COMPSCI 111 / 111G

Mastering Cyberspace:
An introduction to practical computing

Spreadsheets

The 1st Killer App. VisiCalc

- The idea for the electronic spreadsheet came to me while I was a student at the Harvard Business School, working on my MBA degree, in the spring of 1978. Sitting in Aldrich Hall, room 108, I would daydream. "Imagine if my calculator had a ball in its back, like a mouse..." (I had seen a mouse previously, I think in a demonstration at a conference by Doug Engelbart, and maybe the Alto).

- And "..imagine if I had a heads-up display, like in a fighter plane, where I could see the virtual image hanging in the air in front of me. I could just move my mouse/keyboard calculator around, punch in a few numbers, circle them to get a sum, do some calculations, and answer '10% will be fine!'" (10% was always the answer in those days when we couldn't do very complicated calculations...)

- Source: www.bricklin.com/history/intro.htm

Development

- **Background**
  - Dan Bricklin and Bob Frankston
  - VisiCalc released in 1979.

Design

- **Visible Calculator**

  - Organize calculations as we would on paper - in columns and rows.

  - Supports automatic updating of calculations.

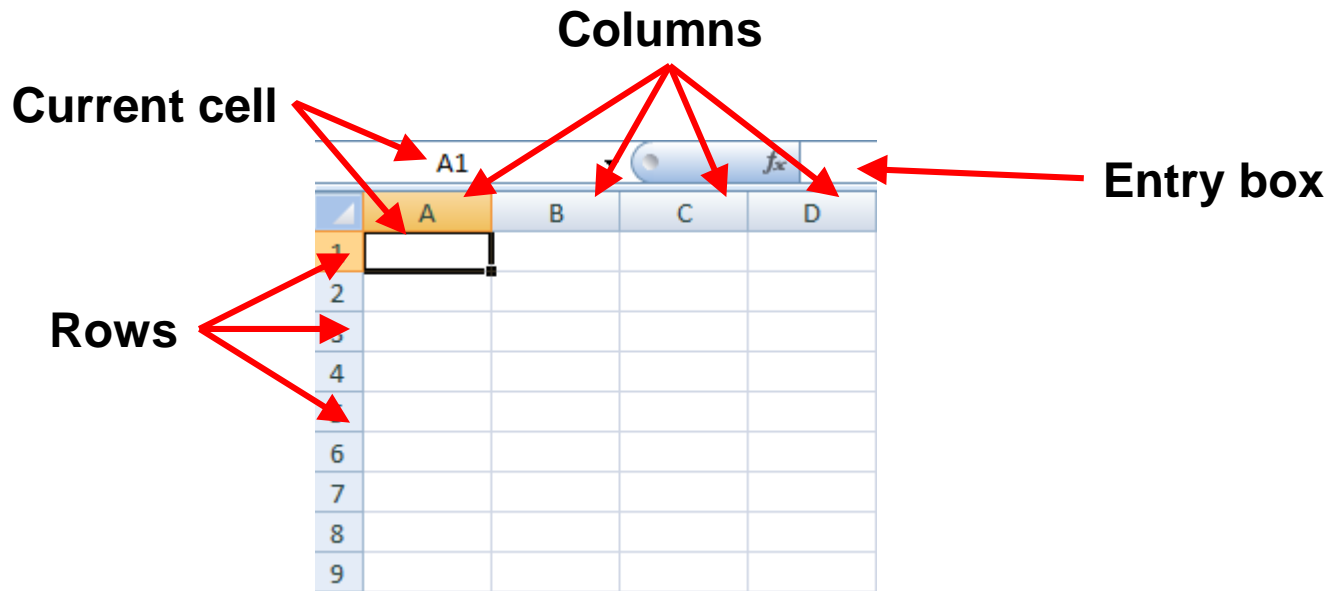 - Copy formulas so we may apply these to large amounts of data.
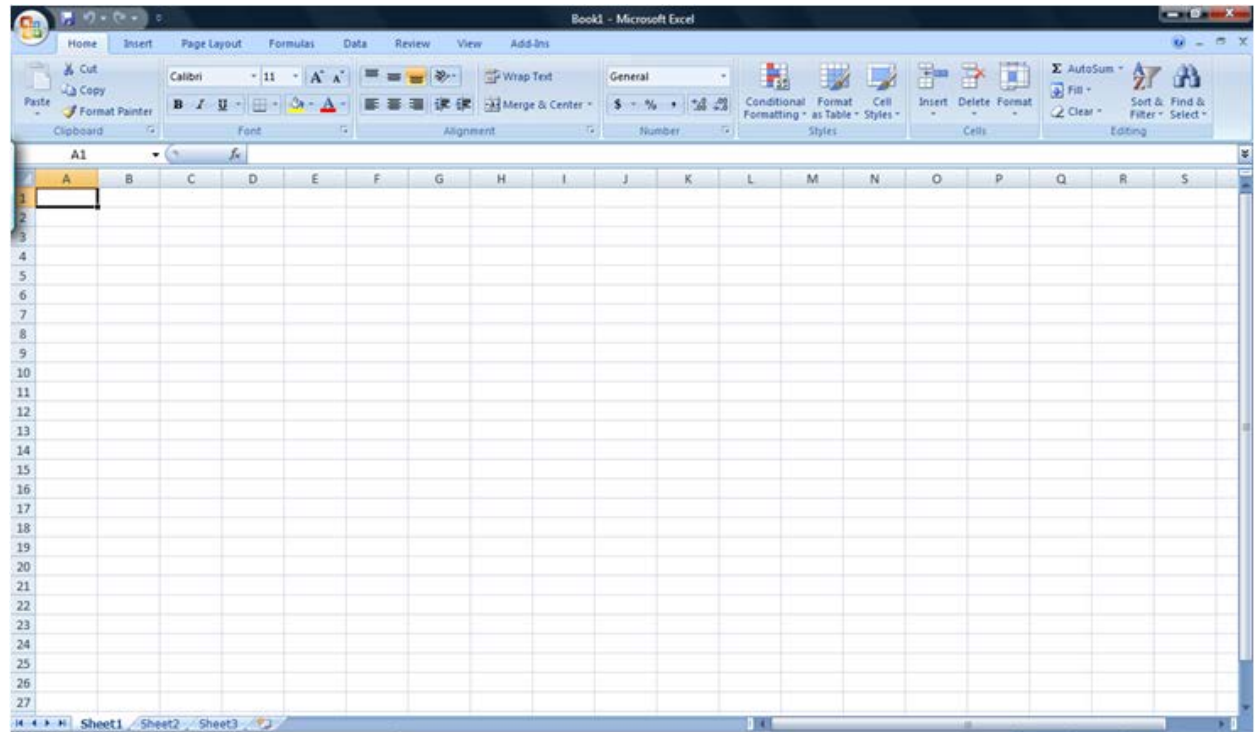
Microsoft Excel - Overview

- **Used to represent a table of data**
  - Rows (labelled with numbers)
  - Columns (labelled with letters)
  - Cells

