ELEC 1520
Final Project

Dylan Phoutthavong

December 15th, 2022

A. Function Design

The functions below are the functions that are used to analyze the data based on a given period of time. The following functions also includes a helper function that are used to display the menu, prompt the user for a period and the analysis, and other functions that are useful for the functions used to analyze the data.

function	analysisByYear
input	int analysis
output	none
declaration	void analysisByYear(int analysis)
body	• prompts user for a range of years • based on the analysis parameter, perform the chosen analysis on the given period

function	analysesByEveryMonth
input	int analysis
output	none
declaration	void analysesByEveryMonth(int analysis)
body	• prompts user for a range of years • based on the analysis parameter, perform the chosen analysis on the given period

function	analysesByOneMonth
input	int analysis
output	none
declaration	void analysesByOneMonth(int analysis)
body	• prompts user for a month and a range of years • based on the analysis parameter, perform the chosen analysis on the given period

function	totalDaysInAYear
input	int year
output	returns the (int)number of days in that year
declaration	int totalDaysInAYear(int year);
body	• check if the year is a leap year to get the number of days in that year. (Will be used for getting the avg. of a data in that year) • if a year is a leap year return 366 days, else return 365 days

function	totalDaysOfMonth
input	int month, int year
output	returns the (int)number of days in a month
declaration	int totalDaysOfMonth(int month, int year);
body	• if a month number is 2, number of days is 28 in a normal year and 29 for a leap year • if a month number is 1, 2, 3, 5, 7 ,8, 10, 12, the number of days is 21 • else, number of days is 30

function	totalDaysOfAMonthInYears
input	int month, int startYear, int endYear
output	returns the (int) number of days consumed by a month given a range of years.
declaration	int totalDaysOfAMonthInYears(int month, int startYear, int endYear)
body	• loop through every year from startYear to endYear

	• get the number of days in a month with respect to the kind of year (leap year or not) • add it to the total number of days

function	analyzePrecipitationByYear
input	int startYear, int endYear
output	none
declaration	void analyzePrecipitationByYear(int startYear, int endYear)
body	• calculates the total precipitation by year and stores it in a map • create an output file using the data in the map

function	analyzePrecipitationByAllMonths
input	int startYear, int endYear
output	none
declaration	void analyzePrecipitationByAllMonths(int startYear, int endYear);
body	• calculates the total precipitation in every month from startYear to endYear and stores it in a map • create an output file using the data in the map

function	analyzePrecipitationByOneMonth
input	int month1, int startYear, int endYear
output	none
declaration	void analyzePrecipitationByOneMonth(int month1, int startYear, int endYear);

body	• calculates the total precipitation of a single month from startYear to endYear and stores it in a map • create an output file using the data in the map

function	analyzeSnowfallByYear
input	int startYear, int endYear
output	none
declaration	void analyzeSnowfallByYear(int startYear, int endYear)
body	• calculates the total snowfall by year and stores it in a map • create an output file using the data in the map

function	findSnowfallByAllMonths
input	int startYear, int endYear
output	none
declaration	void analyzeSnowfallByAllMonths(int startYear, int endYear)
body	• calculates the total snowfall in every month from startYear to endYear and stores it in a map • create an output file using the data in the map

function	analyzeSnowfallByOneMonth
input	int month1, int startYear, int endYear
output	none

declaration	void analyzeSnowfallByOneMonth(int month1, int startYear, int endYear)
body	• calculates the total snowfall in a single month from startYear to endYear and stores it in a map • create an output file using the data in the map

function	analyzeAvgMinMaxTempByYear
input	int startYear, int endYear
output	none
declaration	void analyzeAvgMinMaxTempByYear(int startYear, int endYear)
body	• calculates the average min and max temperature by year and stores it in a map • create an output file using the data in the map

function	analyzeAvgMinMaxTempByAllMonths
input	int startYear, int endYear
output	none
declaration	void analyzeAvgMinMaxTempByAllMonths(int startYear, int endYear)
body	• calculates the average min and max temperature in every month from startYear to endYear and stores it in a map • create an output file using the data in the map

function	analyzeAvgMinMaxTempByOneMonth

input	int month1, int startYear, int endYear
output	none
declaration	void analyzeAvgMinMaxTempByOneMonth(int month1, int startYear, int endYear);
body	• calculates the average min and max temperature in a single month from startYear to endYear and stores it in a map • create an output file using the data in the map

function	analyzeAvgMidDayTempByYear
input	int startYear, int endYear
output	none
declaration	void analyzeAvgMidDayTempByYear(int startYear, int endYear)
body	• calculates the average mid-day temperature by year and stores it in a map • create an output file using the data in the map

function	analyzeAvgMidDayTempByAllMonths
input	int startYear, int endYear
output	none
declaration	void analyzeAvgMidDayTempByAllMonths(int startYear, int endYear)
body	• calculates the average mid-day temperature in every month from startYear to endYear and stores it in a map • create an output file using the data in the map

function	analyzeAvgMidDayTempByOneMonth
input	int month1, int startYear, int endYear
output	none
declaration	void analyzeAvgMidDayTempByOneMonth(int month1, int startYear, int endYear)
body	• calculates the average mid-day temperature in a month from startYear to endYear and stores it in a map • create an output file using the data in the map

function	analyzeMinTempByYear
input	int startYear, int endYear
output	none
declaration	void analyzeMinTempByYear(int startYear, int endYear);
body	• sets a minimum variable that is equal to a very large number • if a temperature is lower than the minimum variable, set that temperature as the minimum variable • stores the year with its corresponding minimum temperature in a map • creates an output file based on the map

