CEE 3804: Computer Applications

Excel Database Functions and Pivot Tables

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1. Topics to be Covered

- Database functions
- Pivot tables:
  - Basics
  - Pivot table reports

Database Functions

a. Overview

- Functions that provide pivot table functionality
- Dfunction(*database,field,criteria*):
  - database:
    - range of cells that make up the data
  - field:
    - name of field to perform operation
  - criteria:
    - range of cells that hold the criteria you want to hold with

Database Functions

b. List of Functions

- The list functions include the following:
  - DAVERAGE(), DCOUNT(), DCOUNTA(), DGET(), DMAX(), DMIN(), DPRODUCT(), DSTDDEV(), DSTDDEVP(), DSUM(), DVAR(), and DVARP().
  - Where:
    - DCOUNTA(): Returns the count of nonblank records
    - DGET(): Returns the value of a specified field for a single matching record
- Example:
  - Use the Cardata file on the course notes

Database Example (Cardata.xls)

The syllabus has a file with car data. Name the file Cardata.xls

	B	C	D	E	F	G	H
1	**Country**	**Type**	**Weight**	**Turning Circle**	**Displacement**	**Horsepower**	**Gas Tank Size**
2	Japan	Small	2700	37	112	130	13.2
3	Japan	Medium	3265	42	163	160	18
4	Other	Medium	2935	39	141	130	21.1
5	Other	Compact	2670	35	121	108	15.9
6	Other	Compact	2790	35	141	130	15.9
7	Other	Compact	2895	35	152	168	16.4
8	Other	Medium	3640	39	209	208	21.1
9	USA	Medium	2880	41	151	110	15.7
10	USA	Large	3350	43	231	165	18
11	USA	Large	3325	42	231	165	18
12	USA	Medium	3465	41	231	165	18.8
13	USA	Compact	2640	39	151	110	13.6
14	USA	Large	4285	44	307	140	25
15	USA	Large	3545	43	273	180	18
16	USA	Medium	3480	42	273	180	18.8
17	USA	Large	4025	42	262	150	27
18	USA	Compact	2655	38	133	95	15.6

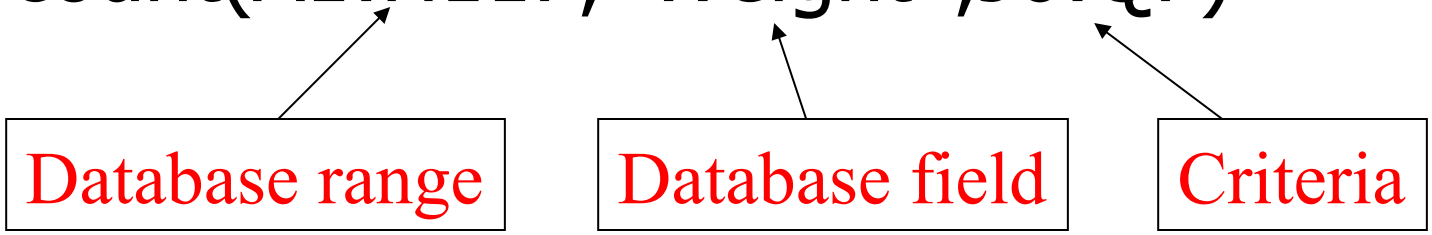
Database Example (Cardata.xls)

- Create a separate section in the worksheet where the query will be done
- Copy the sequence of titles to help you guide the query (see below)

J	K	L	M	N	O	P	Q
Task 1	**Count the number of cars**		**whose weight > 3000 lbs**				
Count	50						
Model	**Country**	**Type**	**Weight**	**Turning Circl**	**Displacemen**	**Horsepower**	**Gas Tank Size**
			>3000				

Database Example (Cardata.xls)

- Suppose we want to count the number of cars whose weight > 3000 lbs
- Dcount(A1:H117,”Weight”,J6:Q7)



Task 1	Count the number of cars whose weight > 3000 lbs						
Count	=DCOUNT(A1:H117,"Weight",J6:Q7)						
Model	Country	Type	Weight	Turning Circl	Displacemen	Horsepower	Gas Tank Size
			>3000				

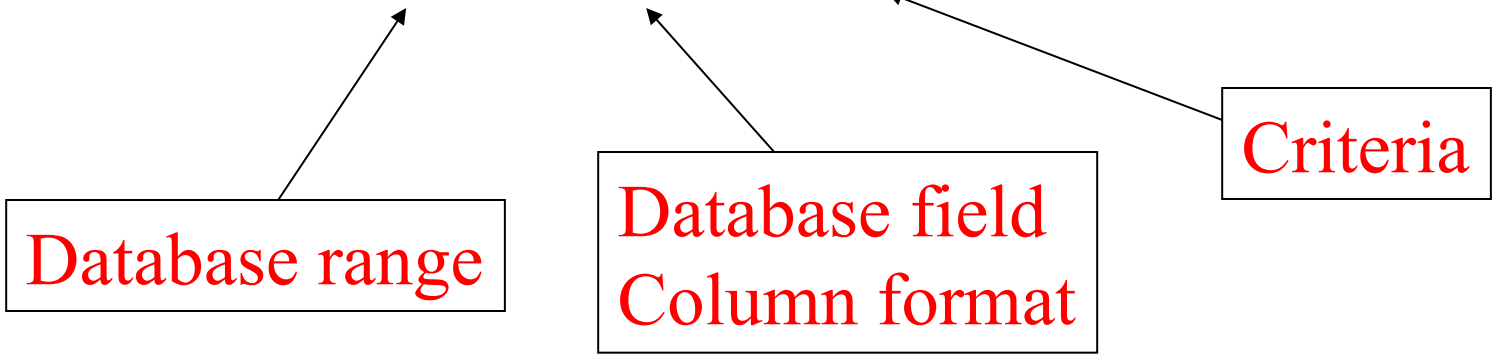
Database Example (Cardata.xls)

- Read the solution from the cell containing the database query
- Note that 50 cars weigh more than 3,000 lbs

J	K	L	M	N	O	P	Q
Task 1	**Count the number of cars**		**whose weight > 3000 lbs**				
Count	50						
Model	**Country**	**Type**	**Weight**	**Turning Circl**	**Displacemen**	**Horsepower**	**Gas Tank Size**
			>3000				

Database Example (Cardata.xls)

- A variation to specify the database field
- Dcount(A1:H117,4,J6:Q7)



J	K	L	M	N	O	P	Q
Task 1	Count the number of cars		whose weight > 3000 lbs				
Count	50						
Model	Country	Type	Weight	Turning Circl	Displacemen	Horsepower	Gas Tank Size
			>3000				

Database Example (Cardata.xls)

- A variation to specify the database range
- Dcount(Cars,4,J6:Q7)

Database range
Variable format

Database field
Column format

Criteria

J	K	L	M	N	O	P	Q
Task 1	Count the number of cars		whose weight > 3000 lbs				
Count	50						
Model	Country	Type	Weight	Turning Circl	Displacemen	Horsepower	Gas Tank Size
			>3000				

Database Example (Cardata.xls)

- Count the number of cars made in Japan whose weight > 2,700 lbs
- Verify using the regular filters in Excel or a "Countif" statement

- Give it a try

Database Example (Cardata.xls)

- Count the number of Sporty cars whose horsepower falls between 150 and 200 HP
- This requires two sets of conditions for one variable (Horsepower)

Task 1c	Count the number of Sporty Cars whose engine horsepower falls between 150 and 200 HP													
Count	4													
Model	Country	Type	Weight	Turning Circl	Displacemen	Horsepower	Gas Tank Siz	Model	Country	Type	Weight	Turning Circl	Displacemen	Horsepower	Gas Tank Size
		Sporty				>150								<200	

Pivot Tables

a. Overview

- A Pivot Table is a powerful data-analysis tool that Excel offers flexibility to summarize results quickly
- Pivot Tables summarize data in several fields:
  - data field
  - row field
  - column field

Pivot Tables

b. Demonstration Example

Region	Quarter	Sales Rep	Sales
East	1st	A	192,345
West	1st	B	210,880
East	1st	C	185,223
South	1st	D	165,778
Midwest	1st	E	155,557
South	1st	F	180,567
West	1st	G	200,767
Midwest	1st	H	165,663
East	2nd	A	173,493
West	2nd	B	200,203
East	2nd	C	170,213
South	2nd	D	155,339
Midwest	2nd	E	148,990
South	2nd	F	175,660
West	2nd	G	190,290
South	2nd	H	170,000
East	3rd	A	145,800
West	3rd	B	211,123
East	3rd	C	175,000
South	3rd	D	150,000
Midwest	3rd	E	147,900
South	3rd	F	171,200
West	3rd	G	188,900
South	3rd	H	178,900
East	4th	A	134,980
West	4th	B	203,000
East	4th	C	168,975
South	4th	D	139,000
Midwest	4th	E	150,000
South	4th	F	200,000
West	4th	G	167,980
South	4th	H	189,000

Regular table

Sales Rep	(All)

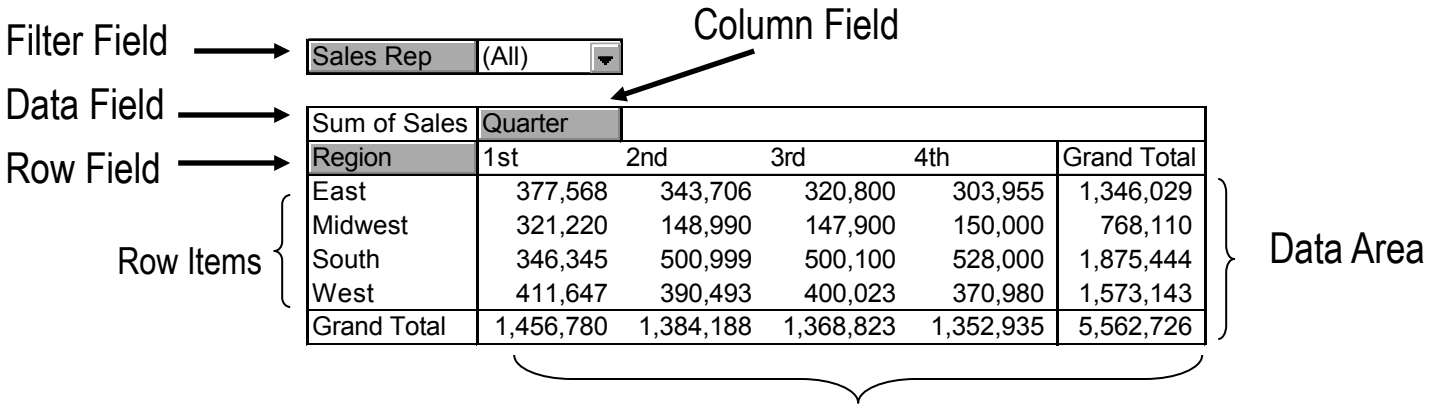
Sum of Sales	Quarter				
Region	1st	2nd	3rd	4th	Grand Total
East	377,568	343,706	320,800	303,955	1,346,029
Midwest	321,220	148,990	147,900	150,000	768,110
South	346,345	500,999	500,100	528,000	1,875,444
West	411,647	390,493	400,023	370,980	1,573,143
Grand Total	1,456,780	1,384,188	1,368,823	1,352,935	5,562,726

Pivot table

Pivot Tables

c. Creating Pivot Tables

- There are four steps to creating a pivot table:
  - Specify the type of source list to use for the pivot table
  - Identify the location of the data
  - Define row, column, values, and filters fields for the table
  - Select a location, name, and other options of the table



Sales Rep	(All)				
Sum of Sales	Quarter				
Region	1st	2nd	3rd	4th	Grand Total
East	377,568	343,706	320,800	303,955	1,346,029
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South	346,345	500,999	500,100	528,000	1,875,444
West	411,647	390,493	400,023	370,980	1,573,143
Grand Total	1,456,780	1,384,188	1,368,823	1,352,935	5,562,726

