

PROBLEM 1

A paper mill converts pulpwood to low, medium and high grade newsprint. The pulpwood requirements for each newsprint, availability of each pulpwood, and selling price (per ton) are shown below:

Wood Type	Low grade	Medium grade	High grade	Available (tons)
Virginia pine	2	2	1	180
White pine	1	2	3	120
Loblolly pine	1	1	2	160
Price	\$90	\$100	\$120	

The associated linear program is

Maximize

$$z = 90x_1 + 100x_2 + 120x_3$$

Subject to

$$2x_1 + 2x_2 + x_3 \leq 180$$

$$x_1 + 2x_2 + 3x_3 \leq 120$$

$$x_1 + x_2 + 2x_3 \leq 160$$

$$x_1, x_2, x_3 \geq 0$$

Given are the B^{-1} and x_B from the optimal tableau,

BV	x_1	x_2	x_3	s_1	s_2	s_3	RHS
z							
x_1				3/5	-1/5	0	
x_3				-1/5	2/5	0	
s_3				-1/5	-3/5	1	

(a) Compute the optimal tableau.

(b) What is the current solution?

(c) What is the new optimal solution if the price of medium grade paper changes to \$110?

(d) What is the new optimal solution if the price of low, medium and high grade paper changed to \$75, \$110 and \$115 respectively?

(e) If 10 additional tons of Virginia pine are obtained, by how much will the optimal profit increase?

(f) If a Medium+ grade newsprint is introduced, that requires 1 unit of Virginia Pine, 2 units of both White and Loblolly pine and is sold at a price of \$110 per ton, should the paper mill produce it?

- (g) Compute the ranges for all the different pulp types for which the current solution remains optimal.

- (h) Compute the range of prices for each newsprint for which the current solution remains optimal.