Week 2: Making Best Decisions in Settings with Low Uncertainty

- ♦ A resource allocation example: Zooter Industries
- Converting a verbal problem description into an algebraic model: decisions, objective, constraints
- From an algebraic model to a spreadsheet implementation: optimizing with Excel Solver
- Matching demand and supply across space: Keystone Dry Goods Logistics

Zooter Resource Allocation Problem: A Complete Model

```
Maximize 150*R+160*N

subject to

4*R+5*N \le 5610 (frame manufacturing hours)

1.5*R+2.0*N \le 2200 (wheel and deck manufacturing hours)

1.0*R+0.8*N \le 1200 (QA and packaging hours)

R, N = \text{integer}

R, N \ge 0
```

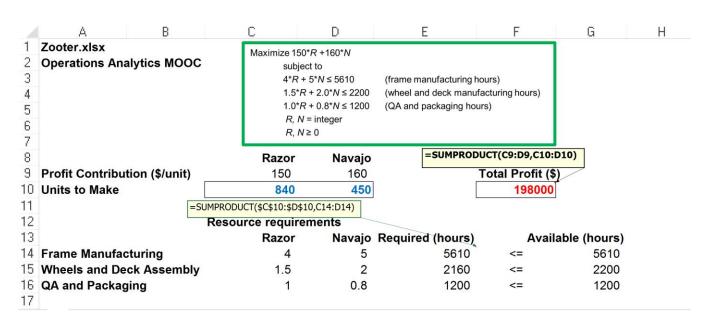
◆ We will use Solver to "optimize" this model, i.e., to find the best combination of values for decision variables *R* and *N*

Solver Optimizer on Various Platforms

- ◆ Likely to be a part of standard Excel installation on Windows
- On Mac (see https://support.microsoft.com/en-us/kb/2431349)
 - Included on Excel 2016 for Mac
 - Included starting with Excel for Mac 2011 Service Pack 1 (version 14.1.0).
 - Not included with Excel for Mac 2008, but can be downloaded from http://www.solver.com/solver-2008-mac

Google Sheets: available as "add-on"

Spreadsheet Solution:



- Zooter.xlsx: a file containing the spreadsheet solution with added comments that express formulas we used
- According to Solver, the best decision is to produce 840 Razors and 450 Navajos in the coming week
- ◆ This decision will result in the weekly profit of \$198000

Optimization Concepts

 Solution: a particular choice of values for the decision variables

♦ Feasible Solution:

- satisfies all constraints
- R=500, N=500 is feasible
- R=500, N=750 is infeasible

Objective Function Value (OFV):

- value of objective function for a solution
- OFV = \$155000 for R=500, N=500

Optimal Solution:

- feasible solution whose OFV cannot be improved upon
- R=840, N=450 is optimal for the Zooter model
- in general, there may be more than one optimal solution