Spreadsheet Basics
Working with numbers

What is a Spreadsheet
- Electronic version of the old paper accounting spreadsheets
- A spreadsheet is a grid of columns and rows which is used primarily for numerical calculations, but also may be used as a data management tool

Spreadsheets Features
- Numbers
- Text or labels (identifies the numbers)
- Numeric formulas or equations are created within a spreadsheet
  - Allows for rapid recalculation.
  - What if analysis
- Graphs
  - Visual display of numbers
- Data management
  - Organize data & simple data management

Uses of Spreadsheets
- Financial
  - Budgets, balance sheets, sales forecasting, payroll, taxes, investment proposals, mortgage calculations, and other accounting and financial applications
- Scientific
  - Analyzing and comparing scientific data, tracking changes
- Education
  - Trends in enrollment, student grading, financial aid calculations, tracking courses
- Sales
  - Inventory tracking, sales forecasting, customer trends
- Criminal Investigations
  - Tracking crime in areas, looking for trends, analysis of data
- And many other areas.

Terms
- **Spreadsheet**
  - Row - Horizontal breakdown (numbered)
  - Column - Vertical breakdown (lettered)
  - Cell - where column & row intersect (referred to by column & row)
  - Range - rectangular area
  - Worksheets - 3rd dimension to spreadsheet
- **Worksheets**
- **Numbers** - Any number entered into a spreadsheet.
- **Value** - Any formula or function or number that yields a numeric value.
- **Text or Label** - Characters and/or numbers entered to identify parts of spreadsheet or to add documentation. Or to enter other needed data
- **Formula** - Mathematical or other relationships created between cells. EXAMPLE: =A1+B1 may be a formula in cell C1
- **Functions** - Built-in shortcuts that help the user perform complex computations.
- **Format** - Style in which values or text appear including:
  - fonts: typefaces, size, bold, italic, color
  - numeric styles: currency, percent, e-notation, fixed decimal places, date, time
  - alignment: left, right, justified, centered, centered across columns, vertical placement

More Terms
Building formulas
- Formulas are the backbone of spreadsheets
- Formulas are similar to equations used in algebra but instead of using letters (x, y, z) for variables we use cell references (A1, A2, A3).
- All formulas start with an equal sign =
- Formulas often use mathematical operations

Symbols used in Formulas
<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>Addition</td>
</tr>
<tr>
<td>-</td>
<td>Subtraction</td>
</tr>
<tr>
<td>*</td>
<td>Multiplication</td>
</tr>
<tr>
<td>/</td>
<td>Division</td>
</tr>
<tr>
<td>^</td>
<td>Exponentiation</td>
</tr>
<tr>
<td>( )</td>
<td>Order of operation</td>
</tr>
</tbody>
</table>

If no order is specified, Exponentiation occurs first, followed by multiplication/division and last addition/subtraction.

Cell References
If the information is elsewhere in the spreadsheet NEVER re-type the information. Just Refer to Cells
Also consider storing numbers in a separate cell if needed in more than one formula then refer to that cell.

Example
<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Sales</td>
<td>$ 10,567.00</td>
</tr>
<tr>
<td>2 Expenses</td>
<td>$ 8,452.00</td>
</tr>
<tr>
<td>3 Net Income</td>
<td>=B1-B2</td>
</tr>
</tbody>
</table>

The answer to the formula will appear in cell B3 after the formula is entered.

Key Concept
- The key to building successful formulas and hence successful spreadsheets is to Refer to Cells
- when the information exists in another cell

Formatting
Character Formatting | Number Formatting | Cell Formatting
---|---|---
Bold | Currency | Alignment
Italics | $1234.56 | Left
Fonts | Percent | Right
Size | General | Centered
Color | 1234 | Merge & center
      | Fixed Decimal | Background color
      | 12.567 | color
      | Date | 1/21/2009
      | Time | 11:00am

Code for next software assignment- Refer to cells
Functions

- A function is a short cut for a formula or adds additional functionality.
  - Sum - allows us to total a range
  - To total cells from A3 to A10, use the function =sum(A3:A10).
  - Maximum - returns maximum value in range
  - max(range)
  - Minimum - returns minimum value in range
  - min(range)
  - Average - returns average value in range
  - average(range)

Formulas

- Not all formulas need a function
- Calculate percentage – divide whole into part.
- Do NOT place a normal calculation inside a Sum function
  - =SUM(B5*D3/D7) - Incorrect
  - =C5*D3/D7 - Correct
- Functions can be part of a formula
  - =sum(A3:A350)/2

Effective use of Sum function

- Use the sum function only when you need to add more than two cells in a range.
- Do not add each individual cell - Use the SUM function with a range!
  - =B2+B3+B4+B5+B6 - Inefficient
  - =SUM(B2,B3,B4,B5,B6) - Inefficient
  - =SUM(B2:B6) Correct!

