculates the annualized historical average return and annualized historical return volatility for a given return series.

```
void calcAnnualizedStats (double const *returns, const int& n,
       const char& seriesType, // 'd'-daily, 'm'-monthly, 'q'-quarterly
       double& avgRet,double & retStd);
```

you will need to annualize the performance stats differently depending on whether the supplied return time series is (a) daily, (b) montly, or (c) quarterly

d. In main()

i. Read from tab delimited data file, SPY1993to2019.txt, twice (I know, it's not efficient, but let's do it anyways):

1. first time, you figure out the size of your data (number of **data** rows)
2. Once you determine the number of data in a file, use appropriate **pointers** to dynamically allocate arrays of appropriate size (you will need 7 different arrays, 1 array for each column of data).
3. **Read** from the data file **again**, fill the dynamic arrays with the appropriate data as you read them

ii. For the price series "AdjClose"

1. (a) Find historical maximum, minimum prices in "AdjClose" series and their respective locations in the array. (b) find the dates when "AdjClose" reached historical high and low prices. Write the result to an output file (give it a descriptive name)
2. (a) Calculate daily return series from "AdjClose". (b) Then calculate its annualized average return and average return volatility. Write the performance stats to the same output file as above.

iii. Use the “Volume” series to find historical max and min trading volume days and write the result to the same output file as in (ii)
iv. Don’t forget to clean up the memory you allocated!

B. Compile your source code, and run your programs. Submit
   1. Your source-code
   2. The output file

Happy coding!