Maximization: Winter Jackets and Parkas

Suppose you are an operations manager at a company that produces clothing for families with an active and outdoor lifestyle. Every winter season, operations managers are tasked with a difficult decision, which is to determine how many winter jackets and parkas should be produced. Both products require the same materials and require very similar sewing and stitching skills and manufacturing steps, and, therefore, compete for the same resources. For example, due to limited resources, the materials that go into the production of winter jackets could have been used in the production of parkas (i.e., therefore, we should expect less production of parkas).

After collecting information, you (the operations manager) start to focus on analyzing data for the medium-sized jackets and parkas.

The per-unit profits are as follows:

- Winter jacket = $9
- Parka = $12.50

A medium-sized jacket requires 8.5 feet of fabric, while a medium-sized parka requires 12.5 feet of the same fabric.

The amount of machine time needed to produce a jacket is 1.5 hours, while the amount of time needed to produce a parka is 2 hours.

A tailor usually spends 2 hours sewing and stitching for a winter jacket and 3 hours for a parka.

Your company has a monthly contract with a supplier to procure 4,000 feet of the required fabric. The amount of machine time allocated to producing the products is 650 hours per month, and each month, a number of skilled tailors are assigned to these products for 900 hours. Historically, your company has never sold more than 400 jackets and 150 parkas in a month; therefore, the monthly production rate of parkas and winter jackets should not exceed these historical limits.

You will use this information to formulate a linear programming model. The objective is to determine the number of winter jackets and parkas that should be produced to maximize the profit from these two products.

First, enter the numerical values for the parameters (rows 5 – 8).

Then, enter the constraints for each resource and the demand (these are on the RHS of the inequality).

	A	B	C	D	E
2					
3		Products			Objective function (profit maximization):
4	Parameters:	Jackets	Parkas		
5	Fabric (feet/unit)				
6	Machine time (hours/unit)				
7	Labor (hours/unit)				
8	Per-unit profit				
9					
10		Jackets	Parkas		
11	Decision variables (units to produce):				
12					
13	Constraints:	Quantity used		Quantity available	
14	Machine time (hours)		<=		
15	Labor (hours)		<=		
16	Fabric (feet)		<=		
17		Units produced		Demand	
18	Number of jackets		<=		
19	Number of parkas		<=		

You will be required to create formulas for the objective function (cell E4), as well as the quantity used (B14:B16) and the units produced (D18:D19). For the units produced, simply cell reference the decision variable cells (B11 and C11).

Note: This example was taken from *Business Analytics* (2nd edition) by Sanjiv Jaggia.