

## Assignment 2: Excel Functions

Date Due: February 6, 2017

Instructor: Trani

Show all your work including VBA code and results of your computation in the spreadsheet as screen captures.

### Problem 1

This problem deals with a beam supported at one end and with a single load  $W$ . More information about the equations of the beam can be found at: [http://www.engineersedge.com/beam\\_bending/beam\\_bending10.htm](http://www.engineersedge.com/beam_bending/beam_bending10.htm).

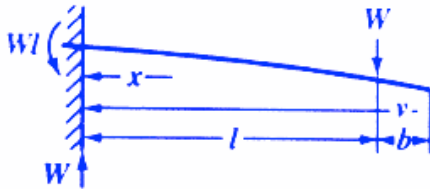


Figure 1. A simple beam supported at both ends. Source: [http://www.engineersedge.com/beam\\_bending/beam\\_bending10.htm](http://www.engineersedge.com/beam_bending/beam_bending10.htm).

Nomenclature for beam deflection and stress calculation equations.

$W$  = load (lb)

$E$  = Modulus of elasticity (lb/sq-in)

$I$  = Moment of inertia (in-in-in-in)

$x$  = distance from datum point (wall) to the station of the single point load ( $W$ ) (units are inches)

$l$  = beam length to point of single load (in)

$b$  = distance from single load point ( $W$ ) to the end of the beam

$v$  = distance past single point load  $W$  measured from the wall (in)

$y$  = deflection (in)

### Task 1:

Create an Excel function (no regular Excel calculations are allowed) to estimate the deflection of the beam ( $y$ ) between the support (i.e., wall) and the load  $W$ . The function should take the following inputs:  $W$ ,  $E$ ,  $I$  (inertia),  $x$ , and  $l$  (length).

$$y = \frac{Wx^2}{6EI}(3l - x)$$

### Task 2:

Create an Excel function (not just Excel calculations) to estimate the deflection of the beam ( $y$ ) beyond the load  $W$ . The function should take the following inputs:  $W$ ,  $E$ ,  $I$  (inertia),  $x$ , and  $l$  (length).

$$y = \frac{Wl^2}{6EI}(3v - l)$$

### Task 3:

Test both Excel functions using the following values for the beam model parameters. Assume a beam is 400 inches in length and the goal is to calculate the deflection of the beam at various stations (say every 10 inches).

$W = 4000$ ,  $E = 30e6$ ,  $I = 258$ , beamLength = 400 inches and  $b = 100$  inches

#### Task 4:

In the worksheet, plot the deflection of the beam against every station (x) on the beam. Label the axes accordingly.

**Note: You will get no credit if you just do regular Excel computations in a spreadsheet and do not show your VBA code.**