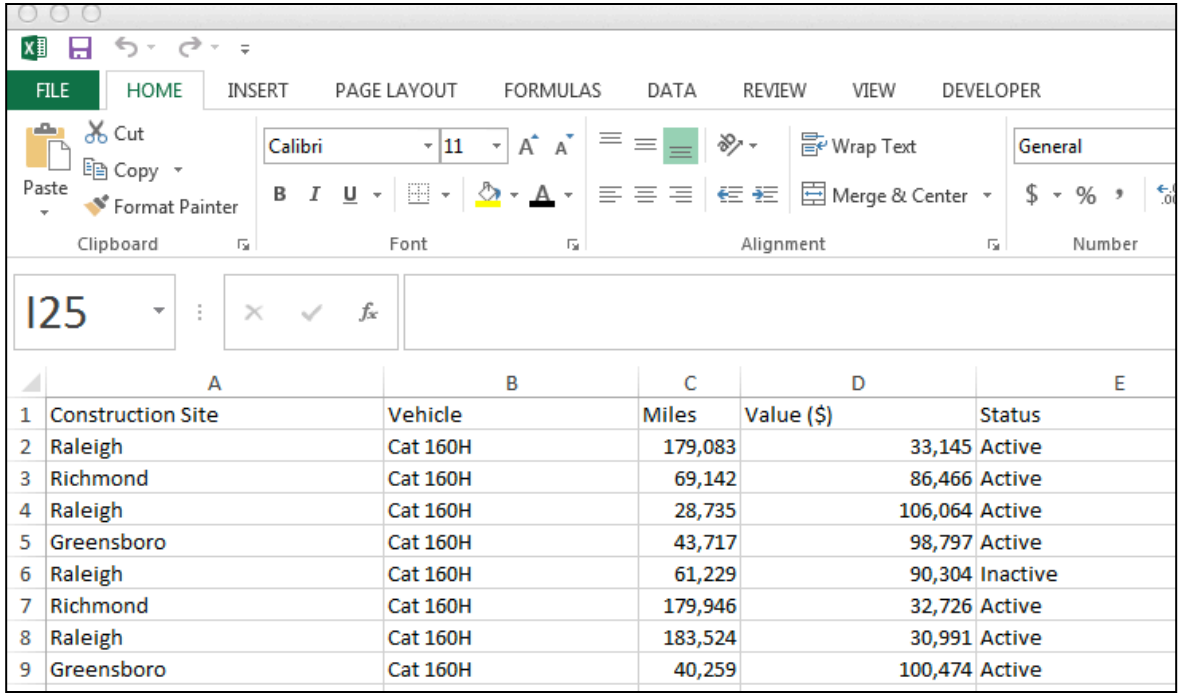
Pivot Tables

d. Data List or Table

- Data list/table can be:
  - Excel list or table on a worksheet
  - A separate database file in Access, FoxPro, etc.
  - A collection of lists with row and column labels in one or more worksheets
  - Another pivot table
- An Excel data table must have **labeled** columns

Practice File for Pivot Tables

- Retrieve the file called Construction_assets_cat.xls from the web site

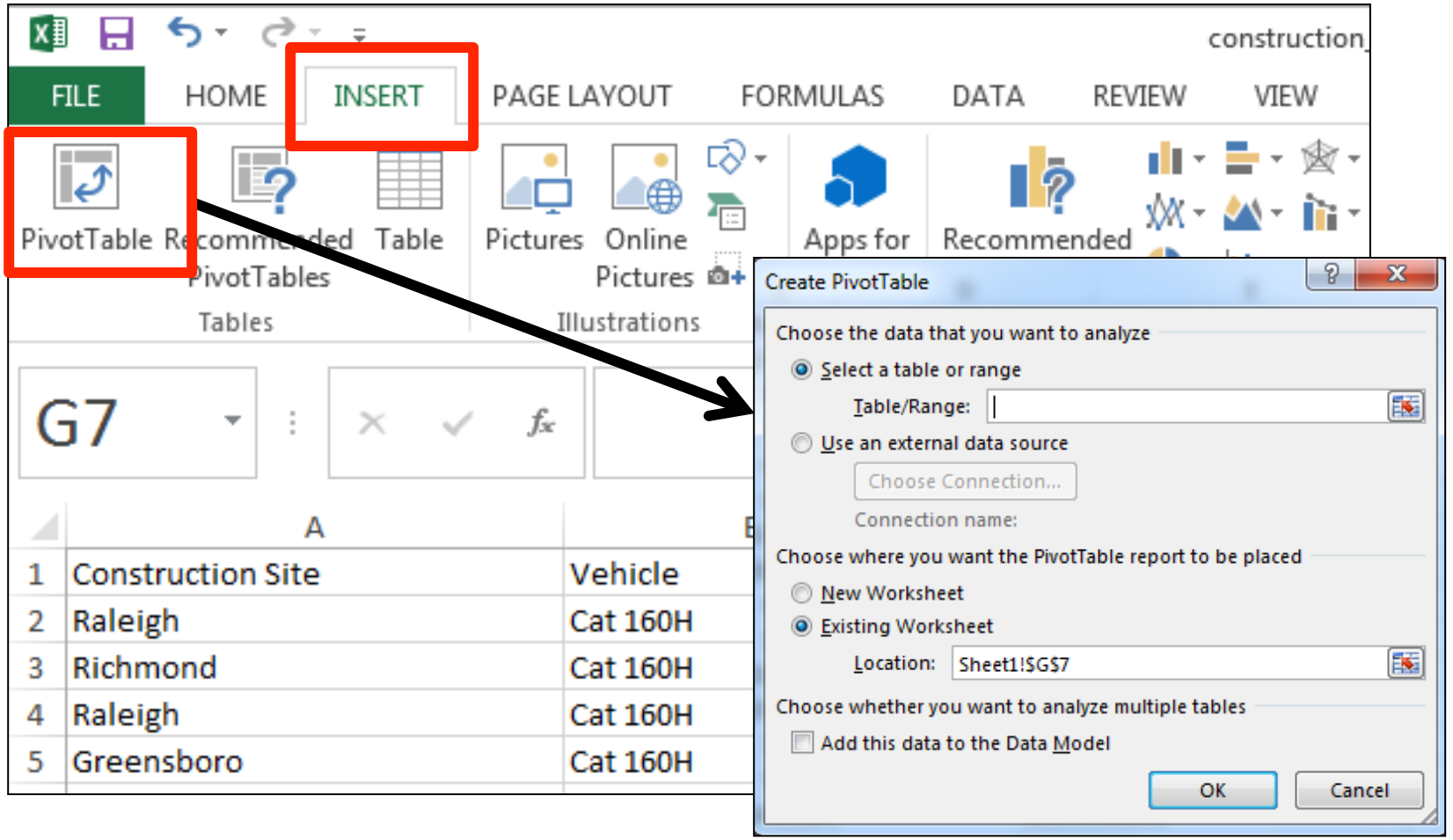


	A	B	C	D	E
1	Construction Site	Vehicle	Miles	Value ($)	Status
2	Raleigh	Cat 160H	179,083	33,145	Active
3	Richmond	Cat 160H	69,142	86,466	Active
4	Raleigh	Cat 160H	28,735	106,064	Active
5	Greensboro	Cat 160H	43,717	98,797	Active
6	Raleigh	Cat 160H	61,229	90,304	Inactive
7	Richmond	Cat 160H	179,946	32,726	Active
8	Raleigh	Cat 160H	183,524	30,991	Active
9	Greensboro	Cat 160H	40,259	100,474	Active

Excel Pivot Table Example

- File contains the Caterpillar vehicles owned by a construction company
- Three construction sites
- Three types of vehicles (CAT 160H, CAT 725 and CAT 775F)
- Mileage, value and status (active or not) are attributes contained in the data set

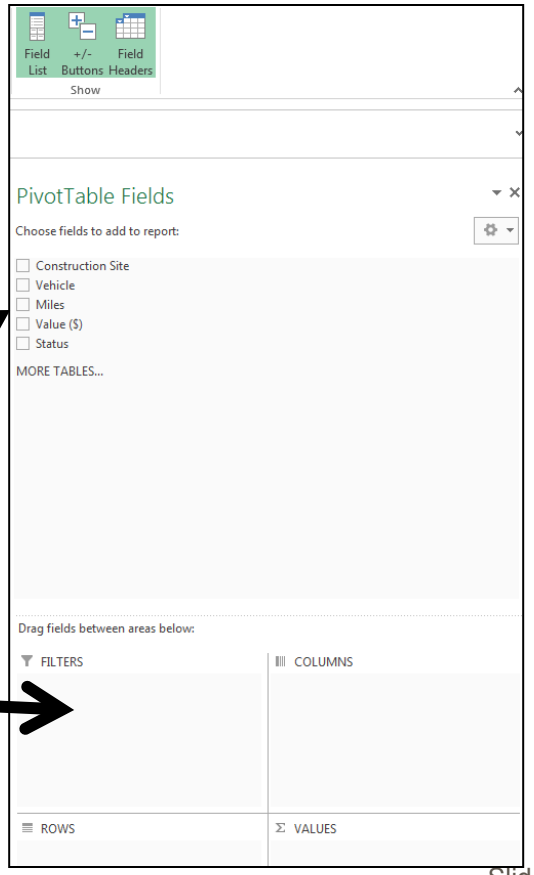
Pivot Table in Excel Ribbon (2013)



Customizing Pivot Tables

a. Specifying the Layout of a Pivot Table

- The PivotTable toolbar simplifies the customizing of the pivot table:
  - enable/disable element selection
  - change row/column/page/data

