

CPS125
Term Project

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Purpose/ Objective:

The purpose of this assignment is to analyse the given data of the six lakes (Ontario, Erie, Huron, Michigan, Superior, and St. Clair) and its temperature for each day of the year, and to determine/calculate using c programming, various data among the lakes, such as the average temperature, which lakes are warmest or coldest and at what specific time of the year, and if the lakes are frozen, or warm/comfortable enough to swim in. This project was worked on by myself individually.

Analysis:

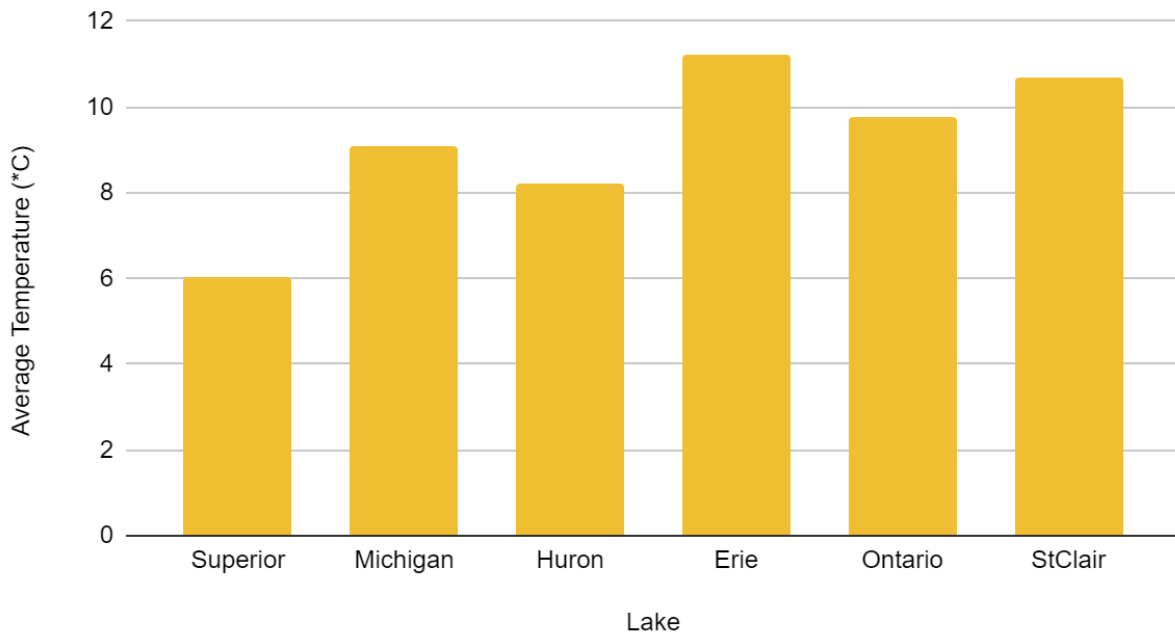
1. Calculate the yearly average temperature for each of the lakes, and the yearly average for all six lakes put together.

The following is the output and a chart for the yearly average temperature:

```
2019 Yearly Average Temperature For Six Lakes:
Lake Superior Average Yearly Temperature:6.05 *C
Lake Michigan Average Yearly Temperature:9.11 *C
Lake Huron Average Yearly Temperature:8.22 *C
Lake Erie Average Yearly Temperature:11.23 *C
Lake Ontario Average Yearly Temperature:9.80 *C
Lake St Clair Average Yearly Temperature:10.73 *C

The Average Yearly Temperature Of All Six Lakes Is 9.19 *C
```

Average Temperature (*C) of Six Great Lakes in 2019



According to the data and in analysing the chart, it is quite clear that Lake Erie is the warmest lake, followed by Lake StClair, whereas Lake Superior is the coldest. This is the case in actuality, because Lake Erie is the southernmost lake out of all six lakes, meaning it is closer to the equator and therefore closer to the sun. Lake StClair is also warm as it is more south than the rest of the lakes, even connecting to lake Erie. On the other hand, lake Superior is the northernmost lake, which means it receives less energy from the sun, thereby leaving it colder in temperature.

2. Indicate which lake is the coldest and which one is the warmest, based on the average yearly temperatures calculated in step #1. Also indicate which lakes have average temperatures above the average of all the lakes and which ones are below that same average.

