Writing and Executing query and .csv Download.

What tools did you use for each step? (Python, SQL, Excel, etc)

I first begin running an SQL Query using the built in, Udacity SQL Engine. To compare the weather trends in my city, Louisville, KY against Global weather trends, I executed a select statement by bringing in the fields, year, city, and country from the city_data table.

I gave an *alias* to city_data.avg_temp AS city_temp and gave an *alias* to global_data.avg_temp AS global_temp.

I joined global_data with the primary key – 'year' from city_data and used the where clause, to filter, city_data.country = 'United States' AND city_data.city= 'Louisville'

I copied my select statement and cleaned it up, using Visual Studio code.

See script below.

```sql
SELECT
        city_data.year,
        city_data.city,
        city_data.country,
        city_data.avg_temp AS city_temp,
        global_data.avg_temp AS global_temp
FROM
        city_data
JOIN    global_data
        ON global_data.year = city_data.year
WHERE
        city_data.country='United States' AND city_data.city= 'Louisville'
```

My Output returned 264 and the following fields:

Output	264 results			↓ Download CSV
year	city	country	city_temp	global_temp
1750	Louisville	United States	13.65	8.72
1751	Louisville	United States	14.44	7.98
1752	Louisville	United States	6.95	5.78
1753	Louisville	United States	13.00	8.39
1754	Louisville	United States	13.10	8.47
1755	Louisville	United States	10.50	8.36
1756	Louisville	United States	13.22	8.85
1757	Louisville	United States	12.59	9.02

I downloaded my results as a, .csv file and opened it using Microsoft Excel. The file type was changed to an .xlsx worksheet. The filename is, *results_cityvsglobal.xlsx.*

Calculating Moving Average

How did you calculate the moving average?

I used what I learned from the *Moving Averages* lesson, and in my extracted file and performed the following actions:
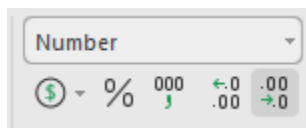
1. I added columns: 7-YEAR Louisville MA and 7-YEAR Global MA.
2. In Column D: Louisville_city_temp, I counted the first 7 rows beginning from, 1756 up to 1762. I moved my mouse to row 7 in Column F – 7-Year Louisville MA as the storage place for my moving average.
3. In Column F, cell:F14 I used the following AVERAGE function; =AVERAGE(D8:D14) to reference the cells from Column D.

	SUM			fx	=AVERAGE(D8:D14)

	A	B	C	D	E	F	G
1	year	city	country	Louisville_city_temp	global_temp	7-YEAR Louisville MA	7-YEAR Global MA
8	1756	Louisville	United States	13	9	12	8
9	1757	Louisville	United States	13	9	12	8
10	1758	Louisville	United States	12	7	12	8
11	1759	Louisville	United States	13	8	12	8
12	1760	Louisville	United States	11	7	12	8
13	1761	Louisville	United States	14	9	12	8
14	1762	Louisville	United States	13	9	=AVERAGE(D8:D14)	8
15	1763	Louisville	United States	11	8	12	8
16	1764	Louisville	United States	13	8	12	8
17	1765	Louisville	United States	13	8	12	8
18	1766	Louisville	United States	13	8	12	8
19	1767	Louisville	United States	12	8	13	8
20	1768	Louisville	United States	12	7	12	8
21	1769	Louisville	United States	13	8	12	8
22	1770	Louisville	United States	13	8	13	8
23	1771	Louisville	United States	13	8	13	8
24	1772	Louisville	United States	13	8	13	8
25	1773	Louisville	United States	13	8	13	8
26	1774	Louisville	United States	13	9	13	8
27	1775	Louisville	United States	14	9	13	8
28	1776	Louisville	United States	13	8	13	8
29	1777	Louisville	United States	13	8	13	8
30	1778	Louisville	United States	10	9	13	8
31	1779	Louisville	United States	4	9	11	9
32	1781	Louisville	United States	13	8	11	9
33	1782	Louisville	United States	13	8	11	8
34	1783	Louisville	United States	12	8	11	8
35	1784	Louisville	United States	12	8	11	8
36	1785	Louisville	United States	12	7	11	8
37	1786	Louisville	United States	13	8	11	8
38	1787	Louisville	United States	13	8	13	8
39	1788	Louisville	United States	13	8	13	8
40	1789	Louisville	United States	13	8	13	8
41	1790	Louisville	United States	13	8	13	8
42	1791	Louisville	United States	13	8	13	8
43	1792	Louisville	United States	13	8	13	8
44	1793	Louisville	United States	13	8	13	8
45	1794	Louisville	United States	13	9	13	8

4. I hit ENTER. In Column F, cell D14, I click the fill handle to bring up, the cross hair cursor, and double click to fill in the remaining cells in the column using the AVERAGE() Function with the earlier, referenced cells (D8:D14).

5. I drag the right corner of, highlighted cell14 in Column F to cell14 in Column G and repeat the steps, in double clicking in the bottom right corner to fill in the remaining cells within the column.

