Test Your Tech

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A. Only happens on laundry day.
B. Is covered with food during holiday meals.
C. Helps answer "what-if" questions.

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Announcement

- Software for rest of quarter
  - Microsoft Excel in Lab 10
  - Microsoft Access for the rest of the labs and Project 3
    - Microsoft Access—PC's only
    - Mac users will have to use the labs on campus
    - No Mac equivalent

Announcements

- Free copy of Access, Windows 7, etc., for educational/academic use:
  - Links on Computing page on Course Web site
    - Search for CSE or INFO to find the link on the page
    - Username is your full UW email address
    - Password is different!
      - Click on "send a reminder"
      - Check wherever your email forwards to

Announcements

- Readings
  - Today—Ch 15
  - Wednesday—Ch 16

Announcements

- Project 2B due Wednesday night at 10pm
- Drop-In Labs
  - Tuesday 8:30am MGH 430
  - Tuesday 5pm MGH 430
  - Wednesday CLUE Tutoring 7pm MGH 058
    - 2 pts extra credit per CLUE session

Announcements

- Lab 10 due Friday night at 10pm
- Drop-In Labs
  - Thursday 8:30am MGH 430
  - Friday 1:30pm MGH 430

Announcements

- Tight deadlines for rest of course
  - No extensions
- No lab time scheduled for Project 3A

FIT 100–Fluency with Information Technology

Unit III: Data Storage, Transfer, and Retrieval

Keeping your private information private and secure

D.A. Clements

Where we've been. . .

- Unit I—Connections
  - Hardware, networks, protocols, Internet, Web, building Web pages
- Unit II—Programming
  - Concepts common to all programming languages
- Unit III—Data
  - Storage, retrieval, transfer

Unit III: Data

- Storage
  - Format—physical and logical
- Retrieval
  - The information you need when you need it
- Transfer
  - Between people, departments, organizations
  - Media—spreadsheets, databases, XML

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 worksheets

- Rows or columns represent a single data type
  - They will be operated on 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, etc.
- Operating on all elements of a column (or row) is an iteration, though not the World Famous Iteration
- Setting a cell to a formula is an (unevaluated) *assignment statement* with cells as variables
- The formula is an expression
- Functions are built-in expressions

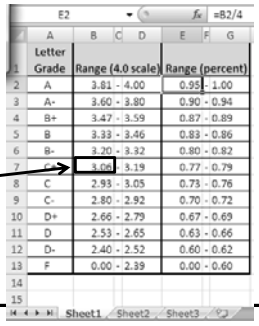
Think of spreadsheets as a handier interface for calculating than JavaScript

Familiar Terminology

column heading

row name

cell



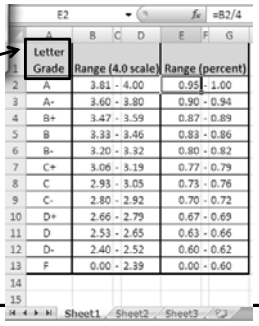
	A	B	C	D	E	F	G
1	Letter Grade	Range (4.0 scale)			Range (percent)		
2	A	3.81 - 4.00			0.95 - 1.00		
3	A-	3.60 - 3.80			0.90 - 0.94		
4	B+	3.47 - 3.59			0.87 - 0.89		
5	B	3.33 - 3.46			0.83 - 0.86		
6	B-	3.20 - 3.32			0.80 - 0.82		
7	C+	3.06 - 3.19			0.77 - 0.79		
8	C	2.93 - 3.05			0.73 - 0.76		
9	C-	2.80 - 2.92			0.70 - 0.72		
10	D+	2.66 - 2.79			0.67 - 0.69		
11	D	2.53 - 2.65			0.63 - 0.66		
12	D-	2.40 - 2.52			0.60 - 0.62		
13	F	0.00 - 2.39			0.00 - 0.60		
14							
15							

Familiar Terminology

column heading

row name

cell



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13	F	0.00 - 2.39			0.00 - 0.60		
14							
15							

Familiar Terminology

column heading

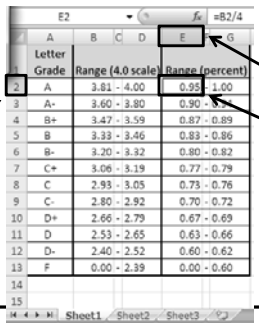
row name

cell

formula

column name

referenced cell E2



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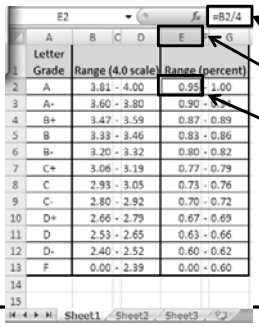
13	F	0.00 - 2.39			0.00 - 0.60		
14							
15							

Familiar Terminology

formula

column name

referenced cell E2



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13	F	0.00 - 2.39			0.00 - 0.60		
14							
15							

Formulas

The data in a spreadsheet can be manipulated using formulas

D2 =B2*0.621

	A	B	C	D
1	Common Name	Distance (km)	Body Length (m)	Distance (mi.)
2	Swainson's Haw	13500	0.52	8383.5
3	Wheatear	13500	0.16	
4	Willow Warbler	15500	0.11	
5	Short-tailed She	12500	0.43	
6	Long-Tailed Sku	16000	0.51	
7	Arctic Tern	19000	0.35	

The value in D2 (selected cell) is the value in B2 times 0.621…the result is shown but the cell has the formula.