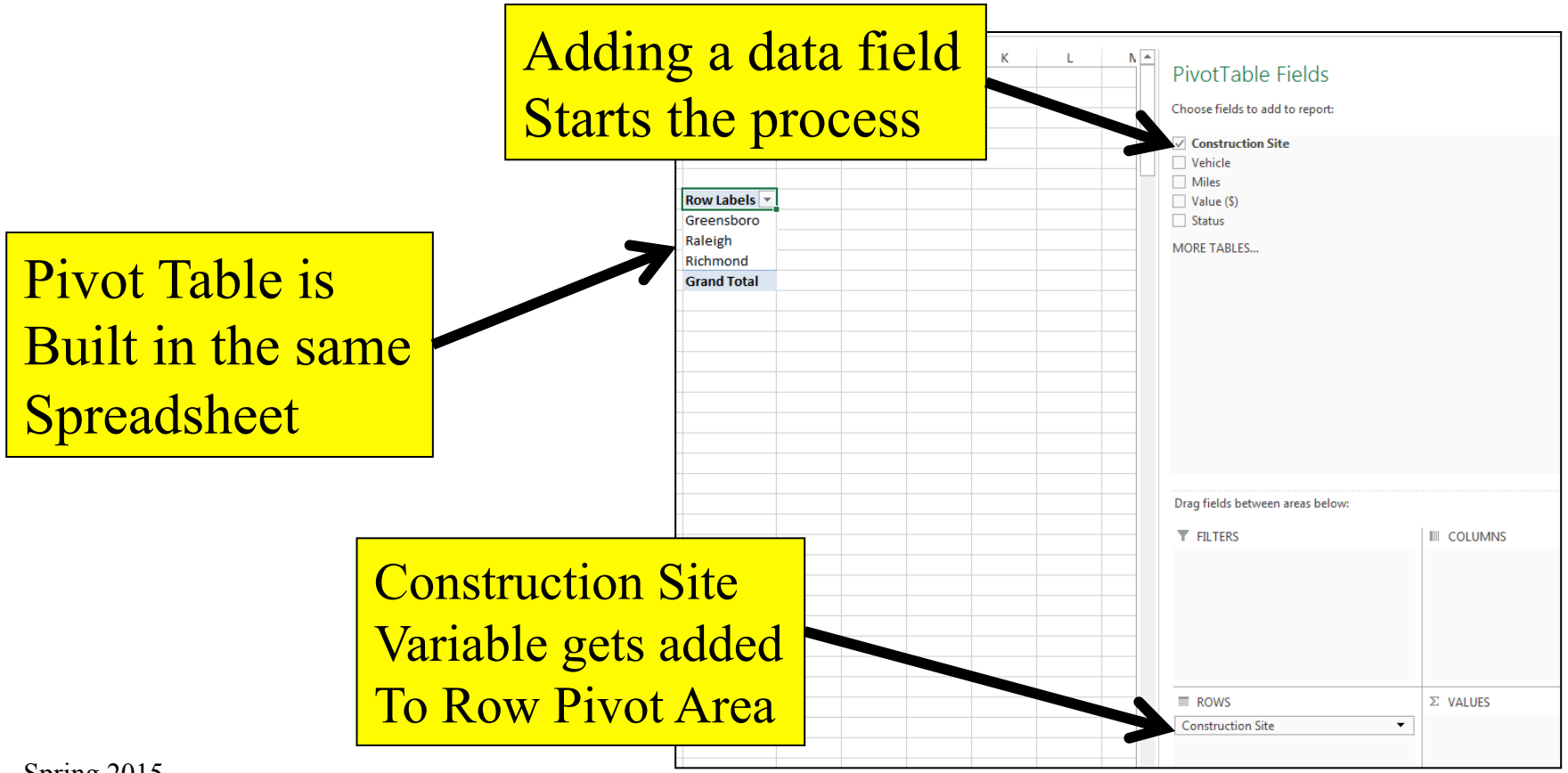


Pivot Table Fields

Areas to Build Pivot Table

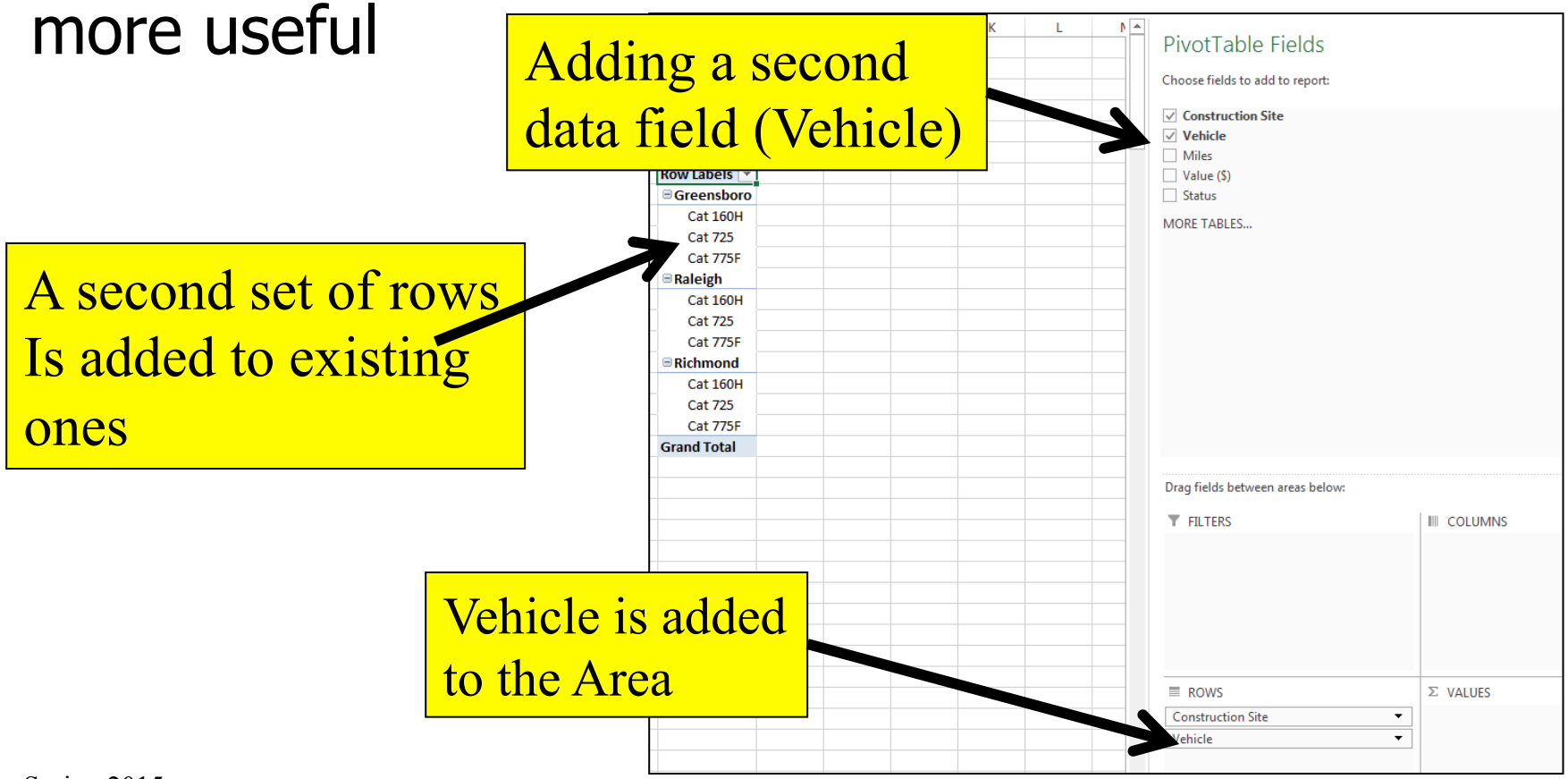
Building the Pivot Table (Excel 2013)

- Start by selecting from the Pivot Table fields



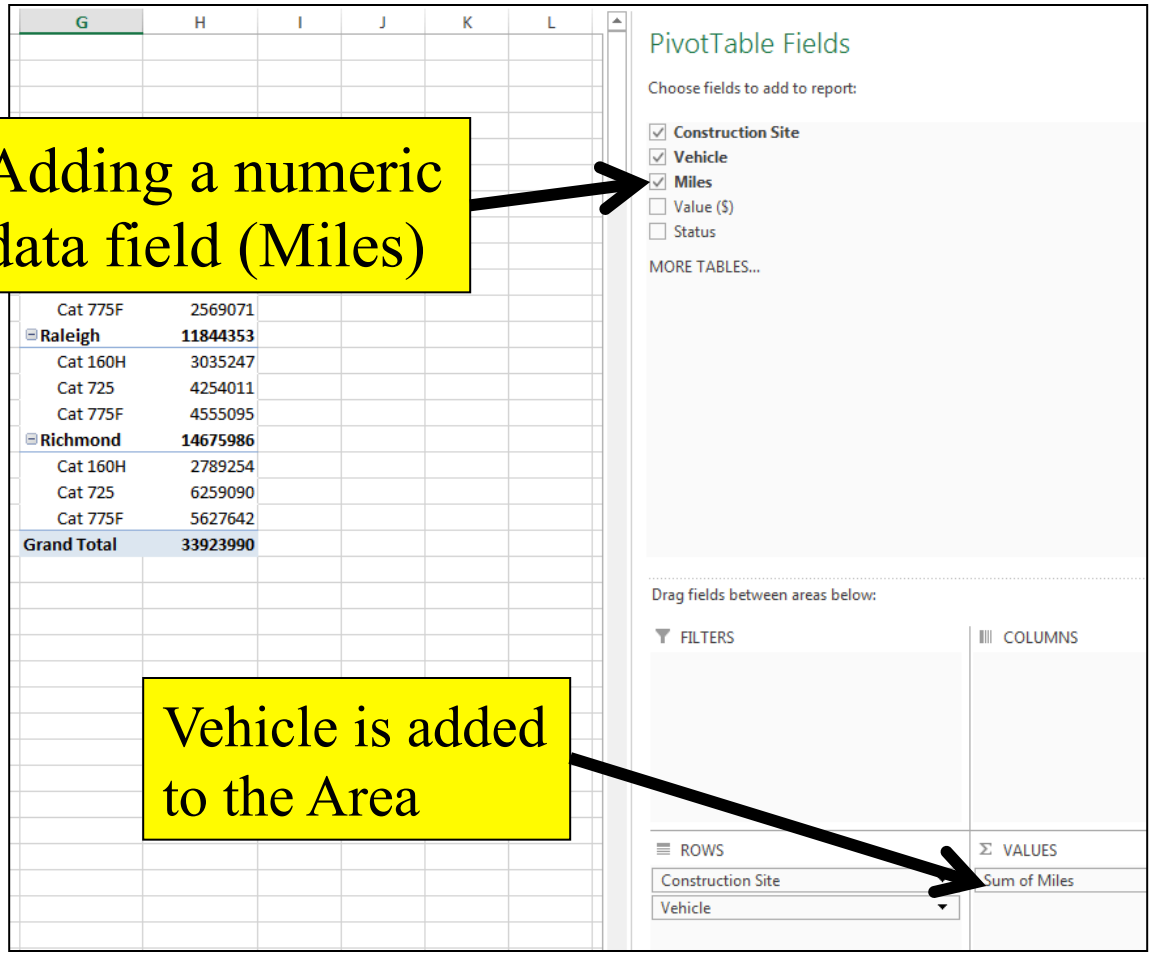
Building the Pivot Table (Excel 2013)

- Adding more variables starts making the Pivot Table more useful



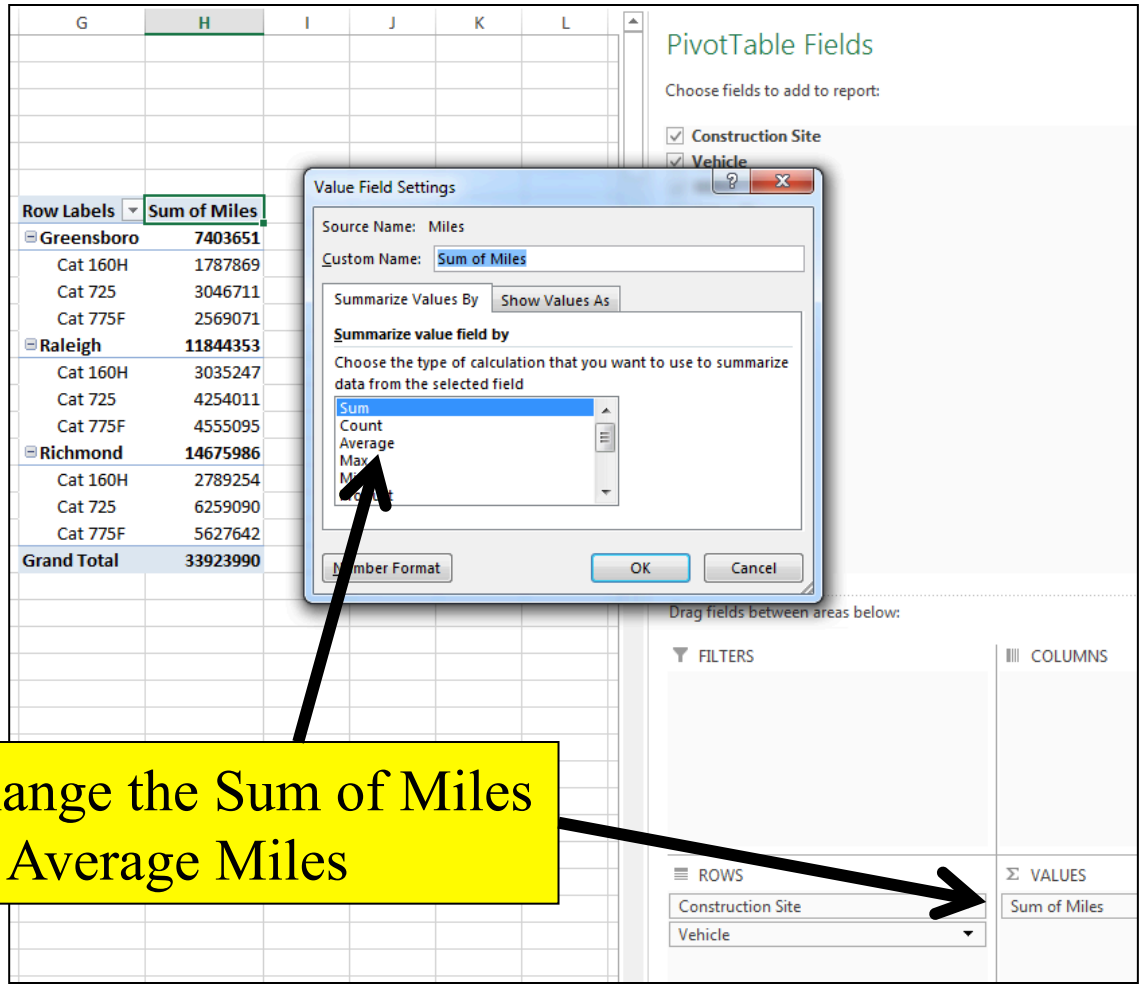
Building the Pivot Table (Excel 2013)

- Adding a numeric variable summarizes the data based on the **Values** field



Building the Pivot Table (Excel 2013)

- You can change the summary in the Value area



Customizing Pivot Tables

d. Changing Excel's Value/Data Field Summary

- Eleven summary functions:
  - Sum: totals the values
  - Count: Counts the values
  - Average: Computes the average
  - Max: Computes the largest value
  - Min: Returns the smallest value
  - Product: Computes the product of the values
  - Count Nums: Counts the number of numeric data
  - StdDev: Computes the standard deviation of the data
  - StdDevp: Computes the standard deviation for a population
  - Var and Varp: Computes the variance

Customizing Pivot Tables

b. Changing Fields (Use your Imagination)

Option 1:

Sales Rep	(All)

Sum of Sales	Quarter				
Region	1st	2nd	3rd	4th	Grand Total
East	377,568	343,706	320,800	303,955	1,346,029
Midwest	321,220	148,990	147,900	150,000	768,110
South	346,345	500,999	500,100	528,000	1,875,444
West	411,647	390,493	400,023	370,980	1,573,143
Grand Total	1,456,780	1,384,188	1,368,823	1,352,935	5,562,726

Option 2:

Sum of Sales		Quarter				
Region	Sales Rep	1st	2nd	3rd	4th	Grand Total
East	A	192,345	173,493	145,800	134,980	646,618
	C	185,223	170,213	175,000	168,975	699,411
East Total		377,568	343,706	320,800	303,955	1,346,029
Midwest	E	155,557	148,990	147,900	150,000	602,447
	H	165,663				165,663
Midwest Total		321,220	148,990	147,900	150,000	768,110
South	D	165,778	155,339	150,000	139,000	610,117
	F	180,567	175,660	171,200	200,000	727,427
	H		170,000	178,900	189,000	537,900
South Total		346,345	500,999	500,100	528,000	1,875,444
West	B	210,880	200,203	211,123	203,000	825,206
	G	200,767	190,290	188,900	167,980	747,937
West Total		411,647	390,493	400,023	370,980	1,573,143
Grand Total		1,456,780	1,384,188	1,368,823	1,352,935	5,562,726

