



Microsoft Excel: Formulas, Formulas...

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Description: Excel has hundreds of functions and nobody knows them all, but spend some time and learn to create more powerful formulas. Students will dive into decision making functions like if() and lookup() and make Excel work for them! Students will also explore efficient use of multiple sheets in a workbook, creating multi-sheet and multi-workbook formulas. Students will learn about: if() functions, lookup() functions, conditional formatting, and using multiple worksheets in a workbook.

1. Course objectives.
 - a. To provide the class with an exploration of spreadsheet design.
 - b. To develop computer and spreadsheet literacy.
 - c. To address the class' questions.
2. Schedule
 - a. 9:00 Registration
 - b. 9:30 Morning session
 - c. 12:00 Departure
3. Handouts available in Adobe Portable Document Format (PDF) for download at www.crowleycomputers.com/handouts.htm

1. Formulas: All formulas begin with = or basic math function

- a. Simple operators
 - (1) +
 - (2) -
 - (3) * multiply
 - (4) / divide
 - (5) ^ exponent
 - (6) = < > comparison

Monthly weather averages.xls

- b. Order of operator precedence (or Algebraic Order of Operations, for those of you as old as me!) determines what order calculations occur.

- (1) Calculations do not occur from left to right.
- (2) $3+4*5$ does not equal $(3+4)*5$
- (3) When you're not sure, use (parenthesis) to force order of calculation.

- c. Edit via double clicking on cell, clicking on formula bar or F2

Operators (in order of evaluation)	
Reference	
Range	:
Intersection	Space
Union	,
Arithmetic	
Negation	-
Percentage	%
Exponentiation	^
Multiplication	*
Division	/
Addition	+
Subtraction	-
Text	
Join	&
Comparison (equal precedence)	
Equal	=
Greater than	>
Less than	<
Greater or equal	>=
Less than or equal	<=
Not equal	<>

2. Autofill formulas!

- a. Drag Autofill handle - make sure you have a black + mouse cursor.

Record High	Record Low	Diff.	
°F	°F		
66	-32	98	
60	-32		
81	-24		
86	3		
89	20		
96	33		
98	40		

- b. Autofill Options button
 - (1) Copy cells
 - (2) Fill formatting only
 - (3) Fill without formatting