function	analyzeMinTempByAllMonths
input	int startYear, int endYear
output	none

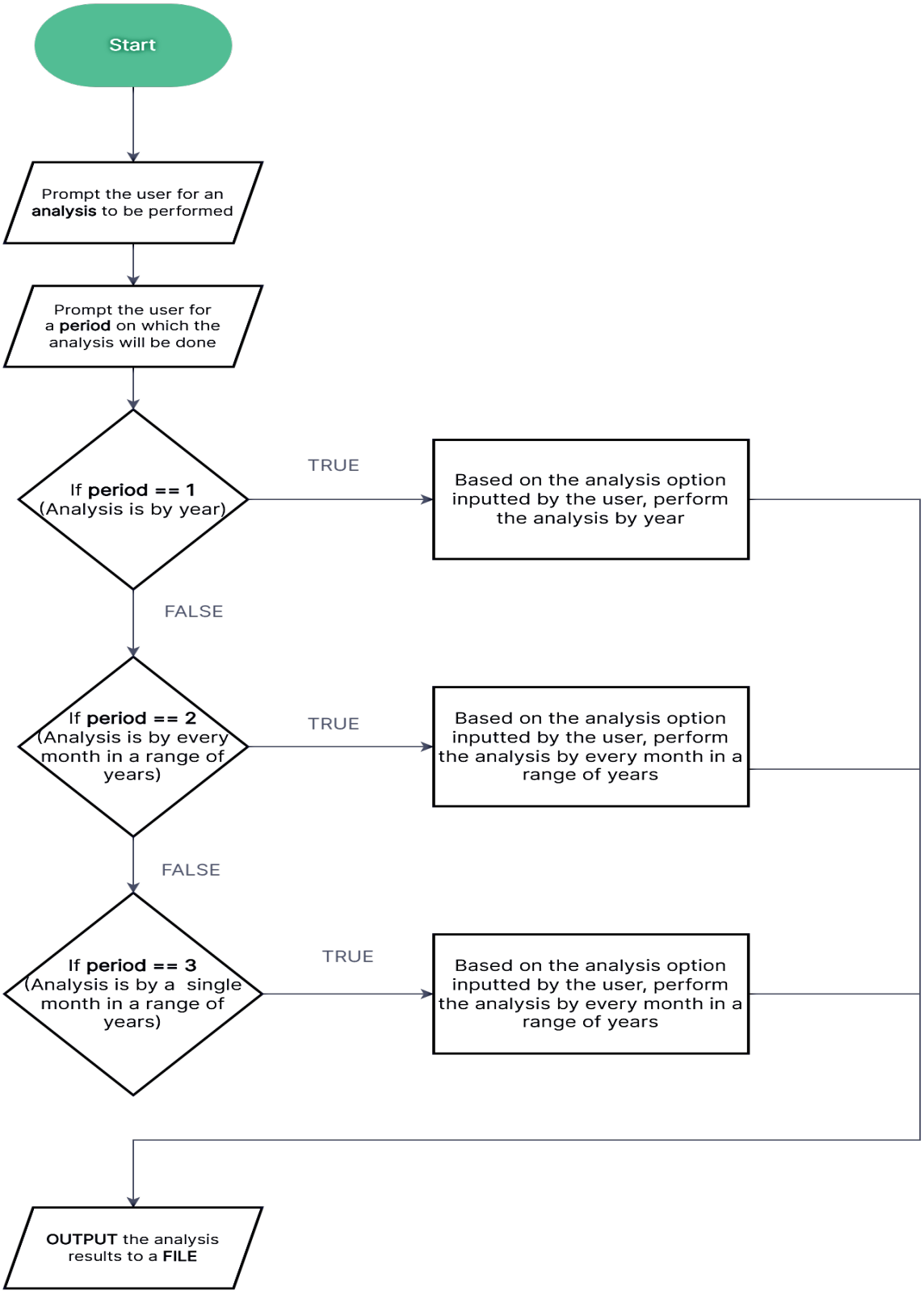
declaration	void analyzeMinTempByAllMonths(int startYear, int endYear)
body	• sets a minimum variable that is equal to a very large number • if a temperature is lower than the minimum variable, set that temperature as the minimum variable • stores the month with its corresponding minimum temperature in a range of year in a map • creates an output file based on the map

function	analyzeMinTempByOneMonth
input	int month1, int startYear, int endYear
output	none
declaration	void analyzeMinTempByOneMonth(int month1, int startYear, int endYear);
body	• sets a minimum variable that is equal to a very large number • if a temperature is lower than the minimum variable, set that temperature as the minimum variable • stores the year with its corresponding minimum temperature in a map • creates an output file based on the map

B. Top-level Design

The top-level design below is made using: https://www.visme.co/flowchart-maker/

***C++ Replit Link*:** https://replit.com/join/nurpawybjn-btchw0ng



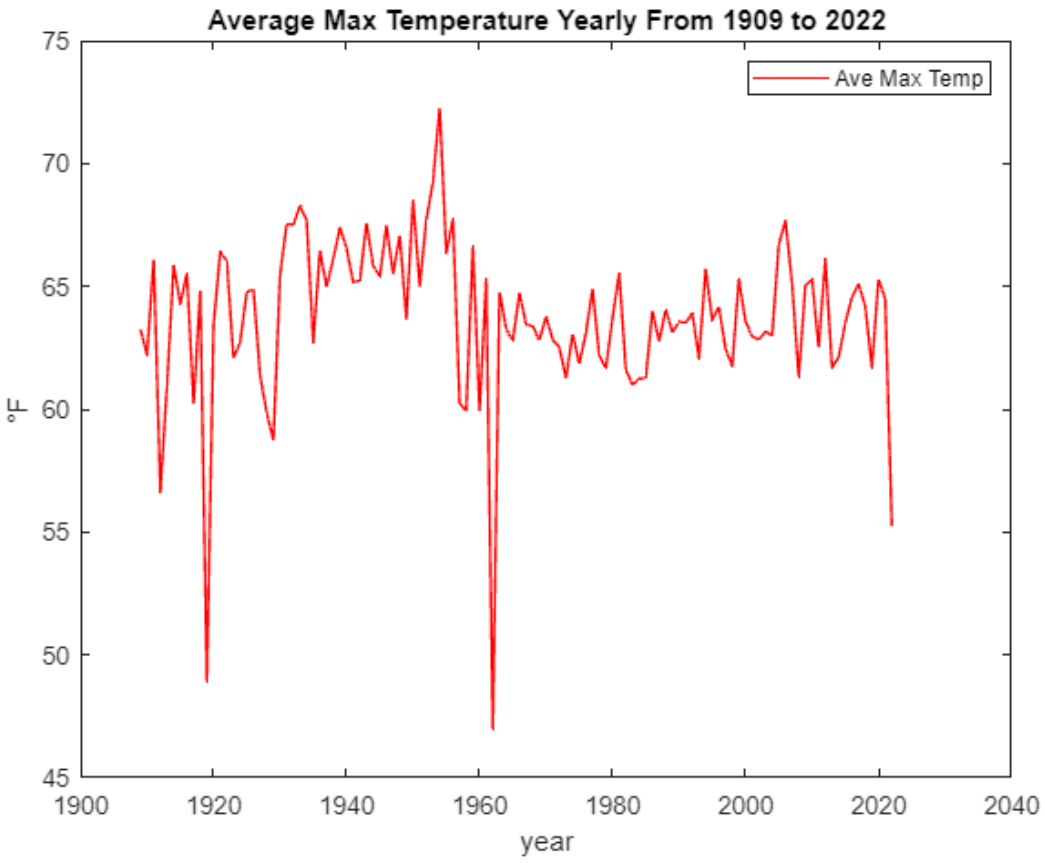
C. MATLAB

The Matlab scripts made for the plots are attached in Appendix I on this document.