F	G
7-YEAR Louisville MA	**7-YEAR Global MA**
12	8
12	8
12	8
12	8
12	8
12	8
12	8
12	8

6. Now that I have the cells filled in with the AVERAGE() function, I highlight columns D- G and convert the text to a Number format and move the decimal, two places to the right to get whole numbers.

Number

Creating PivotTable

1. I converted my worksheet into a table by clicking in a cell and using Ctrl + T. Next, I create a new worksheet and go to options to create a new PivotTable.
2. I drag the fields, 'year' into the ROWS area, '7-YEAR Louisville MA' and '7-YEAR Global MA' into the VALUES area.

year	7-YEAR Louisville MA	7-YEAR Global MA
1756	12	8
1757	12	8
1758	12	8
1759	12	8
1760	12	8
1761	12	8
1762	12	8
1763	12	8
1764	12	8
1765	12	8
1766	12	8
1767	13	8
1768	12	8
1769	12	8
1770	13	8
1771	13	8
1772	13	8
1773	13	8
1774	13	8
1775	13	8
1776	13	8
1777	13	8
1778	13	8
1779	11	9
1781	11	9
1782	11	8
1783	11	8
1784	11	8
1785	11	8
1786	11	8
1787	13	8
1788	13	8
1789	13	8
1790	13	8
1791	13	8
1792	13	8

