

### MITx: 15.053x Optimization Methods in Business Analytics

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#### Lecture 1

Lecture questions due Sep 13, 2016 at 19:30 IST

## Recitation

#### **Problem Set 1**

Homework due Sep 13, 2016 at 19:30 IST

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## PART A

(1/1 point)

A corporation that produces gasoline and oil specialty additives purchases two grades of petroleum distillates, A and B. The company then combines the two according to specifications of the maximum percentages of grade B in each blend, given in Table 1.

Table 1: Description of Distillate B Components

	Max % allowed for Petroleum Distillate B	Selling price (\$/gallon)
Deluxe	15%	7.9
Standard	60%	6.9
Economy		5.0

We would like to formulate a linear program to determine the production policy that maximizes profits. Define  $x_{AD}, x_{BD}$  as the number of gallons of Petroleum Distillates A and B used in making Deluxe;  $x_{AS}, x_{BS}$  as the number of gallons of Petroleum Distillates A and B used in making Standard;  $x_{AE}, x_{BE}$  as the number of gallons of Petroleum Distillates A and B used in making Economy. Select the correct objective and necessary linear constraints from below:

$$ullet$$
 MAX  $7.9(x_{AD}+x_{BD})+6.9(x_{AS}+x_{BS})+ \ 5.0(x_{AE}+x_{BE})-0.6(x_{AD}+x_{AS}+x_{AE})-.52(x_{BD}+x_{BS}+x_{BE})$ 

$$\begin{array}{l} \blacksquare \ \ \mathrm{MAX} \ (x_{AD} + x_{BD}) + (x_{AS} + x_{BS}) + \\ (x_{AE} + x_{BE}) - 0.6(x_{AD} + x_{AS} + x_{AE}) - .52(x_{BD} + x_{BS} + x_{BE}) \end{array}$$

$$\begin{array}{l} \blacksquare \ \ \text{MAX 7.9}(x_{AD}+x_{BD})+6.9(x_{AS}+\\ x_{BS})+5.0(x_{AE}+x_{BE})-0.52(x_{AD}+x_{AS}+x_{AE})-6(x_{BD}+x_{BS}+x_{BE}) \end{array}$$

$$oxed{x_{AD}+x_{AS}+x_{AE}\geq 4000}$$

$$\quad \square \quad x_{AD} + x_{AS} + x_{AE} = 4000$$

$$ule{V} x_{BD} + x_{BS} + x_{BE} \leq 5000$$

$$lacksquare x_{BD} + x_{BS} + x_{BE} \geq 5000$$

- $\quad \square \ \ x_{BD} + x_{BS} + x_{BE} = 5000$
- $\frac{x_{BD}}{x_{AD}+x_{BD}} \leq 0.15$
- $\frac{x_{BS}}{x_{BS}+x_{AS}} \leq 0.6$
- $\Box$   $-0.85x_{AD} + 0.15x_{BD} \leq 0$
- $\quad \ \square \quad -0.4x_{AS}+0.6x_{BS}\leq 0$



You have used 1 of 3 submissions

# PART B

(1/1 point)

Use the spreadsheet PS1\_P4.xlsx to solve the previous linear program

What is the maximum profit you get? Use two decimals.		
Google sheets version available here		
57988.89		
57988.89		
You have used 3 of 5 submissions		
PART C		
(1/1 point) If you could buy more Distillate A, would you?		
● Yes ✔		
○ No		
You have used 1 of 1 submissions		

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