D. Testing and Validation

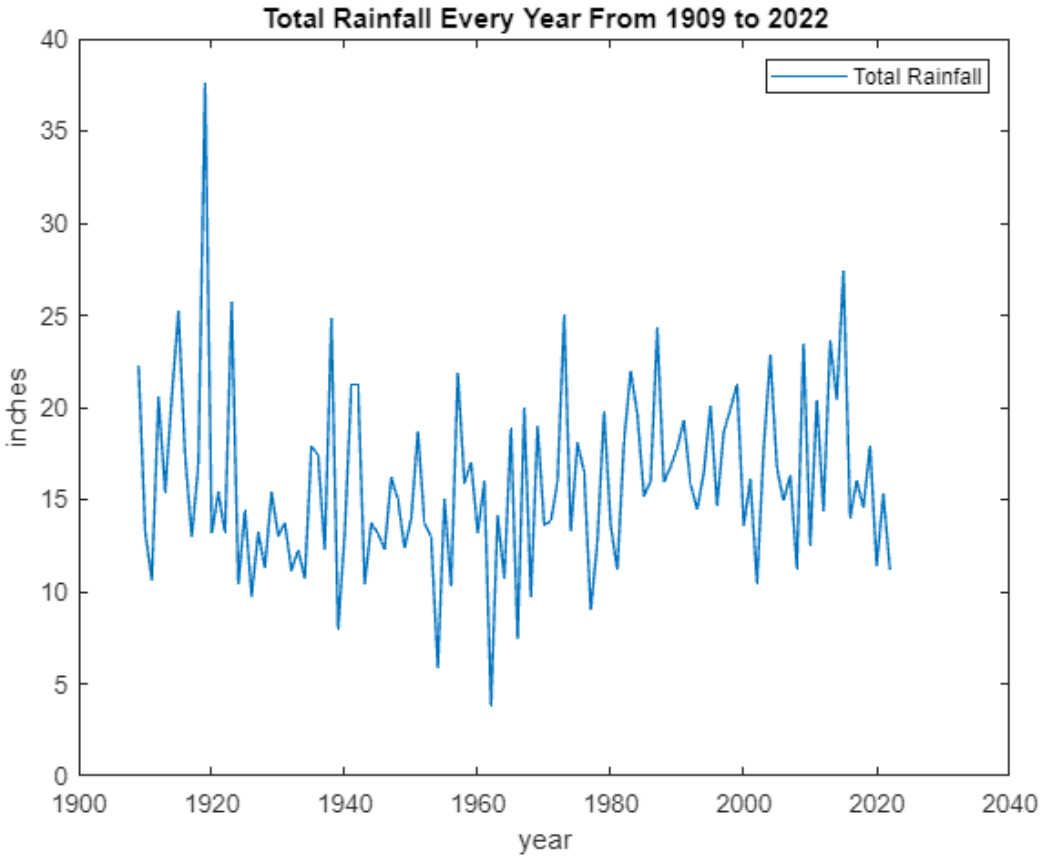
1. The average maximum recorded temperature per year over the period of 1909-2022.

Script used for this testing is attached on Appendix I, section a.



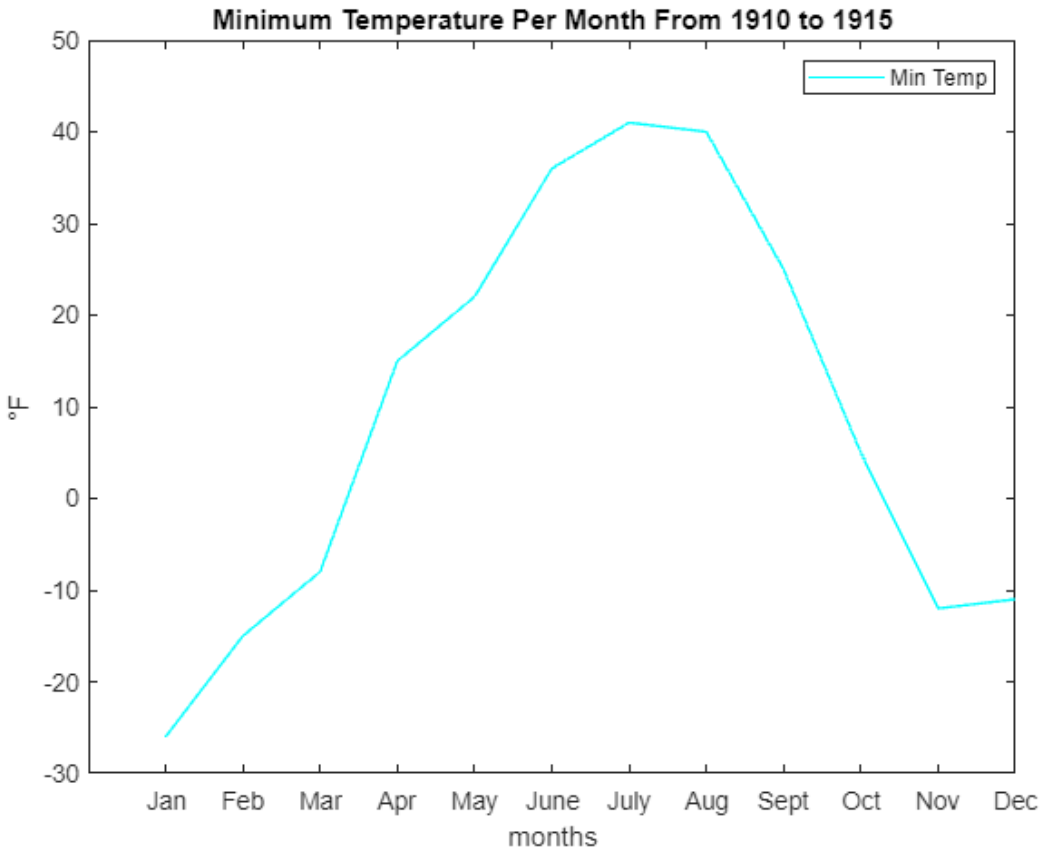
2. Total annual rainfall per year over the period 1909 to 2022

Script used for this testing is attached on Appendix I, section b.