http://en.wikipedia.org/wiki/Microsoft_Excel

Changing appearance of cells
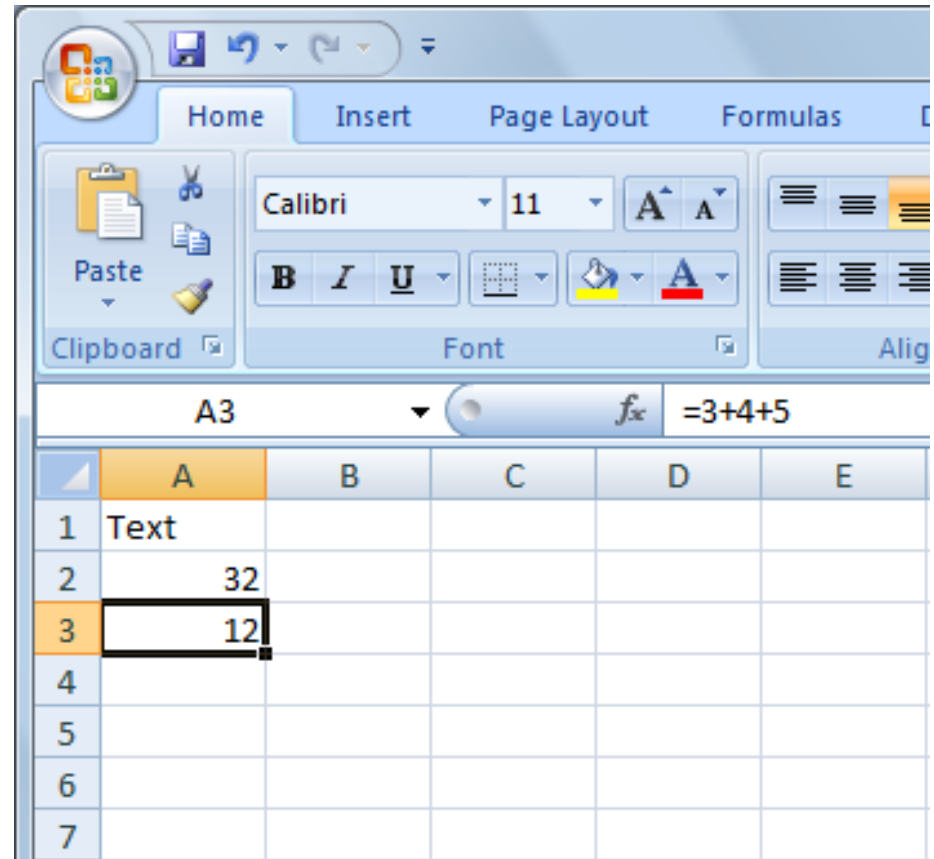
- **Alter Size**
  - Click on cell separator and drag

- **Add Borders**
  - Format Cell

- **Add Shading**
  - Format Cell

- **Font**
  - Style
  - Size
  - Alignment

- **Numbers**
  - Decimal points

Entering Data

- **Cells contain**
  - Text
  - Numbers
  - Formulae
    (start with "=")

- **Entry box**
  - Type data in entry box
  - Hit Enter key to accept value
  - All formulae are recalculated
  - Results shown in each cell

Formulae

- **Entering formulae**
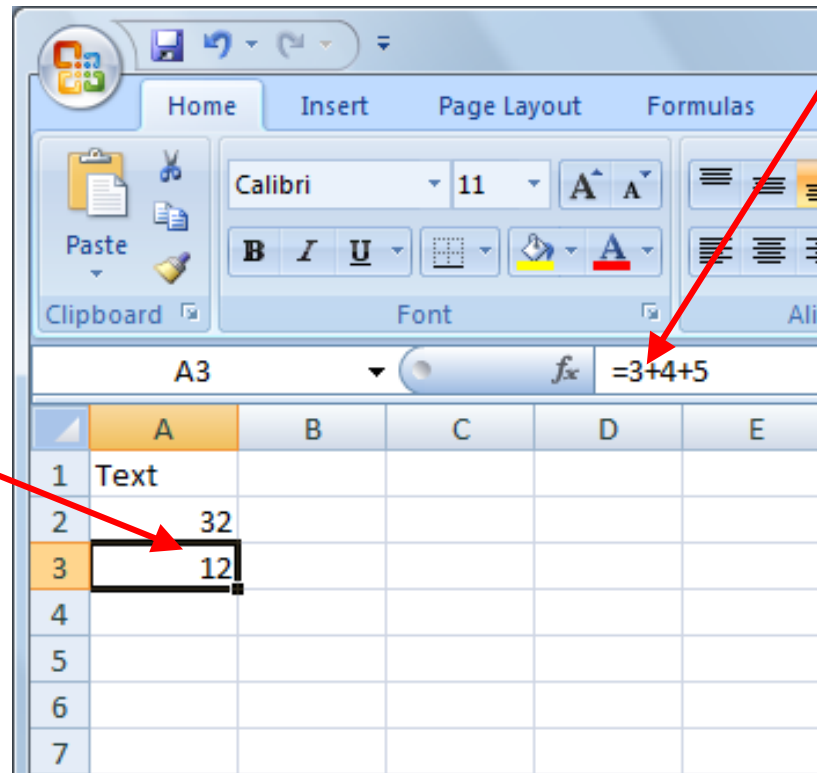 - Always begin with an equals sign
  - Calculation typed into entry box
  - Result displayed in the cell

