

## Visual Basic Functions for Natural Resource Programming

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### Lesson 4

#### Objective:

In this lesson we will learn:

- Learn to program a Simpson's index of Diversity function.
- Learn some basic syntax.
- Learn to use two loops.
- Learn to run the function we just made.

Please refer to the previous lessons for detail not described here.

#### Simpson's index of diversity function

Let's calculate a Simpson's index of diversity in the spreadsheet, first we have a column of data:

	A	B	C	D	E	F
1	Group	Count	p	p <sup>2</sup>		
2	AA	57				
3	BB	23				
4	CC	11				
5	DD	3				
6	EE	1				
7	FF	1				
8	total					
9						
10						
11						
12						
13						
14						

Figure 1, Count data entered in a spreadsheet

# Natural Resource Biometrics

Now we sum the count data.

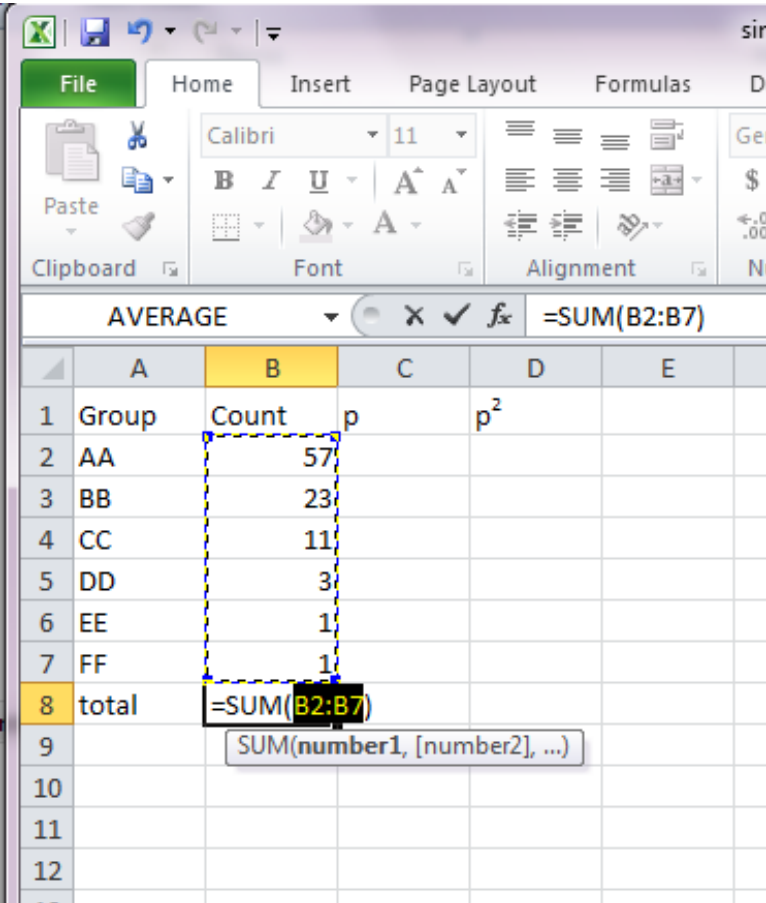
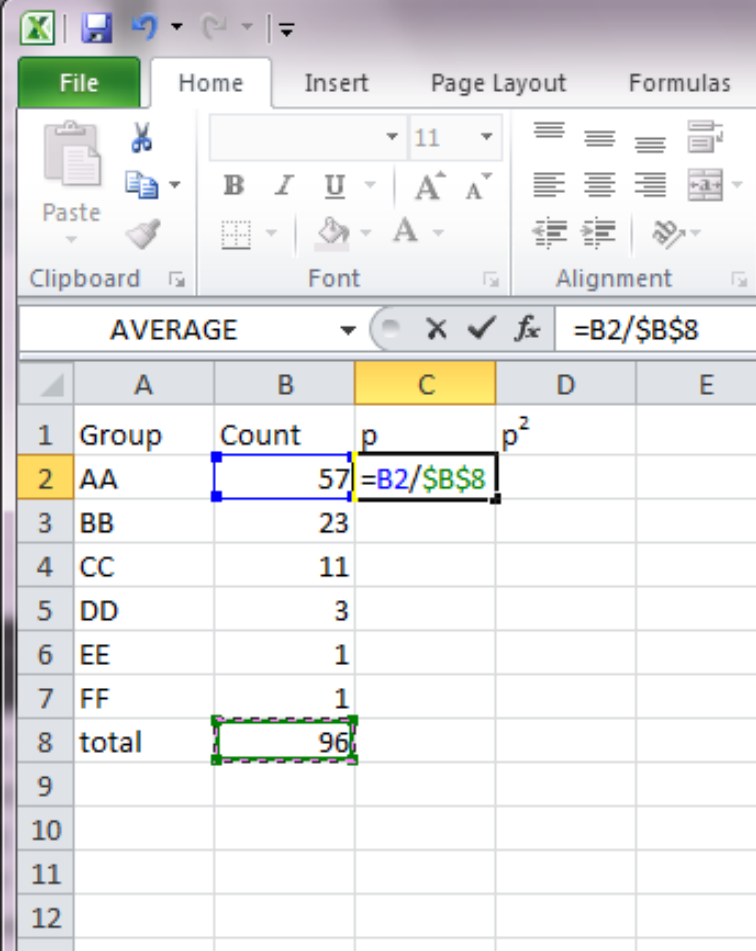