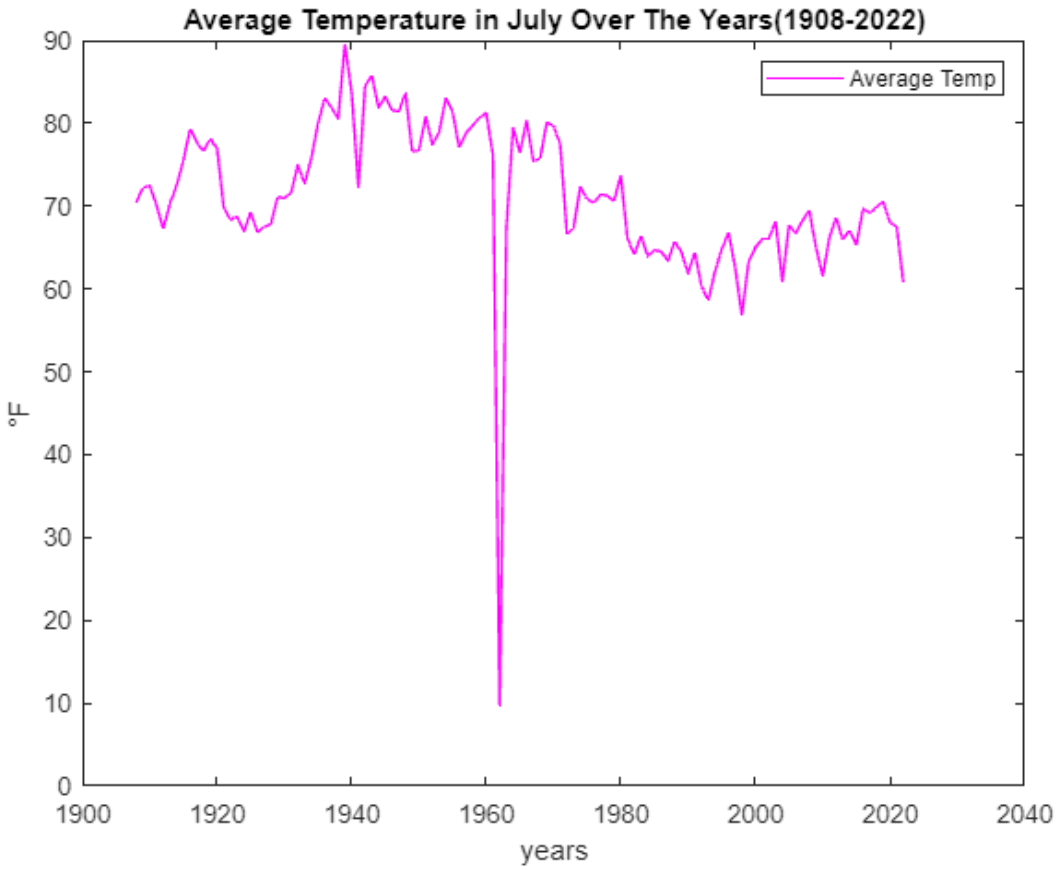
3. The minimum recorded temperature per month over the period of 1910-1915

Script used for this testing is attached on Appendix I, section c.



4. The average temperature in July over the period of 1908-2022.

Script used for this testing is attached on Appendix I, section d.



E. My Analysis

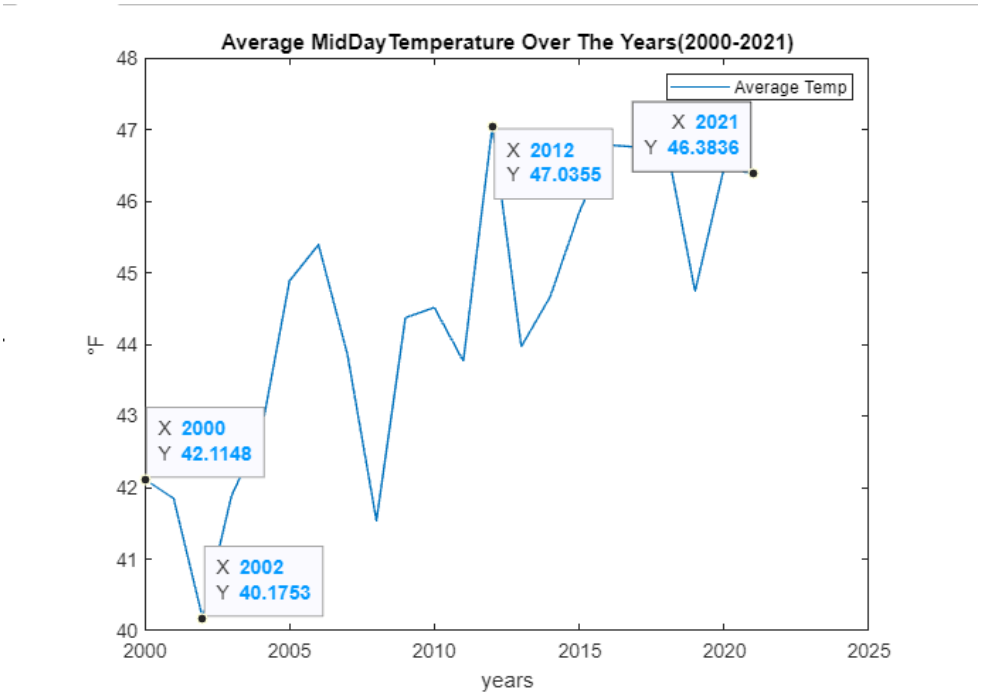
1. The average mid-day temperature per year from 2000 to 2021.

Script used for this testing is attached on Appendix II section a.

Overview:

This analysis aims to investigate the average mid-day temperature from the year 2000 to 2022. This purpose of this analysis is to know what year has the lowest temperature and the year that has the highest temperature using the average mid-day temperature

Plot:



Results and Conclusion:

Based on the graph shown above, the lowest recorded temperature from 2000 to 2021 is on 2002 that has a temperature of 40.1753 °F and 2012 that has a temperature of 47.0355 °F. From 2000 to 2021, the temperature has increased by 4.2688 °F. As we can observe in the graph and based on the data points, we can say that the temperature is gradually increasing by year. The average temperature may go down on some years, but it rises up to a certain degrees higher than the previous ones.