Formula

Result

Using Cell References

- **Cell Reference**
  - Formulae refer to other cells
  - Specify cell location using Row and Column IDs

Filling Down and Filling Right

- **Save time**
  - Fill many cells with same contents
  - Select a group of cells
  - Fill Right
  - Fill Down

Filling Cells with Formulae

- **Use Fill Down/ Fill Right on formulae**
  - Saves us entering new formula for each row

| | | | | D5 | | ▼ | ○ | f_x | =B5+C5 |

◢	A	B	C	D	E	F
1						
2		Hours Worked				
3						
4	Name	Monday	Tuesday	Total		
5	Paul	24	12	36		
6	Sebastian	4	20			
7	Stefan	1	5			
8	Ali	2	11			
9						
10						

  - D5 should contain   =B5 + C5
  - D6 should contain   =B6 + C6
  - D7 should contain   =B7 + C7
  - D8 should contain   =B8 + C8

Relative References

- **Cell reference in formula**
  - Use same formula, different cell references
  - Cell reference is relative to position of formula
  - Spreadsheets adjust formula automatically during fill operation

D5		▼	⬤	f_x	=B5+C5	
	A	**B**	**C**	**D**	**E**	**F**
1						
2		Hours Worked				
3						
4	Name	Monday	Tuesday	Total		
5	Paul	24	12	36		
6	Sebastian	4	20			
7	Stefan	1	5			
8	Ali	2	11			
9						
10						

=B5 + C5

=B8 + C8

Cell references that don't change

- **Absolute references**
  - Sometimes the cell reference should not change
    - Eg. for constants
  - Use a dollar sign $ before the row or column

E7		f_x	=$B$4		
	A	B	C	D	E	F

	A	B	C	D	E	F
1						
2		Hours Worked				
3						
4	Pay rate:	12				
5						
6	Name	Monday	Tuesday	Total	Pay rate	
7	Paul	24	12	36	12	
8	Sebastian	4	20	24	12	
9	Stefan	1	5	6	12	
10	Ali	2	11	13	12	
11						
12						

formula stays the same

Relative and Absolute references

- **Sometimes formulae require a mixture of references that change and references which are fixed**

	A	B	C	D	E	F	G
1							
2		Hours Worked					
3							
4	Pay rate:	12					
5							
6	Name	Monday	Tuesday	Total	Pay rate	Total Pay	
7	Paul	24	12	36	12	432	
8	Sebastian	4	20	24	12	288	
9	Stefan	1	5	6	12	72	
10	Ali	2	11	13	12	156	
11							

= D7 * \$B\$4

Exercises

Exercise 1: Is the reference to cell D6 in the formula =$D$6*2 a relative or an absolute reference?