Figure 2. Sum the count data.



## Natural Resource Biometrics

Then we calculate the group proportions by dividing each count by the total



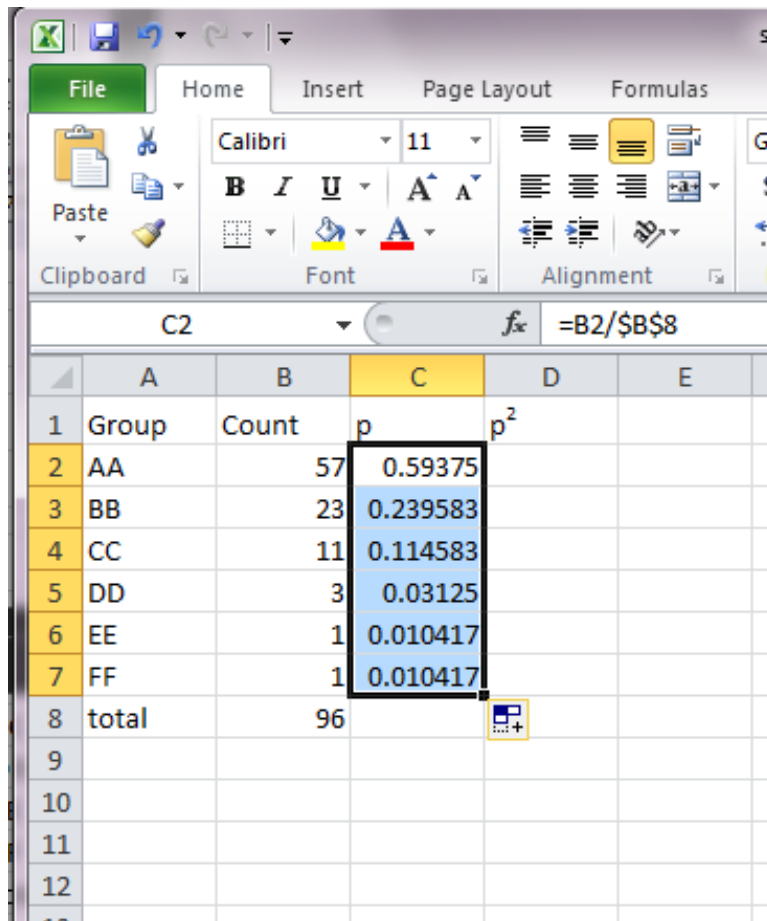
The screenshot shows the Microsoft Excel interface with the following data in the spreadsheet:

	A	B	C	D	E
1	Group	Count	p	p <sup>2</sup>	
2	AA	57	=B2/\$B\$8		
3	BB	23			
4	CC	11			
5	DD	3			
6	EE	1			
7	FF	1			
8	total	96			
9					
10					
11					
12					
13					

Figure 3. Calculate the proportions for each group.