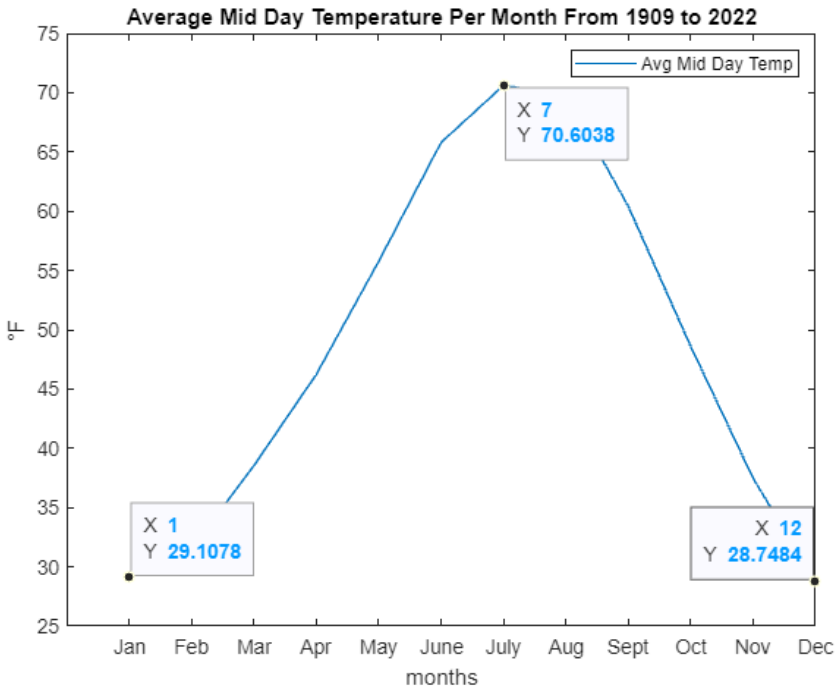
2. The average mid-day temperature per month from 1909 – 2022

Script used for this testing is attached on Appendix II section b.

Overview:

This analysis aims to investigate on what month has the highest and lowest average temperature from 1909 to 2022.

Plot:



Result and Conclusion:

Based on the plot shown above we can say that the month that has the highest average temperature is month 7, which is July. On the other hand, the month that has the lowest average temperature is month 12, which is December 12. From January, which is part of the winter season, the temperature is low. As if approaches the start of spring season, which is March, the temperature is gradually increasing. From that season, the temperature continues to increase as it approaches to the summer season. From the summer season, the temperature then gradually decreases as it approaches the fall season. And continues to decrease as it approaches the start of the winter season, which is December. The graph shows that summer season has the highest temperature, followed by spring and fall and the winter season is the coldest among all seasons.

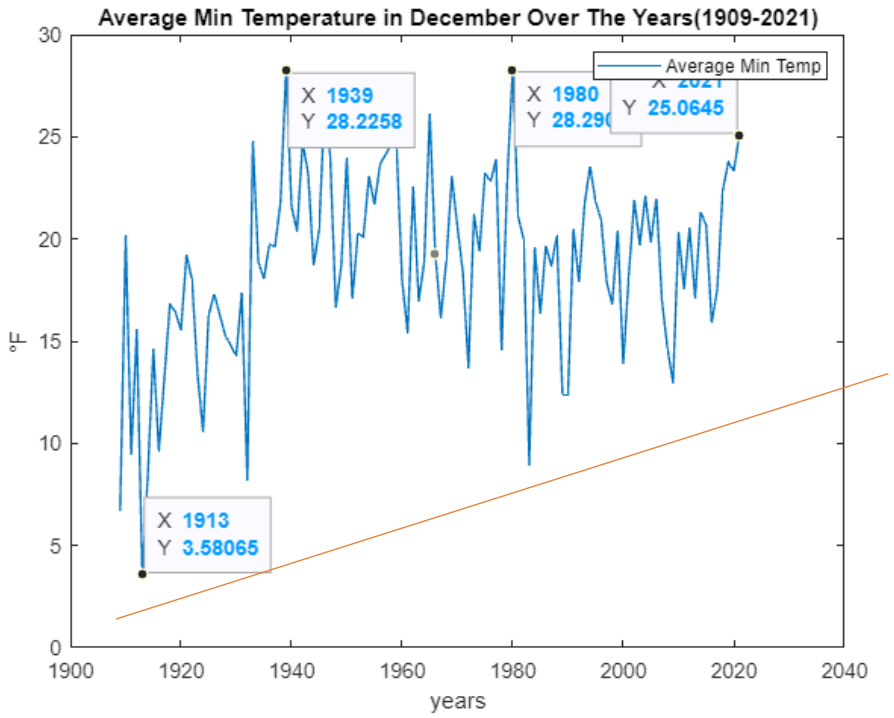
3. **The average minimum temperature of December over the years from 1909 to 2021**

Script used for this testing is attached on Appendix II section c.

Overview:

This analysis aims to know what year has the coldest start of winter season. The analysis will calculate the average minimum temperature of December from 1909 to 2021.

Plot:



Results and Conclusion:

Based on the graph shown above, December of 1913 has an average minimum temperature of 3.58065 °F and December of 1980 has an average minimum temperature of about 28.90 °F. Therefore, December of 1913 has the coldest start of winter season and December of 1980 has the hottest start of winter season relative to the gathered data. As years pass by, the start of winter season is not getting any colder, it's increasing as compared to the previous ones (the drawn orange line indicates the gradual increase)

List of Appendices

I. Matlab Scripts (Testing And Validation)

a. The average maximum recorded temperature per year over the period of 1909-2022.

```
%Average maximum recorded temperature per year
%From 1909-2022.
clear all;
close all;
data = load('avgMaxTempFrom1909To2022.txt');

year = data(:,1);
avgMaxTemp = data(:,2);

plot(year, avgMaxTemp, 'color', 'r');
xlabel('year');
ylabel('°F');
legend('Ave Max Temp');
title('Average Max Temperature Yearly From 1909 to 2022');
```

b. Total annual rainfall per year over the period 1909 to 2022

```
%Total annual rainfall per year over the period 1909 to 2022
clear all;
close all;
data = load('totalPrecipitationFrom1909To2022.txt');

year = data(:,1);
totalPrecipitation = data(:,2);

plot(year, totalPrecipitation);
xlabel('year');
ylabel('inches');
legend('Total Rainfall');
title('Total Rainfall Every Year From 1909 to 2022');
```

c. The minimum recorded temperature per month over the period of 1910-1915

```
%The minimum recorded temperature per month
%From 1910 to 1915
clear all;
close all;
data = load('minTempFrom1910To1915.txt');

year = data(:,1);
minTemp = data(:,2);

plot(year, minTemp, 'color', 'c');
xticks(1:1:12);
xticklabels({'Jan', 'Feb', 'Mar', 'Apr', ...
    'May', 'June', 'July', 'Aug', ...
    'Sept', 'Oct', 'Nov', 'Dec'});
xlabel('months');
ylabel('°F');
legend('Min Temp');
title('Minimum Temperature Per Month From 1910 to 1915');
```

d. The average temperature in July over the period of 1908-2022

```
%The average temperature in July from 1908 to 2022.
clear all;
close all;
data = load('avgMidDayTempIn7From1908To2022.txt');

year = data(:,1);
avgMidDayTemp = data(:,2);
plot(year, avgMidDayTemp, 'color', 'm');

xlabel('years');
ylabel('°F');
legend('Average Temp');
title('Average Temperature in July Over The Years(1908-2022)');
```