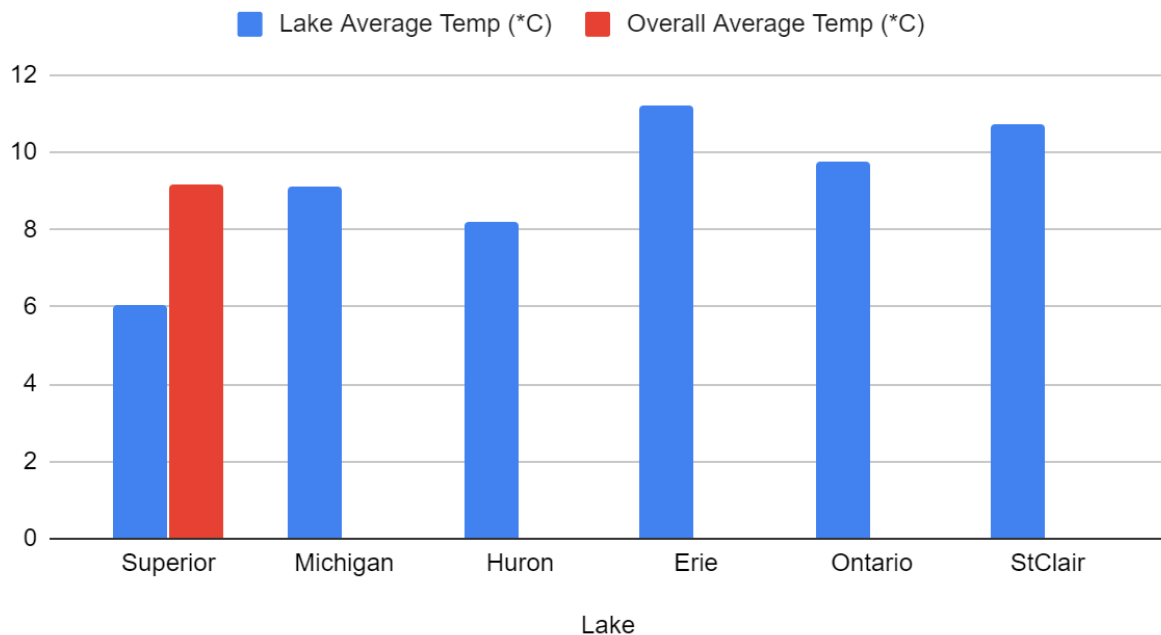
The following is the output and a chart for the yearly average temperature, where the red bar on the chart indicates the overall average temperature of all lakes:

The Average Yearly Temperature Of All Six Lakes Is 9.19 °C

Warmest is Lake Erie: 11.23 °C. This is above the yearly average

Coldest is Lake Superior: 6.05 °C This is below the yearly average

Average Temperature (°C) of Six Great Lakes in 2019



According to the chart, it is quite clear that Lake Erie is the furthest from the average, whereas Lake Superior is the furthest. This, again due to the same reasons as the first question, is because lake Erie is the southernmost lake out of all six lakes, whereas lake Superior is the northernmost lake.

The lakes above the average temperature are:

- Lake Erie
- Lake Ontario
- Lake StClair

The lakes below the average temperature are:

- Lake Superior
- Lake Michigan

- Lake Huron

3. Indicate the day and the temperature for the warmest water temperatures for each of the lakes. Do the same for the coldest temperatures. You must convert the day of the year value into a date/month format.

The following is the output for the warmest and coldest water temperatures:

```
The Coldest Temperature of the water on Lake Superior was 0.20 *C Date: 5/3
The Coldest Temperature of the water on Lake Michigan was 0.89 *C Date: 8/3
The Coldest Temperature of the water on Lake Huron was 0.20 *C Date: 1/3
The Coldest Temperature of the water on Lake Erie was 0.20 *C Date: 1/2
The Coldest Temperature of the water on Lake Ontario was 1.12 *C Date: 1/3
The Coldest Temperature of the water on Lake St.Clair was 0.20 *C Date: 19/1

The Warmest Temperature of the water on Lake Superior was 16.60 *C Date: 17/8
The Warmest Temperature of the water on Lake Michigan was 21.75 *C Date: 20/8
The Warmest Temperature of the water on Lake Huron was 20.41 *C Date: 7/8
The Warmest Temperature of the water on Lake Erie was 24.86 *C Date: 6/8
The Warmest Temperature of the water on Lake Ontario was 23.18 *C Date: 6/8
The Warmest Temperature of the water on Lake StClair was 25.04 *C Date: 20/7
```

In analysing the data, it is apparent that the warmest lakes on a specific day remain to be Lake Erie and Lake StClair. In addition, these two lakes also seem to have the coldest temperatures on a specific day along with Lake Superior, which seems contradictory to the notion that the two lakes are the warmest of 6 lakes. However, Lake Erie and Lake StClair are also the shallowest, and smallest in volume of the six lakes, meaning that during the winter, they drop in temperature more drastically than other lakes, which explains why they have a really cold temperature on a specific day.

4. Indicate the day, lake and temperature of the warmest water temperature overall (all lakes combined). You must convert the day of the year value into a date/month format and indicate which lake. Do the same for the coldest temperature.

