Report Automation Using Excel
Handouts

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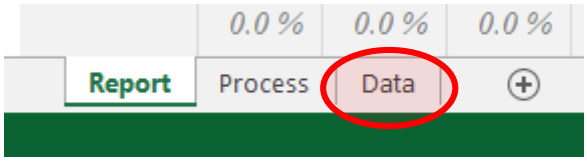
NCAIR Summer Drive-in 2013

Hands-on Exercise 1

Objective: In this exercise, you will add a connection to an Excel Workbook.

1. Open [**W:\Hands-on Exercises\Race, Load, Gender - GRAD ALL.xlsx**].

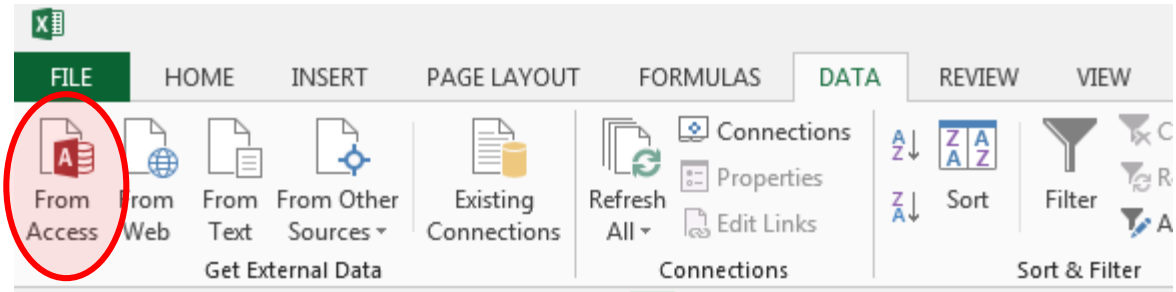
2. Switch to the [**Data**] tab.



There are actually two ways to add a connection to an external data source. Two options are shown here. OPTION 1 works for just Access Databases while OPTION 2 works for all sources.