## Natural Resource Biometrics

This is a view of the calculated proportions.



The screenshot shows an Excel spreadsheet with the following data:

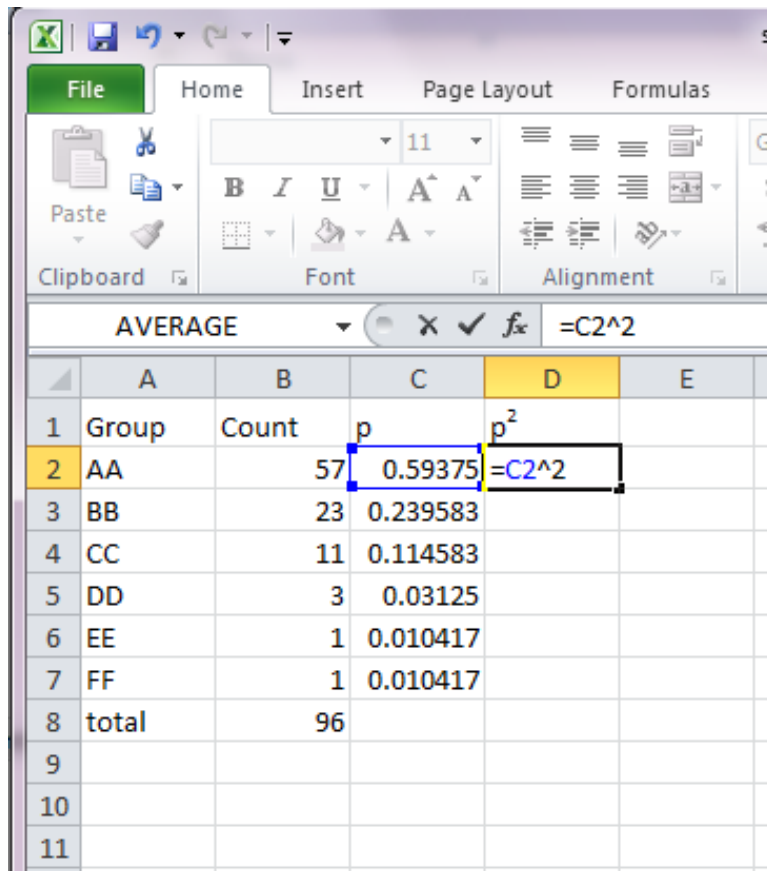
	A	B	C	D	E
1	Group	Count	p	p <sup>2</sup>	
2	AA	57	0.59375		
3	BB	23	0.239583		
4	CC	11	0.114583		
5	DD	3	0.03125		
6	EE	1	0.010417		
7	FF	1	0.010417		
8	total	96			
9					
10					
11					
12					

The formula bar shows the formula  $=B2/\$B\$8$ .

Figure 4. The calculated proportions.

## Natural Resource Biometrics

Next we square each proportion.



The screenshot shows the Microsoft Excel interface. The ribbon includes File, Home, Insert, Page Layout, and Formulas. The Home ribbon is active, showing options for Clipboard, Font, and Alignment. The formula bar displays '=C2^2'. The spreadsheet data is as follows:

	A	B	C	D	E
1	Group	Count	p	p <sup>2</sup>	
2	AA	57	0.59375	=C2^2	
3	BB	23	0.239583		
4	CC	11	0.114583		
5	DD	3	0.03125		
6	EE	1	0.010417		
7	FF	1	0.010417		
8	total	96			
9					
10					
11					

Figure 5. Square each proportion.

