Spreadsheets

With Microsoft Excel® as an example
Reading

- Chapter One and Three
Exercises

- Those in the text of chapters one and three.
- The “Problems” section is not required.
Purpose

- Originally for Accounting & Forecasting
- Currently for all types of computation.
- In addition:
  - Used for database retrieval
  - Used for data collection & Forms
Capabilities

- Formatting Data
- Intelligent Data Entry
- Common Interface
- Calculations
- Charts & Graphs
- Programming
- Database Functions
Formatting Data

- The ability to get data to look the way you need it to.
  - Esthetic values
    - Good presentations
  - Can go beyond esthetics
    - Significant Digits
    - Important values displayed in alternate format
Intelligent Data Entry

- Protect from Unreasonable Values
  - By Type
  - By Range
- Give intelligent Defaults
  - Duplicates earlier entries that have the same starting letters.
Common Interface

- Single interface for a variety of applications
  - Most engineers know spreadsheets
    - Today that means Excel®
  - Convenient interface for numbers
  - On most computers in large firms - and WSU
Calculations

- Makes Creating a Set of Calculations Easy
  - Lots of built in functions
  - Easy to check portions of calculations

- Perform Small to Medium Complexity Calculations
  - Truly large calculations require dedicated programs.
Excel provides a multitude of charts and graphs for presenting results.

- Bar Charts, Line Graphs, Scatter Plots, and many, many more.
- Easy to generate from existing data.
- Makes data visualization easy.
Programming

- Excel is extensible through its programming language.
  - Excel provides a consistent interface.
  - The programming language allows the generation of small to very large programs.
  - Programming is done in Visual Basic
Database Functions

- A spreadsheet can be used as a database table.
  - A worksheet can be a full blown database.
  - Queries can be performed on small to medium data sets.
  - Dedicated databases can be queried to fill the spreadsheet.
Excel’s Parts

- Worksheet
- Row and Column Indicator
- Cell
  - Contents are data or formula
  - Address
- Current Cell Indicator
- Formula Bar
More Parts

- Workbook
  - Contains Worksheets and Charts
- Current Sheet
Limits

- Rows: 65,536
- Columns: 256
- Formula Length: 1024 Chars.
- Text Length: 32,000 chars.
- Sheets in Workbook: Memory.
- Last Date Allowed: Jan. 1st, 9999
- Number of Colors: 56
Effect of Limits

- Some problems cannot be handled because of size.
- Some problems cannot be handled because of computational complexity (how long they run).
- Rarely a problem in the work world. (But be aware!)
Simple Example

- Adding 2 and 2
- Type = into cell
- Follow = with 2 + 2
- Result is displayed in cell.
What happened?

- The equal sign indicates its an equation.
- The plus sign is an operator, adding the values to the right and left of it.
- So, the cell becomes equal to $2 + 2$
More complex

- $= 2 + \frac{3}{10^2}$
- What happened?
- **Order of Precedence of Operators**
  - Rewrite as: $=((2+3)/10)^2$
Order of Precedence of Operators

(  )
-   
^   
*   /  
+   -

• Negation isn’t subtraction.
• Be careful: This is a common source of errors.
Adding variable values

- Variables are necessary for general solutions
- Cells can be referenced by formulas by including their address.
  - Address is the column and row indicator.
Quadratic Formula

\[-b \pm \sqrt{b^2 - 4ac} \over 2a\]

Becomes:

\[= (-b + (b^2 - 4ac)^{0.5}) / (2 \times a)\]
Variables

\[ (-b + (b^2 - 4a^2c)^{0.5})/(2a) \]

a, b, and c are variables.

- In a spreadsheet we can:
  - Replace them with constants
  - Use cell addresses, or
  - Create named cells (later class)
Cell Addresses

- Cell Column (a letter or two)
- Cell Row (a number)
- A4 is the cell in column A, row 4
- B6 is the cell in column B, row 6
Rewriting the Formula

- Given the spreadsheet

- We get:

\[ =(-E2+(E2^2-4*D2*F2)^0.5)/(2*D2) \]
Moving Formulas

- If you fill down the formula and move it, the address change to refer to cells in the same relative position.
- This is nice for making tables.
- If we copy the previous address down one cell we get:

\[ (-E3+(E3^2-4*D3*F3)^0.5)/(2*D3) \]
What if we don’t want this?

- The $ is a “protector”.
- Any address with $ in it does not change when moved.
  - =A1 moved down one cell becomes =A2
  - =$A$1 moved down one cell becomes =$A$1
Functions

Excel has built in functions for many tasks:

- \(\text{COS}(B7)\)
  - Gives the cosine of the value held in cell B7

- \(\text{NOW}()\)
  - Gives the current time.

- \(\text{SQRT}(A17)\)
  - Gives the square root of A17
Range Functions

- Some functions take a series of values.
- Excel calls this a range.
- =SUM(A1:G7)
  - Sums the values of the cells in the A1:G7 block.
- =AVERAGE(A:A)
  - Sums all the values in column A
Range Addresses

- Ranges are rectangular blocks of cells.
- They are defined by two cells addresses split by a colon.
  - These cells form the corners of the block.
- They can be any size from one cell to thousands.
Example: Grade Book

- Traditional grades are averaged, or subsets of the grades are averaged and the results given a weight.
- How would this work with the tools we have seen so far?
Array “Functions”

- Some function return multiple values.
  - Frequency counts are an example.
  - Takes a range of values, and a range of bins, and returns a range telling how many values are in each bin.
Next Time

- Charts and Graphs
- Macros