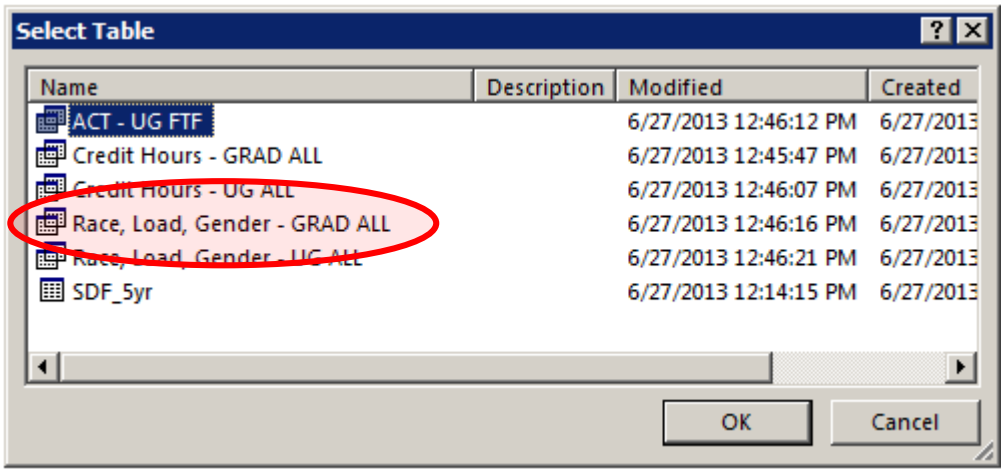
OPTION 1

3. Switch to the [**DATA**] ribbon and select [**From Access**].



4. Navigate to [**W:\Data\Factbook Data.accdb**] and click [**Open**].

5. The [**Select Table**] dialog will appear. Select [**Race, Load, Gender - GRAD ALL**] and click [**OK**].

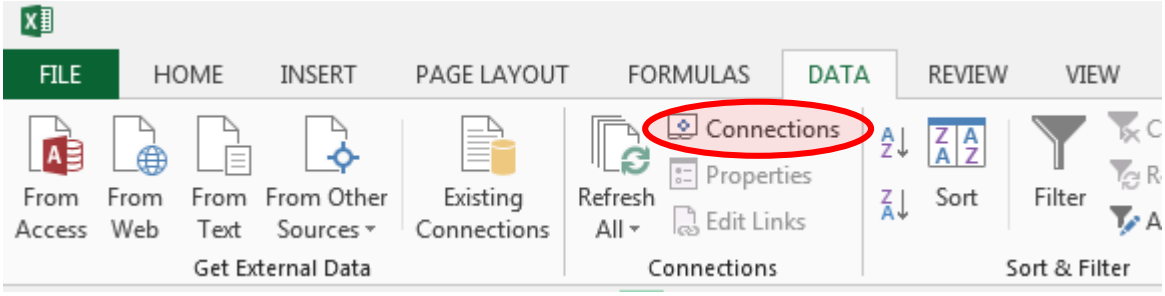


SKIP TO STEP 15

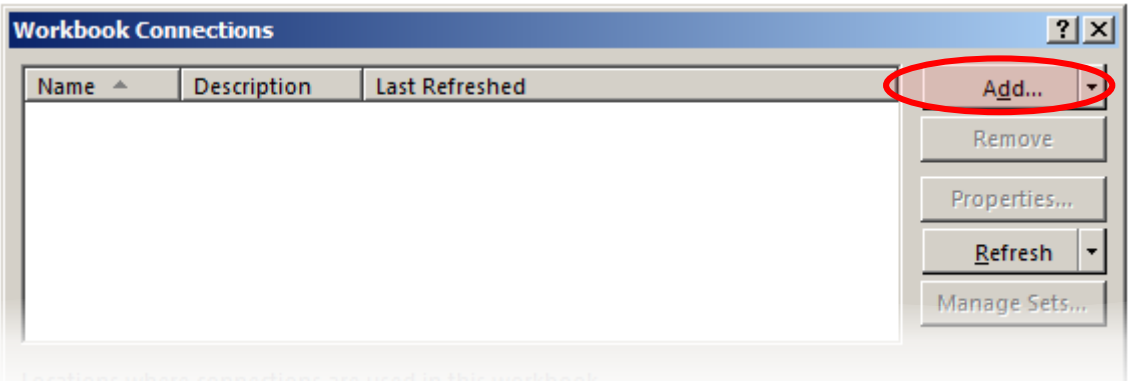
Hands-on Exercise 1

OPTION 2

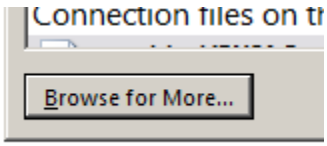
6. Switch to the [**DATA**] ribbon and select [**Connections**].



