DSIC 210: HW #3   Name: <u>SOLUTION</u>
Spring 2016
Points: 35

For this assignment, we will consider the OpenBeer database. (Original Source: OpenBeerDB.com). The files in this database have been cleaned up and have been provided on our course website. There are five tables/datasets I

<div align="center">

[beers.csv](#) | [breweries.csv](#) | [categories.csv](#) | [geocodes.csv](#) | [styles.csv](#)

</div>

1. The beers table is a listing of all beers in the database. Starting with this table, use the INDEX() and MATCH() functions to merge the following into the beer table. (10 pts)

    - Brewery Name
    - Brewery City
    - Brewery State
    - Brewery Latitude
    - Brewery Longitude
    - Beer Style

    <u>Note</u>: If information about a beer or brewery is missing, leave the cell contents blank. That is, you should fix any/all #N/A issues. The ISERROR() will be useful here.

    The first few lines of my final dataset are provided here.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	id	brewery_id	name	cat_id	style_id	abv	ibu	srm	brewery_name	brewery_city	brewery_state	brewery_latitude	brewery_longitude	beer_style	Distance to Winona
2	1	812	Hocus Pocus	11	116	4.5	0	0	Magic Hat	South Burlington	Vermont	44.42839813	-73.21309662	Light American	912.1064919
3	2	264	Grimbergen Blond	-1	-1	6.7	0	0	Brouwerij Alk	Jumet	Hainaut	50.44309998	4.414700031		3494.97242
4	3	779	Widdershins Barle	-1	-1	9.1	0	0	Left Hand Bre	Longmont	Colorado	40.15869904	-105.112999		7012.537675
5	4	287	Lucifer	-1	-1	8.5	0	0	Brouwerij Lie	Oudenaarde	Oost-Vlaanderer	50.84389877	3.617000103		3519.38996
6	5	1056	Bitter	-1	-1	4	0	0	Ridgeway Bre	South Stoke	Oxford	51.5461998	-1.135499954		3562.114494
7	6	1385	Winter Warmer	1	13	5.2	0	0	Youngs & Cor	London		51.46110153	-0.196600005	Old Ale	3555.636028

2. I found the following formula for computing the distance between two GPS locations in Excel from a tweet by Matthew Hill.

    Matthew Hill
    @kiwi_matt_nz

    =ACOS(COS(RADIANS(90-A2))
    *COS(RADIANS(90-A3)) +SIN(RADIANS(90-
    A2)) *SIN(RADIANS(90-A3))
    *COS(RADIANS(B2-B3))) *6371

    a. Find two additional sources from the internet that will collaborate that this is the correct formula.   Provide links to these sources here. (2 pts)

        Additional Source #1: http://bluemm.blogspot.com/2007/01/excel-formula-to-calculate-distance.html

        Additional Source #2: http://excel.tips.net/T003275_Calculating_the_Distance_between_Points.html

Consider the following example that calculates the distance between Leinenkugel Brewery and Winona.

	A	B	
1	Latitude	Longitude	
2	44.94490051	-91.39679718	← Leinenkugel Brewery
3	44.051142	-91.671023	← Winona

Distance in Miles

=ACOS(COS(RADIANS(90-A2)) *COS(RADIANS(90-A3)) +SIN(RADIANS(90-A2)) *SIN(RADIANS(90-A3)) *COS(RADIANS(B2-B3))) *(6371)*(0.621371)

63.214139

b. I had to slightly modify the formula provided by Matthew Hill's tweet. I needed to multiple an additional constant of 0.621371. What is the purpose of this constant? Discuss. (2 pts)

```
The constant in Matt Hill version is for kilometers.  To convert
to miles, we simply need to multiple the outcome by 0.621371.
(Note: 1 km = 0.621471 miles)
```

An alternative to the formula provided above is to create your own Excel function. The following Visual Basic code will create a new function called getDistance() which can be used to directly compute distance between two GPS locations.

Step 1: Open the Visual Basic Editor.

PC: http://www.techonthenet.com/excel/macros/visual_basic_editor2013.php

MAC: http://www.techonthenet.com/excel/macros/visual_basic_editor2011.php

Step 2: Select Insert > Module. Paste the function code into this module.