3. Simplest formula: Bring a value to another location with =


4. Build a complicated formula

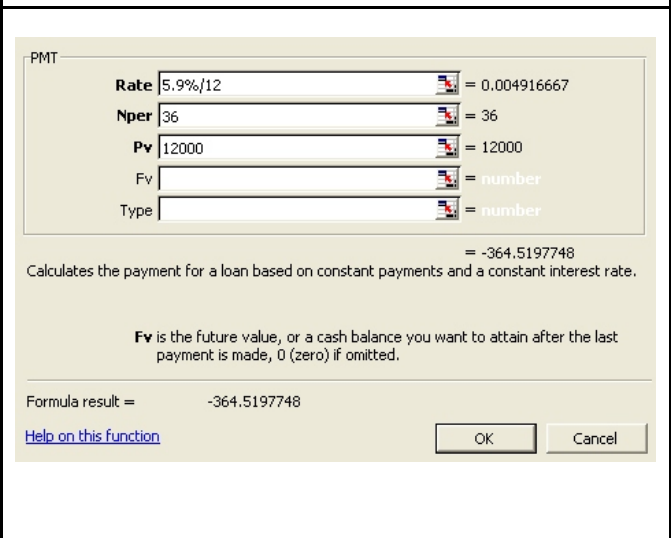
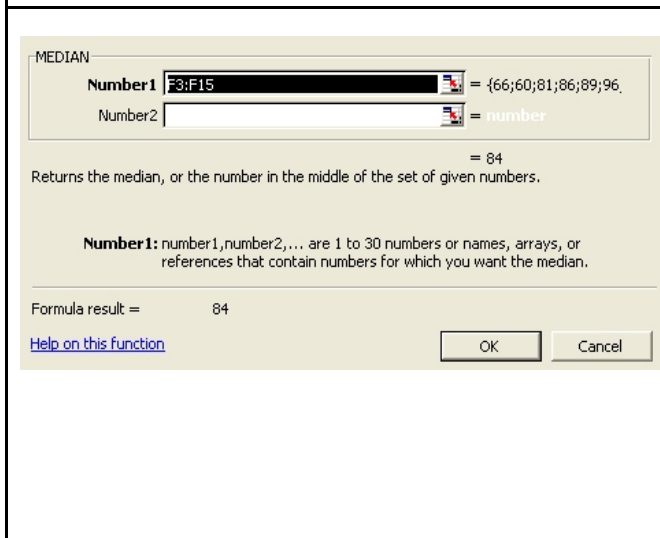
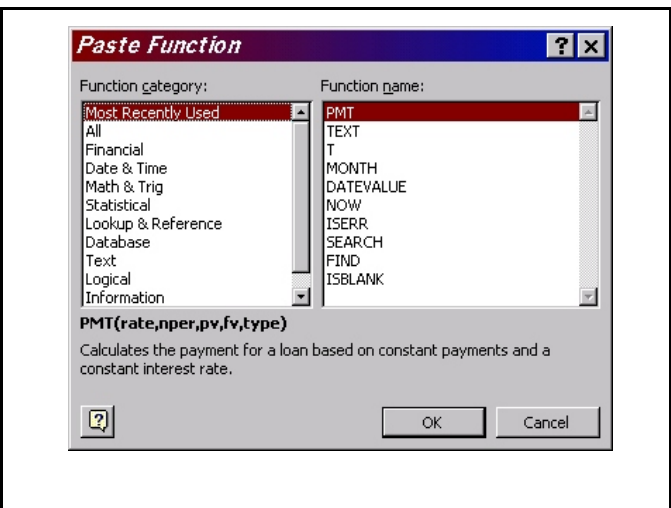
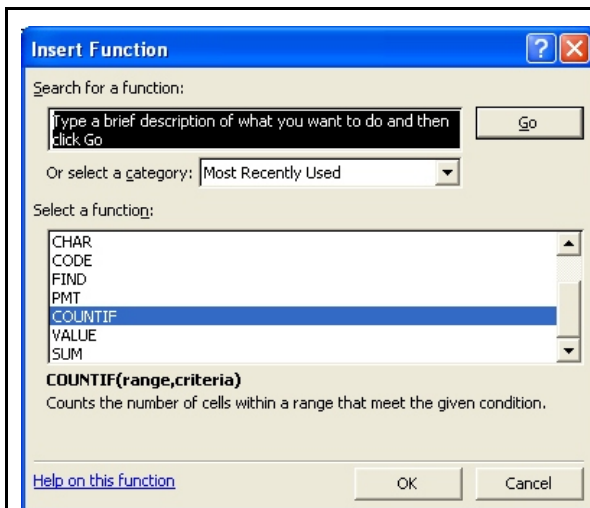
New Windchill.xls

5. Functions: Automate creating very complicated formulas!

- a. Use of Autosum
 - (1) Select cell for formula (result)
 - (2) Click button
 - (3) Select proper cells if they are not highlighted correctly.



- b. With Excel Xp (2002), Automatic average, count, min and max are available!
6. Using Insert Function (Paste Function in older versions) 
- All functions are standard functions are available from dialog
 - Use Search to find a function!!! Describe what you want to do!
 - For example: what is the function that finds the “center” value from the list? It is like an average but it is not an average. Search on “central value” or “average.”
 - Use Category drop down to find related functions.
 - Most Recently Used initially contains the most used functions.
 - As you use Excel, Most Recently Used contains *your* functions.
 - After highlighting a function look below for a description! For still more information, click on [Help on this function](#).
 - Older versions of Excel will not take you directly to the correct help screen. Search for the function name.
 - At anytime, you can invoke Help from the Help menu or F1 and search on a function.



- e. Required / optional arguments
- f. Categories of formulas - additional categories may be available if you use Add Ins.
 - (1) Most recently used
 - (2) All: list all categories
 - (3) Financial
 - (4) Date & Time
 - (5) Math & Trig
 - (6) Statistical
 - (7) Lookup & Reference: helps find data within Excel
 - (8) Database
 - (9) Text
 - (10) Logical: true / false analysis
 - (11) Information: formatting and error handling
 - (12) User Defined
 - (13) Engineering

- 7. Navigation and selection acceleration
 - a. Get around faster using keyboard cheats!
 - b. Select faster using keyboard cheats!
 - (1) Shift+???? for range
 - (2) F8
 - c. Select faster using mouse cheats!
 - (1) Shift+click for a range
 - (2) Ctrl+click for random
 - d. Selecting a full sheet

Keyboard Navigation	Cell	Data block	Screen	Current sheet	Sheet
Left	← / Shift+Tab	Ctrl+←	Alt+PgUp	Home (col A)	
Right	→ / Tab	Ctrl+→	Alt+PgDn		
Up	↑ / Shift+Enter	Ctrl+↑	PgUp	Ctrl+Home (A1)	Ctrl+PgUp
Down	↓ / Enter	Ctrl+↓	PgDn	Ctrl+End (bot rt)	Ctrl+PgDn