Absolute and Relative cell references

- When a formula is copied the cell references in the formula change relative to the new location. This is called relative cell referencing.

Using Absolute Referencing

- Press function key F4 by the cell which needs the absolute reference
- The dollar signs $ indicate that cell column and row should remain the same when copied. You can also type them in instead of pressing $.
- Example:
  - =E3*$E$5

Creating a spreadsheet

- Plan it out!
- Think about what task you need to accomplish
  - What data needs to be input
  - How should the data be labeled
  - What calculations need to be performed
  - What formulas can best perform those calculations
  - Is there any data needed for formulas that can be stored in a cell for referencing
Example
- A company needs to purchase some items. The boss wants to know what the total cost for each item including the taxes on these items. The price, excise tax, and total should be displayed for each item.
- What data needs to be input
  - List of items
  - Prices for these items
- How should the data be labeled
  - Item, Price, Excise Tax, Total

Example (cont)
- What calculations need to be performed
  - Calculate tax on each item
  - Calculate total price for each item
- What formulas can best perform those calculations
  - Calculate tax is a multiplication formula
  - Calculate total is an addition formula
- Is there any data needed for formulas that can be stored in a cell for referencing
  - Excise Tax Rate

Building Spreadsheet
- Enter labeling
- Build the formulas
- Enter data
- Copy formulas as needed
- Format appropriately
- Update as needed

Formulas - REFER TO CELLS
- Most important concept!
- If data is contained elsewhere in a spreadsheet, do NOT type in the data. Refer to cells!
  - NEVER RETYPE NUMBERS
- For data used more than one formula, store in a cell.
  - If the amount changes, it is simple to update the changes.

Formulas - REFER TO CELLS
- Is relative or absolute referencing needed?
  - Will any of the formulas be copied?
  - What cells need to remain absolutely the same when copied, then use absolute cell reference
- When referring to cells on another sheet, include the sheet name followed by !
  - Example: Sheet1!C3
- Code for this lesson “Refer to Cells”

Using Functions
- A function can be a shortcut for a more complex formula.
  - For instance: when summing numbers, one could add each cell. =A1+A2+A3+......+A575
    - Takes too long!
  - The function Sum allows us to total a range =sum(A1:A575)
- Functions consist of a function name and parameters set in parenthesis if more than one parameter is needed the parameters are separated by commas
Common Functions

- ABS(value or cell) - Returns absolute value
  - For negative values this yields a positive value.
- ROUND(value or cell, number of decimal places) - Rounds number to specified decimal places.
  - Round above other than decimal specify a negative number for the decimal places parameter
    - Example: to round cell B5 to the thousands place
      - =ROUND(B5,-3)
  - NOTE: Formatting can make numbers appear rounded, but it does not change the value calculated.

More Functions

- PMT(interest, term, principal) - Returns a payment for a loan given the specified interest, term and principal
  - If calculating monthly payments, divide annual interest by 12.
  - Term is the number of payments.
    - 60 month loan is 60.
    - 20 year loan is 240 (20 years times 12 months)
- IF(condition, ifyes, ifno) - Provides a conditional return.
  - If the condition is met, the if yes parameter is returned otherwise if no parameter is

Embedding Functions

- Embedding or nesting of functions - placing one function inside another.
  - Example: =Round(PMT (B1/12,B2,B3),2)
- Functions can also be embedded in a more complex formula
  - Example: =Sum(A5:A95)*B4+(B59/C3)

Spreadsheet Charts

A picture’s worth a thousand words

Charts (also called Graphs)

- Convey information visually.
  - Quicker to perceive comparisons
- Represent numbers visually
  - A picture is worth a thousand words
  - ...but a picture without words is meaningless -- be sure to label your charts

Types of Charts

- Many different types of charts are available which will help convey the information
- Bar & column
- Area
- Pie
- Line
- Stacked Column
- And many more
Designing a Chart

- Keep it simple
- Decide which information to convey
- Decide how the information should be presented:
  - Most spreadsheets can show the same information in two aspects
    - Series in rows
    - Series in column
  - Select the most appropriate type of chart

Designing a Chart (cont)

- Include only the information needed
  - Don’t include totals if comparing individual amounts (most often for column/bar, line, area types)
  - Select only totals if comparing only the totals (most often for pie charts) but don’t include individual amounts or the grand total.