II. Matlab Scripts (My Analysis)

a. The average mid-day temperature per year from 2000 to 2021.

```
%The average mid-day temperature per year from 2000 to 2021.
clear all;
close all;
data = load('avgMidDayTempByYearFrom2000To2021.txt');

year = data(:,1);
avgMidDayTemp = data(:,2);
plot(year, avgMidDayTemp);

xlabel('years');
ylabel('°F');
legend('Average Temp');
title('Average MidDayTemperature Over The Years(2000-2021)');
```

b. The average mid-day temperature per month from 1909 – 2022

```
%The average mid-day temperature per month
%from 1909 – 2022

clear all;
close all;
data = load('avgMidDayTempEveryMonthFrom1909To2022.txt');

year = data(:,1);
minTemp = data(:,2);

plot(year, minTemp);
xticks(1:1:12);
xticklabels({'Jan', 'Feb', 'Mar', 'Apr', ...
    'May', 'June', 'July', 'Aug', ...
    'Sept', 'Oct', 'Nov', 'Dec'});
xlabel('months');
ylabel('°F');
legend('Min Temp');
title('Average Mid Day Temperature Per Month From 1909 to 2022');
```

c. The average minimum temperature of December over the years from 1909 to 2021

```
%The average temperature in December from 1909 to 2021.
clear all;
close all;
data = load('avgMinTempIn12From1909To2021.txt');

year = data(:,1);
avgMinTemp = data(:,2);
plot(year, avgMinTemp);

xlabel('years');
ylabel('°F');
legend('Average Min Temp');
title('Average Min Temperature in December Over The Years(1909-2021)');
```

III. Program Output

a. The average maximum recorded temperature per year over the period of 1909-2022.

```
What analysis would you like to do?
1.  - Total precipitation
2.  - Total snowfall
3. Average maximum and/or minimum temperature
4. Average temperature at mid-day
5. Mininum/Maximum temperature
Enter choice: 3

Enter the period of time for this analysis you've chosen
1. By Year (1908-2022)
2. By Every Month in Years (Ex. January-December data from 2002-2022)
3. By One Month in Years (Ex: October data from 2002-2022)
Enter choice: 1
Enter startYear: 1909
Enter endYear: 2022
```

avgMaxTemp(1909 - 2022)

1909	63.274	1938	66.1041	1967	63.4548	1997	62.4493
1910	62.2219	1939	67.4164	1968	63.3661	1998	61.7616
1911	66.0986	1940	66.5628	1969	62.8082	1999	65.3096
1912	56.6284	1941	65.1726	1970	63.7753	2000	63.5683
1913	60.9589	1942	65.2438	1971	62.8356	2001	62.9589
1914	65.8575	1943	67.589	1972	62.5164	2002	62.8219
1915	64.2849	1944	65.8579	1973	61.263	2003	63.1671
1916	65.5219	1945	65.3945	1974	63.074	2004	62.9836
1917	60.211	1946	67.4685	1975	61.8411	2005	66.7041
1918	64.8192	1947	65.5178	1976	63.123	2006	67.6822
1919	48.8877	1948	67.0656	1977	64.8904	2007	65.0959
1920	63.4399	1949	63.6767	1978	62.1863	2008	61.3005
1921	66.4082	1950	68.5288	1979	61.674	2009	65.0137
1922	66.0274	1951	65.0192	1980	63.7022	2010	65.2986
1923	62.0712	1952	67.7213	1981	65.5616	2011	62.5068
1924	62.7322	1953	69.2411	1982	61.5918	2012	66.1148
1925	64.7753	1954	72.2658	1983	61	2013	61.7041
1926	64.8685	1955	66.3589	1984	61.2377	2014	62.1096
1927	61.3863	1956	67.735	1985	61.2822	2015	63.5096
1928	59.8388	1957	60.2575	1986	64.0027	2016	64.5738
1929	58.7315	1958	59.9288	1987	62.7616	2017	65.0932
1930	65.4548	1959	66.6247	1988	64.0601	2018	64.2055
1931	67.537	1960	59.9317	1989	63.1342	2019	61.6959
1932	67.5055	1961	65.2959	1990	63.5616	2020	65.3087
1933	68.2822	1962	46.9562	1991	63.5233	2021	64.5205
1934	67.6959	1963	64.7781	1992	63.918	2022	55.2164
1935	62.7178	1964	63.2814	1993	62.074		
1936	66.4645	1965	62.7671	1994	65.6932		
1937	64.9781	1966	64.7342	1995	63.6164		

avgMinTemp(1909 - 2022)

1909	32.737	1938	38.3014	1967	36.4959	1996	35.5137
1910	31.7014	1939	38.4301	1968	35.7787	1997	34.589
1911	33.3205	1940	38.6011	1969	37.2521	1998	33.3753
1912	28.5082	1941	36.2301	1970	36.9726	1999	34.9671
1913	31.0493	1942	36.3041	1971	36.0164	2000	35.8306
1914	33.126	1943	38.6466	1972	36.1913	2001	36.1616
1915	32.8658	1944	36.9153	1973	35.9808	2002	34.7014
1916	31.3251	1945	37.674	1974	36.6137	2003	36.2
1917	29.8274	1946	38.8247	1975	35.0822	2004	37.1066
1918	32.4247	1947	37.8685	1976	36.3689	2005	38.2329
1919	24.3315	1948	35.9126	1977	38.9616	2006	37.9616
1920	32.7486	1949	36.811	1978	36.9507	2007	35.8411
1921	34.3562	1950	35.5233	1979	37.0849	2008	33.653
1922	32.9452	1951	34.1342	1980	38.9098	2009	35.389
1923	32.9562	1952	34	1981	39.0575	2010	35.4027
1924	31.6066	1953	35.274	1982	34.9918	2011	36.2521
1925	34.7616	1954	38.726	1983	35.5781	2012	39.8852
1926	34.3315	1955	34.6329	1984	35.6803	2013	37.0192
1927	32.7753	1956	36.4508	1985	34.7863	2014	37.1699
1928	31.8142	1957	34.5836	1986	37.9288	2015	38.2795
1929	31.6658	1958	32.6822	1987	36.8822	2016	39.1448
1930	33.611	1959	36.5863	1988	36.9399	2017	38.9507
1931	35.5233	1960	32.571	1989	34.6466	2018	38.5808
1932	34.9481	1961	35.8329	1990	36.063	2019	37.2055
1933	36.2575	1962	24.5425	1991	37.326	2020	39.0519
1934	37.4055	1963	36.6247	1992	37.929	2021	39.4137
1935	36.4219	1964	34.9016	1993	35.7808	2022	33.4521
1936	35.6749	1965	36.663	1994	39.011		
1937	36.1041	1966	37.1014	1995	36.7534		

b. Total annual rainfall per year over the period 1909 to 2022

```
What analysis would you like to do?
1.  - Total precipitation
2.  - Total snowfall
3. Average maximum and/or minimum temperature
4. Average temperature at mid-day
5. Mininum/Maximum temperature
Enter choice: 1

Enter the period of time for this analysis you've chosen
1. By Year (1908-2022)
2. By Every Month in Years (Ex. January-December data from 2002-2022)
3. By One Month in Years (Ex: October data from 2002-2022)
Enter choice: 1
Enter startYear: 1909
Enter endYear: 2022
>
```