7. Click the [**Add…**] button to add a new connection.



8. Click the [**Browse for More…**] button and navigate to [**W:\Data\Factbook Data.accdb**].



9. The [**Data Link Properties**] dialog may appear. If so, ensure the following are set correctly and click **OK**.

Provider Tab

OLE DB Provider(s): Microsoft Office 12.0 Access Database Engine OLE DB Provider

Connection Tab

User Name: Admin

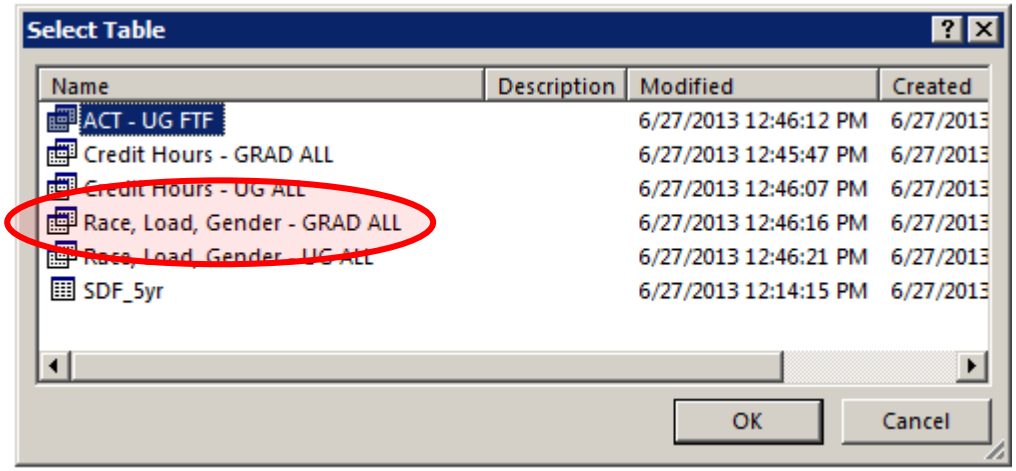
Blank password: <Selected>

Advanced Tab

Access permissions: Only Read selected

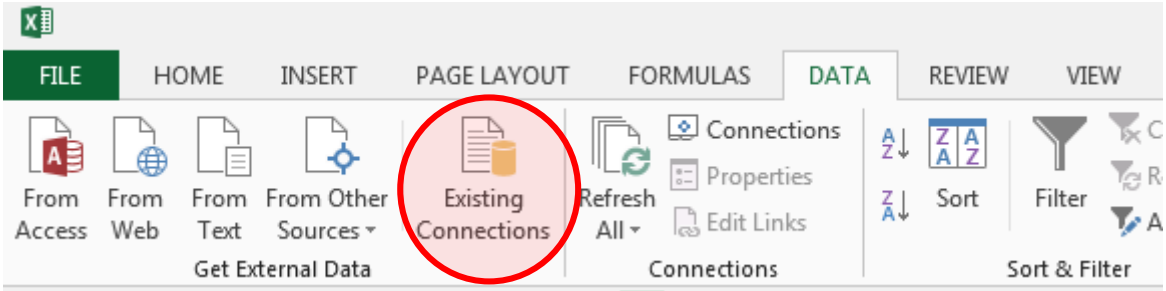
Hands-on Exercise 1

10. The [**Select Table**] dialog will appear. Select [**Race, Load, Gender - GRAD ALL**] and click [**OK**].



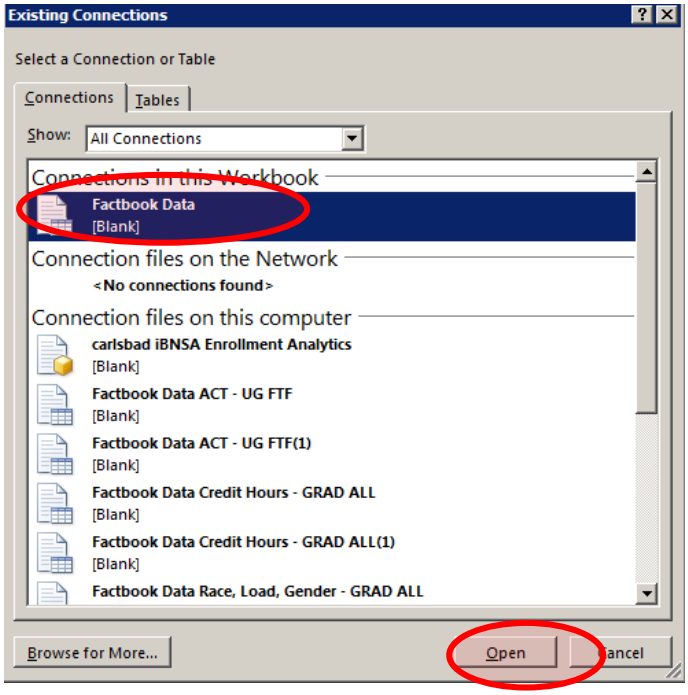
11. Click the [**Close**] button.

12. Switch to the [**DATA**] ribbon and select [**Existing Connections**].

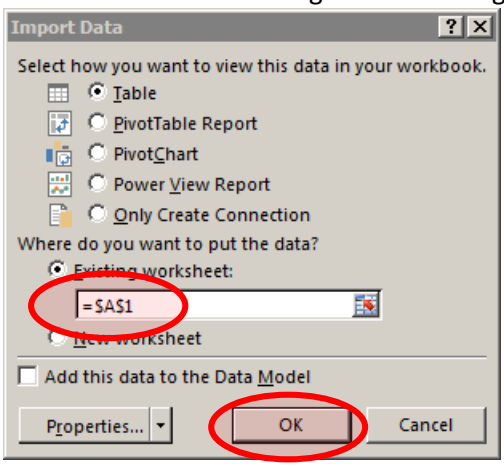


Hands-on Exercise 1

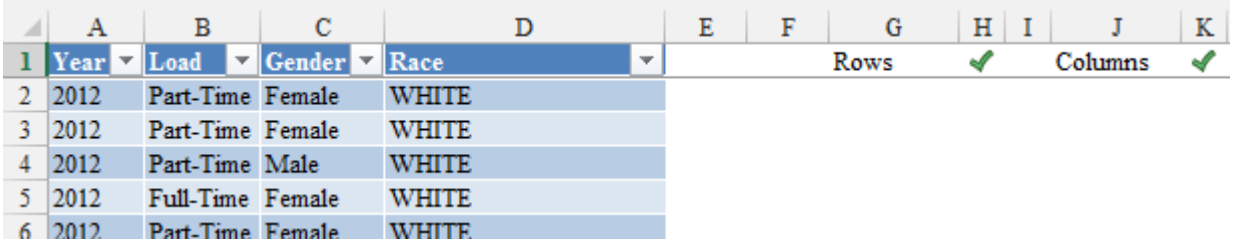
13. Section [**Factbook Data**] and click [**Open**].



14. Click [**OK**] to insert the table on the existing worksheet beginning in cell [**$A$1**].



15. The table will be created and appear in the upper left corner of the worksheet (the **Rows** and **Columns** indicators will have green checkmarks if this step is completed correctly).



	A	B	C	D	E	F	G	H	I	J	K
1	Year	Load	Gender	Race			Rows	✓		Columns	✓
2	2012	Part-Time	Female	WHITE							
3	2012	Part-Time	Female	WHITE							
4	2012	Part-Time	Male	WHITE							
5	2012	Full-Time	Female	WHITE							
6	2012	Part-Time	Female	WHITE							

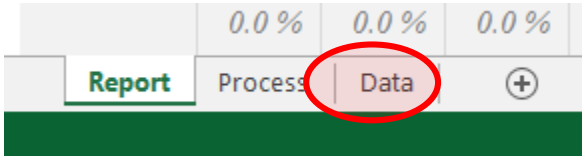
Bonus Exercise:
If you have time, try this exercise on [**W:\Hands-on Exercises\Race, Load, Gender - UG ALL.xlsx**].

