AGEC 622- LP
Homework #1- Answer Key

1.

a. LP Model

Decision Variables	Fine	Fancy	Super	Sum		RHS Limit
Change						
Objective to Max	28	35	55	-	max	
Lathe Time	0.125	0.25	0.33	0	LE	30
Labor use	0.375	0.3	0.66	0	LE	80
Sale price	88	185	255			
- Cost of production	60	150	200			
= Net Returns	28	35	55			

b. Excel Solution

Decision Variables	Fine	Fancy	Super	Sum		RHS Limit
Change	195.56	22.22	0			
Objective to Max	28	35	55	6,253.33	max	
Lathe Time	0.125	0.25	0.33	30	LE	30
Labor use	0.375	0.3	0.66	80	LE	80

C. Optimal Values
    1. Objective Function Value= 6,253.33

> The objective of the firm is to maximize net returns. Given the parameters and resource constraints, the maximum amount of money the firm can make is $6,253.33.

    2. Shadow Prices: Lathe time=84, Labor=46.67

> Shadow prices are defined as the change in the objective function value when one unit of the resources has changed. Economically, shadow prices can be interpreted as the marginal value of the resource. In this LP model, if lathe time is increased by one unit the objective function will increase by $84, while a one hour increase in labor availability will increase the objective function by $46.67.

    3. Decision Variables: Fine=195.56, Super=22.22

> In order to optimize net returns, the firm should produce 195.66 fine

chairs and 22.22 fancy chairs.

4. Reduced Costs: Super=-3.52

Reduced costs are the change in the objective function when one unit of a decision variable that is not in the optimal solution is forced into the solution. In this problem, if one super chair is forced into production the objective function will decrease by $3.52.

2. Make 2 changes to your model. There are unlimited possibilities for the changes you could make to the model. Here is an example of a change you could make.

1st Run: What would happen if we changed the net margin on super chairs to be $65? Are super chairs now included in the optimal solution?

Decision Variables	Fine	Fancy	Super	Sum		RHS Limit
Change	160	0	30.3			
Objective to Max	28	35	65	6,449.70	max	
Lathe Time	0.125	0.25	0.33	30	LE	30
Labor use	0.375	0.3	0.66	80	LE	80

By changing the net margin on super chairs to $65, the optimal value of the decision variables changes to 160 fine chairs and 30.3 super chairs.

2nd Run: What would happen if we changed lathe capacity to be 31 hours? Is the value of objective function changed?

Decision Variables	fine	Fancy	Super	Sum		RHS Limit
Change	190.2	0.0	28.9			
Objective to Max	28	55	35	6337.3	max	
lathe Time	0.125	0.33	0.25	31	LE	31
Labor use	0.375	0.66	0.3	80	LE	80

By changing the lathe capacity to 31 hours, the value of the Objective function increases by $84. It is equal to the shadow price of lathe. The optimal value of the decision variables changes to 190.2 fine chairs and 28.9 super chairs.