Customizing Pivot Tables

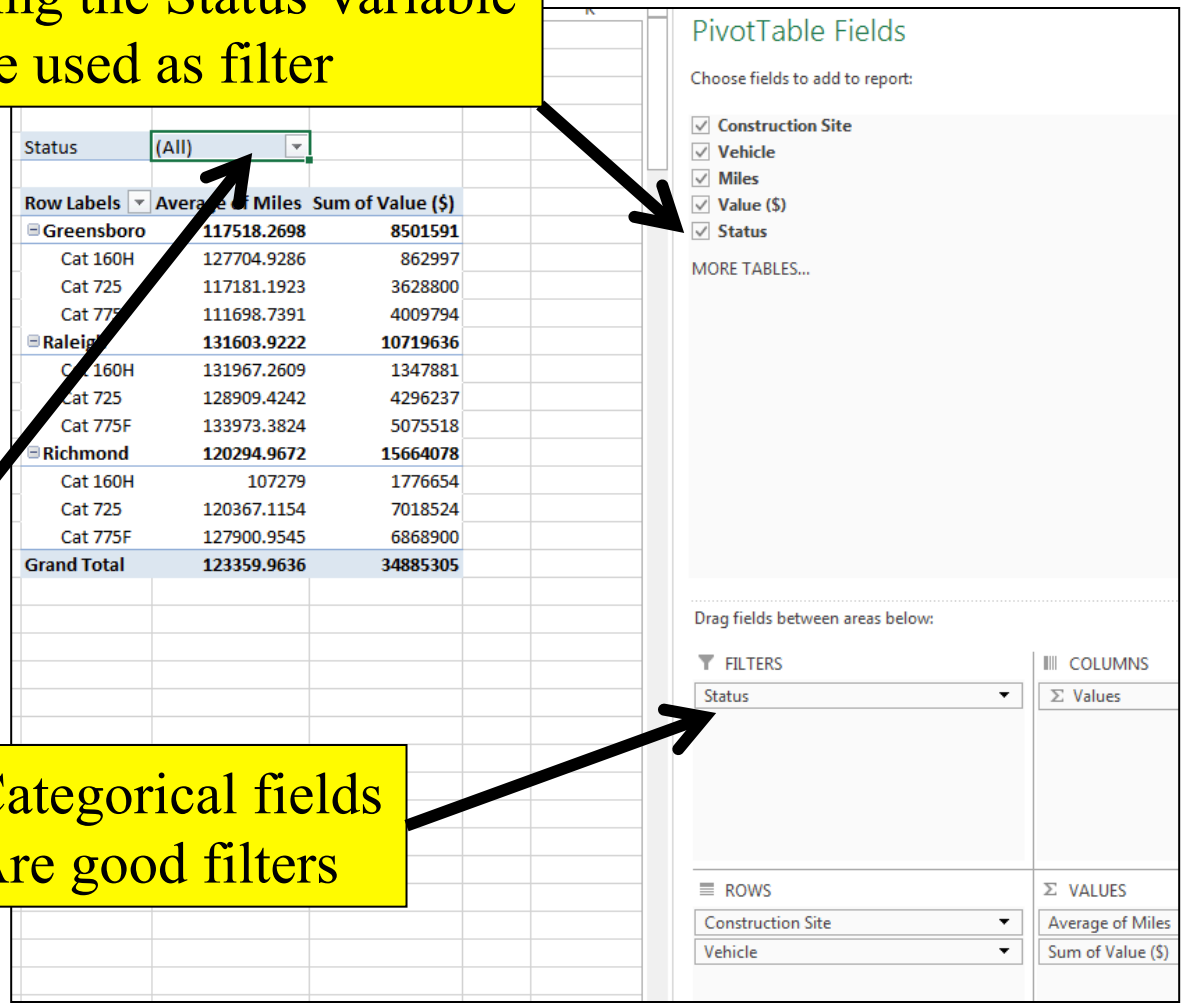
c. Adding Filters

- Adding categorical fields (non-numeric) to the Filter area allows you to execute quick filters

Adding the Status Variable To be used as filter

Apply the filter using this pull down menu

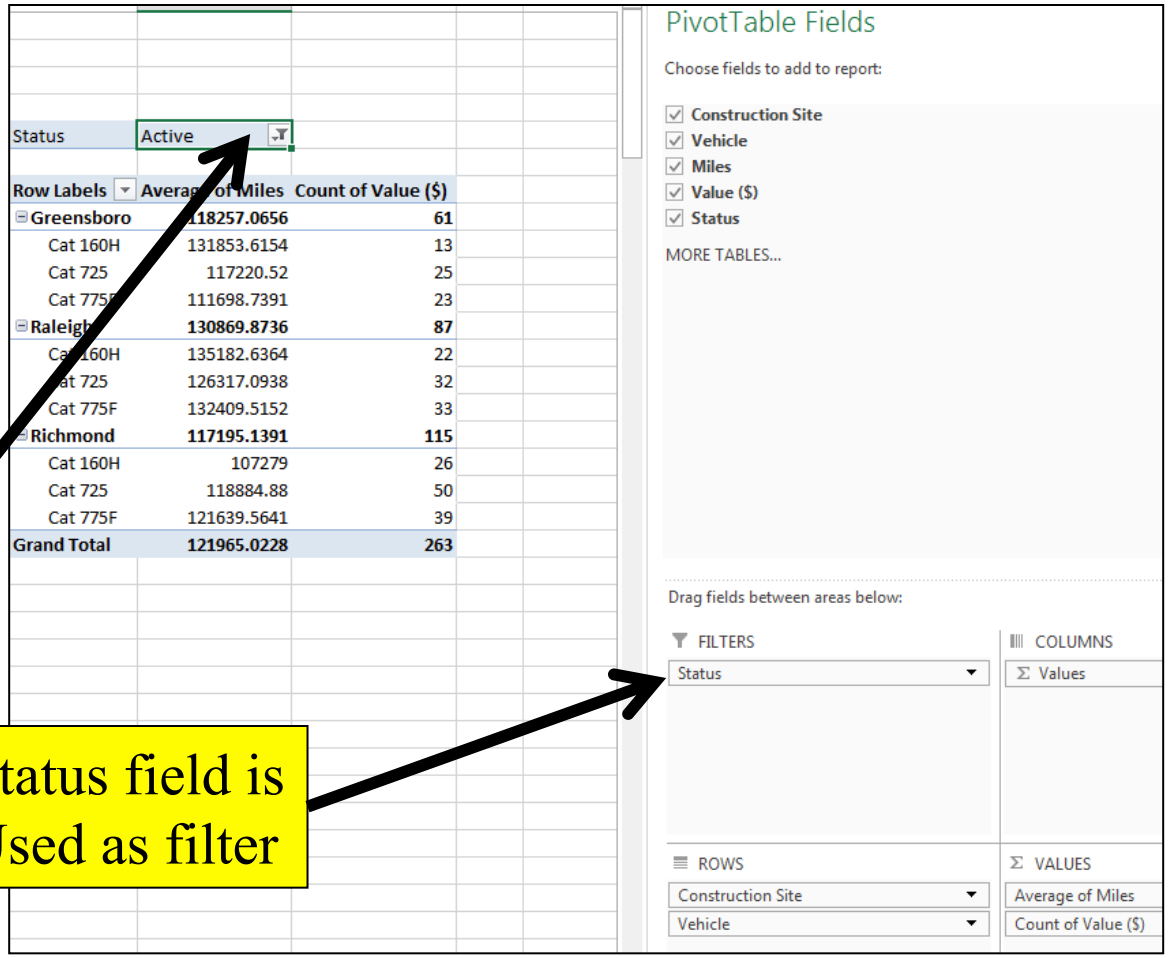
Categorical fields Are good filters



Customizing Pivot Tables

c. Adding Filters

- Adding categorical fields (non-numeric) to the Filter area allows you to execute quick filters



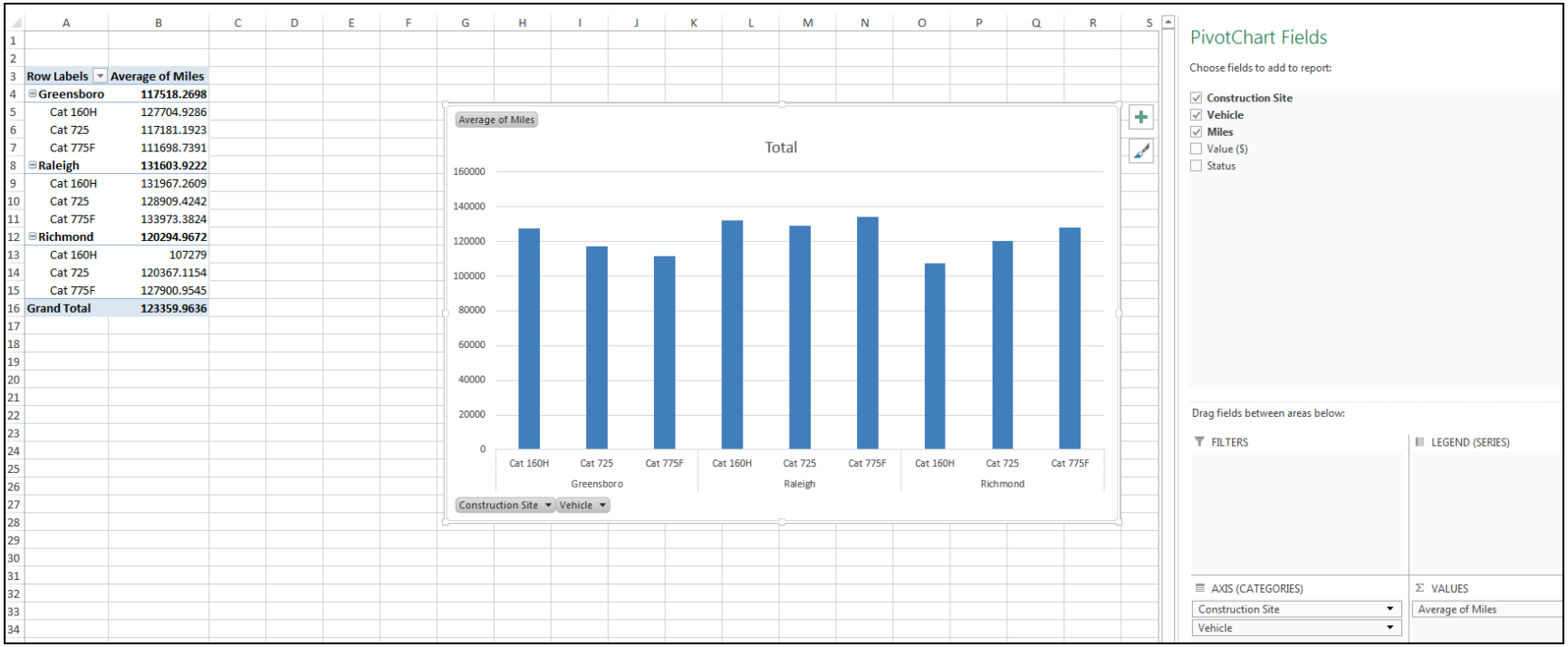
Selected "Active" Vehicles

Status field is Used as filter

Customizing Pivot Tables

c. Adding Pivot Charts

- You can also build Pivot Tables and Pivot Charts at the same time (Windows version of Excel)

