## Problem 1.

The product mix problem occurs when we manufacture 3 products. Each unit produced of a given product uses a given amount of resources.( Table 25). Each unit produced of product earns profit. Formulate LINDO model that could be used to maximize profit in this situation.

TABLE 24

|  | Cars | Trucks | Trains |
| :--- | ---: | ---: | ---: |
| Steel used (tons) | 2 | 3 | 5 |
| Rubber used (tons) | .3 | .7 | .2 |
| Labor used (hrs) | 10 | 12 | 20 |
| Unit profit (\$) | 800 | 1,500 | 2,500 |

TABLE 25

| Resource | Quantity Available |
| :--- | :---: |
| Steel | 50 tons |
| Rubber | 10 tons |
| Labor | 150 hours |

## Problem 2.

The media mix problem occurs when company has 3 media in which the company can place an ad. There are 3 groups of people the company wishes to reach, and the company wishes its ads to be seen at least $e_{i}$ times by member group $i$. An ad on media cost $c_{j}$ dollars and reaches $a_{i j}$ members of group i. The goal minimize the cost of ensuring that the desired number of people in each group see the ads. Set up LINDO model that can be used to solve any media mix problem.(Table 26-27)

| TABLE 26 |  |
| :--- | :---: |
| Group | Needed Exposures (in Millions) |
| Children | 15 |
| Men | 40 |
| Women | 50 |

tABLE 27

| No. | Program |  |  |
| :--- | :---: | :---: | :---: |
| Watching (million) | Sponge Bob | Friends | Dawson's Creek |
| Children | 3 | 1 | 0 |
| Men | 1 | 15 | 4 |
| Women | 2 | 20 | 9 |
| Unit cost (\$) | 30,000 | 360,000 | 80,000 |

## Problem -3.

Consider the following school redistricing problem. There are 10 districts in a city and 3 high school in the city. The distance between district i and high school j is $\mathrm{d}_{\mathrm{ij}}$ miles. District i has $\mathrm{w}_{\mathrm{i}}$ white and $b_{i}$ black residents. Each high school must have between $L$ and $U$ students. In the interests of racial harmony the percentages of blacks at each high school must have between $80 \%$ and $120 \%$ of the percentage of black students entire city. Set up LINDO model that can be used to minimize the total distance that students will have to travel in order to meet the racial balance requirements.(Table 28)

## TABLE 28

|  | District |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Whites | 400 | 200 | 150 | 300 | 400 | 100 | 200 | 300 | 250 | 150 |
| Blacks | 200 | 150 | 100 | 120 | 80 | 90 | 140 | 160 | 100 | 60 |
|  | Distance (Miles) |  |  |  |  |  |  |  |  |  |
|  | 1 | 2 | 3 | 4 | 5 | $\bigcirc$ | 7 | 8 | 9 | 10 |
| High School 1 | 1 | 2 | 3 | 2 | 3 | 4 | 2 | 3 | 1 | 2 |
| High School 2 | 2 | 1 | 3 | 3 | 4 | 2 | 1 | 2 | 2 | 3 |
| High School 3 | 3 | 3 | 2 | 1 | 2 | 3 | 2 | 2 | 3 | 1 |