The following is the output of the hottest and coldest overall temperature on a day of the six lakes:

```
Hottest Overall is Lake StClair : 25.04 *C, On Day:201  
Coldest Overall Is Lake Superior: 0.20 *C, On Day:64
```

From the data, the warmest overall temperature was Lake StClair, which was 25.04 °C on the 19/7 (June 19), followed by Lake Erie: 24.86 °C on the day: 5/8 (August 5).

For the coldest temperature, multiple lakes had the same trough for multiple days, as multiple lakes had a temperature of : 0.20 °C, the coldest of which. These lakes include:

- Lake Superior on Days: 64-70,73-75
- Lake Huron on Days: 60, 67-70
- Lake Erie on Days: 32-33,36, 41-70
- Lake StClair from Day 19-74

The data makes sense as lake Erie and Lake StClair should be warmer due to the southern position in comparison to the other lakes, and they should also remain cold for long since they have lesser volume of water. Lake Superior and Lake Huron, due to their northernmost positions, should also have relatively colder temperatures Lake Ontario and Michigan did not have a temperature lower than or equal to the lakes above.

5. Calculate the summer average (day 172 to day 265) for all 6 lakes (one average per lake). Display the names of the lakes in order from warmest to coldest. Is the order from warmest to coldest the same as with the yearly average calculated in step #2?

6. Calculate the winter average (days 1 to 79 and days 355 to 365) for all 6 lakes (one average per lake). Display the names of the lakes in order from warmest to coldest. Is the order from warmest to coldest the same as with the yearly average calculated in step #2?

The following is the output:

```
The summer average temperature from warmest to coldest:
Lake Erie: 22.87 *C
Lake StClair: 22.45 *C
Lake Ontario: 20.58 *C
Lake Michigan: 19.06 *C
Lake Huron: 17.75 *C
Lake Superior: 12.58 *C

The Winter average temperature from warmest to coldest:
Lake Ontario: 2.69 *C
Lake Michigan: 2.39 *C
Lake Huron: 1.53 *C
Lake Superior: 1.45 *C
Lake Erie: 1.42 *C
Lake StClair: 0.85 *C
```

The data shown correlates with the analysis made prior regarding lake Erie and Lake StClair being the warmest lakes, and Lake Superior being coldest. In comparison to the data from step #2, the average temperature values are different for both summer and winter averages, however the order from warmest to coldest for the summer averages is similar to the order of yearly average from warmest to coldest calculated in step #2. The order of the winter average is different, however.

7. Assuming that you can swim comfortably in the lake if the temperature is above 20 degrees. Calculate the number of days in the year you can swim for each of the 6 lakes.

8. Assuming that lakes freeze when the water falls below 0 degrees. Calculate the number of days in the year that the lake is frozen.

The following is the output:

```
Lake Superior: 0
Lake Michigan: 36
Lake Huron: 9
Lake Erie: 99
Lake Ontario: 65
Lake StClair: 91
```

The number of days the lakes are frozen (Temperature below 0 °C):

```
Lake Superior: 0
Lake Michigan: 0
Lake Huron: 0
Lake Erie: 0
Lake Ontario: 0
Lake StClair: 0
```

According to the data lake Erie and StClair have the most days in which you can swim comfortably (Temperature above 20 °C) which was expected. Additionally, none of the lakes had days where the lakes were frozen (Temperature below 0 °C). This may be due to the fact that the winter in 2019 had been much warmer than usual, causing less formation of ice.

9. Re-do question 1 (the 7 yearly averages) but with data from 2018 instead. Make a table of the averages side by side to illustrate the two yearly results. Any notable changes between 2018 and 2019?

The following is the output and a table comparing the two yearly averages:

2018 Yearly Average Temperature For Six Lakes:

```
Lake Superior Average Yearly Temperature:5.87 °C
Lake Michigan Average Yearly Temperature:9.87 °C
Lake Huron Average Yearly Temperature:8.78 °C
Lake Erie Average Yearly Temperature:11.56 °C
Lake Ontario Average Yearly Temperature:10.60 °C
Lake St Clair Average Yearly Temperature:11.20 °C
```

The Average Yearly Temperature Of All Six Lakes Is 9.65 °C

Lake	2019 Yearly avg Temp (°C)	2018 Yearly avg Temp (°C)
Superior	6.05	5.87
Michigan	9.11	9.87
Huron	8.22	8.78
Erie	11.23	11.56
Ontario	9.80	10.60
StClair	10.73	11.20
Ovr Avg (all 6 lakes)	9.19	9.65

A key notable change between the two yearly average temperatures is aside from Lake Superior, each lake got colder, and the overall average temperature of 2018 was warmer than 2019. Lake Erie and StClair additionally were still the warmest lakes, and Superior the coldest. Also, Lake Ontario and Lake Michigan dropped in temperature more drastically than the other lakes

Conclusion:

My experience doing this project was challenging, however it helped me get more comfortable and more accustomed to writing long bits of code. In addition, the project was great practice for the major concepts we have learned throughout the course, such as the use of files, printf/fscanf, if else statements, for-loops, and arrays. If I could do things differently, I would definitely begin the project more early and work with a partner, in order to lessen the burden of writing a lot of code within a shorter period of time, and to reduce the stress that I felt while writing this code alone.