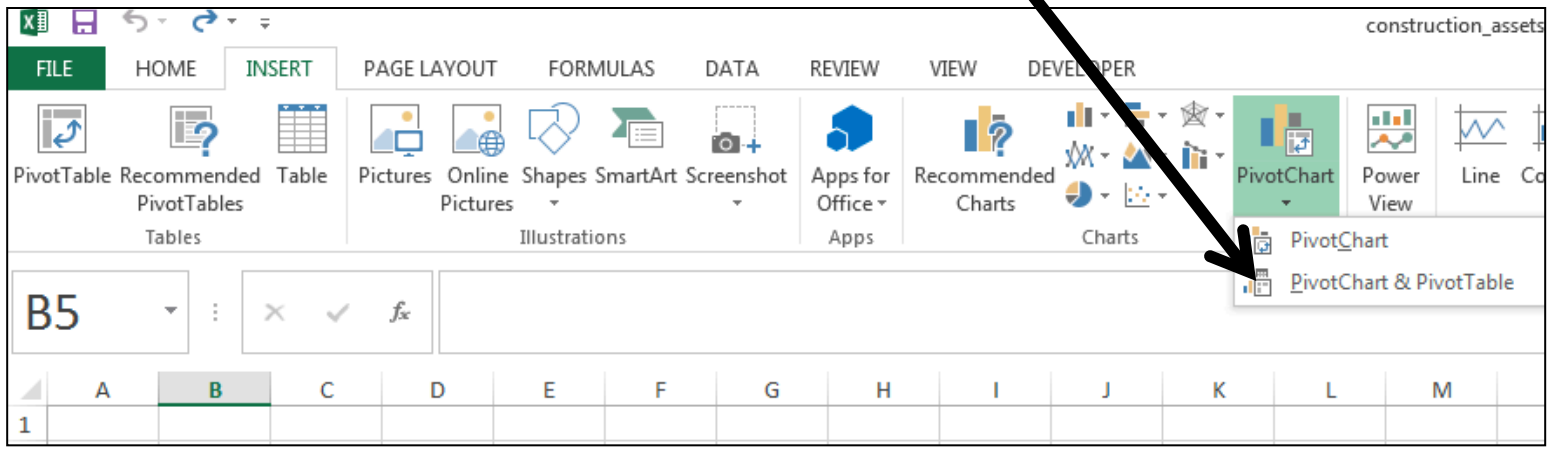


Row Labels	Average of Miles
Greensboro	117518.2698
Cat 160H	127704.9286
Cat 725	117181.1923
Cat 775F	111698.7391
Raleigh	131603.9222
Cat 160H	131967.2609
Cat 725	128909.4242
Cat 775F	133973.3824
Richmond	120294.9672
Cat 160H	107279
Cat 725	120367.1154
Cat 775F	127900.9545
Grand Total	123359.9636

Customizing Pivot Tables

c. Adding Pivot Charts

- Building Pivot Tables and Pivot Charts in one step
- Select the icon in the Insert Tab

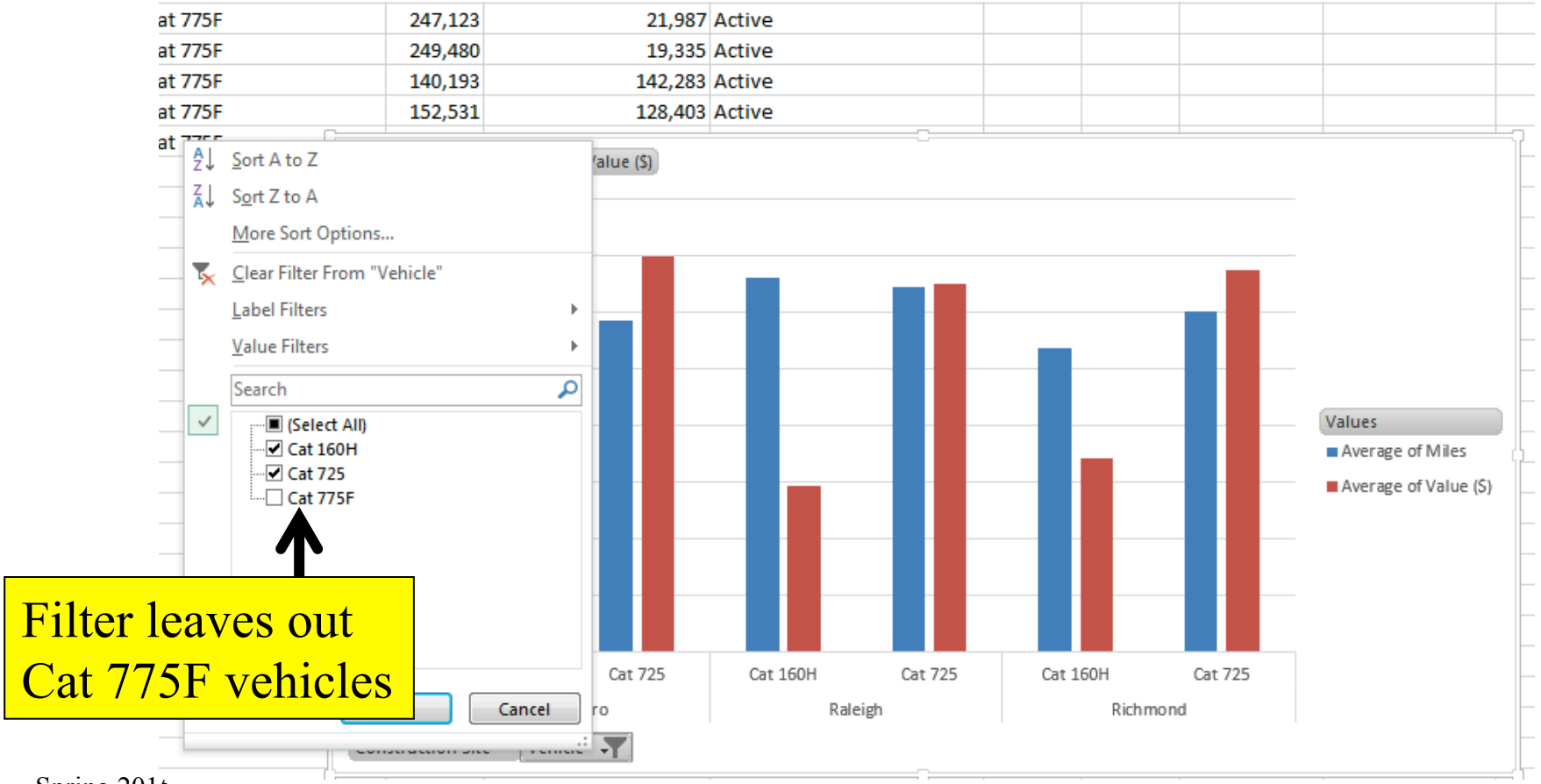


- The following steps are the same as those used to create a Pivot Table

Customizing Pivot Tables

c. Filtering on the Fly in Pivot Charts

- You can apply filters to Pivot Charts



Customizing Pivot Tables

e. Calculation Types

- Excel can perform a number of calculations:
  - Difference from, % Of, % Difference From, Running Total in, % of row, % of column, % of total, Index

Percent Difference from East Region

Sales Rep	(All)

Sum of Sales	Quarter				
Region	1st	2nd	3rd	4th	Grand Total
East					
Midwest	-14.92%	-56.65%	-53.90%	-50.65%	-42.94%
South	-8.27%	45.76%	55.89%	73.71%	39.33%
West	9.03%	13.61%	24.70%	22.05%	16.87%
Grand Total					

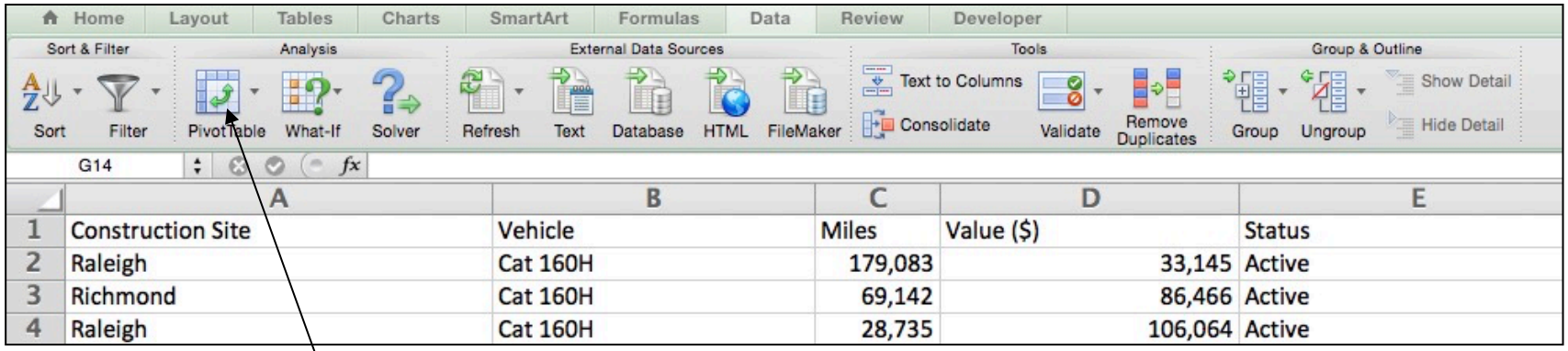
Percent of Row

Sales Rep	(All)

Sum of Sales	Quarter				
Region	1st	2nd	3rd	4th	Grand Total
East	28.05%	25.53%	23.83%	22.58%	100.00%
Midwest	41.82%	19.40%	19.26%	19.53%	100.00%
South	18.47%	26.71%	26.67%	28.15%	100.00%
West	26.17%	24.82%	25.43%	23.58%	100.00%
Grand Total	26.19%	24.88%	24.61%	24.32%	100.00%

Pivot Tables in Excel 2011 for Mac

- Look under Insert pull-down menu

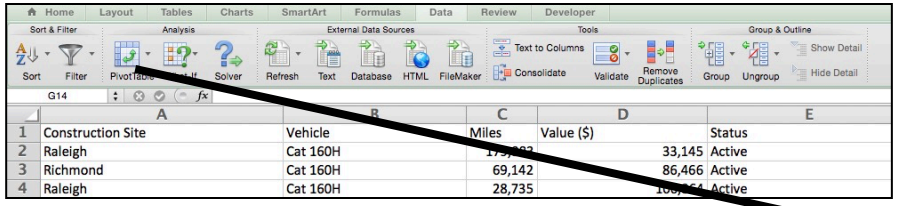


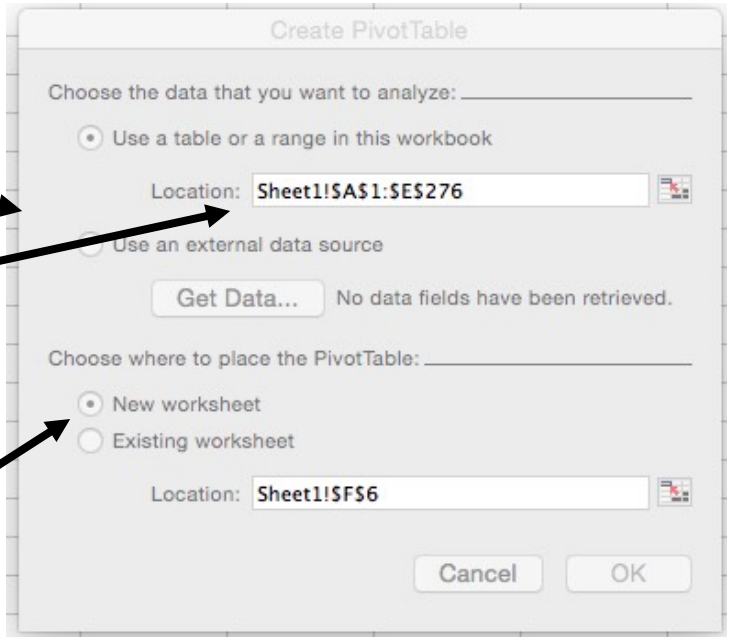
	A	B	C	D	E
1	Construction Site	Vehicle	Miles	Value ($)	Status
2	Raleigh	Cat 160H	179,083	33,145	Active
3	Richmond	Cat 160H	69,142	86,466	Active
4	Raleigh	Cat 160H	28,735	106,064	Active

Pivot Table information

Pivot Tables in Excel 2011 for Mac (2)

