Spreadsheet Basics

Working with numbers

**What is a Spreadsheet**
- Digital 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

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### 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**

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### More Terms
- **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

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### 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

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### 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></th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sales</td>
<td>10,567.00</td>
</tr>
<tr>
<td>2</td>
<td>Expenses</td>
<td>8,452.00</td>
</tr>
<tr>
<td>3</td>
<td>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

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(C5:D3/D7) - Incorrect
  ➢ =C5*D3/D7 - Correct
❖ Functions can be part of a formula
  ➢ =sum(A3:A350)/2

Formatting

<table>
<thead>
<tr>
<th>Character Formatting</th>
<th>Number Formatting</th>
<th>Cell Formatting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bold, Italic, Fonts</td>
<td>Currency, $1234.56</td>
<td>Alignment</td>
</tr>
<tr>
<td>Size, Color</td>
<td>Percent, 10%</td>
<td>Left</td>
</tr>
<tr>
<td></td>
<td>General, 1234</td>
<td>Right</td>
</tr>
<tr>
<td></td>
<td>Fixed Decimal, 12.56</td>
<td>Centered</td>
</tr>
<tr>
<td></td>
<td>Date, 1/21/2009</td>
<td>Merge &amp; center</td>
</tr>
<tr>
<td></td>
<td>Time, 11:00am</td>
<td>Background color</td>
</tr>
</tbody>
</table>
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
  \[ =\text{sum}(B2,B3,B4,B5,B6) \] - Inefficient
  \[ =\text{sum}(B2:B6) \] Correct!

Excel’s Automatic Fill

- Click on cell B2
- Move the cursor to the dot at the right bottom corner of cell B2.
- The cursor should look like +. Click and drag the dot to the right 2 cells.
- When you release the mouse, Excel should show February and March in cell C2 & D2

- Click on Cell A3 and drag the dot down to cell A7. This will fill in the computer models in sequence from CRZ201 to CRZ205

Effective use of Sum function

- Specifying a range allows one to insert or delete rows anywhere between the start and ending rows of the range without adjusting the formula.

Formula Bar

- Select cell E3 by clicking on it.
- Look above the column labels to see the formula bar. This shows the actual formula that is in the cell, while the cell shows the amount.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crazy Computer Company</td>
<td>Model</td>
<td>January</td>
<td>February</td>
<td>March</td>
</tr>
<tr>
<td>1</td>
<td>CRZ2010</td>
<td>45,966.00</td>
<td>41,391.00</td>
<td>47,580.00</td>
</tr>
<tr>
<td>2</td>
<td>CRZ2020</td>
<td>36,776.00</td>
<td>36,500.00</td>
<td>38,575.00</td>
</tr>
<tr>
<td>3</td>
<td>CRZ2030</td>
<td>42,985.00</td>
<td>40,775.00</td>
<td>48,775.00</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A5+C6</td>
</tr>
<tr>
<td>2</td>
<td>A5+C6</td>
</tr>
<tr>
<td>3</td>
<td>A5+C7</td>
</tr>
</tbody>
</table>

- Sometimes we don’t want a cell reference to change when we copy it. Absolute cell referencing keeps the cell reference absolutely the same.
  \[ =A5+C$6 \] represented by $ in formula and can be achieved by pressing F4 after typing in the cell reference.

Formulas & Functions

Creating Spreadsheets
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

- You want to know what your grade is throughout the course
- What data needs to be input
  - List of assignments
  - Total possible points for each assignment
  - My Score
- How should the data be labeled

Example (cont)

- What calculations need to be performed
  - Calculate total possible points
  - Calculate total points earned
  - Calculate percents
- What formulas can best perform those calculations
  - Calculate totals is an addition formula
    - More than two cells in range - Use SUM function
    - Percent part divided by whole
- Is there any data needed for formulas that can be stored in a cell for referencing

Building Spreadsheet

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

Building Formulas

- Many formulas are based on mathematical equations.
  - Use +, -, *, /, ^
  - Be sure to indicate order if necessary ( )
- If there is a function to simplify a calculation use the function
- Not all formulas need a function.
  - Don’t use a function if it isn’t needed
- The sum function is for adding cells ONLY
  - Do NOT place a formula in the sum function

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
- 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 also contain
  - Annotations
  - Other images

Types of Charts
- Many different types of charts are available which will help convey the information
  - Bar & column
  - Pie
  - Area
  - Stacked Column
  - Line
  - 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
  - Row-wise
  - Column-wise
Managing Spreadsheet Data

Tools for Long Worksheets

- Locking Titles
- Split Screen
- Sorting Lists
- Data Filters
- Data summaries

Locking 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

Sorting Data
- Sort list by particular columns
- Sort ascending or descending order
- Create multiple levels of sorts

Data Filters
- Shows only the rows specified by the filter
- Autofilter (easiest to use)
  - Filters using a column heads.
  - Select Data contained in column
  - Top ten
  - Custom
  - Boolean logic (AND / OR)
  - Blanks
  - Non blanks
Data Summaries

- List must be sorted first on categories to be summarized
- 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

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
    - \( \text{round}(\text{rand}() \times 10, 0) \)
- randbetween(low number, high number)
  - similar to rand, but yields a random number between and including the low and high numbers specified

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 looks at top row

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

In the next assignment you will be asked to enter a code for this lesson. The code is What If Table. Make note of it.