

EM384: Analytical Methods for Engineering Management

Lesson 2: Modeling with Spreadsheets I

13 January 2023

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Lesson 2 Objectives

- Understand basic Excel skills for good model development, such as creating efficient and logical layouts.
- Understand and apply relative and absolute cell referencing.
- Understand and apply basic Excel formulas, value formatting, cell formatting, and row/column manipulation.

Spreadsheet Engineering

Spreadsheet Engineering

Designing a spreadsheet model:

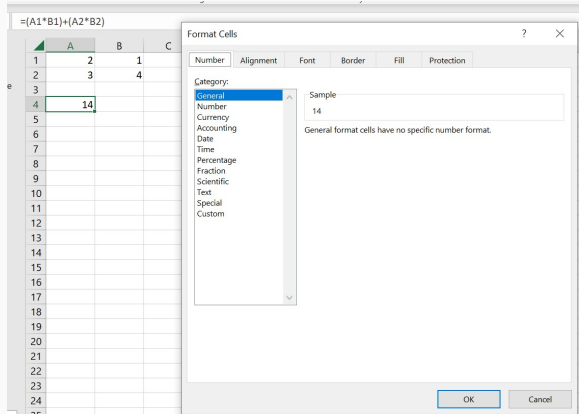
- Sketch on Paper
- Organize into Modules
- Start Small
- Isolate Input Parameters
- Design for Use
- use boxes/colors
- Keep it Simple
- Design for Communication
- Document Data and Formulas

Parameters	Price/Lesson	\$50
	Instructor Cost/Day	\$90
	Max # of Lessons/Instructor/Day	3
	# of Lessons/day, Demand (Hot)	50
	# of Lessons/day, Demand (Warm)	30
	# of Lessons/day, Demand (Cool)	10
	# of Days (Hot)	30
	# of Days (Warm)	30
	# of Days (Cool)	30
	Total # of Days	90
Decision	# of Instructors Hired	10
Calculations	Total # of Lessons, Capacity (Hot)	900
	Total # of Lessons, Capacity (Warm)	900
	Total # of Lessons, Capacity (Cool)	900
	Total # of Lessons, Demand (Hot)	1500
	Total # of Lessons, Demand (Warm)	900
	Total # of Lessons, Demand (Cool)	300
	Total # of Lessons, Taught (Hot)	900
	Total # of Lessons, Taught (Warm)	900
	Total # of Lessons, Taught (Cool)	300
	Total # of Lessons	2100
	Total Revenue	\$105,000
	Cost	\$81,000
Objective	Profit	\$24,000

Basic Excel Skills

Cell Formatting

- When you type something in a cell, Excel will infer the data type (e.g. Date, number, text etc.)



Relative versus Absolute Referencing

- Excel indexes columns by letters and rows by numbers. E.g. A1, \$A1, A\$1, \$A\$1.
- the \$ symbol before a column or row index denotes absolute referencing. This only matters if you want to copy and paste a formula elsewhere on your spreadsheet.
- By default, Excel uses relative referencing.
- When copying and pasting a formula to a new cell, only relative references will change.

	A	B	C	D	E
1	Inventory			Tax:	13%
2					
3	Items	Price	Qty	Tax	Total
4	Pencils	0.25	15	0.49	
5	Pens	0.99	18	2.32	
6	Hilights	1.29	6	1.01	
7	Scissors	2.99	3	1.17	
8	Notebooks	1.99	8	2.07	
9	Sticky Notes	2.99	20	7.77	
10	Paper Clips	0.99	12	= (B10 * C10) * \$E\$1	
11					

- The power of Excel comes from its ability to process formulas and display the results in real-time. These results are automatically updated when an input to a formula changes.
- An Excel formula always starts with = to tell Excel that a formula will follow and it has to do a calculation.
- Formulas use basic math or more advanced *functions*.
- Formulas can use cell references to make calculations - and will automatically use the value in whatever cell is referenced.

Excel Functions

- Excel has many built-in functions that can make formulas more complex in order to do exactly what you want.
- Pay attention to the arguments of each function. Sometimes an argument is a single cell reference, sometimes it is a range of cells.
- You can populate your formulas by either typing in the cell references or by clicking on your spreadsheet to the cells or ranges that you want.

Some basic functions:

`=SUM(`

`=AVG(`

`=STD(`

`=MIN(`

`=MAX(`

- Download and open the Excel Skills Lesson 2 PE (available on Teams)

Conclusion

Homework:

- Work on Homework Set 1 (due lesson 5).
- Read "The art of modeling with spreadsheets" PDF from TEAMS chapters 21.3 and 21.4.
- Watch the NPV video on TEAMS.

Next Lesson:

- We will cover more advanced excel functions and begin to model problems using spreadsheets.