- Create a pivot table manually



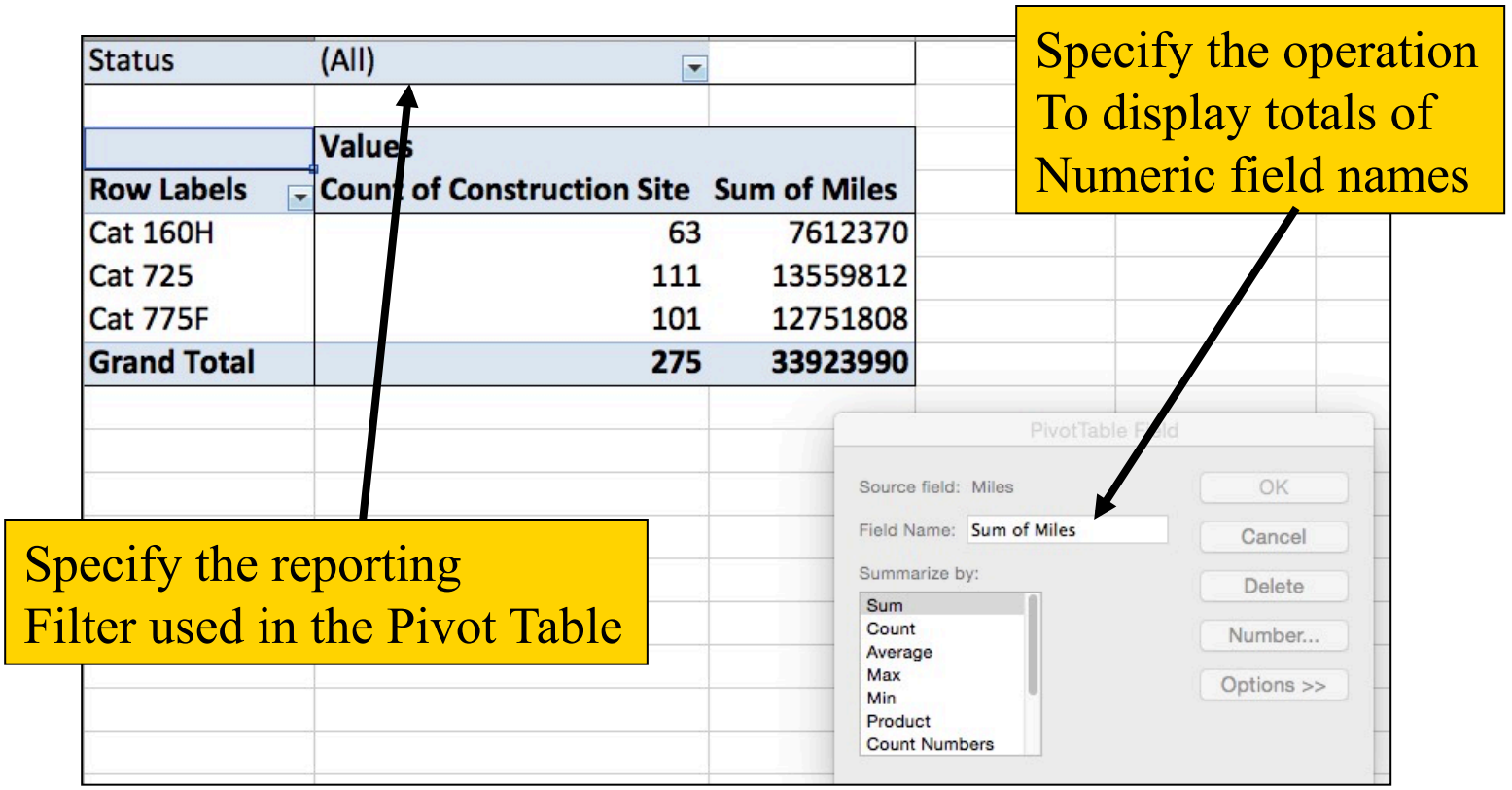


Specify the data range For Pivot Table

Specify the location of The new Pivot Table (new worksheet shown)

Pivot Tables in Excel 2011 for Mac (3)

- Complete the Pivot Table



Pivot Tables in Excel 2011 for Mac (4)

- Try other variations of the Pivot Table

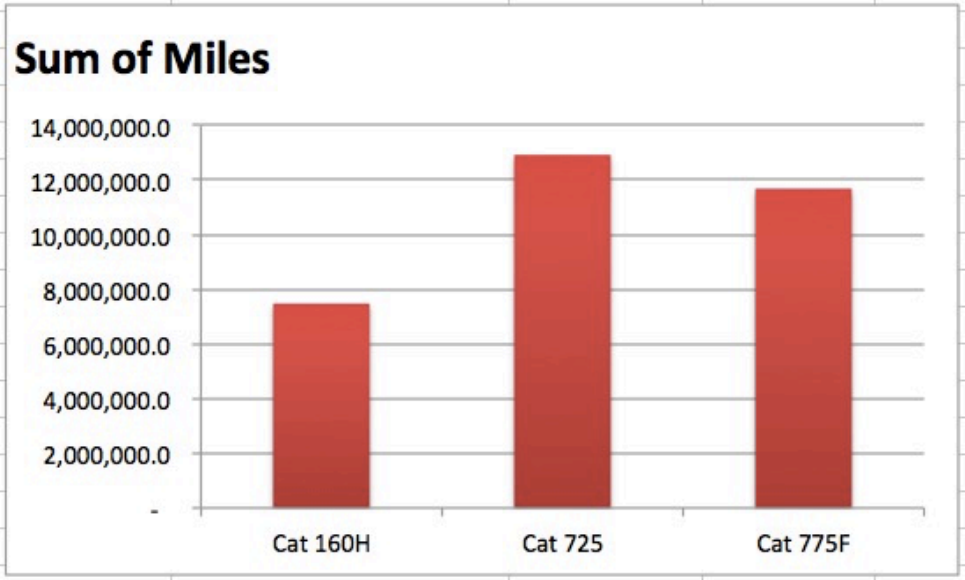
Construction Site	(All)	
	Values	
Row Labels	Sum of Miles	Sum of Value ($)
▼ Cat 160H	7477369	3813007
Active	7477369	3813007
▼ Cat 725	12916904	14555674
Active	12916904	14555674
▼ Cat 775F	11682528	15357153
Active	11682528	15357153
Grand Total	32076801	33725834

The vehicle and status Variables are rows in this Pivot Table

Pivot Tables in Excel 2011 for Mac (4)

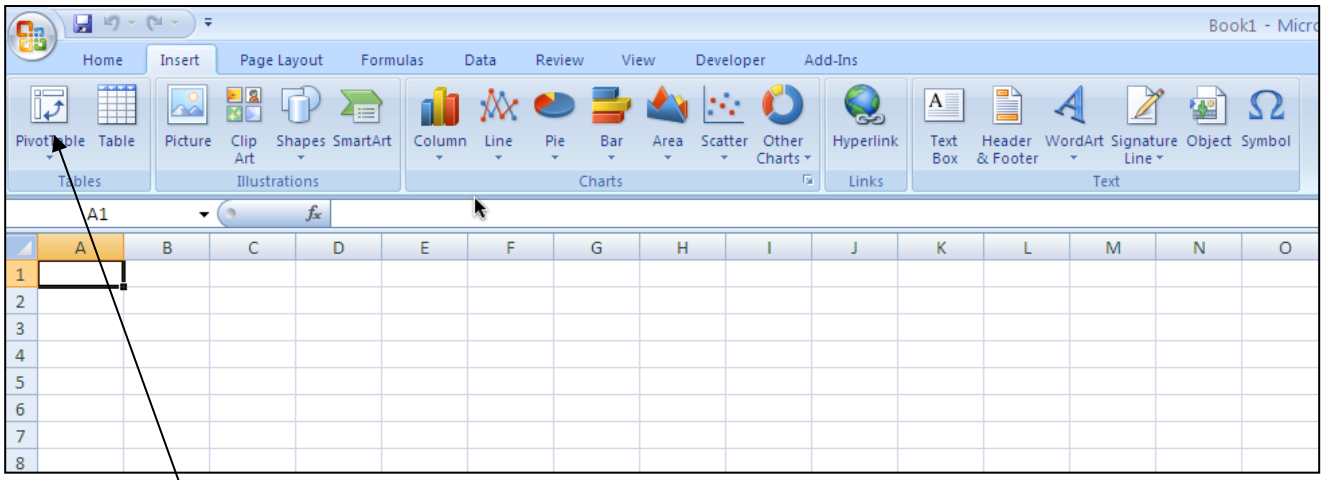
- Add a graphical depiction to the Pivot Table
- Plot is done manually on the Mac

Status	Active	
	Values	
Row Labels	Count of Construction Site	Sum of Miles
Cat 160H	61	7,477,369.0
Cat 725	107	12,916,904.0
Cat 775F	95	11,682,528.0
Grand Total	**263**	**32,076,801.0**



