

AGEC 641
Homework 2 B Group Effort

1. Chips Potato Chips makes three lines of potato chips: Regular, Ruffles, and Bar-B-Que. At current prices, the net margin per unit on the three lines exclusive of labor cost is \$1.20, \$1.70, and \$2.00, respectively. Plant capacity limits production to 10,000 units daily. The company has a labor contract which requires that at least 40 employees work 8 hrs/day every day. There are at most 75 employees available. A laborer costs \$64 per day. Labor requirements are 0.05, 0.08, and 0.10 man-hour per unit for the three product lines, respectively.
 - a) Formulate a LP problem which will determine the optimal production plan.
 - b) Write the dual to the problem formulated in part a).
 - c) Give an economic interpretation to
 - 1) the dual variables
 - 2) the dual objective function
 - 3) the dual constraints

2. Fine Food Specialties, Inc. purchases 3 raw ingredients and combines them to produce 2 products. The two products must meet certain specifications regarding fat content, protein and fiber. The relevant data are

Ingredient	Supply		Composition		
	Cost (\$/cwt)	Availability (cwt)	Fat %	Protein %	Fiber %
INGR1	4.50	18,000	10	25	18
INGR2	5.00	20,000	9	24	18
INGR3	3.75	17,000	11	29	17

Product	Formulation			Demand	
	Max Fat %	Min Protein %	Max Fiber	Price (\$/cwt)	Sales Potential (cwt)
PROD1	10.0	24.8	18	7.15	Max 25,000
PROD2	10.1	25.2	17.8	7.5	Min 22,000 Max 32,000

Formulate a linear programming model which will determine the profit maximizing production level.

3. Easy shipment Company wishes to ship goods from four supply locations to two demand locations. The distances between regions and the amount of goods available at each supply point are given below:

Supply	Goods in Inventory	Distance to Demand Region	
		A	B
1	50	20	25
2	30	15	30
3	20	10	15
4	10	17	19

Cost of shipping is \$.50 per mile

Easy Shipment has had its analysts make demand projections and has obtained three estimates. Analyst One has said that he knows the quantities of goods that will be sold and the quantities are as follows:

Demand Region	Quantity to be Sold
A	55
B	45

Analyst Two has said that the quantities of each good are impossible to estimate but the prices are easy.

Demand Region	Price at which Goods Would be Sold
A	\$19
B	\$28

Analyst Three has said that price depends on quantity and quantity depends on price. Therefore, he says Region A will pay \$25 for the first ten units and \$2 less for each five units thereafter and region B will pay \$30 for the first 15 units and \$5 less for each ten units thereafter.

- Formulate a linear program for the demand projection of each analyst.
- How would you expect the answers to be different?
- How would you attempt to reconcile the three answers?

4. Darius of Darius' Delicious Dairy is developing a direct action directive on how to deal with incoming daily delivery of milk. Darius of Darius' Delicious Dairy wishes to figure the way that milk can be processed so as to make maximum profits. Darius has several process that can be used, the result of which is cream, skim milk, 2% milk, and whole milk. Each process uses whole milk energy packaging and holding capacity. The processes are resource usages and:

Yield of:	<u>Process 1</u>	<u>Process 2</u>	<u>Process 3</u>
Cream	.03	0.02	0.0
Skim Milk	.97	-	-
2% Milk	-	.98	-
Homog Milk	-	-	1.00
Use inputs of:	<u>Process 1</u>	<u>Process 2</u>	<u>Process 3</u>
Energy	4	3.9	3.5
Whole Milk	1 gal.	1 gal.	1 gal.

In addition, each of the products produced used the following amounts of packaging time and holding capacity.

	Time	Holding Capacity
Cream	5 seconds	2.5 cu. ft.
All Milks	10 seconds	2 cu. ft.

The sale price for cream is \$3.00, skim milk \$1.85, 2% milk \$1.90, and homog milk \$1.95.

The Firm has 12 hours of packaging time, 10,000 cu. ft. of holding capacity (although more can be rented at 0.10/unit). Energy costs 0.10/unit. Whole milk is available for \$1.00/gallon up to 5,000 gallons and for a \$1.25 for as much more as required.

Formulate a profit maximizing LP.

5. Solve one of the above models in GAMS