Hands-on Exercise 2

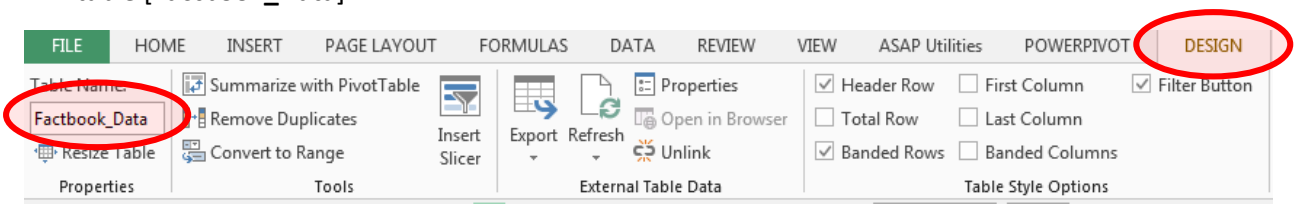
Objective: In this exercise, you will insert some formulas referencing a table.

1. Open [**W:\Hands-on Exercises\Race, Load, Gender - GRAD ALL.xlsx**].

2. Switch to the [**Data**] tab.



3. Click anywhere in the table, switch to the [**DESIGN**] ribbon under [**TABLE TOOLS**], and rename the table [**Factbook_Data**].



4. Switch to the [**Process**] tab.

5. Correct the formula in cell [**A2**], replace "#REF!" with "Factbook_Data[Year]".

6. In cell [**B4**], enter "=COUNTIFS(Factbook_Data[Gender],$A4,Factbook_Data[Race],B$3)". Copy and paste cell [**B4**] (*DO NOT DRAG AND FILL*) to cells [**C4**] – [**J4**]. Enter "=SUM(B4:J4)" into cell [**K4**].

   Check answers in cells [**B28**] – [**K28**].

7. Copy cell [**B4**] to [**B6**]. Notice the result is now "0". Edit the formula and make sure it is as follows:

   "=COUNTIFS(Factbook_Data[Gender],$A4,Factbook_Data[Race],B$3,Factbook_Data[Load],$A6)"

   Copy and paste cell [**B6**] to cells [**C6**] – [**J6**] and copy cell [**K4**] to [**K6**].

8. Copy and paste cell [**B6**] to cell [**B8**] and correct the formula so the Gender criteria is coming from [**$A4**] instead of [**$A6**].

   Copy and paste cell [**B8**] to cells [**C8**] – [**J8**] and copy cell [**K6**] to [**K8**].

9. Complete the Female section in the same way and use SUM to calculate the grand totals.

Bonus exercise: Repeat this process for [**W:\Hands-on Exercises\Race, Load, Gender - UG ALL.xlsx**].

Hands-on Exercise 3

Objective: In this exercise, you will insert some formulas into a worksheet.

1. Open [**W:\Hands-on Exercises\KPIs.xlsm**].

2. Switch to the [**Retention Rate**] tab.

3. In cell [**V3**], enter “=MATCH("Actual",$A:$A)”.

4. In cell [**U7**], enter “=AVERAGE(OFFSET($A$1,$V$3-1,$W$3-3,1,3))”.

5. Copy cell [**U7**] into cell [**U8**] and change the formula to use 10 columns of data instead of 3 (Hint: two of the 3’s in the formula above need changed to 10’s – which 3’s will you choose?).

Bonus exercise: Complete cells [**U5**] and [**U6**].

Hands-on Exercise 4

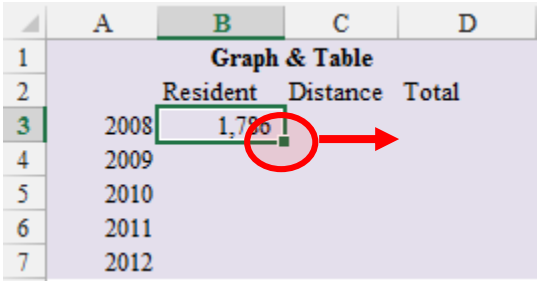
Objective: In this exercise, you will insert some formulas into a worksheet and use Drag and Fill.

1. Open [**W:\Hands-on Exercises\Credit Hours - GRAD ALL.xlsx**].

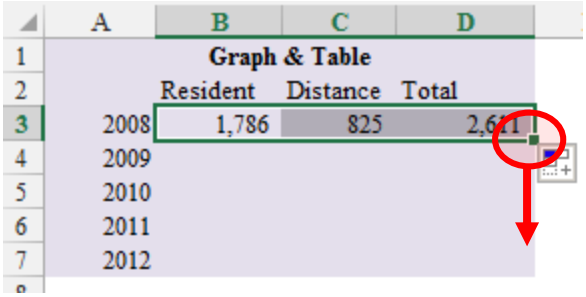
2. Switch to the [**Process**] tab.