Imagine that you are keeping track of the sales for tickets at the Olympic games. A number of different sports are located in different venues. Each venue has a number of seats available. Your spreadsheet will keep track of the number of tickets available and the number actually sold.
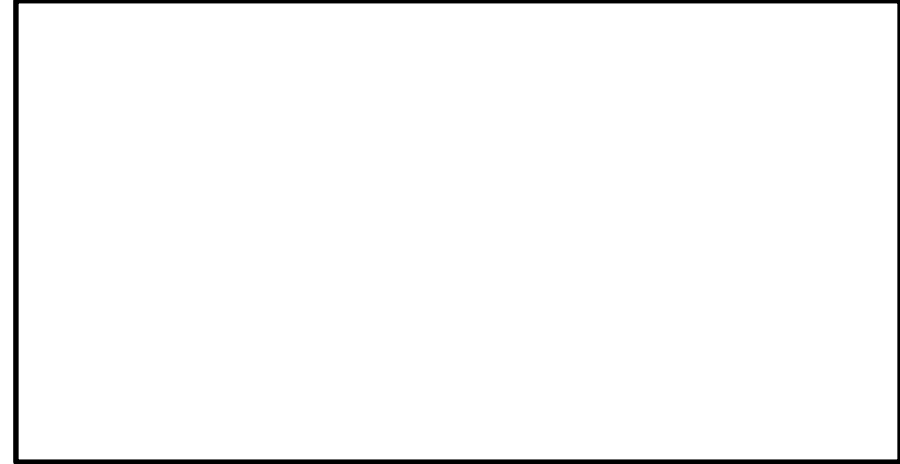
Exercise 2: Given the following spreadsheet, what formula would you use in cell D6 to calculate the number of tickets remaining?

	A	B	C	D
1		Ticket Sales		
2				
3	Price	$10.00		
4				
5	Event	Tickets Available	Tickets Sold	Remaining
6	Cycling	4000	2000	2000
7	Weightlifting	2000	750	1250
8	Triathlon	1000	100	900
9	Football	3000	3000	0
10	Badminton	5000	4500	500
11		15000	10350	4650

Exercises

Exercise 3: What formula would you use in cell E8 to calculate the money made from ticket sales?

	A	B	C	D	E
1		Ticket Sales			
2					
3	Price	$10.00			
4					
5	Event	Tickets Available	Tickets Sold	Remaining	Sales
6	Cycling	4000	2000	2000	$20,000.00
7	Weightlifting	2000	750	1250	$7,500.00
8	Triathlon	1000	100	900	$1,000.00
9	Football	3000	3000	0	$30,000.00
10	Badminton	5000	4500	500	$45,000.00