# Natural Resource Biometrics

And then sum the squared proportions. This number is Simpson's D a measure of similarity.

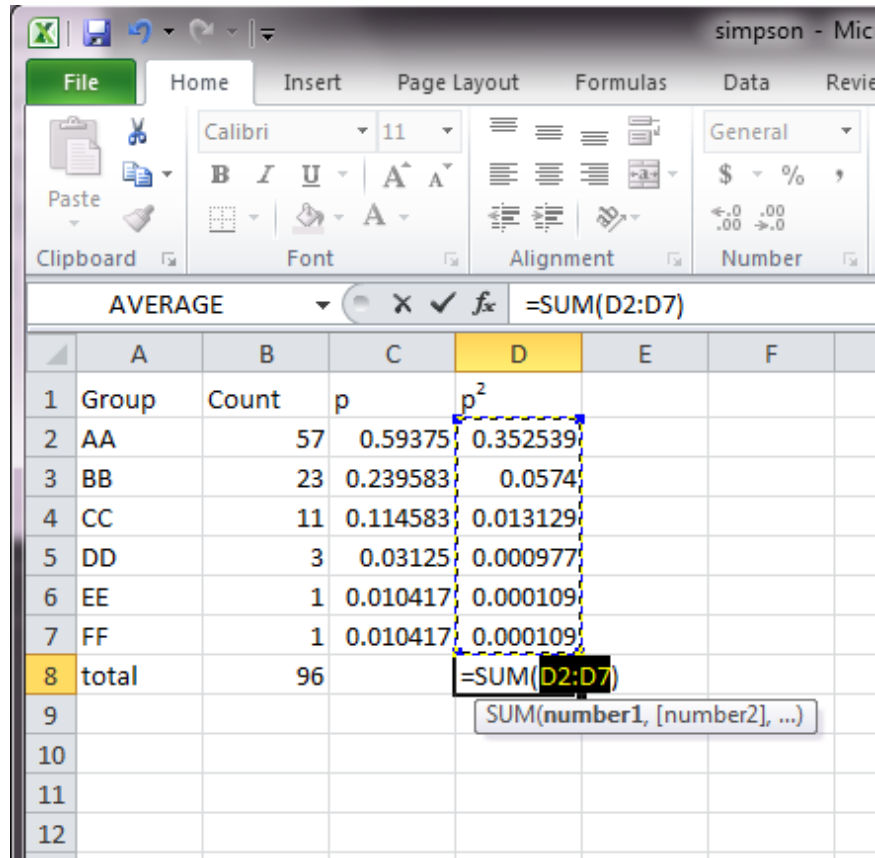
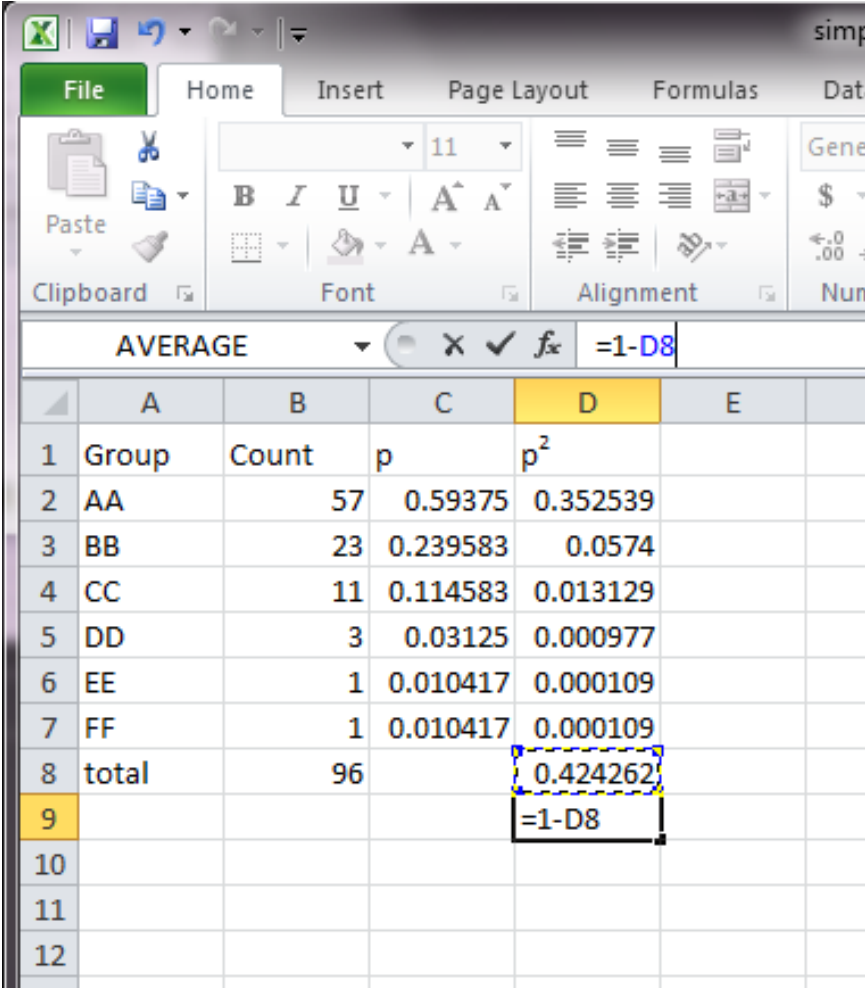