3. Enter "=VLOOKUP($A3,Data[#All],COLUMN(B2))" into cell [**B3**].

4. Drag and Fill from cell [**B3**] to cells [**C3**] and [**D3**].



5. Drag and Fill from cells [**B3:D3**] to cells [**B4**] through [**D7**].



Hands-on Exercise 5

Open [**W:\Hands-on Exercises\ Program Prioritization.xlsm**].

We will complete the highlighted row of cells, summing degrees within the same CIP, level, and institutuon. Use a SUMIFS formula.

5							Report
6		2007	2008	2009	2010	2011	2012
7	WCU	97	97	93	94	108	98
8	% of total enrollment	1.1%	1.1%	1.0%	1.0%	1.2%	1.0%
9	*WCU Median @ level*	*41*	*42*	*41*	*47*	*45*	*46*
10	*Total - Upper + Lower*	**190**	**166**	**192**	**182**	**185**	**178**
11	*% of Enrllmnt in Upper Div*	*51%*	*58%*	*48%*	*52%*	*58%*	*55%*
12	ASU	106	107	113	125	155	124
13	% of total enrollment	0.7%	0.6%	0.7%	0.7%	0.9%	0.7%
14	FSU	63	51	63	61	40	28
15	% of total enrollment	0.9%	0.8%	1.0%	1.1%	0.7%	0.5%
16	NCCU						
17	% of total enrollment						
18	UNC-P	31	40	41	39	39	34
19	% of total enrollment	0.5%	0.6%	0.6%	0.6%	0.6%	0.5%
20	UNC-W	153	150	153	134	132	123
21	% of total enrollment	1.3%	1.2%	1.2%	1.0%	1.0%	0.9%
22	WSSU	17	17	28	24	19	24
23	% of total enrollment	0.3%	0.3%	0.4%	0.4%	0.3%	0.4%
24							
25							
26							

We are going to start by finding all majors for a given institution. Here is your starting formula:

Table name | Field name | Table name | Field name

=SUMIFS(Enrollment_Conferral[2007_Majors], Enrollment_Conferral[Institution],'Enrollment and Degree - Process'!A16)

Criteria Value - Institution

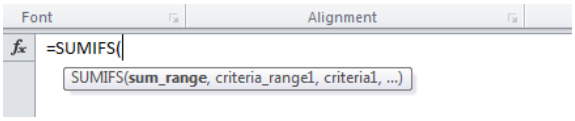
In this example, “Enrollment Conferral” is the table name. It’s located on the “Enrollment and Degree - GA Data” tab.

TO BUILD THIS FORMULA:

Start by type =SUMIFS(

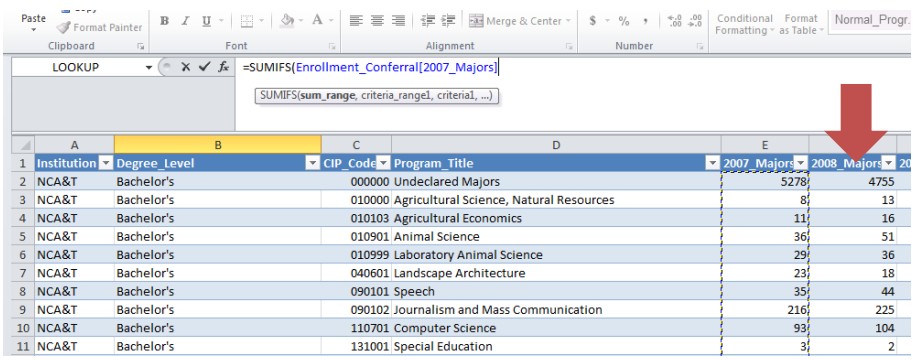
Hands-on Exercise 5

This handy box comes up to prompt the user about the components and syntax of the formula.



Notice that the first portion of the formula is the sum_range. That is the data that will actually be summed.

Navigate to the "Enrollment and Degree - GA Data" tab. Click directly above the header of the column to be summed. In this case, that is 2007 Majors.

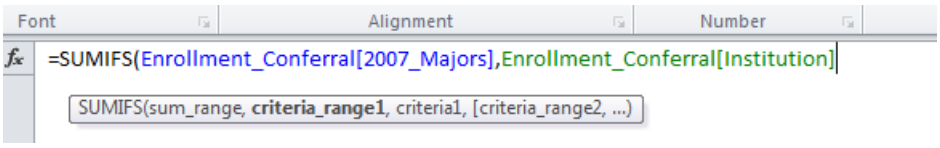


	A	B	C	D	E	
1	Institution	Degree_Level	CIP_Code	Program_Title	2007_Majors	2008_Majors
2	NCA&T	Bachelor's	000000	Undeclared Majors	5278	4755
3	NCA&T	Bachelor's	010000	Agricultural Science, Natural Resources	8	13
4	NCA&T	Bachelor's	010103	Agricultural Economics	11	16
5	NCA&T	Bachelor's	010901	Animal Science	36	51
6	NCA&T	Bachelor's	010999	Laboratory Animal Science	29	36
7	NCA&T	Bachelor's	040601	Landscape Architecture	23	18
8	NCA&T	Bachelor's	090101	Speech	35	44
9	NCA&T	Bachelor's	090102	Journalism and Mass Communication	216	225
10	NCA&T	Bachelor's	110701	Computer Science	93	104
11	NCA&T	Bachelor's	131001	Special Education	3	2

That click will complete the first part of the formula.