TotalPrecipitation(1909 - 2022)

1909	22.29
1910	13.25
1911	10.63
1912	20.57
1913	15.41
1914	20.59
1915	25.23
1916	17.39
1917	12.96
1918	16.94
1919	37.61
1920	13.14
1921	15.4
1922	13.23
1923	25.77
1924	10.4
1925	14.41
1926	9.76
1927	13.23
1928	11.29
1929	15.4
1930	13.04
1931	13.71
1932	11.15
1933	12.27
1934	10.71
1935	17.9
1936	17.38
1937	12.24
1938	24.82
1939	7.95
1940	13.13
1941	21.25
1942	21.25
1943	10.37
1944	13.73
1945	13.14
1946	12.3
1947	16.21
1948	14.99
1949	12.36
1950	13.97
1951	18.68
1952	13.74
1953	12.94
1954	5.85
1955	15.02
1956	10.3
1957	21.89
1958	15.91
1959	17.03
1960	13.19
1961	15.96
1962	3.83
1963	14.14
1964	10.73
1965	18.88
1966	7.4
1967	19.92
1968	9.71
1969	19.02
1970	13.61
1971	13.84
1972	15.95
1973	24.98
1974	13.29
1975	18.07
1976	16.51
1977	8.97
1978	12.72
1979	19.75
1980	13.59
1981	11.18
1982	18.14
1983	21.99
1984	19.66
1985	15.2
1986	15.96
1987	24.27
1988	15.92
1989	16.79
1990	17.79
1991	19.3
1992	15.87
1993	14.46
1994	16.46
1995	20.08
1996	14.65
1997	18.66
1998	19.91
1999	21.25
2000	13.6
2001	16.06
2002	10.45
2003	17.75
2004	22.84
2005	16.72
2006	14.92
2007	16.33
2008	11.25
2009	23.48
2010	12.48
2011	20.43
2012	14.36
2013	23.59
2014	20.43
2015	27.45
2016	14
2017	16.04
2018	14.56
2019	17.91
2020	11.38
2021	15.3
2022	11.14

c. The minimum recorded temperature per month over the period of 1910-1915

```
What analysis would you like to do?
1.  - Total precipitation
2.  - Total snowfall
3. Average maximum and/or minimum temperature
4. Average temperature at mid-day
5. Mininum/Maximum temperature
Enter choice: 5

Enter the period of time for this analysis you've chosen
1. By Year (1908-2022)
2. By Every Month in Years (Ex. January-December data from 2002-2022)
3. By One Month in Years (Ex: October data from 2002-2022)
Enter choice: 2
Enter startYear: 1910
Enter endYear: 1915
```

minTemp(1910 - 1915)

1	-26
2	-15
3	-8
4	15
5	22
6	36
7	41
8	40
9	25
10	5
11	-12
12	-11

d. The average temperature in July over the period of 1908-2022

```
What analysis would you like to do?
1.  - Total precipitation
2.  - Total snowfall
3. Average maximum and/or minimum temperature
4. Average temperature at mid-day
5. Mininum/Maximum temperature
Enter choice: 4

Enter the period of time for this analysis you've chosen
1. By Year (1908-2022)
2. By Every Month in Years (Ex. January-December data from 2002-2022)
3. By One Month in Years (Ex: October data from 2002-2022)
Enter choice: 3
Enter a month number(1-12): 7
Enter startYear: 1908
Enter endYear: 2022
```

avgMidDayTempIn7(1908 - 2022)

1	1908	70.4516	1936	83.0645	1965	76.4194	1993	58.6129
2	1909	72.2258	1937	81.871	1966	80.3226	1994	62.129
3	1910	72.4839	1938	80.5806	1967	75.4516	1995	64.7419
4	1911	70.0968	1939	89.5806	1968	75.7097	1996	66.8387
5	1912	67.2903	1940	83.7097	1969	80.129	1997	62.5806
6	1913	70.3226	1941	72.3548	1970	79.6774	1998	56.871
7	1914	72.5161	1942	84.4516	1971	77.4839	1999	63.2903
8	1915	75.5161	1943	85.8065	1972	66.6129	2000	65.0323
9	1916	79.3226	1944	81.871	1973	67.4516	2001	66
10	1917	77.6774	1945	83.2903	1974	72.3226	2002	66.0323
11	1918	76.6129	1946	81.5806	1975	70.871	2003	68.1935
12	1919	78.129	1947	81.4194	1976	70.3871	2004	60.9032
13	1920	76.9677	1948	83.6774	1977	71.4194	2005	67.6452
14	1921	69.7742	1949	76.6129	1978	71.2258	2006	66.7097
15	1922	68.3548	1950	76.6774	1979	70.6452	2007	68.2258
16	1923	68.7742	1951	80.7742	1980	73.7097	2008	69.5161
17	1924	66.871	1952	77.4516	1981	66.0968	2009	65.0968
18	1925	69.2903	1953	78.9032	1982	64.1613	2010	61.5484
19	1926	66.871	1954	83.0645	1983	66.4516	2011	66.1935
20	1927	67.4839	1955	81.3548	1984	63.9677	2012	68.6452
21	1928	67.871	1956	77.0645	1985	64.6774	2013	65.9355
22	1929	71.0968	1957	78.8387	1986	64.5161	2014	67.129
23	1930	70.9677	1959	80.6774	1987	63.3871	2015	65.2581
24	1931	71.5806	1960	81.2581	1988	65.7097	2016	69.6774
25	1932	74.9355	1961	76.2258	1989	64.4839	2017	69.1935
26	1933	72.7419	1962	9.70968	1990	61.871	2018	69.8387
27	1934	75.7419	1963	67.3226	1991	64.4516	2019	70.5806
28	1935	79.9355	1964	79.5484	1992	60.3871	2020	68

e. The average mid day temperature per year from 2000 to 2021.

```
What analysis would you like to do?
1.  - Total precipitation
2.  - Total snowfall
3. Average maximum and/or minimum temperature
4. Average temperature at mid-day
5. Mininum/Maximum temperature
Enter choice: 4

Enter the period of time for this analysis you've chosen
1. By Year (1908-2022)
2. By Every Month in Years (Ex. January-December data from 2002-2022)
3. By One Month in Years (Ex: October data from 2002-2022)
Enter choice: 1
Enter startYear: 2000
Enter endYear: 2021
```

avgMidDayTempByYear(2000 - 2021)