Figure 6. Sum the squared proportions, this is Simpson's D

## Natural Resource Biometrics

To get Simpson's index of diversity we subtract D from 1.



	A	B	C	D	E
1	Group	Count	p	p <sup>2</sup>	
2	AA	57	0.59375	0.352539	
3	BB	23	0.239583	0.0574	
4	CC	11	0.114583	0.013129	
5	DD	3	0.03125	0.000977	
6	EE	1	0.010417	0.000109	
7	FF	1	0.010417	0.000109	
8	total	96		0.424262	
9				=1-D8	
10					
11					
12					

Figure 7. Calculate Simpson's index of Diversity (1-D)

### Programming the Function

I start with a mean function from lesson 2.

- Accept a range of numbers as an argument returning a single number. ( Note: the input data is count by category)
- Add appropriate comments.

## Natural Resource Biometrics

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- Determine the sum of the counts
- Divide each input number by the sum of the counts to get a proportion.
- Sum the squared proportions.
- Take the 1 - result.
- Return the answer as a number of type single.

During these tutorials, I will give you short examples to help you learn the process. I will only give examples on items that are new, please refer to previous lessons of steps already covered.

In a Module window type

```
Function simpsons(data As Range) As Single
```

Please reuse your code from the mean example as the function is very similar.

In this function we need the total of the input counts. To do this we will need 2 [For Loops](#)

Initialize a variable sumcount to 0 as in the previous examples

In the first [For loop](#) enter:

```
sumcount = sumcount + data.Item(i)
```

then close the loop.

In the second [For loop](#), replace the mean statement with the following statement.

```
prop = data.Item(i) / sumcount
```

this statement says a variable prop equals the number is data item i divided by the total count . Also in the second [For loop](#) enter the following command.

```
simpsons = simpsons + (prop * prop)
```

This statement says a variable simpsons equals the old value of simpsons + the prop value squared. At this point the simpsons variable hold the value D (simpsons index) which is an index of similarity. To get Simpson's index of diversity we need to subtract simpsons from 1. Place the following statement outside the second [For loop](#).

```
simpsons = 1 - simpsons
```