Next, the formula calls for the criteria range 1, and then criteria 1. In this case, the criteria range is the column with data about institution.

In your formula, insert a comma, and then click the top of the institution column. Your formula should now look like this:



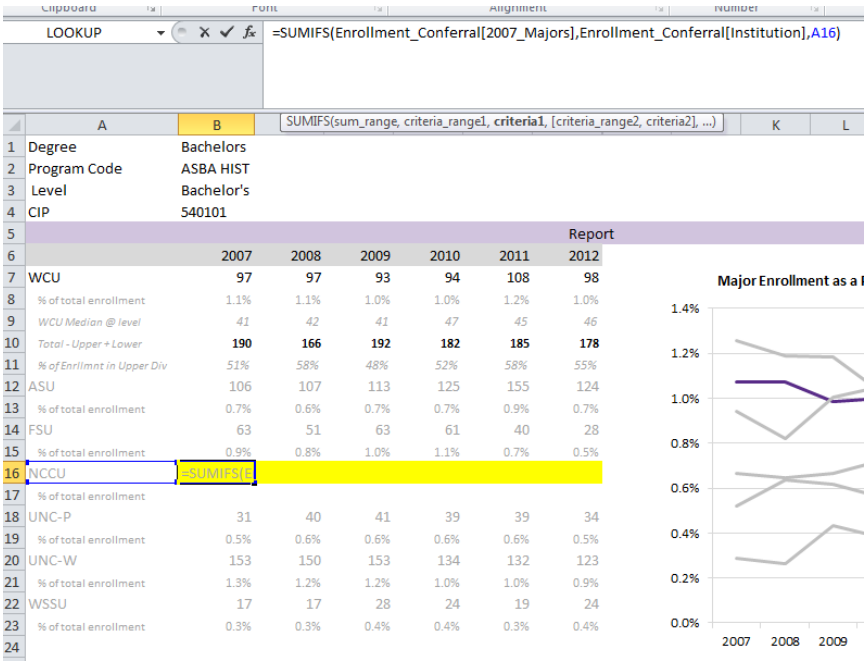
Again, put a comma in your formula to move to the next part – the criteria 1. In this case, the criteria 1 is "NCCU". You formula would be correct if you typed the abbreviation directly:

=SUMIFS(Enrollment_Conferral[2007_Majors],Enrollment_Conferral[Institution],"NCCU")

Hands-on Exercise 5

But the better approach is to fill the criteria with the cell reference, so it can be reused for UNC-P, UNC-W, etc.

If you already typed “NCCU”, just delete that part of your formula, and click the cell with the NCCU abbreviation.



In this case, the new reference A16 isn’t anchored at all. That means that if you drag that formula to the next cell, it will change the reference to B16. Take a moment to try that if you like.

We can add an anchor to that reference, so that it always looks in column A. To do this, use the F4 key to cycle through the anchor options (i.e., anchor both row and column, only row, only column, neither) until you have made the reference $A16 (anchored column, moveable row).

Your formula at this point should look like this:
=SUMIFS(Enrollment_Conferral[2007_Majors],Enrollment_Conferral[Institution],'Enrollment and Degree - Process'!A16)

Now, we still need to add the criteria for level. To do this, click into the parenthesis at the end of the formula, and add the criteria range for level, and then the criteria for level.

Your formula at this point should look like this:

=SUMIFS(Enrollment_Conferral[2007_Majors],Enrollment_Conferral[Institution],'Enrollment and Degree - Process'!$A16,Enrollment_Conferral[Degree_Level],'Enrollment and Degree - Process'!$B$3)

Notice above that $B$3 is anchored on both the row and column. This is because the level value is always in the exact same cell.

Hands-on Exercise 5

Now add the final criteria – CIP code. Same as before, add the criteria range (i.e., column of CIP codes, followed by the criteria (i.e., CIP code 540101).

Now your formula should look like this:
=SUMIFS(Enrollment_Conferral[2007_Majors],Enrollment_Conferral[Institution],'Enrollment and Degree - Process'!$A16,Enrollment_Conferral[Degree_Level],'Enrollment and Degree - Process'!$B$3,Enrollment_Conferral[CIP_Code],'Enrollment and Degree - Process'!$B$4)

In plain English that formula reads:
=SUMIFS(2007 majors, Institution, “NCCU”, Level, “Bachelor’s”, CIP Code, 540101)