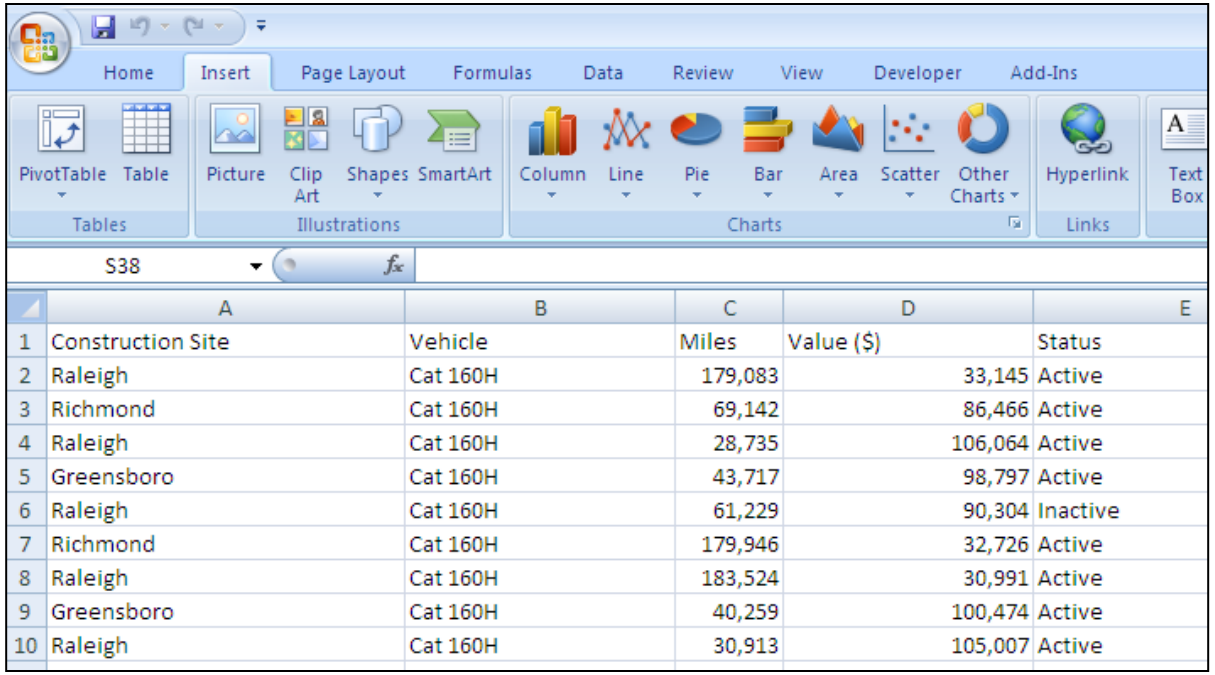
Pivot Tables in Excel 2010

- Look under Insert pull-down menu



Example in Excel 2010

- Retrieve the file called Construction_assets_cat.xls from the web site



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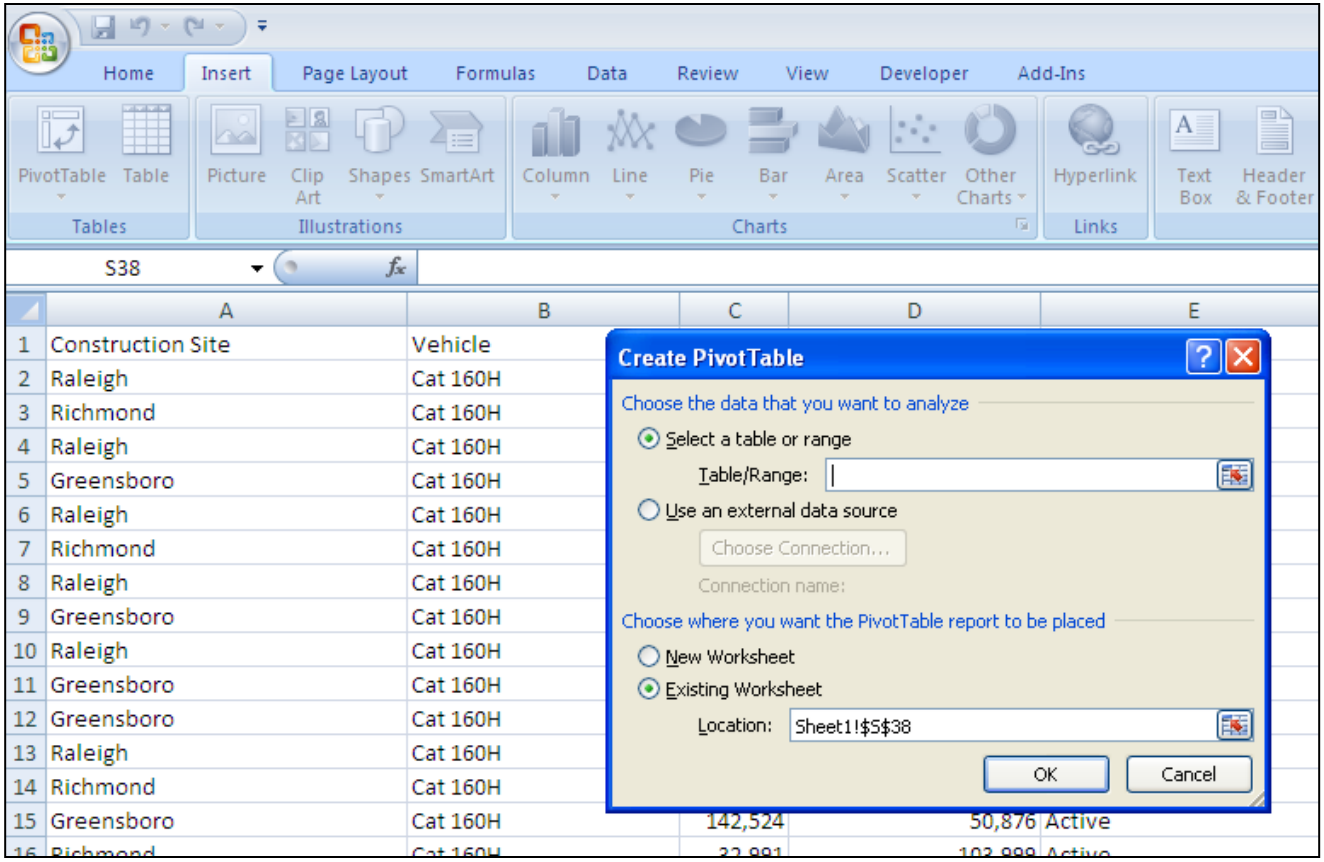
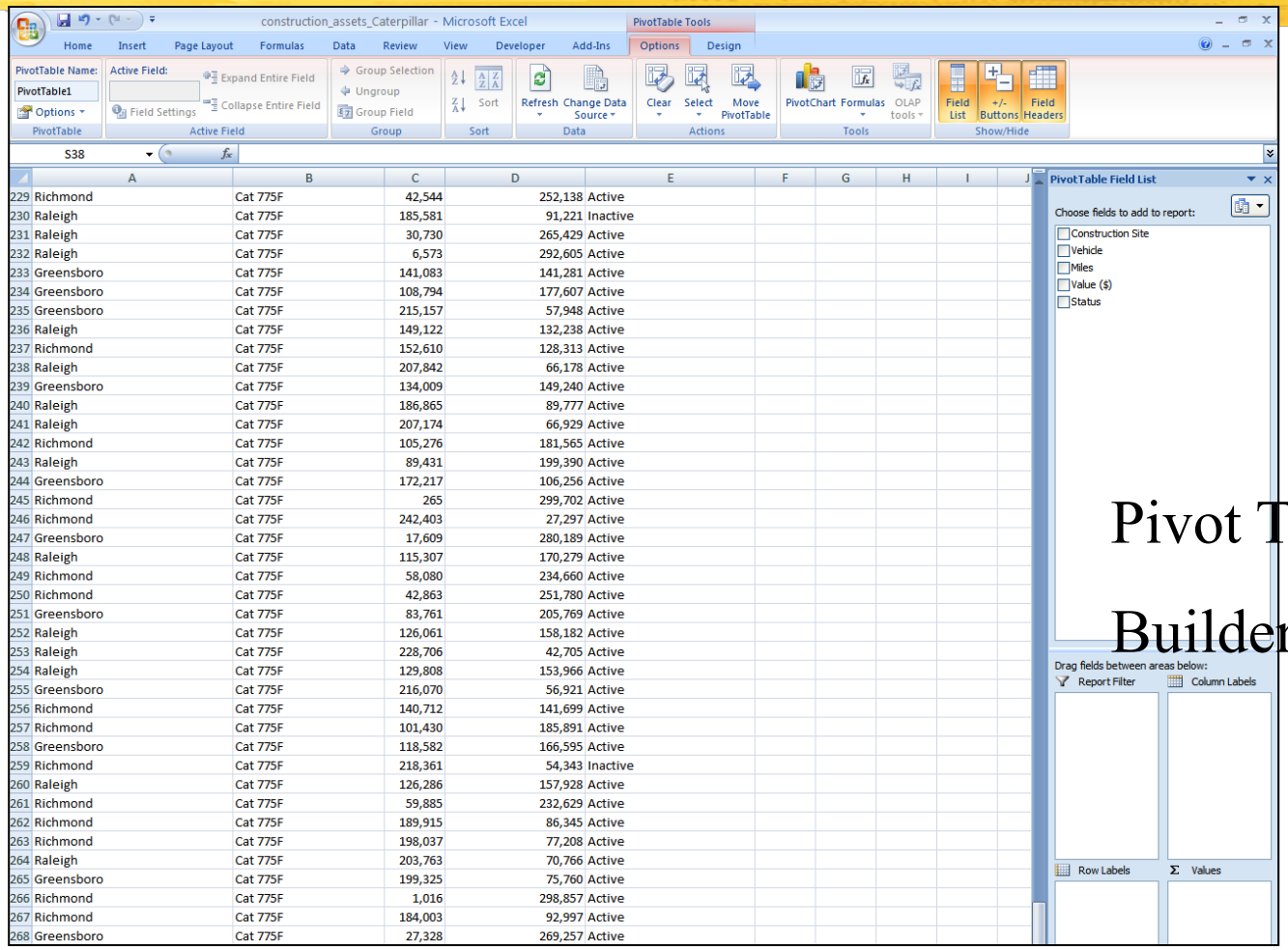
3	Richmond	Cat 160H	69,142	86,466	Active
4	Raleigh	Cat 160H	28,735	106,064	Active
5	Greensboro	Cat 160H	43,717	98,797	Active
6	Raleigh	Cat 160H	61,229	90,304	Inactive
7	Richmond	Cat 160H	179,946	32,726	Active
8	Raleigh	Cat 160H	183,524	30,991	Active
9	Greensboro	Cat 160H	40,259	100,474	Active
10	Raleigh	Cat 160H	30,913	105,007	Active

Creating Pivot Table (Excel 2007/2010)



	A	B	C	D	E
1	Construction Site	Vehicle			
2	Raleigh	Cat 160H			
3	Richmond	Cat 160H			
4	Raleigh	Cat 160H			
5	Greensboro	Cat 160H			
6	Raleigh	Cat 160H			
7	Richmond	Cat 160H			
8	Raleigh	Cat 160H			
9	Greensboro	Cat 160H			
10	Raleigh	Cat 160H			
11	Greensboro	Cat 160H			
12	Greensboro	Cat 160H			
13	Raleigh	Cat 160H			
14	Richmond	Cat 160H			
15	Greensboro	Cat 160H	142,524	50,876	Active

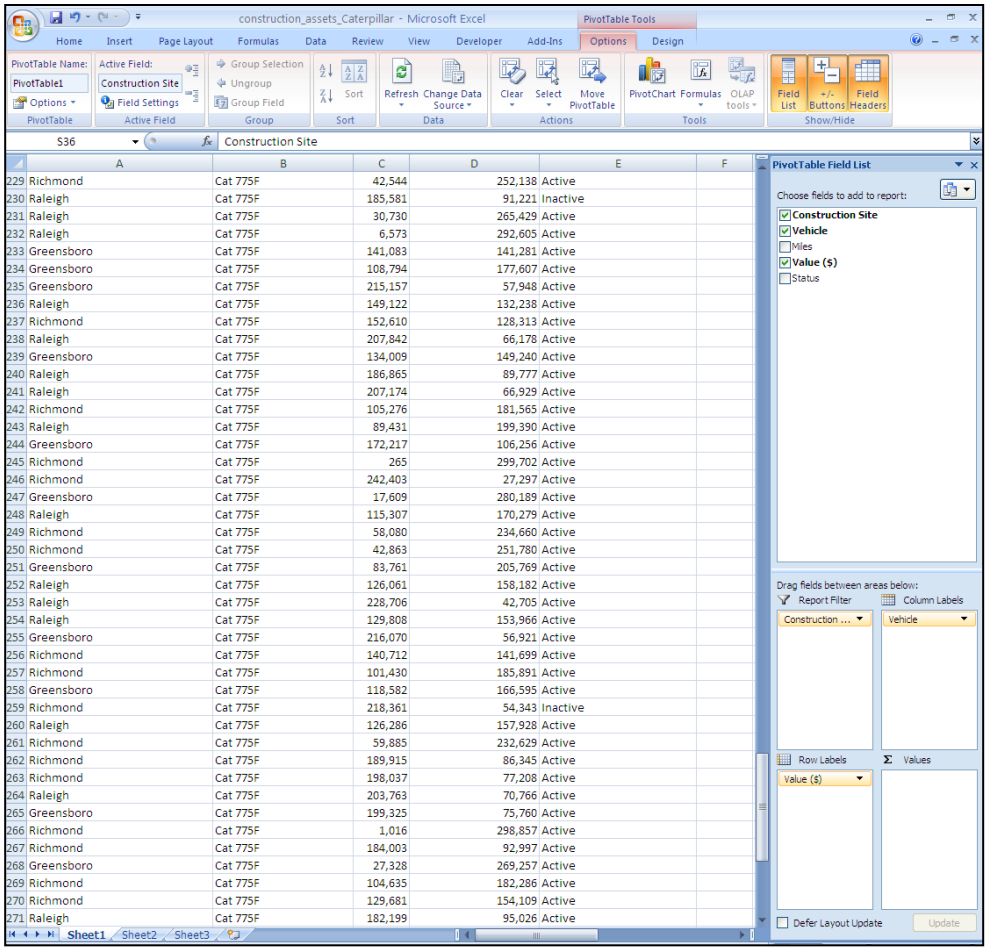
Creating Pivot Table (Excel 2007/2010)



	A	B	C	D	E
229	Richmond	Cat 775F	42,544	252,138	Active
230	Raleigh	Cat 775F	185,581	91,221	Inactive
231	Raleigh	Cat 775F	30,730	265,429	Active
232	Raleigh	Cat 775F	6,573	292,605	Active
233	Greensboro	Cat 775F	141,083	141,281	Active
234	Greensboro	Cat 775F	108,794	177,607	Active
235	Greensboro	Cat 775F	215,157	57,948	Active
236	Raleigh	Cat 775F	149,122	132,238	Active
237	Richmond	Cat 775F	152,610	128,313	Active
238	Raleigh	Cat 775F	207,842	66,178	Active
239	Greensboro	Cat 775F	134,009	149,240	Active
240	Raleigh	Cat 775F	186,865	89,777	Active
241	Raleigh	Cat 775F	207,174	66,929	Active
242	Richmond	Cat 775F	105,276	181,565	Active
243	Raleigh	Cat 775F	89,431	199,390	Active
244	Greensboro	Cat 775F	172,217	106,256	Active
245	Richmond	Cat 775F	265	299,702	Active
246	Richmond	Cat 775F	242,403	27,297	Active
247	Greensboro	Cat 775F	17,609	280,189	Active
248	Raleigh	Cat 775F	115,307	170,279	Active
249	Richmond	Cat 775F	58,080	234,660	Active
250	Richmond	Cat 775F	42,863	251,780	Active
251	Greensboro	Cat 775F	83,761	205,769	Active
252	Raleigh	Cat 775F	126,061	158,182	Active
253	Raleigh	Cat 775F	228,706	42,705	Active
254	Raleigh	Cat 775F	129,808	153,966	Active
255	Greensboro	Cat 775F	216,070	56,921	Active
256	Richmond	Cat 775F	140,712	141,699	Active
257	Richmond	Cat 775F	101,430	185,891	Active
258	Greensboro	Cat 775F	118,582	166,595	Active
259	Richmond	Cat 775F	218,361	54,343	Inactive
260	Raleigh	Cat 775F	126,286	157,928	Active
261	Richmond	Cat 775F	59,885	232,629	Active
262	Richmond	Cat 775F	189,915	86,345	Active
263	Richmond	Cat 775F	198,037	77,208	Active
264	Raleigh	Cat 775F	203,763	70,766	Active
265	Greensboro	Cat 775F	199,325	75,760	Active
266	Richmond	Cat 775F	1,016	298,857	Active
267	Richmond	Cat 775F	184,003	92,997	Active
268	Greensboro	Cat 775F	27,328	269,257	Active

Pivot Table Builder Panel

Adding Elements to the Pivot Table (Excel 2007)



