Spreadsheets
Lecture 19 – COMPSCI 111/111G SS 2018

"Autosum aside, these numbers just don't add up."

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…)

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

Columns

Current cell

Entry box

Rows

A1

A B C D E F

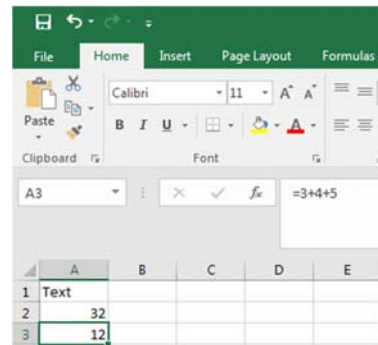1 2 3 4 5 6 7 8
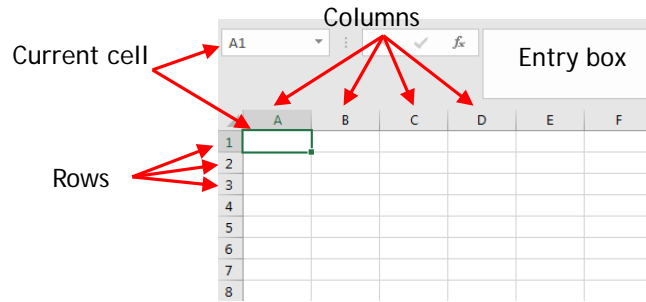
http://en.wikipedia.org/wiki/Microsoft_Excel

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
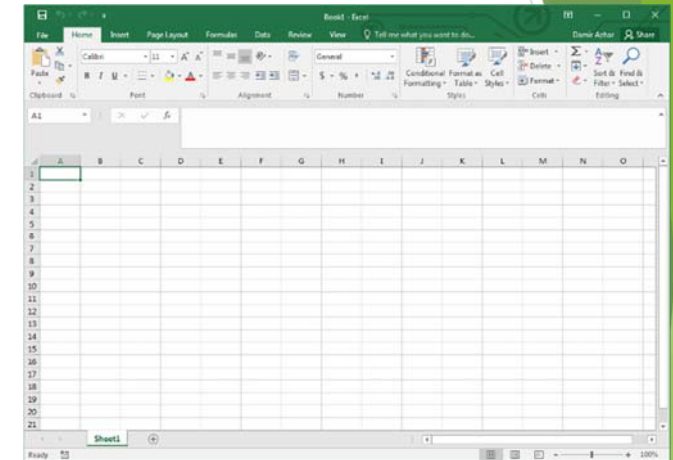
Entering Data

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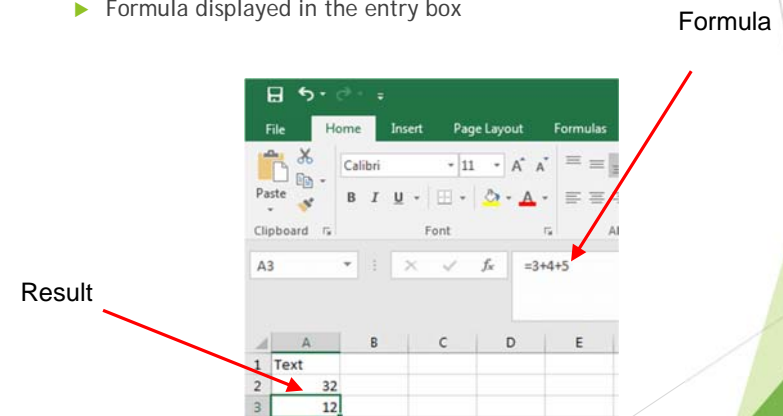 - Text
  - Numbers
  - Formulae
    (start with "=")

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

Formulae

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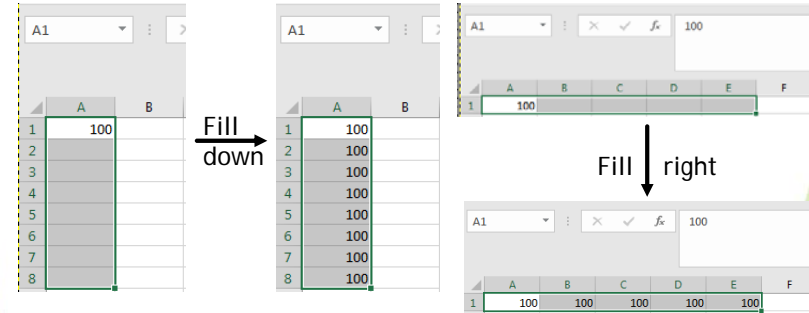
Formula

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 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

=B5 + C5

=B8 + C8

Absolute references

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

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

E7 =D7*B4

= D7 * B4

Exercises

Exercise 1: Is the reference to cell D6 in the formula =D6*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

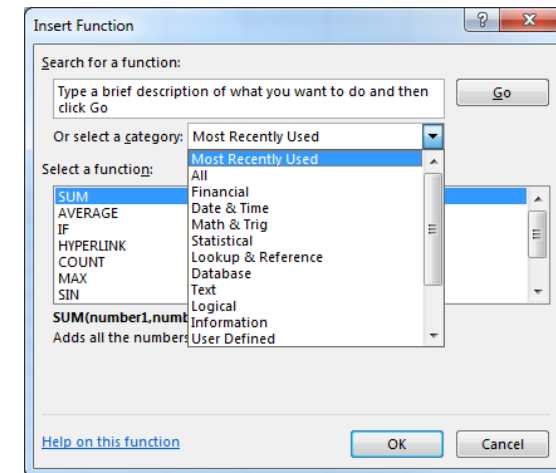Exercise 3: What formula would you use in cell E8 to calculate the money made from ticket sales?

	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

Insert Function

Search for a function:

Type a brief description of what you want to do and then click Go   Go

Or select a category: Most Recently Used

Select a function:

SUM
AVERAGE
IF
HYPERLINK
COUNT
MAX
SIN

Most Recently Used
All
Financial
Date & Time
Math & Trig
Statistical
Lookup & Reference
Database
Text
Logical
Information
User Defined

SUM(number1,numb

Adds all the numbers

Help on this function   OK   Cancel

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)

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))

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