2000	42.1148
2001	41.8466
2002	40.1753
2003	41.8904
2004	42.7268
2005	44.8849
2006	45.3918
2007	43.8548
2008	41.5355
2009	44.3726
2010	44.5123
2011	43.7644
2012	47.0355
2013	43.9671
2014	44.6658
2015	45.8411
2016	46.7842
2017	46.7534
2018	46.8164
2019	44.7397
2020	46.4645
2021	46.3836

f. The average mid-day temperature per month from 1909 – 2022

```
What analysis would you like to do?
1.  - Total precipitation
2.  - Total snowfall
3. Average maximum and/or minimum temperature
4. Average temperature at mid-day
5. Mininum/Maximum temperature
Enter choice: 4

Enter the period of time for this analysis you've chosen
1. By Year (1908-2022)
2. By Every Month in Years (Ex. January-December data from 2002-2022)
3. By One Month in Years (Ex: October data from 2002-2022)
Enter choice: 2
Enter startYear: 1909
Enter endYear: 2022
```

avgMidDayTempEveryMonth(1909 - 2022)

```
1      29.1078
2      31.5034
3      38.5294
4      46.2228
5      55.7586
6      65.793
7      70.6038
8      69.8659
9      60.4181
10      48.6078
11      37.476
12      28.7484
```

g. The average minimum temperature of December over the years from 1909 to 2021

```
What analysis would you like to do?
1.  - Total precipitation
2.  - Total snowfall
3. Average maximum and/or minimum temperature
4. Average temperature at mid-day
5. Mininum/Maximum temperature
Enter choice: 3

Enter the period of time for this analysis you've chosen
1. By Year (1908-2022)
2. By Every Month in Years (Ex. January-December data from 2002-2022)
3. By One Month in Years (Ex: October data from 2002-2022)
Enter choice: 3
Enter a month number(1-12): 12
Enter startYear: 1909
Enter endYear: 2021
```

avgMaxTempIn12(1909 - 2021)

1909	33.8387	1940	47.0323	1969	46.129	1997	43.1613
1910	48.9355	1941	48.1935	1970	48.2581	1998	45.5484
1911	40.129	1942	50.6452	1971	44.7097	1999	48.871
1912	44.0323	1943	45.6129	1972	39.4516	2000	41.2258
1913	23.2581	1944	45.6452	1973	46.9355	2001	42.6774
1914	38.8387	1945	43.6452	1974	42.871	2002	46.6452
1915	50.7419	1946	52.3226	1975	50.2581	2003	45.7097
1916	42.9032	1947	47.1935	1976	49.1935	2004	48.1613
1918	42.871	1948	46.0323	1977	48.9355	2005	47.2903
1919	48.1613	1949	53	1978	39.2903	2006	48.2258
1920	43.2903	1950	54.6129	1979	48.0323	2007	44.9032
1921	47.6774	1951	44.6774	1980	54.3548	2008	41.8387
1922	51.5806	1952	49.1613	1981	47.4516	2009	40.4194
1923	43.6774	1953	47.2581	1982	44.2581	2010	50.5484
1924	36.4516	1954	54.5161	1983	28.4839	2011	41.4516
1925	44.4516	1955	48.9032	1984	47.1935	2012	45.3548
1926	46.871	1956	53.4516	1985	44.129	2013	43.2903
1928	45.3871	1958	50.2258	1986	42.8387	2014	44.5806
1930	46.5161	1959	49.0968	1987	40.3226	2015	42.9355
1931	48.0645	1960	45.6774	1988	44.9032	2016	41.6452
1932	35.5484	1961	42.3226	1989	41.5161	2017	50.129
1933	57.129	1962	53.4839	1990	39.4194	2018	45.9677
1934	41.0645	1963	45.8387	1991	46.7742	2019	45.9355
1935	45.2581	1964	46.2258	1992	42.5161	2020	46.1613
1936	48.6452	1965	49.7097	1993	48.7419	2021	53.6452
1937	44.7742	1966	45.7097	1994	51.4194		
1938	44.0968	1967	39.7742	1995	49.2258		
1939	53.0968	1968	44.9677	1996	48.1935		

avgMinTempIn12(1909 - 2021)

1909	6.70968	1940	21.5806	1969	23.0645	1997	17.9032
1910	20.1613	1941	20.3871	1970	20.6129	1998	16.8065
1911	9.45161	1942	24.7419	1971	18.3548	1999	20.4194
1912	15.5484	1943	23.1935	1972	13.7097	2000	13.871
1913	3.58065	1944	18.7097	1973	21.1935	2001	18.1935
1914	8.45161	1945	20.4839	1974	19.3871	2002	21.9032
1915	14.5806	1946	26.7419	1975	23.2258	2003	19.7097
1916	9.64516	1947	24.0323	1976	22.8065	2004	22.0968
1918	16.8065	1948	16.6452	1977	23.9032	2005	19.8387
1919	16.4194	1949	18.7097	1978	14.5806	2006	22
1920	15.5484	1950	23.9677	1979	22.8065	2007	17
1921	19.2258	1951	17.0645	1980	28.2903	2008	14.6452
1922	18	1952	20.2903	1981	21.0968	2009	12.9677
1923	13.3871	1953	20.0968	1982	19.9677	2010	20.3226
1924	10.5806	1954	23.0645	1983	8.93548	2011	17.5484
1925	16.2581	1955	21.6774	1984	19.5484	2012	20.5484
1926	17.3226	1956	23.6452	1985	16.3548	2013	17.0968
1928	15.2903	1958	24.6129	1986	19.6774	2014	21.3226
1930	14.2903	1959	24.5161	1987	18.6774	2015	20.6774
1931	17.3871	1960	17.9677	1988	20.1613	2016	15.9032
1932	8.16129	1961	15.4194	1989	12.3871	2017	17.5161
1933	24.7742	1962	22.5806	1990	12.3548	2018	22.3548
1934	18.871	1963	16.9677	1991	20.4839	2019	23.7742
1935	18.0645	1964	18.871	1992	17.9032	2020	23.3226
1936	19.7419	1965	26.129	1993	21.7097	2021	25.0645
1937	19.6129	1966	19.2903	1994	23.5484		
1938	21.7742	1967	16.129	1995	21.8387		
1939	28.2258	1968	18.9677	1996	20.9355		