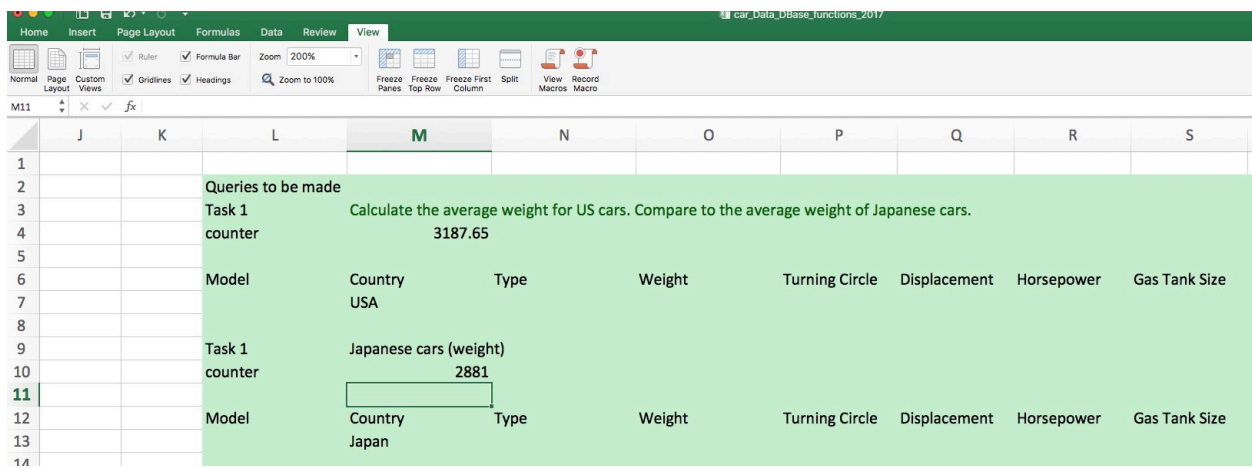
#### Problem 2

Auto data for several vehicles is contained in the file Car data.txt. The data file contains various characteristics for automobiles produced in the year 1998. Use Excel Database functions (Dfunctions) and pivot charts to do this problem. Show all your work and provide screen captures of the your work and include the actual database commands used to make each query.

#### Task 1:

Calculate the average weight for US cars. Compare to the average weight of Japanese cars.

`=DAVERAGE(A1:H117,"Weight",L6:S7)` to get average weight of cars made in the USA.



The average weight of cars made in Japan is 2,881 lb. The USA made cars are significantly heavier at 3,187 lbs.

#### Task 2:

Calculate the average weight for Medium size US cars whose tank size < 17.5 gallons

### Task 3:

Calculate the average tank size for Sporty U.S. cars with horsepower > 180 HP

The screenshot shows an Excel spreadsheet with the following data:

	K	L	M	N	O	P	Q	R	S	T	U	V	W
4		counter											
5			3187.65										
6		Model	Country	Type	Weight	Turning Circle	Displacement	Horsepower	Gas Tank Size				
7			USA										
8													
9		Task 1	Japanese cars (weight)										
10		counter											
11			2881										
12		Model	Country	Type	Weight	Turning Circle	Displacement	Horsepower	Gas Tank Size				
13			Japan										
14													
15													
16		Task 3	Calculate the average tank size for Sporty U.S. cars with horsepower > 180 HP										
17		counter											
18			19.167										
19		Model	Country	Type	Weight	Turning Circle	Displacement	Horsepower	Gas Tank Size	Model	Country	Type	Weight
20			USA					>180			USA		

The screenshot shows a pivot table in Excel with the following data:

	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																
16																
17																
18																
19	Model	Country	Type	Weight	Turning Circle	Displacement	Horsepower	Gas Tank Size	Model	Country	Type	Weight	Turning Circle	Displacement	Horsepower	Gas Tank Size
20		USA									Sporty					

**The average tank size is 19.17 gallons.**

### Task 4:

Calculate the average horsepower for Japanese cars whose weight < 2600 lbs

### Task 5:

Calculate the average turning circle for US cars whose weight < 3000 lbs and a tank size >= 15 gallons

### Task 6:

Use a pivot chart to plot the average weight of cars of distinct countries of origin. Use a bar chart with the x-axis as the country of origin and the y-axis the average weight of the car.

### Problem 3

Use the construction company assets file provided in class and use your knowledge of **Excel Pivot tables** when appropriate to answer the following questions. Show your Pivot table.

- a) Find the average dollar value for all three types of vehicles as a function of construction site. Make a summary table using a pivot table.

Average of Value (\$) Column Labels				
Row Labels	Cat 160H	Cat 725	Cat 775F	Grand Total
Greensboro	151,617	142,389	135,575	141,952
Raleigh	157,876	154,144	163,687	158,703
Richmond	129,650	145,093	153,687	144,901
<b>Grand Total</b>	<b>144,836</b>	<b>147,150</b>	<b>152,929</b>	<b>148,743</b>

- b) Find the average number of miles for Caterpillar Cat 775F vehicles at the Raleigh office.  
 c) Find the total number of miles traveled by all Caterpillar Cat 775F owned by the company at each of the three sites.  
 d) Make a summary table showing the average miles traveled for each vehicle type for all sites.