Apply Formula Again

The data in a spreadsheet can be manipulated using formulas

D3 =B3*0.621

	A	B	C	D
1	Common Name	Distance (km)	Body Length (m)	Distance (mi.)
2	Swainson's Haw	13500	0.52	8383.5
3	Wheatear	13500	0.16	8383.5
4	Willow Warbler	15500	0.11	9625.5
5	Short-tailed She	12500	0.43	7762.5
6	Long-Tailed Sku	16000	0.51	9936
7	Arctic Tern	19000	0.35	11799

Notice the formula.

Filling Replicates Formulas

Fill is a spreadsheet shortcut for copy-and-paste.

D2 =B2*0.621

	A	B	C	D
1	Common Name	Distance (km)	Body Length (m)	Distance (mi.)
2	Swainson's Haw	13500	0.52	8383.5
3	Wheatear	13500	0.16	
4	Willow Warbler	15500	0.11	
5	Short-tailed She	12500	0.43	
6	Long-Tailed Sku	16000	0.51	
7	Arctic Tern	19000	0.35	

Fill tab

D
Distance (mi.)
8383.5
8383.5
9625.5
7762.5
9936
11799

Grab the fill tab and pull in the direction to be pasted.

It's magic!

Relative & Absolute Addressing

- References to cells happens in two ways: Relative and Absolute (with $)
  - F2 relative column, relative row
  - F$2 relative column, absolute row
  - $F2 absolute column, relative row
  - F2 absolute column, absolute row

Relative references change when pasted/filled; absolute references do not!

Your intent determines which to pick.

A Powerful Translation

C11

	A	B	C	D
1	Common Name	Distance (km)	Body Length (m)	Distance (mi.)
2	Swainson's Haw	13500	0.52	=B2*0.621
3	Wheatear	13500	0.16	=B3*0.621
4	Willow Warbler	15500	0.11	=B4*0.621
5	Short-tailed She	12500	0.43	=B5*0.621
6	Long-Tailed Sku	16000	0.51	=B6*0.621
7	Arctic Tern	19000	0.35	=B7*0.621

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

An Example

Creating a discount table uses both relative and absolute refs

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

	CDs Purchased							
Spent	1	2	3	4	5	6	7	8
$10	$2.00	$4.00	$5.00	$7.00	$8.00	$10.00	$11.00	$13.00
$20	$3.00	$5.00	$6.00	$8.00	$9.00	$11.00	$12.00	$14.00
$30	$4.00	$6.00	$7.00	$9.00	$10.00	$12.00	$13.00	$15.00
$40	$5.00	$7.00	$8.00	$10.00	$11.00	$13.00	$14.00	$16.00
$50	$6.00	$8.00	$9.00	$11.00	$12.00	$14.00	$15.00	$17.00
$60	$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

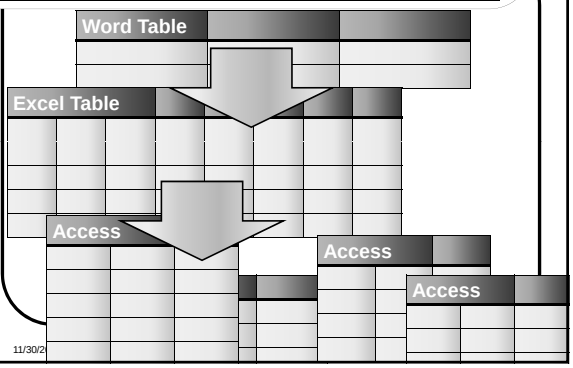
Series

- 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

Excel vs. Access…

SPREADSHEET VS. DATABASE

Tables



Advantages of Spreadsheets

- Familiar format of rows and columns
- Can work directly with the data
- "What-If" scenarios
- Involved computations like taxes
- Storing lists

Microsoft reports that….

- 70% of Excel users use it like a database

Databases are better…

- When you…
  - Have a lot of spreadsheets
  - Need to pass data back and forth between spreadsheets
  - Scroll a lot to find answers
  - Have a lot of repetitious data, like
    - Many contacts at same company with
    - Repeated company address for each one

Databases are better

- No repetition
- Can search for exactly the data you need
  - Solves the problem of information overload

Example

- List all students who received a "B"
  - Spreadsheet
    1. Sort the data
    2. Scroll (and scroll) to find those in the "B" range
  - Database
    1. Query for students who received a "B"
       - Results: All the students and only the students who received a "B"

Database Advantage

- You can
  - Save a query for later
    - Use over and over and over again
  - Edit the query later
  - Copy the query
  - Format an attractive report that prints every time you run the query

The Database Disadvantage

- It takes time to set up the database and make sure it's working properly
- Spreadsheets are easier, faster to set up
  - If they're small

How do you decide?

- Do changes made in one spreadsheet force you to make changes in another?
- Do you have several spreadsheets containing similar information (such as separate sheets with inventory for Dallas, D.C., and Detroit)?
- Do you want some data to be hidden from some users?

How do you decide?

- Can you see all pertinent data on one screen or do you have to keep scrolling?
- Are several people accessing the data at the same time?
- Do you have a hard time viewing the specific sets of data you want?
- Is the data you want divided among one or more spreadsheets?

Move to a database if…

- You answered "yes" to at least 2 of these questions

Next lecture…

- We'll continue to look at data storage, transfer, and retrieval
- Read Chapter 16