Appendix:

```
#include <stdio.h>
#include <stdlib.h>
#include <ctype.h>
#include <string.h>
#include <math.h>
```

```
//prototyping function that converts date into day/month format
```

```
void (daytodate (int n));
```

```
//main function
```

```
int main(void){
```

```
// opening file
```

```
FILE *f = fopen("laketemp2019.txt", "r");
```

```
// variables
```

```
int k,j,c,year,day[365],hday[6],cday[6];
```

```
int coldest1,coldest2,coldest3,coldest4,coldest5,coldest6;
```

```
int warmest1,warmest2,warmest3,warmest4,warmest5,warmest6;
```

```
double lakeSupavg=0;
```

```
double lakeMichavg=0;
double lakeHuronavg=0;
double lakeErieavg=0;
double lakeOntavg=0;
double lakeStCavg=0;

double coldestSup, coldestMich,coldestHuron,coldestErie,coldestOnt,
coldestStC;

double warmestSup,warmestMich,warmestHuron,warmestErie,warmestOnt,
warmestStC;

double avg[6],avg2[6],array3[6],array4[6];
double yearlyavg,smallestavg,highestavg,hottest,coldest;

double LakeSup[365],LakeMich[365], LakeHuron[365], LakeErie[365],
LakeOnt[365], LakeStC[365];

// fscanf assigning values from text file into the array variables
for(c=0;c<365;c++){
```

```
fscanf(f, "%d %d %lf %lf %lf %lf %lf %lf", &year, &day[c], &LakeSup[c], &LakeMich[c],  
&LakeHuron[c],&LakeErie[c], &LakeOnt[c], &LakeStC[c]);  
}
```

```
// PART 1 OF ASSIGNMENT
```

```
// Reach lake value is summed up into a variable, then divided by 365 to find the average
```

```
printf("\n2019 Yearly Average Temperature For Six Lakes:\n");
```

```
for(j=0;j<365;j++){  
lakeSupavg=lakeSupavg + LakeSup[j];  
}  
printf("\nLake Superior Average Yearly Temperature:%.2lf *C\n",lakeSupavg/365);
```

```
for(j=0;j<365;j++){  
lakeMichavg=lakeMichavg + LakeMich[j];  
}  
printf("Lake Michigan Average Yearly Temperature:%.2lf *C\n",lakeMichavg/365);
```

```
for(j=0;j<365;j++){  
lakeHuronavg=lakeHuronavg + LakeHuron[j];  
}  
printf("Lake Huron Average Yearly Temperature:%.2lf *C\n",lakeHuronavg/365);
```

```
for(j=0;j<365;j++){  
lakeErieavg=lakeErieavg + LakeErie[j];
```

```

}
printf("Lake Erie Average Yearly Temperature: %.2lf *C\n", lakeErieavg/365);

for(j=0; j<365; j++){
lakeOntavg=lakeOntavg + LakeOnt[j];
}
printf("Lake Ontario Average Yearly Temperature: %.2lf *C\n", lakeOntavg/365);

for(j=0; j<365; j++){
lakeStCavg=lakeStCavg + LakeStC[j];
}
printf("Lake St Clair Average Yearly Temperature: %.2lf *C\n\n", lakeStCavg/365);

yearlyavg=((lakeSupavg/365) + (lakeMichavg/365) + (lakeHuronavg/365) +
(lakeErieavg/365) + (lakeOntavg/365) + (lakeStCavg/365))/6;

printf("The Average Yearly Temperature Of All Six Lakes Is %.2lf *C\n", yearlyavg);

//PART2
// Store each average into an array index, then use loops to
//figure out the smallest and highest average

avg[0]=lakeSupavg/365;
avg[1]=lakeMichavg/365;
avg[2]=lakeHuronavg/365;
avg[3]=lakeErieavg/365;
avg[4]=lakeOntavg/365;
avg[5]=lakeStCavg/365;

