

Your company produces four different pallet types that sell for different prices and require a different amount of resources.

	Tahoe	Pacific	Savannah	Aspen
Sell Price (\$)	450	1,150	800	400
Glue (quarts)	50	50	100	50
Pressing (hours)	5	15	10	5
Pine Chips (lbs)	500	400	300	200
Oak Chips (lbs)	500	750	250	500

Given the following resources 6000 quarts of glue, 700 hours of pressing, 29,000 lbs of pine chips, and 60,000 lbs of oak chips, how many of each pallet should you produce to maximize your profit?

1. Write this as an optimization problem and convince yourself that this is an linear programming problem (LP).
2. Activate the Excel solver (search how to do it for your operating system).
3. Solve the problem assuming continuous variables. After each solve choose “Restore original values” (or manually reset the starting point yourself). If you don’t you’ll be starting from the optimum each time and have nothing to do.
  - (a) First use an LP solver (Simplex LP). Answer should be: profit = \$56,714,  $x = [24.286, 10, 42.86, 0]$
  - (b) Try the GRG (generalized-reduced gradient - a gradient-based method). You’ll need to check the box make unconstrained variables non-negative otherwise it might find a nonsensical solution. That just a shortcut for a constraint:

$$x_i \geq 0 \quad (1)$$

Should get the same answer.

- (c) Try the Evolutionary solver (a genetic algorithm). It won’t work unless you give an upper bound constraint on the design variables. Be patient, it takes a while to solve. Likely will get a different answer, not the optimal answer, but a better answer than your starting point.
4. Solve the integer constrained LP (add integer constraints). Show that the solution is different. You can try the GRG and evolutionary solvers, although you may not get a satisfying answer.