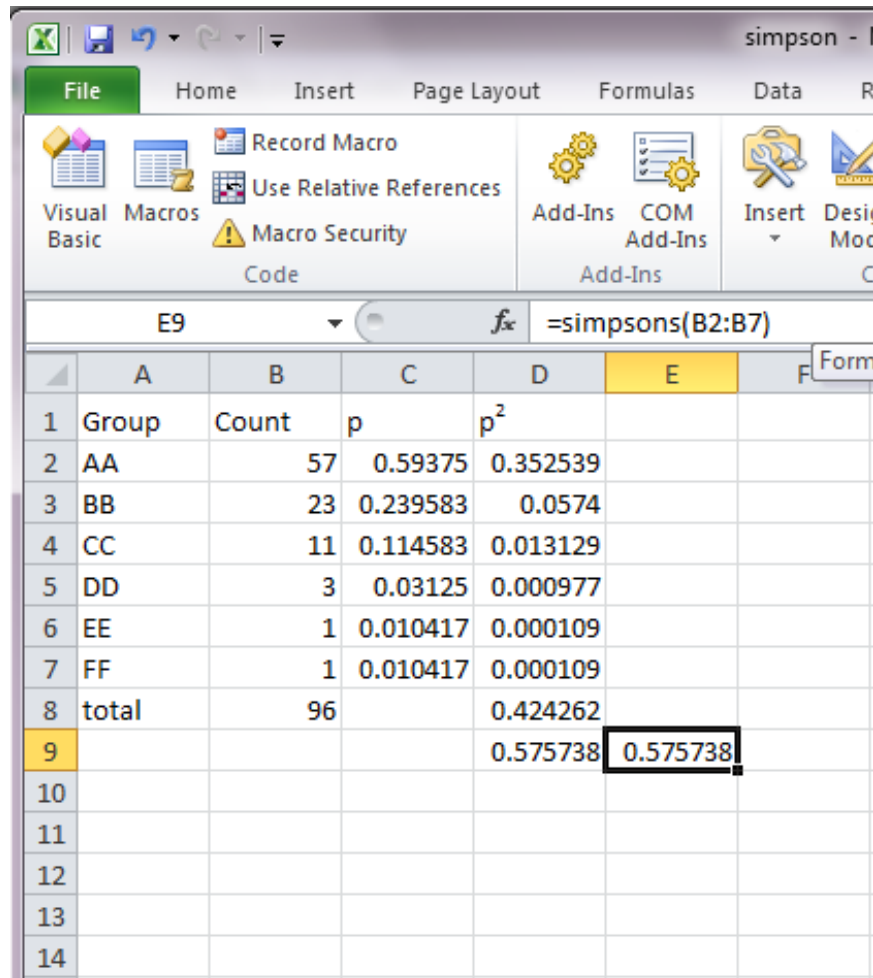
this statement says that the new value of simpsons equals 1 - old value of simpsons , just as we did in the spreadsheet.



## Natural Resource Biometrics

Now remember that the variable simpsons is returned to the spreadsheet. My actual working code need only 5 line of instructions.

Now we will use the new simpsons function.



The screenshot shows an Excel spreadsheet with the following data:

	A	B	C	D	E	F
1	Group	Count	p	p <sup>2</sup>		
2	AA	57	0.59375	0.352539		
3	BB	23	0.239583	0.0574		
4	CC	11	0.114583	0.013129		
5	DD	3	0.03125	0.000977		
6	EE	1	0.010417	0.000109		
7	FF	1	0.010417	0.000109		
8	total	96		0.424262		
9				0.575738	0.575738	
10						
11						
12						
13						
14						

The formula bar shows the formula `=simpsons(B2:B7)` entered in cell E9. The result of the function, 0.575738, is displayed in cell E9.

Figure 8. Using the Simpsons function.

In this lesson we have learn:

- Learn to program a Simpson's index of Diversity function.
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## Natural Resource Biometrics

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Please write the simpsons function the works. Copy and paste the VBA commands into a document be sure your name is in the comments and send that to the Blackboard drop box.

