Problem 4:

Retailing: Bullox Department Store is ordering suits for its spring season. It orders four styles of suits. Three are "*off-the-rack suits*": (1)polyester blend suits, (2) pure wool suits and (3) pure cotton suits. The fourth style is an imported line of fine suits of various fabrics. Studies have given Bullox a good estimate of the amount of hours required of its sales staff to sell each suit. In addition, the suits reqire differing amounts of advertising dollars and floor space during the season. The following table gives the unit profit per suit as well as the estimates for salesperson-hours, advertising dollars, and floor space required for their sale.

Suit	Unit Profit	Salesperson Hours	Advertising Dollars	Display Space
Polyester	35$	0.4	2$	1.00
Wool	47$	0.5	4$	1.50
Cotton	30$	0.3	3$	1.25
Import	90$	1.0	9$	3.00

Bullox expects its spring season to last 90 days. The store is open an avarage of 10 hours a day, 7 days a week; an avarage of two salespersons will be in the suit department. The floor space allocated to the suit department is a rectengular area fo 300 feet by 60 feet. Total advertising budget for the suits is 15.000$.

a. Formulate the problem to determine how may of each type of suit to purchase for the season in order to maximize profits and solve as a linear program.

b. From the solution to part (a) you wil note that at least one of the suit lines will not be carried. Suppose management wishes to carry at least 200 suits from each line. Amend your formulation and re-solve for the optimal solution. What effect does this have on profitability?

Solution:

Variables

X_A : Number of polyester suits

X_B : Number of wool suits

X_C : Number of cotton suits

X_D : Number of import suits

Model

Maximize: $X_A*33 + X_B*43 + X_C*27 + X_D*81$

$X_A*0.4 + X_B*0.5 + X_C*0.3 + X_D*1.0 \leq 90*10*2$ (Sales Person Limit)

$X_A*1.0 + X_B*1.50 + X_C*1.25 + X_D*3.0 \leq 300*60$ (Area Limit)

$X_A*2 + X_B*4 + X_C*3 + X_D*9 \leq 15000$ (Advertising Limit)

$X_A, X_B, X_C, X_D \geq 0$

Note You can see the solution of the problem in the excel sheet g6-s4-p4-a.xls for part a and g6-s4-p4-b.xls for part b with using solver. As seened from the solutions the managers' request about carring suits causes 1602$ of less profit.