Step 3: Select File > Save. You must **save** your file as an **Excel Macro-Enabled Workbook**.

getDistance() function code was corrected on Wednesday, 2/24, please use this updated code

getDistance() function to compute distance between two GPS locations

```
Option Explicit
Dim earth_radius, Pi, deg2rad, dLat, dLon, a, c, d

Public Function getDistance(latitude1, longitude1, latitude2, longitude2)

    ' Use this for Km
    'earth_radius = 6371

    'Use this for Miles
    earth_radius = 6371 * 0.621371
    Pi = 3.14159265
    deg2rad = Pi / 180

    dLat = deg2rad * (latitude2 - latitude1)
    dLon = deg2rad * (longitude2 - longitude1)

    a = Sin(dLat / 2) * Sin(dLat / 2) + Cos(deg2rad * latitude1) * Cos(deg2rad * latitude2) *
Sin(dLon / 2) * Sin(dLon / 2)
    c = 2 * WorksheetFunction.Asin(Sqr(a))
```

```
    d = earth_radius * c

    getDistance = d

End Function
```

Use the following to return to your workbook.

> PC: Select File > Close and Return to Microsoft Excel

> MAC: Select Excel > Close and Return to Excel.

Once you return to your workbook, you should now be able to use your custom function. The following is using the =getDistance() function to obtain the distance between two GPS points.

	A	B	C	D	E	F
1	Latitude	Longitude		Distance in Miles		
2	44.94490051	-91.39679718		=getDistance(A2,B2,A3,B3)		
3	44.051142	-91.671023		63.21414		

The =getDistance() function in Excel is shown here.

```
Option Explicit
Dim earth_radius, Pi, deg2rad, dLat, dLon, a, c, d

Public Function getDistance(latitude1, longitude1, latitude2, longitude2)

    ' Use this for Km
    'earth_radius = 6371

    'Use this for Miles
    earth_radius = 6371 * 0.621371
    Pi = 3.14159265
    deg2rad = Pi / 180

    dLat = deg2rad * (latitude2 - latitude1)
    dLon = deg2rad * (longitude2 - longitude1)

    a = Sin(dLat / 2) * Sin(dLat / 2) + Cos(deg2rad * latitude1) * Cos(deg2rad * latitude2) * Sin(dLon / 2) * Sin(dLon / 2)
    c = 2 * WorksheetFunction.Asin(Sqr(a))

    d = earth_radius * c

    getDistance = d

End Function
```

3. Use the process outlined above to create your own getDistance() function in Excel. You must save your working file as a Macro-Enabled File so that your function gets properly saved. -- the standard excel file format does not save visual basic code. Put this macro-enabled excel file on the class storage directory. (5 pts)

Now, use your getDistance() to compute distances between all breweries and Winona. If you cannot get the getDistance() function to work properly, simply use the code provided in Problem #2.

The first few lines of the distances from Winona (see Column O).

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	id	brewery_i	name	cat_i	style	abv	ibu	srm	brewery_name	bre	bre	bre	bre	bee	Distance to Winona
2	1	812	Hocus Pocus	11	116	4.5	0	0	Magic Hat	Sou	Ver	44	-73	Ligh	912.1064919
3	2	264	Grimbergen Blond	-1	-1	6.7	0	0	Brouwerij Alken-Maes	Jum	Hai	50	4	##	3494.97242
4	3	779	Widdershins Barley	-1	-1	9.1	0	0	Left Hand Brewing Con	Lon	Col	40	##	##	7012.537675
5	4	287	Lucifer	-1	-1	8.5	0	0	Brouwerij Liefmans	Oud	Oos	51	4	##	3519.38996
6	5	1056	Bitter	-1	-1	4	0	0	Ridgeway Brewing	Sou	Oxf	52	-1	##	3562.114494
7	6	1385	Winter Warmer	1	13	5.2	0	0	Youngs & Company Bre	Lon	0	51	-0	Old	3555.636028

4. A couple of my favorite beers are Leinenkugel's Sunset Wheat and Leinenkugel's Honey Weiss. Find the 10 closest breweries to Winona that have a beer whose name contains the word "Wheat." Provide the list of breweries in the table below. (3 pts)

10 Closest Breweries to Winona who have a Wheat Beer	
1 (Closest)	Wingdam Wheat
2	Whitetail Wheat
3	Leinenkugel's Sunset Wheat
4	Honey Wheat
5	WPA (Wheat Pale Ale)
6	Wheat
7	Belgian Wheat
8	Wild Boar Wild Wheat
9	Trailside Wheat
10 (Furthest of top 10)	Capital Island Wheat

5. Next, suppose I want to drive to all these breweries using the shortest route possible. The SpeedyRoute website (Link: https://www.speedyroute.com/) will map out the shortest driving path through multiple destinations. Provide a map for the shortest route to all 10 of these breweries. Include a screen shot of this map. (4 pts)