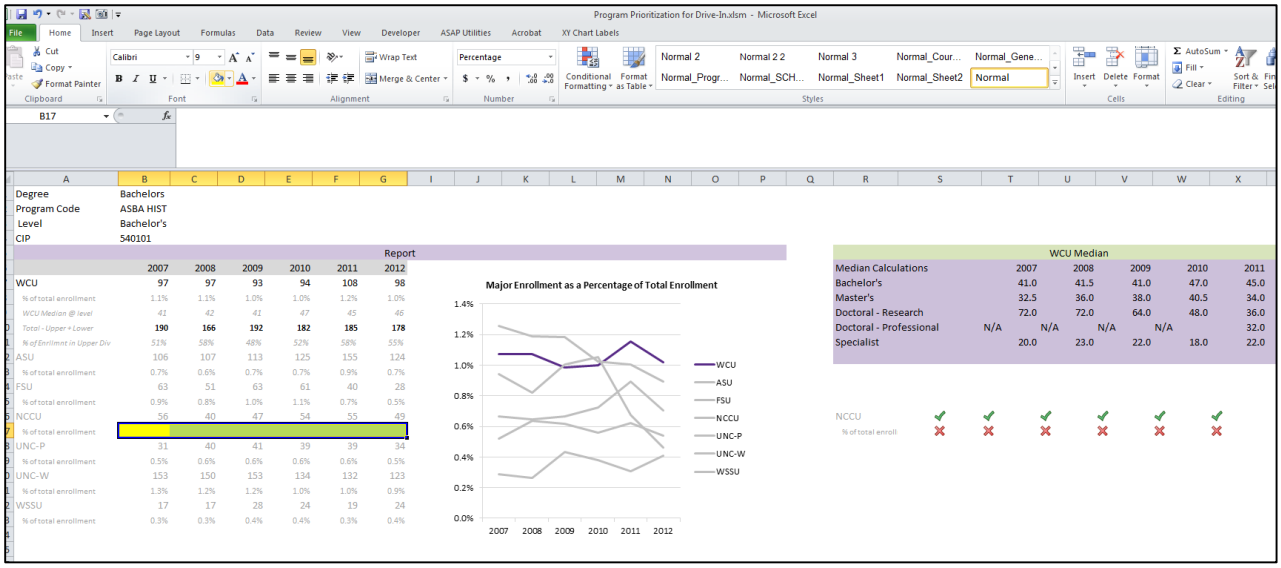
Now, fill in the rest of that row. The icons to the right will indicate if you have achieved the correct answer.
Note – In this case, degree for each year are in a separate column, so adjust your formulas accordingly.

Hands-on Exercise 6

Open [**W:\Hands-on Exercises\ Program Prioritization.xlsm**].

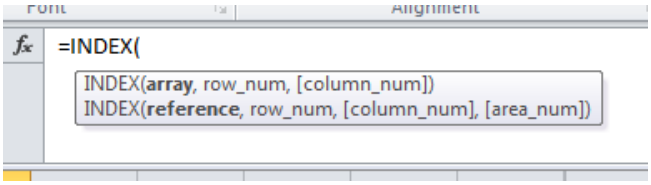
Now we will move onto an example using Index-Match, within an IF statement.

At this point, your sheet should look like the screenshot below, and we are now going to work on the highlighted cells, which provide percentage of total enrollment within the level. (Rationale – our leadership wanted to look at numbers of majors within a CIP and level at other institutions, but wanted those numbers to be within the context of institution size)



We will start with the INDEX-MATCH part of the formula.

Here is the guidance Excel provides when we type =INDEX(



This is one of the least clear formula descriptions that Excel provides, mainly because the INDEX formula is versatile and can be used in several ways. Don't be discouraged, we will walk through an example.

In this case, we will start by pulling the total institutional enrollment for the year into the cell. In plain English, here is the first step:
=INDEX(dimensions of the reference table)

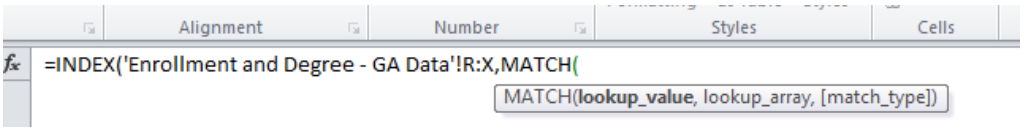
Here we are going to reference a table where I have pre-totaled the enrollment by institutions by year. That table name is "Enrollment_Conferrals_Total" and it's also on the "Enrollment and Degree - GA Data" tab.

Hands-on Exercise 6

==INDEX('Enrollment and Degree - GA Data'!R:X)

Now we will add the MATCH formula, which will find a specific value in the INDEX table.

Here is Excel's description of the MATCH function:



In this case, the lookup value is the institution. Below you will see that we can indicate the cell reference that contains the NCCU abbreviation, and anchor on the column (as the institution abbreviation is always in the column A):

=INDEX('Enrollment and Degree - GA Data'!R:X, MATCH('Enrollment and Degree - Process'!$A16)

The Lookup array part of the MATCH formula is looking for the column of the INDEX table that contains the matching value (in this case the institution abbreviation).