```

```
avg2[0]=lakeSupavg/365;
avg2[1]=lakeMichavg/365;
avg2[2]=lakeHuronavg/365;
avg2[3]=lakeErieavg/365;
avg2[4]=lakeOntavg/365;
avg2[5]=lakeStCavg/365;
```

```
highestavg=avg[0];
smallestavg=avg2[0];
```

```
for(j=1;j<6;j++){
    if(avg[j]>highestavg){
        highestavg=avg[j];
    }
}
```

```
for(j=1;j<6;j++){
    if(avg[j]<smallestavg){
        smallestavg=avg[j];
    }
}
```

```
if(highestavg==avg[0]){
    printf("\nWarmest is Lake Superior:%lf *C. This is above the yearly
average\n",highestavg);
}else if(highestavg==avg[1]){
    printf("\nWarmest is Lake Michigan:%lf*C. This is above the yearly
average\n",highestavg);
```

```

} else if(highestavg==avg[2]){
    printf("\nWarmest is Lake Huron:%lf *C. This is above the yearly
\n",highestavg);
} else if(highestavg==avg[3]){
    printf("\nWarmest is Lake Erie: %.2lf *C. This is above the yearly
average\n",highestavg);
} else if(highestavg==avg[4]){
    printf("\nWarmest is Lake Ontario:%lf *C.This is above the yearly
average\n",highestavg);
} else if(highestavg==avg[5]){
    printf("\nWarmest is Lake StClair:%lf *C.This is above the yearly
average\n",highestavg);
}

if(smallestavg==avg[0]){
    printf("Coldest is Lake Superior: %.2lf *C This is below the yearly
average\n",smallestavg);
} else if(smallestavg==avg2[1]){
    printf("Coldest is Lake Michigan: %.2lf *C. This is below the yearly
average\n",smallestavg);
} else if(smallestavg==avg2[2]){
    printf("Coldest is Lake Huron: %.2lf *C. This is below the yearly average\n",smallestavg);
} else if(smallestavg==avg2[3]){
    printf("Coldest is Lake Erie: %.2lf *C. This is below the yearly average\n",smallestavg);
} else if(smallestavg==avg2[4]){
    printf("Coldest is Lake Ontario: %.2lf *C. This is below the yearly average\n",smallestavg);
} else if(smallestavg==avg2[5]){
    printf("Coldest is Lake StClair: %.2lf *C. This is below the yearly average\n",smallestavg );
}

```

```

// PART 3

// Set first index to coldest, the use loop and if statement to find
// coldest temp in each respective lake.
coldestSup=LakeSup[0];

for(j=1;j<365;j++){
    if(LakeSup[j]<coldestSup){
        coldestSup=LakeSup[j];
        coldest1=day[j];
    }
}

printf("\n The Coldest Temperature of the water on Lake Superior was %.2lf *C",coldestSup);
daytodate (coldest1);

coldestMich=LakeMich[0];

for(k=1;k<365;k++){
    if(LakeMich[k]<coldestMich){
        coldestMich=LakeMich[k];
        coldest2=day[k];
    }
}

printf(" The Coldest Temperature of the water on Lake Michigan was %.2lf *C",coldestMich);
daytodate (coldest2);

```



```
coldestHuron=LakeHuron[0];
```

```
for(k=1;k<365;k++){  
    if(LakeHuron[k]<coldestHuron){  
        coldestHuron=LakeHuron[k];  
        coldest3=day[k];  
    }  
}
```

```
printf(" The Coldest Temperature of the water on Lake Huron was %.2lf *C",coldestHuron);  
daytodate (coldest3);
```

```
coldestErie=LakeErie [0];
```

```
for(j=1;j<365;j++){  
    if(LakeErie[j]<coldestErie){  
        coldestErie=LakeErie[j];  
        coldest4=day[j];  
    }  
}
```

```
printf(" The Coldest Temperature of the water on Lake Erie was %.2lf *C",coldestErie);  
daytodate (coldest4);
```

```
coldestOnt=LakeOnt [0];
```

```
for(j=1;j<365;j++){
```

```

    if(LakeOnt[j]<coldestOnt){
        coldestOnt=LakeOnt[j];
        coldest5=day[j];
    }

}

printf(" The Coldest Temperature of the water on Lake Ontario was %.2lf *C",coldestOnt);
dayto date (coldest5);

coldestStC=LakeStC[0];

for(j=1;j<365;j++){
    if(LakeStC[j]<coldestStC){
        coldestStC=LakeStC[j];
        coldest6=day[j];
    }

}

printf(" The Coldest Temperature of the water on Lake St.Clair was %.2lf *C",coldestStC);
dayto date (coldest6);

warmestSup=LakeSup [0];

for (j=1;j<365;j++){
    if(LakeSup[j ]>warmestSup){
        warmestSup=LakeSup[j];
        warmest1=day[j];
    }
}

```

```

}
printf("\n The Warmest Temperature of the water on Lake Superior was %.2lf *C",warmestSup);
daytodate (warmest1);

warmestMich=LakeMich [0];

for (j=1;j<365;j++){
    if(LakeMich[j]>warmestMich){
        warmestMich=LakeMich[j];
        warmest2=day[j];
    }

}

printf(" The Warmest Temperature of the water on Lake Michigan was %.2lf *C",warmestMich);
daytodate (warmest2);

warmestHuron=LakeHuron [0];

for (j=1;j<365;j++){
    if(LakeHuron[j]>warmestHuron){
        warmestHuron=LakeHuron[j];
        warmest3=day[j];
    }

}

printf(" The Warmest Temperature of the water on Lake Huron was %.2lf *C",warmestHuron);
daytodate (warmest3);