Two Perspectives

- Data can be shown different ways

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Jan</td>
<td>Feb</td>
<td>Mar</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>CR201</td>
<td>$45,565.00</td>
<td>$43,200.00</td>
<td>$47,500.00</td>
</tr>
<tr>
<td>3</td>
<td>CR202</td>
<td>$35,775.00</td>
<td>$40,500.00</td>
<td>$36,500.00</td>
</tr>
<tr>
<td>4</td>
<td>CR203</td>
<td>$47,000.00</td>
<td>$25,675.00</td>
<td>$46,775.00</td>
</tr>
<tr>
<td>5</td>
<td>CR204</td>
<td>$25,000.00</td>
<td>$48,000.00</td>
<td>$55,500.00</td>
</tr>
<tr>
<td>6</td>
<td>CR205</td>
<td>$67,409.00</td>
<td>$32,456.00</td>
<td>$70,700.00</td>
</tr>
</tbody>
</table>

- Row-wise
- Column wise

About Charts

- Charts update automatically when numbers are changed.
- Charts should contain
  - Labels
    - horizontal (X) & vertical (Y) axis labels
  - Titles
  - Data series portrayed graphically
  - Legends explaining the graph
- Charts may contain
  - Annotations
  - Other images

Managing Spreadsheet Data

and working with long sheets

Tools for Long Worksheets

- Locking Titles
  - Freezing the titles rows or column on the screen
- Split Screen
  - Viewing two parts of a list at once
- Sorting Lists
  - Sorting columns by one or more criteria
- Data Filters
  - Viewing parts of the data
- Data summaries
  - Summarizing specified data
Freezing Titles
- Column and/or row titles can be locked
- Allows titles to remain in place while scrolling
- Position cursor in the cell after the titles
  - If spreadsheet has just column titles, click in the cell in first column on the row just below the titles
  - If spreadsheet has just row titles, click in the cell in first row in column just left of the titles
  - If both columns & row title click in the first data cell after the titles

Split Screen
- Splits the screen so that two parts of the same spreadsheet can be viewed at once.
- Allows for independent scrolling of sections
- Example:

Data Filters
- Shows only the rows specified by the filter
- Excel offers two types of filters
  - AutoFilter (easiest to use)
  - Advanced Filter
    - Filters using a column heads.
    - Select Data contained in column
    - Top ten
    - Custom
    - Boolean logic (AND / OR)
    - Blanks
    - Non blanks

Sorting Data
- Sort list by particular columns
- Sort ascending or descending order
- Create up to three levels of sorts
- Sort options allow sorting non alphabetic lists such as days of the week, months
- Be sure to select complete range to be sorted

Autofilter Example
- Note the down arrows, click on these to create filter
  - AutoFilter on Course = ICS101
Advanced Filter

- Filtering a list of courses with fill rates set at different rates for each of three campuses
  - This type of criteria cannot be accomplished through autofilters.
- Criteria range has been added to top of worksheet and is the first 4 rows

Data Summaries

- Summarize data in lists
- List must be sorted first on categories to be summarized
  - One of the columns such as course number
- Various columns can be summarized
  - Sum, Average, Count, Max Min, etc.
- Subtotal function can be automatically inserted
- Details can be hidden and just summaries shown

Just the Summary Data

- Shows just the subtotals for each course and the grand total. No data rows are shown
- Note the 1 2 3 in the upper left hand corner
  - Click on 2 to see the subtotals
  - Click on 1 to see just the grand total
  - Click on 3 to bring back the data rows

Example

![Example Table Image]

Example of Summary

- Subtotals for each course, summing the seats filled column

Just Summaries Example

![Just Summaries Example Image]
**More Functions**

- **vlookup (lookup item, range to look in, column)**
  - Looks vertically through a range to find the lookup item in the left hand column of the range.
  - Yields the contents of a cell in the same row in the column you specify.
  - **Lookup item** – refer to the cell that contains the item you wish to look up.
  - **Range to look in** – refer to the range you wish to search
  - **Column** – a number greater than 1 which is the column of the range from which the data is needed. The lefthand column is 1, the next column over is 2.

- **hlookup (lookup item, range to look in, row)**
  - Similar to Vlookup but looks horizontally at top row

**More Functions (cont.)**

- **rand ()**
  - Yields a random decimal number between 0 and 1
  - Multiply by a number to yield a number larger than 1
    - For a random number between 0-10
    - Multiply by 10
    - Round to 0 decimal places
      - =round(rand()*10,0)

- **randbetween(low number, high number)**
  - Similar to rand, but yields a random number between and including the low and high numbers specified

**What If Analysis**

- **What if Analysis**
  - Allows us to vary and compare data

- **Methods**
  - **What If - Table**
    - Produces a matrix of varying data along horizontal and vertical, and fills in data answers to varying the data
  - **What If - Goal Seek**
    - Input the desired amount and indicate which cell to vary