The resulting map from Speedy Route website.
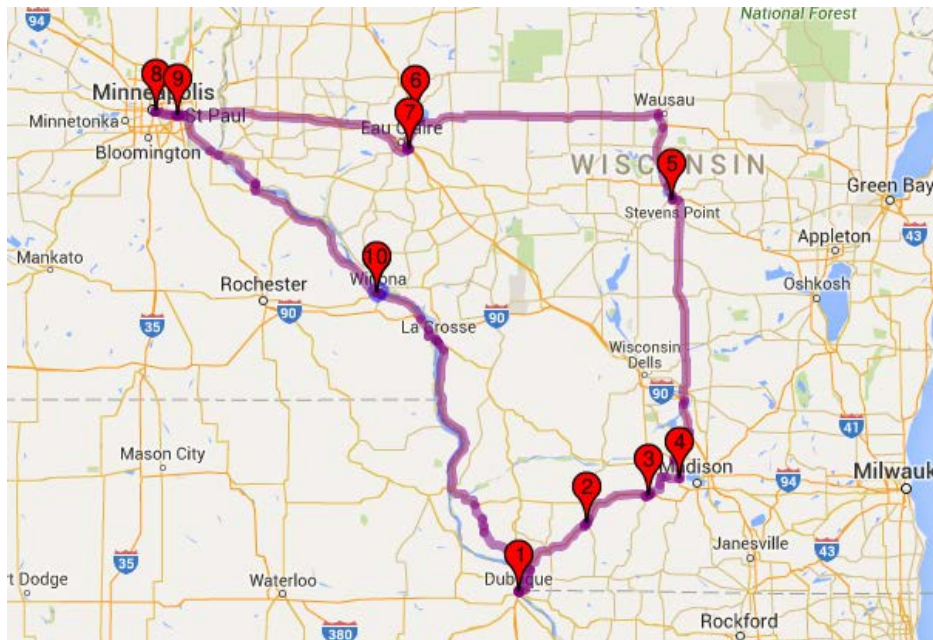
6. Leinenkugel's Sunset Wheat is considered a Belgian-Style White beer (Style_ID = 67). The following is a list of the 5 closest beers (from Winona) in this category. I have excluded the beers whose Brewery ID = 100. Figure out why these beers should indeed be excluded from this list? Discuss. (3 pts)

	A	B	C	P	Q
1	id	brewer	name	Style	Distanc
32	4333	708	Leinenkugel's Sunset Wheat	Belgian-Style White	63.21414
860	2983	1054	Bottom Up Wit	Belgian-Style White	248.8115
L132	4135	100	Winter White Ale	Belgian-Style White	336.1415
L143	4146	100	Batch 8000	Belgian-Style White	336.1415
L262	5302	161	Boulevard ZÃ…Å'N	Belgian-Style White	375.0923
L303	3977	44	Shock Top	Belgian-Style White	384.2974
L326	5605	44	Bud Light Golden Wheat	Belgian-Style White	384.2974

```
These beers are made by the Bell's Brewery, Inc. in Galesburg, MI.
The =getDistance() function computes the straight-line distance
between two GPS locations. Lake Michigan sits between Winona and
Galesburg, MI; thus, the straight-line distance is not a good
estimate.  Google Maps suggest the distance in miles between these two
locations is 462 miles.
```
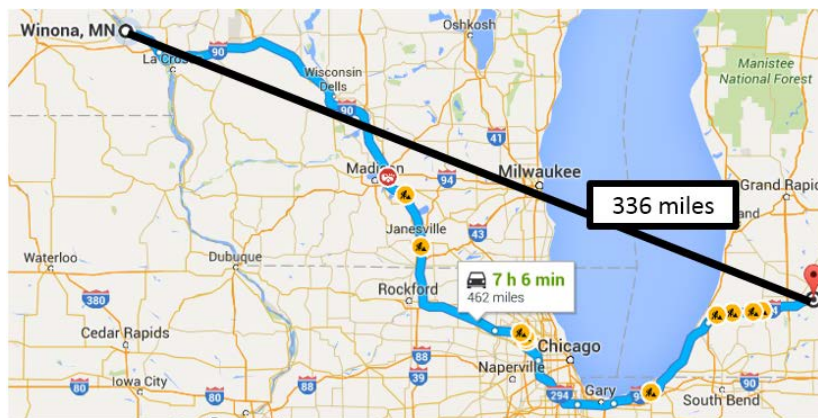

7. Leinenkugel's Honey Weiss is considered an American-Style Lager (Style = 95). Provide a list of all beers that are of this style that are within 100 miles of Winona. You will have to add more rows to this table for this problem. (3 pts)