```

```
warmestErie=LakeErie [0];
```

```
for (j=1;j<365;j++){
```

```
    if(LakeErie[j]>warmestErie){
```

```
        warmestErie=LakeErie[j];
```

```
        warmest4=day[j];
```

```
    }
```

```
}
```

```
printf(" The Warmest Temperature of the water on Lake Erie was %.2lf *C",warmestErie);
```

```
daytodate (warmest4);
```

```
warmestOnt=LakeOnt [0];
```

```
for (j=1;j<365;j++){
```

```
    if(LakeOnt[j]>warmestOnt){
```

```
        warmestOnt=LakeOnt[j];
```

```
        warmest5=day[j];
```

```
    }
```

```
}
```

```
printf(" The Warmest Temperature of the water on Lake Ontario was %.2lf *C",warmestOnt);
```

```
daytodate (warmest5);
```

```
warmestStC=LakeStC [0];
```

```
for (j=1;j<365;j++){
```

```
    if(LakeStC[j]>warmestStC){
```

```
        warmestStC=LakeStC[j];
```

```

        warmest6=day[j];
    }

}

printf(" The Warmest Temperature of the water on Lake StClair was %.2lf *C",warmestStC);
daytodate (warmest6);

```

//PART 4

```

// Intialize one array with all the warmest temps for all the lakes,
// and intialize another with their respective days. Use comparison in
// array using if statment to find hottest temp, and
// match with corresponding day, done identical with coldest temps

```

```

array3[0]=warmestSup;
array3[1]=warmestMich;
array3[2]=warmestHuron;
array3[3]=warmestErie;
array3[4]=warmestOnt;
array3[5]=warmestStC;
hday[0]=warmest1;
hday[1]=warmest2;
hday[2]=warmest3;
hday[3]=warmest4;
hday[4]=warmest5;
hday[5]=warmest6;

```

```

hottest=array3[0];

```

```

for(j=1;j<6;j++){
    if(array3[j]>hottest){
        hottest=array3[j];
    }
}

if(hottest==array3[0]){
    printf("\nHottest Overall is Lake %s : %.2lf *C, On
Day:%d\n", "Superior", hottest, hday[0]);
} else if(hottest==array3[1]){
    printf("\nHottest Overall is Lake %s : %.2lf *C, On
Day:%d\n", "Michigan", hottest, hday[1]);
} else if(hottest==array3[2]){
    printf("\nHottest Overall is Lake %s : %.2lf *C, On Day%d\n", "Huron", hottest, hday[2]);
} else if(hottest==array3[3]){
    printf("\nHottest Overall is Lake %s : %.2lf *C, On Day:%d\n", "Erie", hottest, hday[3]);
} else if(hottest==array3[4]){
    printf("\nHottest Overall is Lake %s : %.2lf *C, On Day:%d\n", "Ontario", hottest, hday[4]);
} else if(hottest==array3[5]){
    printf("\nHottest Overall is Lake %s : %.2lf *C, On Day:%d\n", "StClair", hottest, hday[5]);
}

array4[0]=coldestSup;
array4[1]=coldestMich;
array4[2]=coldestHuron;
array4[3]=coldestErie;
array4[4]=coldestOnt;
array4[5]=coldestStC;

```

```

cday[0]=coldest1;
cday[1]=coldest2;
cday[2]=coldest3;
cday[3]=coldest4;
cday[4]=coldest5;
cday[5]=coldest6;

coldest=array4[0];

for(j=1;j<6;j++){
    if(array4[j]<coldest){
        coldest=array4[j];
    }
}

if(coldest==array4[0]){
    printf("Coldest Overall Is Lake Superior: %.2lf *C, On Day:%d\n",coldest,cday[0]);
}else if(coldest==array3[1]){
    printf("Coldest Overall is Lake Michigan: %.2lf *C, On Day:%d\n",coldest,cday[1]);
}else if(coldest==array3[2]){
    printf("Coldest Overall is Lake Huron: %.2lf *C, On Day:%d\n",coldest,cday[2]);
}else if(coldest==array3[3]){
    printf("Coldest Overall is Lake Erie: %.2lf *C, On Day:%d\n",coldest,cday[3]);
}else if(coldest==array3[4]){
    printf("Coldest Overall is Lake Ontario: %.2lf *C, On Day:%d\n",coldest,cday[4]);
}else if(coldest==array3[5]){
    printf("Coldest Overall is Lake StClair: %.2lf *C, On Day:%d\n",coldest,cday[5]);
}