city_global_compare   results_cityvsglobal

Creating PivotChart

1. I accessed options>PivotChart. I chose to insert chart as a line graph.
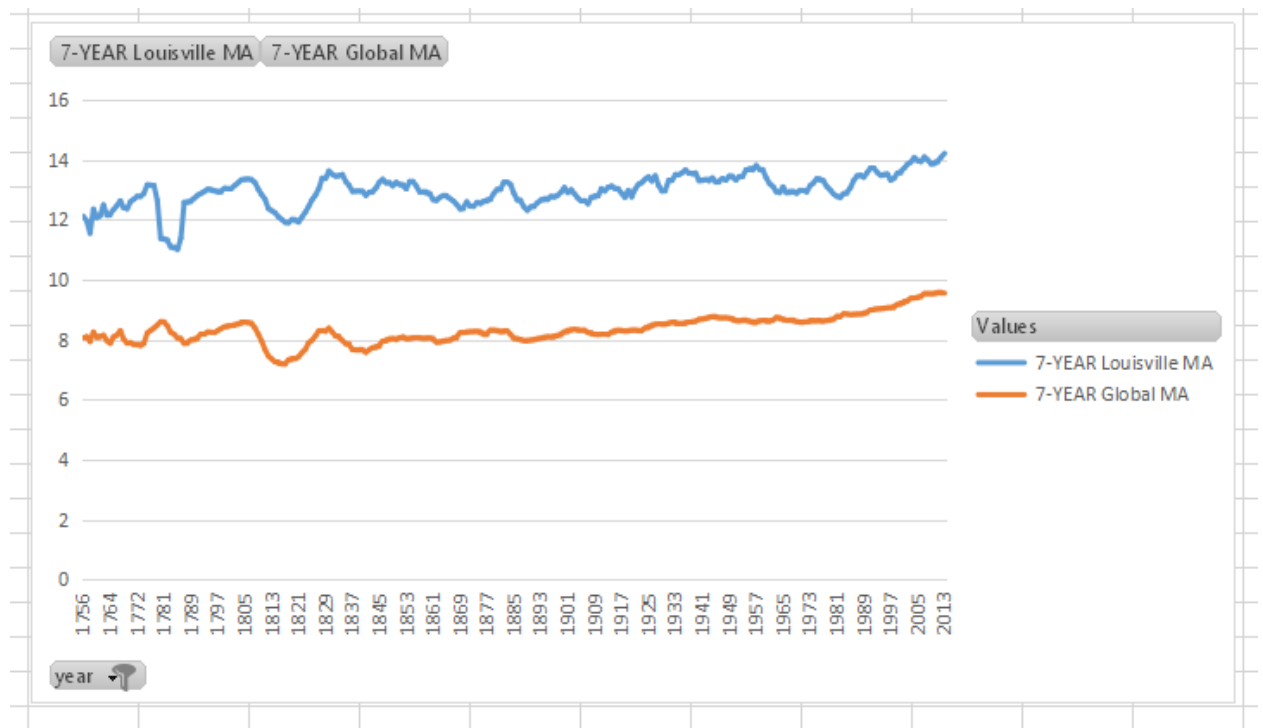
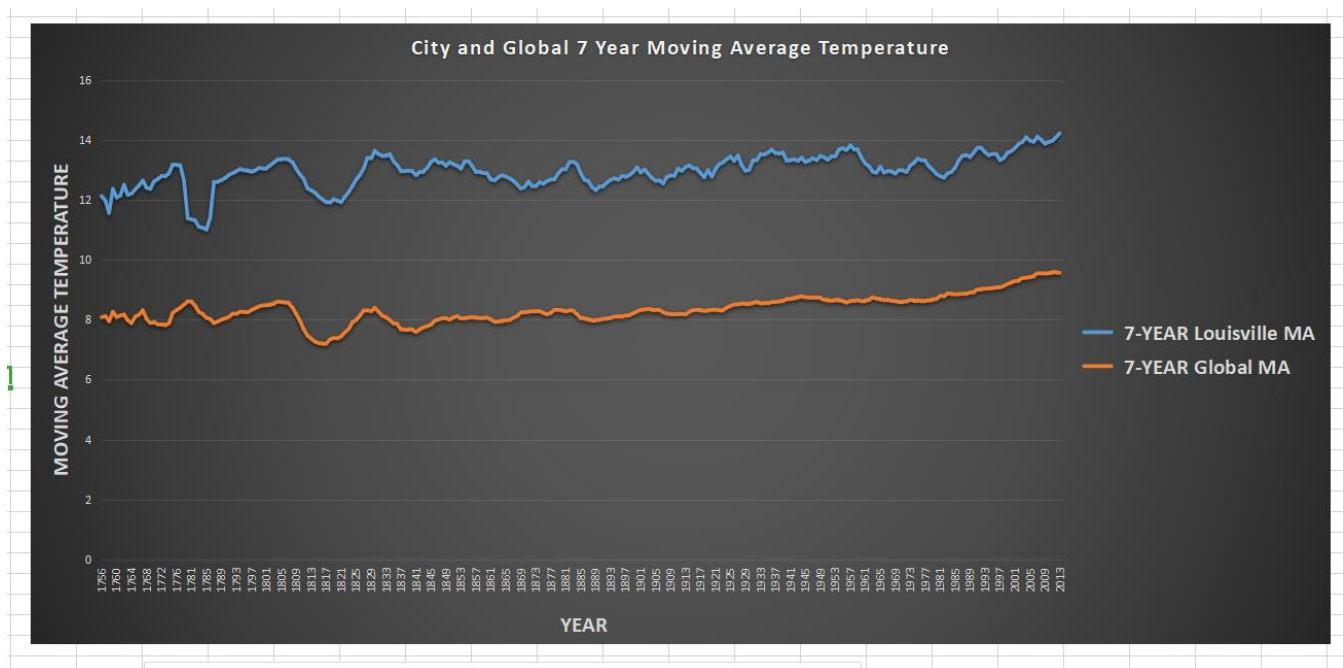2. To properly, plot the moving average and smooth out the lines, I performed the following actions:
   a. Hide all Field Buttons on Chart.
   b. In Chart element, I added Axis Title, Chart Title.
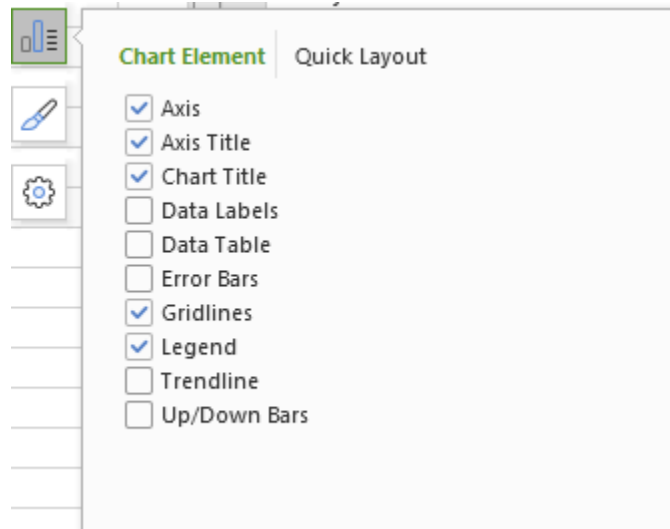
   c. I added titles and changed each title to have bold font and size 16 font.
   d. Changed the chart style.

Final line graph

What were your key considerations when deciding how to visualize the trends?

My key considerations were:

- Ensure I round each average temperature in Louisville and Globally to whole numbers.
- I color coded the plots in the chart to distinguish the difference in city and global data.
- I bolded the Axis and Chart titles in Pivotchart.
- I included a legend in my chart.
- Due to me entering the AVERAGE(D2:D8) function and beginning with the 7 year average, I filtered out the first six years which were (blanks) in my results_cityvsglobal sheet and in the city_global_compare sheet.

Is your city hotter or cooler on average compared to the global average? Has the difference been consistent over time?

Louisville's temperatures have fluctuated over time with a rapid decline in temperatures in 1789 at 11.5C and in, 1821 at 12C. The differences are not rapidly inconsistent.

"How do the changes in your city's temperatures over time compare to the changes in the global average?"

In comparison, Louisville's average temperature is around 7 degrees higher, than that of the Global average temperature.

What does the overall trend look like? Is the world getting hotter or cooler? Has the trend been consistent over the last few hundred years?

Overall, the Global temperature is getting hotter and over the last few hundreds of years, I do notice a steady trend where the temperature is 8C from years 1756-1926 and then around 1926 onward there is a 1-2 increase in the average temperature, globally.