Beer ID	Beer Name	Brewery Name	City / State	Distance
3093	Old Style	G. Heileman Brewing	La Crosse, WI	27.54390865
3293	Special Export	G. Heileman Brewing	La Crosse, WI	27.54390865
1319	Whitetail Wheat	Northwoods Brewpub Grill	Eau Claire, WI	51.4361535
232	Creamy Dark	Jacob Leinenkugel Brewing Company	Chippewa Falls, WI	63.21413894

2178	Red Lager	Jacob Leinenkugel Brewing Company	Chippewa Falls, WI	63.21413894
2749	Northwoods Lager	Jacob Leinenkugel Brewing Company	Chippewa Falls, WI	63.21413894
3092	Original	Jacob Leinenkugel Brewing Company	Chippewa Falls, WI	63.21413894
4334	Leinenkugel's Honey Weiss	Jacob Leinenkugel Brewing Company	Chippewa Falls, WI	63.21413894
1618	Lager	Logjam Microbrewery	Unity, WI	86.72764858
2936	Rock River Lager Beer	Tunner's Guild Brewing Systems	Saint Paul, MN	93.1150527
1909	Honey Wheat	Great Waters Brewing Company	Saint Paul, MN	93.63112076
1184	Kabeelo Lodge Lager	Green Mill Brewing – Saint Paul	Saint Paul, MN	95.55876849
1190	Honey Brown	O'Gara's Bar & Grill	Saint Paul, MN	96.20741142
1880	Pilsner	Moosejaw Pizza & Dells Brewing Company	Wisconsin Dells, WI	98.83433652

8. The internal structure of the OpenBeer database can be reviewed from some of their online resources. When this database was setup, the default value for abv (alcohol by volume) is 0. Thus, when a beer is entered into the database and the value of abv is not known, the abv will be set to 0. This is bad database/table design as one of the possible styles is non-alcoholic which would also have an abv value of 0.

Consider the following summaries of the average abv by Style -- sorted from highest to lowest. From this table, a Belgian-Style Quadrupel style beer has the highest alcoholic content by volume in this database. However, these averages are incorrect because 0 is the default value for missing values and thus zeros are being used to compute these averages.

PivotTable Setup for initial abv analysis	PivotTable sorted by average abv

Row Labels	Average of abv
Belgian-Style Quadrupel	11.44000006
Strong Ale	11.25
American-Style Imperial Stout	10.17922079
American-Style Barley Wine Ale	9.896000004
Imperial or Double Red Ale	9.199999809
Belgian-Style Dark Strong Ale	9.185714211
Specialty Beer	8.75

Drag fields between areas below:

FILTERS

COLUMNS

ROWS
Style

Σ VALUES
Average of abv

Defer Layout Update   UPDATE

Place abv field in the FILTERS box on the PivotTable setup. Now, use this Filter to figure out how to remove the zeros from the calculations for average abv. Screen shot the updated table of the first few styles of beer that have the highest average abv. (3 pts)

Putting abv field in the
FILTERS box
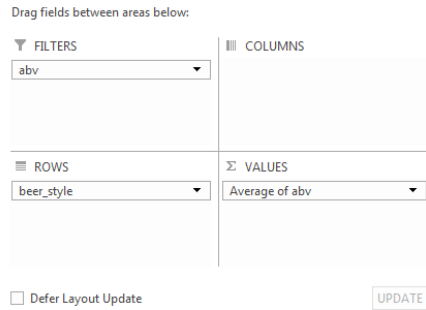
To remove zeros from the
calculations, simply deselect 0 from
the abv filter. This is shown here.
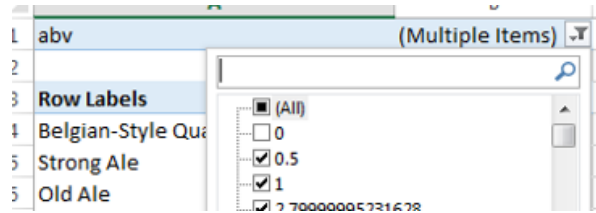
The updated PivotTable.

	A	B
1	abv	(Multiple Items)
2		
3	**Row Labels**	**Average of abv**
4	Belgian-Style Quadrupel	11.44000006
5	Strong Ale	11.25
6	Old Ale	10.7763829
7	American-Style Barley Wine Ale	10.41684211
8	American-Style Imperial Stout	10.31315791
9	Belgian-Style Dark Strong Ale	9.892307612
10	Imperial or Double Red Ale	9.199999809
11	Imperial or Double India Pale Ale	9.129787232
12	Belgian-Style Tripel	9.062439046
13	Specialty Beer	8.75
14	American-Style India Black Ale	8.699999809