```

```
//PART 5
```

```
//variables for part 5 summer averages for lakes
```

```
double lssa=0,lmsa=0,lhsa=0,lesa=0,losa=0,lscsa=0;
```

```
//Create variables and for loops for each lake and sum the all up.
```

```
//Next divide that sum with the number of summer days of 93.
```

```
// This is done identical with the winter days
```

```
printf("\nThe summer average temperature from warmest to coldest:\n");
```

```
for(j=171;j<264;j++){
```

```
    lesa=lesa + LakeErie[j];
```

```
}
```

```
printf("\nLake Erie: %.2lf *C\n",lesa/93);
```

```
for(j=171;j<264;j++){
```

```
    lscsa=lscsa + LakeStC[j];
```

```
}
```

```
printf("Lake StClair: %.2lf *C\n",lscsa/93);
```

```
for(j=171;j<264;j++){
```

```
    losa=losa + LakeOnt[j];
```

```
}
```

```
printf("Lake Ontario: %.2lf *C\n",losa/93);
```



```
for(j=171;j<264;j++){
lmsa=lmsa + LakeMich[j];
}
printf("Lake Michigan: %.2lf *C\n",lmsa/93);
```

```
for(j=171;j<264;j++){
lhsa=lhsa + LakeHuron[j];
}
printf("Lake Huron: %.2lf *C\n",lhsa/93);
```

```
for(j=171;j<264;j++){
lssa=lssa + LakeSup[j];
}
printf("Lake Superior: %.2lf *C\n",lssa/93);
```

```
//part 6
```

```
//variables needed
```

```
double lswa=0,lmwa=0,lhwa=0,lewa=0,lowa=0,lscwa=0;
```

```
//need two for loops for winter average since there are multiples day ranges
```

```
//printing the winter average temperature of the lakes
```

```
printf("\n\nThe Winter average temperature from warmest to coldest:\n");
```

```

for(j=0;j<78;j++){
lowa=lowa + LakeOnt[j];
}
for(j=354;j<364;j++){
lowa=lowa + LakeOnt[j];
}
printf("\nLake Ontario: %.2lf *C\n",lowa/89);

```

```

for(j=0;j<78;j++){
lmwa=lmwa + LakeMich[j];
}
for(j=354;j<364;j++){
lmwa=lmwa + LakeMich[j];
}
printf("Lake Michigan: %.2lf *C\n",lmwa/89);

```

```

for(j=0;j<78;j++){
lhwa=lhwa + LakeHuron[j];
}
for(j=354;j<364;j++){
lhwa=lhwa + LakeHuron[j];
}
printf("Lake Huron: %.2lf *C\n",lhwa/89);

```

```

for(j=0;j<78;j++){
lswa=lswa + LakeSup[j];
}
for(j=354;j<364;j++){

```

```

lswa=lswa + LakeSup[j];
}
printf("Lake Superior: %.2lf *C\n",lswa/89);

```

```

for(j=0;j<78;j++){
lewa=lewa + LakeErie[j];
}
for(j=354;j<364;j++){
lewa=lewa + LakeErie[j];
}
printf("Lake Erie: %.2lf *C\n",lewa/89);

```

```

for(j=0;j<78;j++){
lscwa=lscwa + LakeStC[j];
}
for(j=354;j<364;j++){
lscwa=lscwa + LakeStC[j];
}
printf("Lake StClair: %.2lf *C\n",lscwa/89);

```

```

//Part 7

```

```

// Creating count variables for each lake, and count number of times

```

```

// temp is greater than 20, then print the value.

```

```

int wsuptemp=0,wmichtemp=0,whurontemp=0,werietemp=0,wonttemp=0,
wstctemp=0;

```

```
printf("\nThe number of days you can swim in each lake (Temperature above 20 *C):\n");
```

```
for (j=0;j<364;j++){
```

```
    if (LakeSup[j]>20){
```

```
        wsuptemp =wsuptemp +1;
```

```
    }
```

```
}
```

```
printf("\nLake Superior: %d\n",wsuptemp);
```

```
for (j=0;j<364;j++){
```

```
    if (LakeMich[j]>20){
```

```
        wmichtemp =wmichtemp +1;
```

```
    }
```

```
}
```

```
printf("Lake Michigan: %d\n",wmichtemp);
```

```
for (j=0;j<364;j++){
```

```
    if (LakeHuron[j]>20){
```

```
        whurontemp =whurontemp +1;
```

```
    }
```

```
}
```

```

printf("Lake Huron: %d\n",whurontemp);

for (j=0;j<364;j++){

    if (LakeErie[j]>20){
        werietemp =werietemp +1;
    }
}

printf("Lake Erie: %d\n",werietemp);

for (j=0;j<364;j++){

    if (LakeOnt[j]>20){
        wonttemp =wonttemp +1;
    }
}

printf("Lake Ontario: %d\n",wonttemp);

for (j=0;j<364;j++){

    if (LakeStC[j]>20){
        wstctemp =wstctemp +1;
    }
}

printf("Lake StClair: %d\n",wstctemp);