8. Formula troubleshooting? If you want the spreadsheet to show the formulas instead of the results, press **Ctrl+`** to toggle between showing formula values and formulas. That

	A	B	C	D	E
1	\$ 16,500				
2		1	2	3	4
3	0.0%	\$1,375.00	\$687.50	\$458.33	\$343.75
4	0.5%	\$1,378.73	\$691.09	\$461.87	\$347.27
5	1.0%	\$1,382.46	\$694.68	\$465.43	\$350.81

	A	B	C
1	16500		
2		1	2
3	0	=ABS(PMT(\$A3/12,B\$2*12,\$A\$1))	=ABS(PMT(\$A3/12,B\$2*12,\$A\$1))
4	0.005	=ABS(PMT(\$A4/12,B\$2*12,\$A\$1))	=ABS(PMT(\$A4/12,B\$2*12,\$A\$1))
5	0.01	=ABS(PMT(\$A5/12,B\$2*12,\$A\$1))	=ABS(PMT(\$A5/12,B\$2*12,\$A\$1))

is Ctrl+apostrophe, not a single quote mark.

- 9. Absolute and relative references
 - a. Cell references are normally "relative" references, as

Absolute references.xls
 New Windchill.xls
 Car payment (16,500).xls

they are copied, the reference moves relative to copy direction.

b. Absolute references lock a reference to a particular row, column or cell. Absolute references do not change as they are copied.

- (1) \$ indicates absolute reference to column or row
- (2) F4 rotates through four possible combinations (none, both, row, column)
- (3) Four patterns of absolute and relative references.

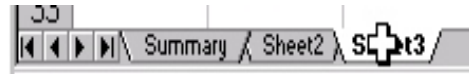
Pattern can be entered manually or with F4.

- (a) None A1
- (b) Column \$A1
- (c) Row A\$1
- (d) Cell (both) \$A\$1

=B2	=B\$2
=B3	=B\$2
=B4	=B\$2
=B5	=B\$2
=B6	=B\$2

10. Pages & working in 3D

- a. Navigating
- b. Inserting and deleting pages
- c. Renaming
- d. Copying and moving
- e. Grouping and ungrouping using Shift+click and Ctrl+click
- f. Generating formulas IE. =SUM(Sheet2:Sheet3!A1) Sheet range prior to exclamation point, cell reference after exclamation point.



See Sales Trip Expense Report!Jan02.xls

11. Formulas across pages

- a. Page name(s) prior to ! in cell references
- b. Simplest method to build via point and click

12. Advanced cut/copy/paste techniques

- a. Four steps!!!
 - (1) Select
 - (a) Toolbar
 - (b) Edit menu
 - (c) Right+click menu
 - (d) Ctrl+X or Ctrl+C
 - (2) Select new

location

- (4) Paste (Ctrl+V)

13. Conditional formatting

- a. Format, Conditional formatting...

14. Formulas across files

- a. File name prior to ! in cell references
- b. Simplest method

	A	B	C	D	E	F	G	H
1	\$ 16,500							
2		1	2	3	4	5	6	7
3	0.0%	\$1,375.00	\$687.50	\$458.33	\$343.75	\$275.00	\$229.17	\$196.43
4	0.5%	\$1,378.73	\$691.09	\$461.87	\$347.27	\$278.51	\$232.67	\$199.93
5	1.0%	\$1,382.46	\$694.68	\$465.43	\$350.81	\$282.05	\$236.21	\$203.47
6	1.5%	\$1,386.20	\$698.29	\$469.01	\$354.38	\$285.61	\$239.78	\$207.04
7	2.0%	\$1,389.94	\$701.91	\$472.60	\$357.97	\$289.21	\$243.38	\$210.66
8	2.5%	\$1,393.69	\$705.55	\$476.21	\$361.58	\$292.83	\$247.02	\$214.32
9	3.0%							\$218.02
10	3.5%							\$221.76
11	4.0%							\$225.54
12	4.5%							\$229.35
13	5.0%							\$233.21
14	5.5%							\$237.11
15	6.0%							\$241.04
16	6.5%							\$245.02
17	7.0%							\$249.03
18	7.5%							\$253.08
19	8.0%	\$1,435.31	\$746.25	\$517.05	\$402.81	\$334.56	\$289.30	\$257.17
20	8.5%	\$1,439.13	\$750.02	\$520.86	\$406.70	\$338.52	\$293.34	\$261.30
21	9.0%	\$1,442.95	\$753.80	\$524.70	\$410.60	\$342.51	\$297.42	\$265.47
22	9.5%	\$1,446.78	\$757.59	\$528.54	\$414.53	\$346.53	\$301.53	\$269.68
23	10.0%	\$1,450.61	\$761.39	\$532.41	\$418.48	\$350.58	\$305.68	\$273.92
24								

