

#### Announcements

Project 3 will be assigned Friday

Midterm 2 will be returned in sections

Today & Thursday



## Spreadsheets

Spreadsheets are a powerful abstraction for organizing data and computation



## An Array of Cells

## A spreadsheet is a 2 dimensional array of cells ... it's 3D with multiple sheets

- \* The idea is that the rows or columns represent a common kind of data
  - They will be operated upon similarly, so that's easy to do
  - Adding more data of the same type means adding more rows or columns
  - Often spreadsheets contain numbers, but text-only spreadsheets are useful, too



### Looking for Similar Ideas

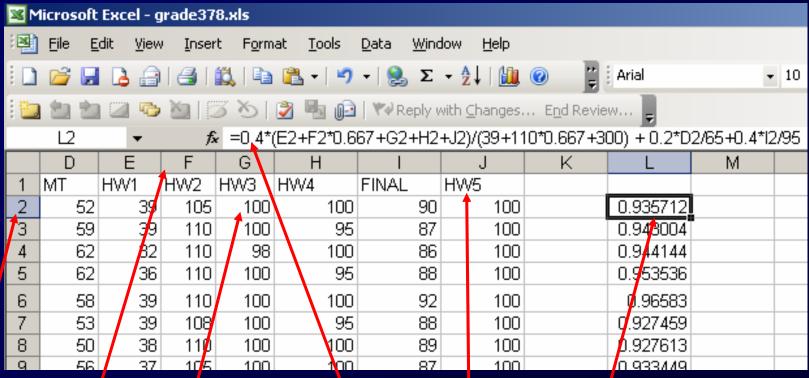
#### Spreadsheets are not so unusual ...

- \* The position (row/column) names the data, as with memory locations, variables, forms...
- \* Operating on all elements of a column (or row) is an iteration, though not usually a WFI
- \* Setting a cell to a formula is an (unevaluated) assignment statement with cells as variables
- \* The formula is an expression
- \* Functions are (built-in) functions

Think of spreadsheets as a handier interface for computing ideas than JS



## Familiar Terminology



row name cell column name

formula referenced cell L2 column heading 5



#### **Formulas**

# The data in a spreadsheet can be manipulated using formulas

🗓 🖢 🐿 🖾 🤝 🦄   🎜 💍 🖟 📳 📵   🕶 Reply with Changes End Review									
H2 ▼ f₂ =F2*0.621									
	В	F	G	Н	I				
1	Common Name	Distance (km	Body Len (n	Distance (Mi)					
2	Swainson's Hawk	13500	0.52	8383.5					
3	Wheatear	13500	0.16						
4	Willow Warbler	15500	0.11						
5	Short-tailed Shearwa	12500	0.43						
6	Long-tailed Skua	16000	0.51						
7	Arctic Tern	19000	0.35						
- 000000									

The value in H2 (selected cell) is the value in F2 times 0.621 ... the result is shown, but the cell has the formula



## Apply Formula Again

One way to repeat the formula is to copy-and-paste

End Review								
H3 <b>▼</b> f <sub>8</sub> =F3*0.621								
	В	F G		Н	I			
1	Common Name	Distance (km	Body Len (n	Distance (Mi	i)			
2	Swainson's Hawk	13500	0.52	8383.5				
3	Wheatear	13500	0.16	8383.5	·			
4	Willow Warbler	15500	0.11	9625.5				
5	Short-tailed Shearwa	12500	0.43	7762.5				
6	Long-tailed Skua	16000	0.51	9936				
7	Arctic Tern	19000	0.35	11799				
8					œ.			
9	Notice the formula							
10	Notice the formula							



## Filling Replicates Formulas

#### Fill is a spreadsheet shortcut for copyand-paste

1 2	1 2 2 5 2 5 5 2					
ŀ	d2 <b>▼  f</b> ≥ =F2*0.62	G	Н			
	В	F	G	Н	Len (n	Distance (Mi)
1	Common Name	Distance (km	Body Len (n	Distance (Mi)	0.52	
2	Swainson's Hawk	13500	0.52	8383.5	0. 0	8383.5
3	Wheatear	13500	0.16	<b></b>	0.11	
4	Willow Warbler	15500	0.11		0.43	7762.5
5	Short-tailed Shearwa	12500	0.43		0.51	9936
6	Long-tailed Skua	16000	0.51	fill tab	0.35	11799
7	Arctic Tern	19000	0.35			<b></b>
8						

\* Grab the fill tab with the cursor and pull in the direction to be pasted It's Magic!



#### Relative & Absolute Addr

## Reference to cells happens in 2 ways: Relative and Absolute (with \$)

```
* F2 relative column, relative row
```

\* F\$2 relative column, absolute row

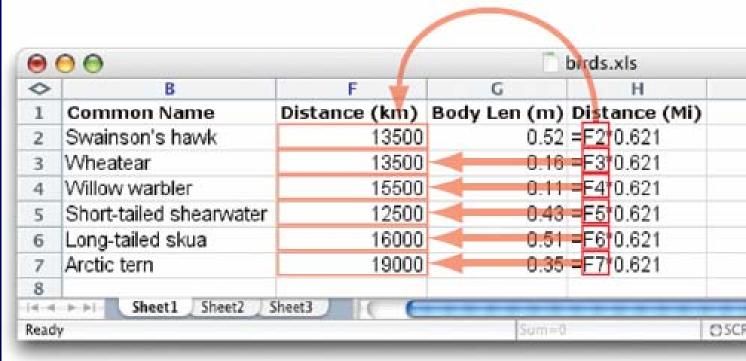
\* \$F2 absolute column, relative row

\* \$F\$2 absolute column, absolute row

Relative references change when pasted/filled; absolute references do not change Your intent determines which to pick



#### A Powerful Translation



The graphic shows the equations in the cells with the translation: The row changes going down, but the column doesn't



### A Example

# Creating a discount table is case of using both relative and absolute refs

- \* Consider store credit of \$1 per \$10 spent
- \* \$3 store credit for every 2 CDs (1 earns \$1)

	1	2	3	4	5	6	7	8	
\$10.00	\$2.00	\$4.00	\$5.00	\$7.00	\$8.00	\$10.00	\$11.00	\$13.00	
\$20.00	\$3.00	\$5.00	\$6.00	\$8.00	\$9.00	\$11.00	\$12.00	\$14.00	
\$30.00	\$4.00	\$6.00	\$7.00	\$9.00	\$10.00	\$12.00	\$13.00	\$15.00	
\$40.00	\$5.00	\$7.00	\$8.00	\$10.00	\$11.00	\$13.00	\$14.00	\$16.00	
\$50.00	\$6.00	\$8.00	\$9.00	\$11.00	\$12.00	\$14.00	\$15.00	\$17.00	
\$60.00	\$7.00	\$9.00	\$10.00	\$12.00	\$13.00	\$15.00	\$16.00	\$18.00	

A cell is based on first column, top row data *in that row and column* ... must mix relative and absolute references



#### Series

## Another handy property of fill is that it can make a series based on constants

- \* Fill Sunday => Monday, Tuesday, Wed...
- \* Fill 22 Feb => 23 Feb, 24 Feb, 25 Feb, ...

### More generally

- \* Series fill will even count using a constant
- \* Counting by odd sizes: give 1st two items