	A	B	C	D	E
229	Richmond	Cat 775F	42,544	252,138	Active
230	Raleigh	Cat 775F	185,581	91,221	Inactive
231	Raleigh	Cat 775F	30,730	265,429	Active
232	Raleigh	Cat 775F	6,573	292,605	Active
233	Greensboro	Cat 775F	141,083	141,281	Active
234	Greensboro	Cat 775F	108,794	177,607	Active
235	Greensboro	Cat 775F	215,157	57,948	Active
236	Raleigh	Cat 775F	149,122	132,238	Active
237	Richmond	Cat 775F	152,610	128,313	Active
238	Raleigh	Cat 775F	207,842	66,178	Active
239	Greensboro	Cat 775F	134,009	149,240	Active
240	Raleigh	Cat 775F	186,865	89,777	Active
241	Raleigh	Cat 775F	207,174	66,929	Active
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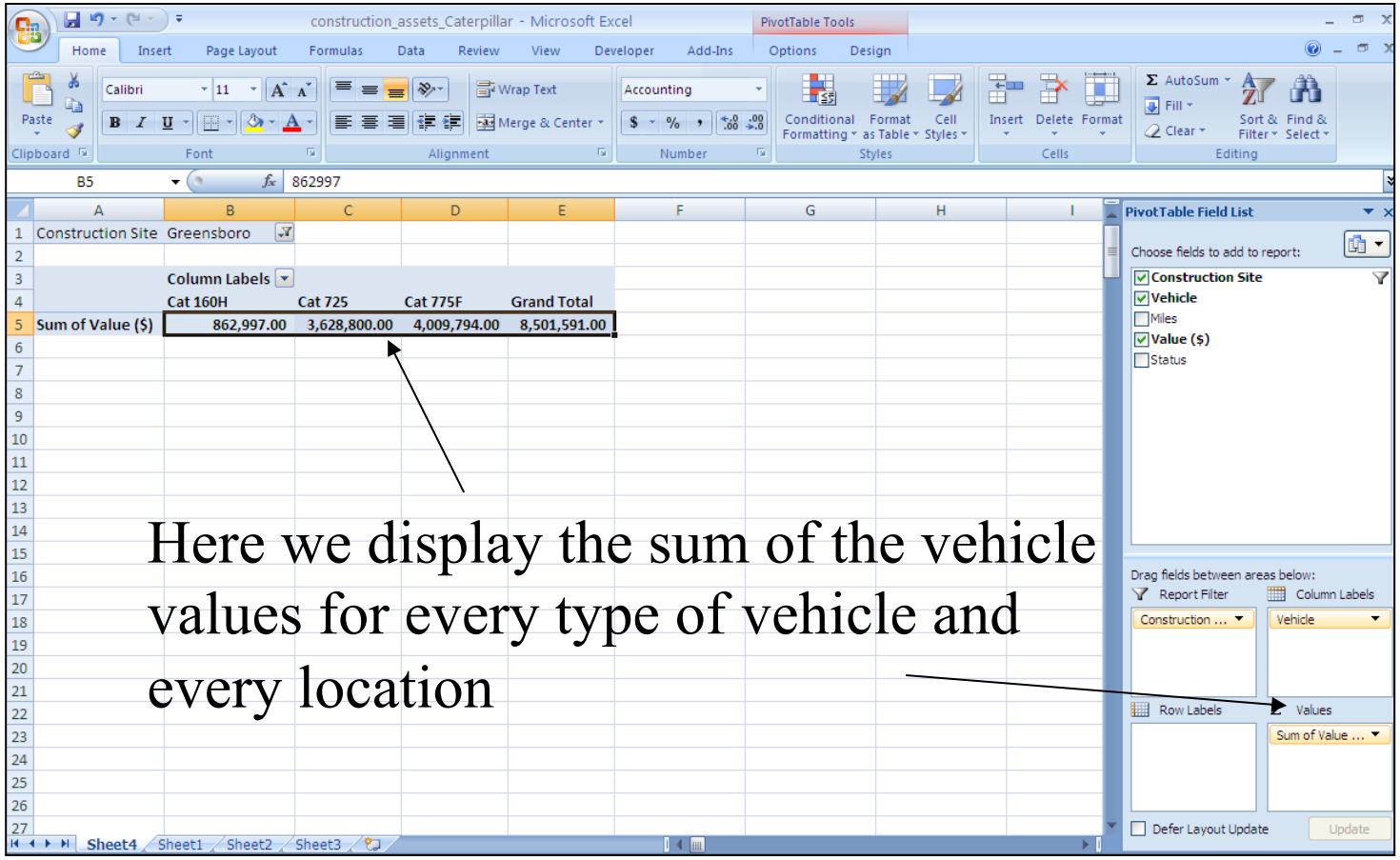
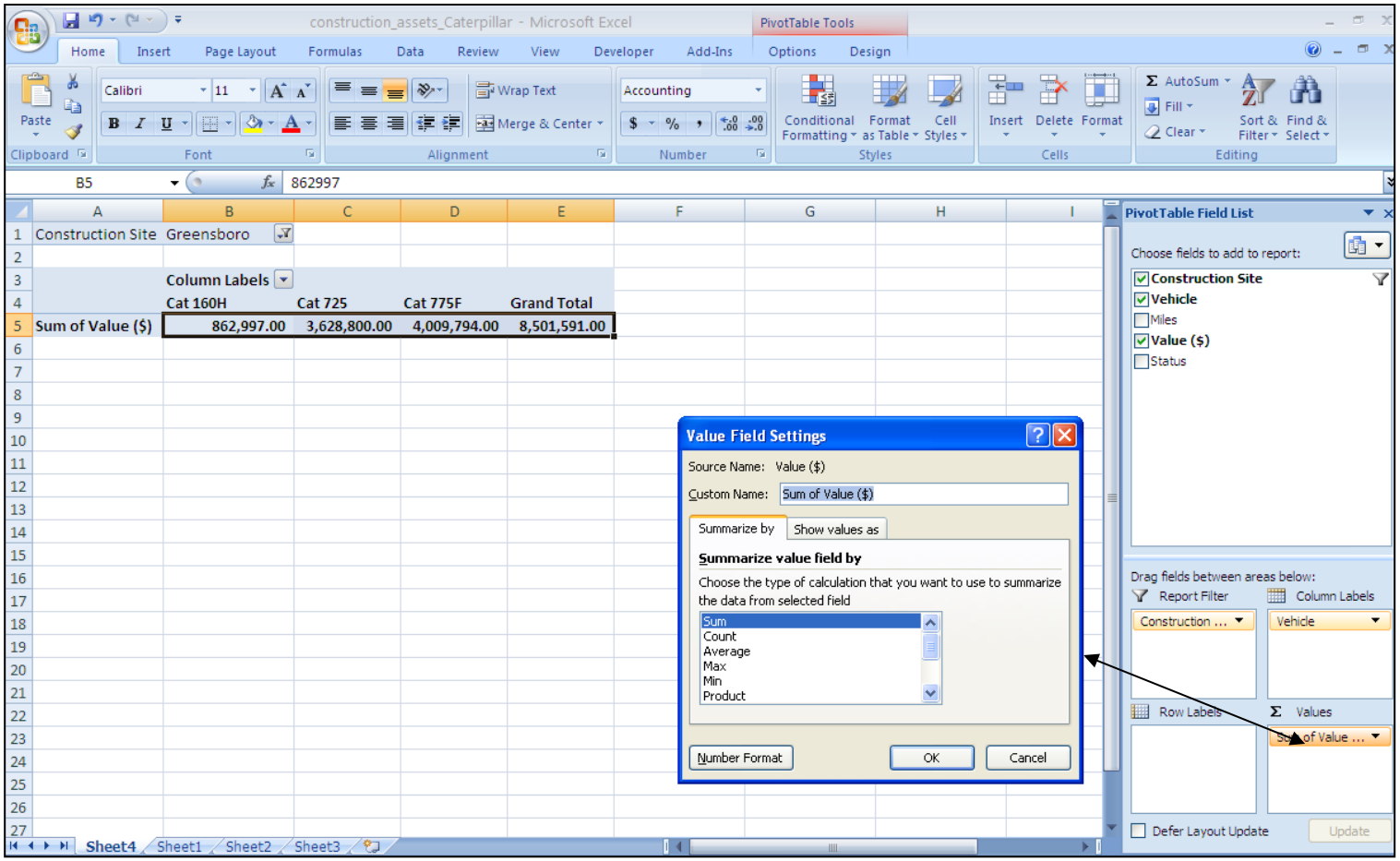
245	Richmond	Cat 775F	265	299,702	Active
246	Richmond	Cat 775F	242,403	27,297	Active
247	Greensboro	Cat 775F	17,609	280,189	Active
248	Raleigh	Cat 775F	115,307	170,279	Active
249	Richmond	Cat 775F	58,080	234,660	Active
250	Richmond	Cat 775F	42,863	251,780	Active
251	Greensboro	Cat 775F	83,761	205,769	Active
252	Raleigh	Cat 775F	126,061	158,182	Active
253	Raleigh	Cat 775F	228,706	42,705	Active
254	Raleigh	Cat 775F	129,808	153,966	Active
255	Greensboro	Cat 775F	216,070	56,921	Active
256	Richmond	Cat 775F	140,712	141,699	Active
257	Richmond	Cat 775F	101,430	185,891	Active
258	Greensboro	Cat 775F	118,582	166,595	Active
259	Richmond	Cat 775F	218,361	54,343	Inactive
260	Raleigh	Cat 775F	126,286	157,928	Active
261	Richmond	Cat 775F	59,885	232,629	Active
262	Richmond	Cat 775F	189,915	86,345	Active
263	Richmond	Cat 775F	198,037	77,208	Active
264	Raleigh	Cat 775F	203,763	70,766	Active
265	Greensboro	Cat 775F	199,325	75,760	Active
266	Richmond	Cat 775F	1,016	298,857	Active
267	Richmond	Cat 775F	184,003	92,997	Active
268	Greensboro	Cat 775F	27,328	269,257	Active
269	Richmond	Cat 775F	104,635	182,286	Active
270	Richmond	Cat 775F	129,681	154,109	Active
271	Raleigh	Cat 775F	182,199	95,026	Active

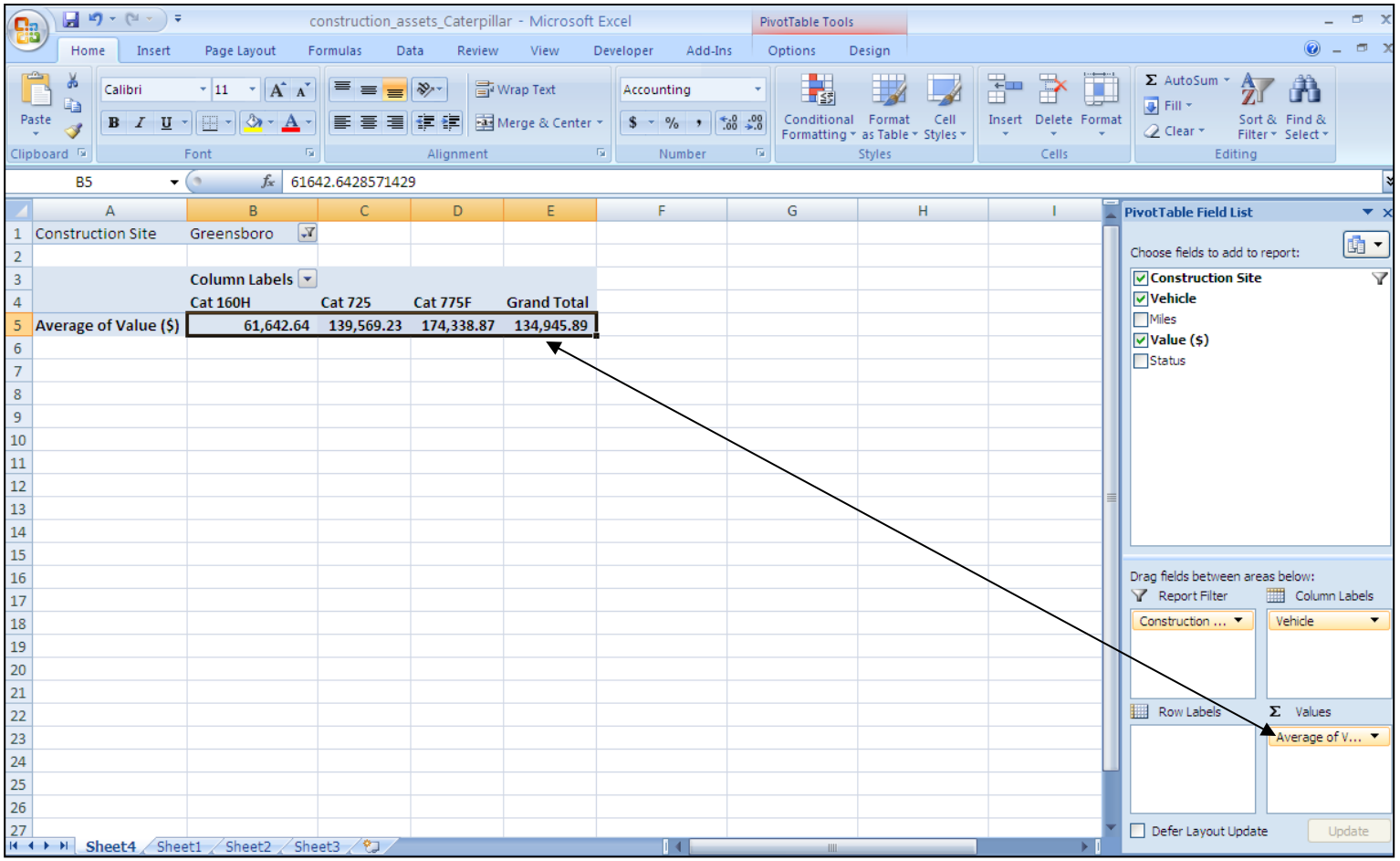
Displaying Summaries in the Pivot Table (Excel 2007/2010)



Finding the Average Value of Vehicles in the Fleet (Excel 2007/2010)



Finding the Average Value of Vehicles (Excel 2007/2010)



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