- (1) Open all required sheets
- (2) Use mouse to build formula via point and click

15. Reference and Lookup functions - give your spreadsheet power by creating formulas that “make decisions.”

a. IF(logical_test,value_if_true,value_if_false) = returns a value based on whether a value is true or false

See Pass fail book.xls

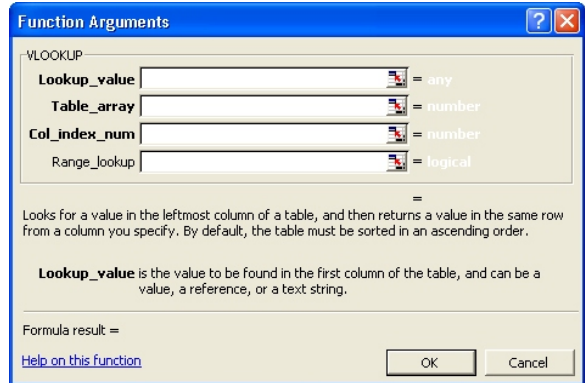
- (1) Logical_test is any value or expression that can be evaluated to TRUE or FALSE.
- (2) Value_if_true is the value that is returned if logical_test is TRUE.
- (3) Value_if_false is the value that is returned if logical_test is FALSE.

b. VLOOKUP(lookup_value,table_array,col_index_num,range_lookup) = look up a value *vertically*

See Grade book.xls

(1) Arguments

- (a) lookup_value = “what” you want to look up
- (b) table_array = “where” you want to look it up
- (c) col_index_num = “which” column to return
- (d) range_lookup = TRUE (default) returns approximate match, FALSE returns only exact matches



- (i) If the range_lookup is TRUE, the table_array must be sorted in ascending order!
- (ii) If the range_lookup is FALSE, values do not need to be sorted.
- (iii) If VLOOKUP can't find lookup_value, and range_lookup is FALSE, VLOOKUP returns the #N/A value

(2) Notes

- (a) If VLOOKUP can't find lookup_value, and range_lookup is TRUE, it uses the largest value that is less than or equal to lookup_value.
- (b) If lookup_value is smaller than the smallest value in the first column of table_array, VLOOKUP returns the #N/A error value.

c. HLOOKUP(lookup_value,table_array,row_index_num,range_lookup) = look up a value horizontally

See 2002 Payroll taxes.xls

- (1) See all VLOOKUP notes
- (2) row_index = “which” row to return

d. LOOKUP - gives the same functionality, but you define the search range. Works in to modes:

- (1) Vector: LOOKUP(lookup_value,lookup_vector,result_vector)
 - (a) lookup_vector = where to find lookup_value
 - (b) result_vector = what to return

- (2) Array: LOOKUP(lookup_value,array)
- (a) If array covers an area that is wider than it is tall (more columns than rows), LOOKUP searches for lookup_value in the first row.
 - (b) If array is square or is taller than it is wide (more rows than columns), LOOKUP searches in the first column.
- e. MATCH(lookup_value,lookup_array,match_type)
- (1) Returns the position of the answer rather than a looked up value
- (2) match_type =
- (a) If match_type is 1, MATCH finds the largest value that is less than or equal to lookup_value. Lookup_array must be placed in ascending order: ...-2, -1, 0, 1, 2, ..., A-Z, FALSE, TRUE.
 - (b) If match_type is 0, MATCH finds the first value that is exactly equal to lookup_value. Lookup_array can be in any order.
 - (c) If match_type is -1, MATCH finds the smallest value that is greater than or equal to lookup_value. Lookup_array must be placed in descending order: TRUE, FALSE, Z-A, ...2, 1, 0, -1, -2, ..., and so on.
- f. OFFSET(reference, rows, cols, height, width)
- (1) Returns a (range) reference so many rows and columns from the starting reference.
 - (2) Reference = starting point
 - (3) Rows = rows from reference, positive value is down from starting reference.
 - (4) Columns = columns from reference, positive value is to right from starting reference.
 - (5) Height and width use returns a range.

See Ben's weight.xls