Exercise 4: What formula would you use in cell B11 to calculate the total number of tickets available?
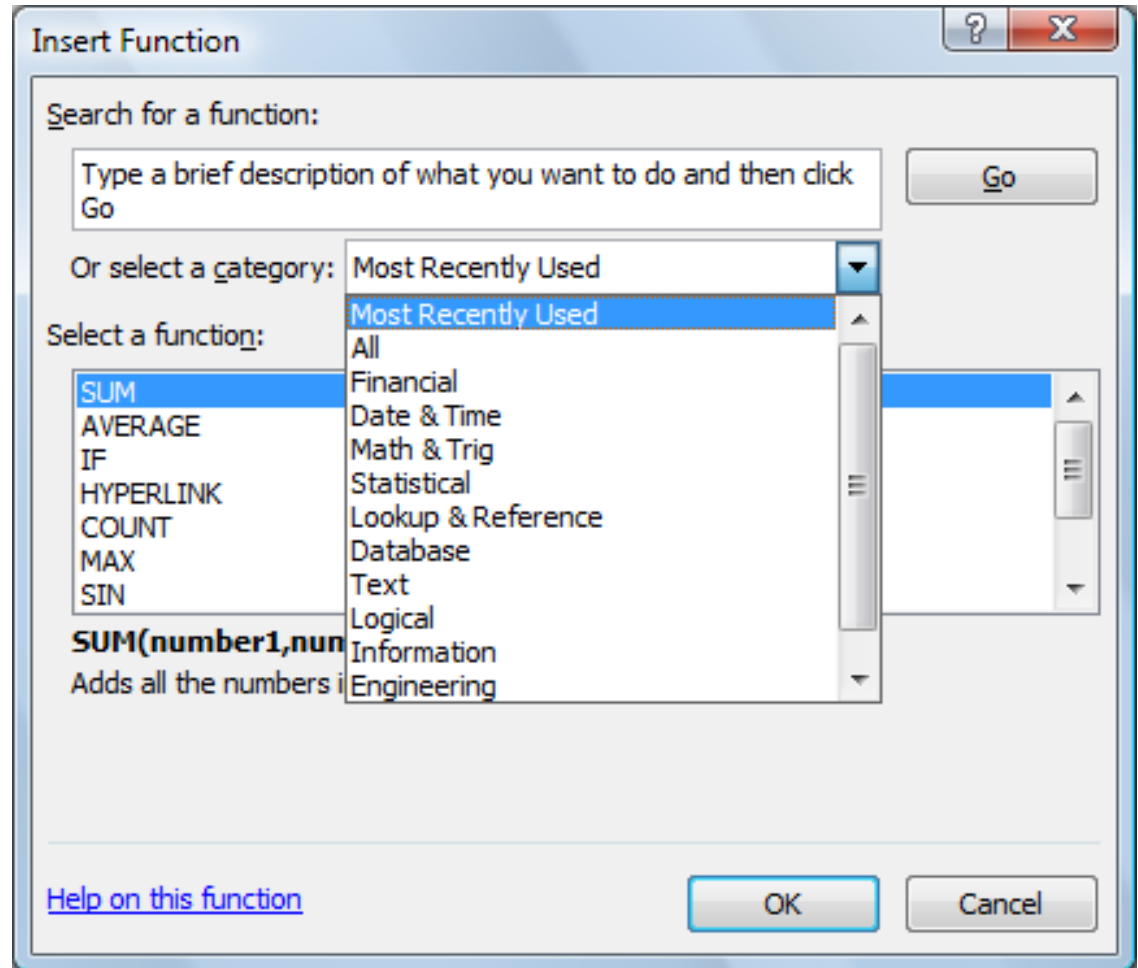
	A	B	C	D	E
1		Ticket Sales			
2					
3	Price	$10.00			
4					
5	Event	Tickets Available	Tickets Sold	Remaining	Sales
6	Cycling	4000	2000	2000	$20,000.00
7	Weightlifting	2000	750	1250	$7,500.00
8	Triathlon	1000	100	900	$1,000.00
9	Football	3000	3000	0	$30,000.00
10	Badminton	5000	4500	500	$45,000.00
11		15000	10350	4650	$103,500.00

Using built-in functions

- **Insert a Function**
  - Many categories
  - Help is useful

Functions

- **Many functions exist**
  - Allow us to make more complicated formulae
  - Examples
    - SUM
    - MAX
    - MIN
    - AVERAGE

- **Specifying a range of cells**
  - Top Left cell
  - Bottom Right cell
  - B6:C10

Functions

- **Format of Excel functions:**

`=nameOfFunction(comma separated list of parameters)`

- **Examples:**

`=SUM(5,6,7)`

`=AVERAGE(A2:D2)`

Boolean Logic

- **Boolean value**
  - True or False
  - 2-valued logic

- **Compare two different values**
  - =
  - >
  - <
  - >=
  - <=

- **Example. Are the following true or false?**
  - =(3 = 4)
  - =(4 < 6)
  - =(MAX(5, 6) = 5)
  - =(SUM(1,2,3) = 6)

IF functions

- **Makes a decision**
  - Different values used in the cell depending on the logical test

- **IF(logical_test , value_if_true, value_if_false)**

Must be either true or false
- value
- condition (test)
- boolean function

This value appears
in the cell if the
boolean is true

This value appears
in the cell if the
boolean is false

Boolean Functions

- ## AND(a, b)
  - True only when a and b are both true

- ## OR(a, b)
  - True if either a is true or b is true

- ## NOT(a)
  - True only when a is false

- ## Are the following formulae TRUE or FALSE?
  - =AND(3 = 4, 2 = 2)
  - =OR(7 < 5, 3 > 3)
  - =NOT(3 = 2)
  - =OR(AND(2 = 3, 4 > 3), NOT(2 = 3))