```

```

//Part 8

// Create 6 counting variables, to count when the temp is below zero,
// using a for loop and if statment. Then print that value.

    int fsuptemp=0,fmichtemp=0,fhurontemp=0,ferietemp=0,fonttemp=0,
fstctemp=0;

    printf("\nThe number of days the lakes are frozen (Temperature below 0 *C):\n");

for (j=0;j<364;j++){

    if (LakeSup[j]<0){
        fsuptemp =fsuptemp +1;
    }
}

    printf("\nLake Superior: %d\n",fsuptemp);

for (j=0;j<364;j++){

    if (LakeMich[j]<0){
        fmichtemp =fmichtemp +1;
    }
}

    printf("Lake Michigan: %d\n",fmichtemp);

```

```

for (j=0;j<364;j++){

    if (LakeHuron[j]<0){
        fhurontemp =fhurontemp +1;
    }
}

printf("Lake Huron: %d\n",fhurontemp);

```

```

for (j=0;j<364;j++){

    if (LakeErie[j]<0){
        ferietemp =ferietemp +1;
    }
}

printf("Lake Erie: %d\n",ferietemp);

```

```

for (j=0;j<364;j++){

    if (LakeOnt[j]<0){
        fonttemp =fonttemp +1;
    }
}

printf("Lake Ontario: %d\n",fonttemp);

```

```

for (j=0;j<364;j++){

```

```

        if (LakeStC[j]<0){
            fstctemp =fstctemp +1;
        }
    }

    printf("Lake StClair: %d\n",fstctemp);
//Closing 2019 file
fclose (f);

//Opening 2018 file

    FILE *f2 = fopen("laketemp2018.txt", "r");

    int year2,day2[365];
    double LakeSup2[365], LakeMich2[365], LakeHuron2[365],LakeErie2[365], LakeOnt2[365],
    LakeStC2[365];

    double lakeSupavg2=0, lakeMichavg2=0, lakeHuronavg2=0, lakeErieavg2=0,
    lakeOntavg2=0, lakeStCavg2=0,yearlyavg2;

    for(c=0;c<365;c++){
        fscanf(f2, "%d %d %lf %lf %lf %lf %lf %lf", &year2, &day2[c], &LakeSup2[c],
        &LakeMich2[c], &LakeHuron2[c],&LakeErie2[c], &LakeOnt2[c], &LakeStC2[c]);
    }
    printf ("\n\n2018 Yearly Average Temperature For Six Lakes:\n");

```



```
for(j=0;j<365;j++){  
lakeSupavg2=lakeSupavg2 + LakeSup2[j];  
}  
printf("\nLake Superior Average Yearly Temperature:%.2lf *C\n",lakeSupavg2/365);
```

```
for(j=0;j<365;j++){  
lakeMichavg2=lakeMichavg2 + LakeMich2[j];  
}  
printf("Lake Michigan Average Yearly Temperature:%.2lf *C\n",lakeMichavg2/365);
```

```
for(j=0;j<365;j++){  
lakeHuronavg2=lakeHuronavg2 + LakeHuron2[j];  
}  
printf("Lake Huron Average Yearly Temperature:%.2lf *C\n",lakeHuronavg2/365);
```

```
for(j=0;j<365;j++){  
lakeErieavg2=lakeErieavg2 + LakeErie2[j];  
}  
printf("Lake Erie Average Yearly Temperature:%.2lf *C\n",lakeErieavg2/365);
```

```
for(j=0;j<365;j++){  
lakeOntavg2=lakeOntavg2 + LakeOnt2[j];  
}  
printf("Lake Ontario Average Yearly Temperature:%.2lf *C\n",lakeOntavg2/365);
```

```
for(j=0;j<365;j++){
```

```

lakeStCavg2=lakeStCavg2 + LakeStC2[j];
}
printf("Lake St Clair Average Yearly Temperature: %.2lf *C\n\n", lakeStCavg2/365);

yearlyavg2=((lakeSupavg2/365) + (lakeMichavg2/365) + (lakeHuronavg2/365) +
(lakeErieavg2/365) + (lakeOntavg2/365) + (lakeStCavg2/365))/6;

printf("The Average Yearly Temperature Of All Six Lakes Is %.2lf *C\n", yearlyavg2);


return 0;
}
//function to convert the day of the year value into a date/month format
//
void (daytodate (int n))
{
    int monthdays[12]={31,28,31,30,31,30,31,31,30,31,30,31};
    int j;
    for (j=0;j<12;j++){

        if (n > monthdays[j]){

            n -= monthdays[j];

        }

        else{

            printf(" Date: %d/%d \n", n, j + 1);

```

```
        break;  
    }  
}  
}
```