Average of Miles Column Labels				
Row Labels	Cat 160H	Cat 725	Cat 775F	Grand Total
Greensboro	127,705	117,181	111,699	117,518
Raleigh	131,967	128,909	133,973	131,604
Richmond	107,279	120,367	127,901	120,295
<b>Grand Total</b>	<b>120,831</b>	<b>122,160</b>	<b>126,256</b>	<b>123,360</b>

- e) Make a Pivot Chart to show graphically the results of items (a) and (d). Use your judgement to make the best presentation of the data.

### Problem 4

Use the population file (see sample) provided to answer the following.

TOTAL POPULATION (IN THOUSANDS)							
NAME	1970	1975	1980	1985	1990	1995	1996
AUTAUGA, AL	24.659	29.619	32.216	32.248	34.353	39.112	40.207
BALDWIN, AL	59.526	67.812	78.949	89.402	98.955	120.896	125.412
BARBOUR, AL	22.642	24.864	24.739	25.001	25.505	27.854	28.298
BIBB, AL	13.823	14.751	15.745	16.157	16.697	18.507	18.885
BLOUNT, AL	27.04	32.138	36.536	37.416	39.473	44.06	45.344
BULLOCK, AL	11.734	11.112	10.599	10.778	11.032	11.431	11.574
BUTLER, AL	21.964	21.195	21.772	22.425	21.886	21.824	21.863
CALHOUN, AL	103.185	108.245	120.025	118.648	116.118	116.79	116.684
CHAMBERS, AL	36.333	37.506	39.228	38.613	36.884	37.179	36.907
CHEROKEE, AL	15.781	18.11	18.888	18.891	19.643	21.871	22.387
CHILTON, AL	25.256	28.521	30.648	31.56	32.55	35.537	36.467
CHOCTAW, AL	16.557	17.217	16.801	16.708	15.994	16.195	16.232
CLARKE, AL	26.545	27.405	27.773	27.421	27.289	27.455	27.503
CLAY, AL	12.682	13.154	13.737	13.701	13.284	13.59	13.734

#### Task 1:

Create a new column (or columns as needed) to extract the two letter code of the state associated with each country. Use the functions in Excel to recognize text within text and also to extract text. Note that the state two letter code follows the comma in the first column.

V	W	X	Y
Find Position of comma			
	8	Get County AUTAUGA	Get State AL
	8	BALDWIN	AL
	8	BARBOUR	AL

V	W	X	Y
Find Position of comma			
	8	Get County AUTAUGA	Get State AL
	8	BALDWIN	AL
	8	BARBOUR	AL

V	W	X	Y
Find Position of comma			
	8	Get County AUTAUGA	Get State AL
	8	BALDWIN	AL
	8	BARBOUR	AL

**Task 2:**

Create a pivot table that summarizes and counts the number of counties by state in the year 2015. Find the state that has the largest number of counties.

**Task 3:**

Create a function in VBA to estimate the growth rate of population given two years of data and the time span between the two data points. Test the function with the data file provided and estimate the growth rate of the US population (for each county) between the years 1970 and 2015. Find the top 10 counties with the fastest growth.

**Problem 5**

Mexico City is building a new airport to replace the 60-year old facility. The Mexican Government obtains financing for 5.2 billion dollars needed for phase 1 of the airport from several large banks. The loan has an interest rate of 5.3% per year.

- a) Estimate the monthly payments to pay the loan over 30 years. Show all your Excel formulas and work.

A	B	C	D	E	F
<b>Problem</b>					
<b>Airport Loan</b>					
<b>Tasks</b>					
Estimate the monthly payments to pay the loan over 30 years. Show all your Excel formulas and work.					
Loan of 5.2 billion	5,200,000,000	Dollar amount of loan			
No. of Periods	360	periods in loan			
Interest	5%	percent per year			
Monthly Payment	(\$28,748,867.76)	PMT(interest/month,periods,loan present value,future value,payment schedule)			
Yearly Payment	(\$344,986,413.10)				
Total Payments	(\$10,349,592,393.15)				

The Government will have to pay 10.3 billion over the life of the loan.