=INDEX('Enrollment and Degree - GA Data'!R:X, MATCH('Enrollment and Degree - Process'!$A16),'Enrollment and Degree - GA Data'!R:R)

The final part of the formula (match type) = 0 for an exact match, so at the end of the MATCH formula above, we will put a comma, followed by a zero, to indicate that we are looking to match the institution abbreviation exactly.

=INDEX('Enrollment and Degree - GA Data'!$R:$X, MATCH('Enrollment and Degree - Process'!$A16,'Enrollment and Degree - GA Data'!$R:$R, 0)

Finally, once you close the parenthesis on the MATCH formula, you will see that one additional argument is needed for the INDEX, namely the column number. In this case the column is 2 (that column which holds total enrollment for 2007).

At this point, you should have a crazy number – 838300%

Next we need to divide the program enrollment into the total enrollment. This is easy – at the very start of the formula, just drop in the cell reference with the problem enrollment about, and divide by the calculation you just made:

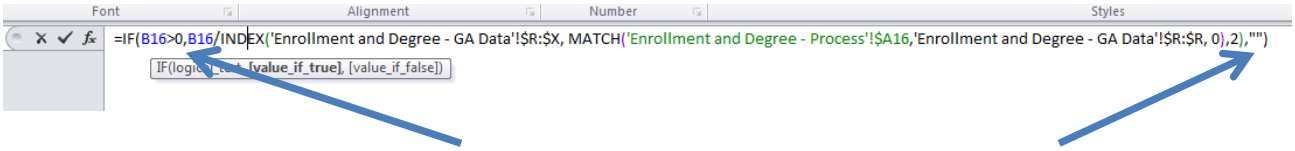
=**B16/**INDEX('Enrollment and Degree - GA Data'!$R:$X, MATCH('Enrollment and Degree - Process'!$A16,'Enrollment and Degree - GA Data'!$R:$R, 0),2)

One more thing to think about, if your program enrollment for this combination of institution, CIP, and level is zero (a particular institution didn't offer a CIP, at a certain level, in a certain year), your formula will return an error. You can avoid this error printing on your report by checking for a zero, and suppressing the error in cases of zero. To do this, at the beginning of your formula type

Hands-on Exercise 6

=IF(

Now evaluate the value of the enrollment cell:



If the enrollment figure is greater than 0, proceed with the calculation, if not, return a null value

Hands-on Exercise 7

Open [**W:\Hands-on Exercises\ Program Prioritization.xlsm**].

Now we will move onto an example using an array formula that was built to manage a "MEDIANIFS" calculation. This example is on the same tab as the last example - Enrollment and Degree – Process

	WCU Median					
Median Calculations	2007	2008	2009	2010	2011	2012
Bachelor's						
Master's	32.5	36.0	38.0	40.5	34.0	34
Doctoral - Research	72.0	72.0	64.0	48.0	36.0	28
Doctoral - Professional	N/A	N/A	N/A	N/A	32.0	62
Specialist	20.0	23.0	22.0	18.0	22.0	18
Bachelor's						

We knew the functionality we were looking for, and found an example on the web that we followed. This is a complex example, and there really isn't a way to build the formula incrementally, so we will start with this:

=MEDIAN(IF(Enrollment_Conferral[Degree_Level]='Enrollment and Degree - Process'!$R7, Enrollment_Conferral[2007_Majors]))

NOTE – Instead of pasting the formula, then clicking ENTER, you will click CTRL+SHIFT+ENTER simultaneously. Sometimes these formulas are referred to as CSE for this reason. That action should add curly braces around the formula, so that it looks like this. (PS – You cannot type the curly braces directly, and get it to work; you need to let Excel change the formula on the CSE action.)

{=MEDIAN(IF(Enrollment_Conferral[Degree_Level]='Enrollment and Degree - Process'!$R7, Enrollment_Conferral[2007_Majors]))}

At this point, the result of the calculation should be 48. This is median size of all bachelors' programs in the data set.

In this case, we want to get only the median size of WCU programs, so we will add the WCU criteria, resulting in this formula (the added parts are highlighted below):

{=MEDIAN(IF((Enrollment_Conferral[Degree_Level]='Enrollment and Degree - Process'!$R7)*(Enrollment_Conferral[Institution]="WCU"), Enrollment_Conferral[2007_Majors]))}

This step checks for both values to be true (i.e., level = bachelor's AND institution = WCU), so it is a trick for adding multiple criteria into the formula.

Hands-on Exercise 7

Finally, as this will occasionally return an error, we can add an IFERROR statement to handle cases where a particular institution did not have any enrollment at a particular level in a particular year.

The final formula is

{=IFERROR(MEDIAN(IF((Enrollment_Conferral[Degree_Level]='Enrollment and Degree - Process'!$R7)*(Enrollment_Conferral[Institution]="WCU"), Enrollment_Conferral[2007_Majors])),"N/A")}

This is quite complex, and took us a little while to figure out. The main purpose of this exercise is to introduce the concept, so that you know this expanded functionality exists within Excel. Please don't get discouraged if this doesn't make sense to you yet!