



DATE \_\_\_\_\_

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Monday — 9-11

Wed — 10-11

Thurs — 10-11

4- credits

100	→	25	25	50
		<u>        </u>	<u>        </u>	<u>        </u>
		Theory	Project	Paper

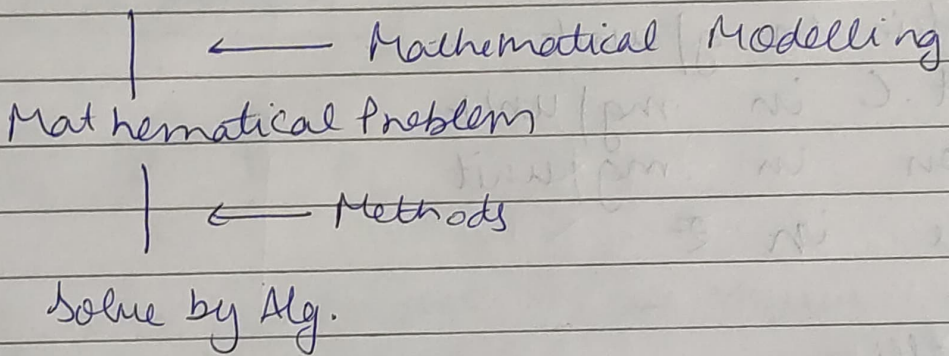


4 January 2021 (Lecture - 1)

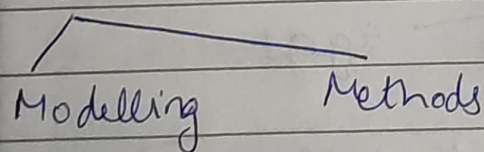
## LPP - Linear Programming Problems

- |                 |  |
|-----------------|--|
| 1) TORA         | } Softwares for LPP<br>↳ Inbuilt Methods |
| 2) LP Assistant |  |
| 3) Excel        |  |

### The Real Life Problem



LPP → Divide into 2 Parts



### Modelling

#### Diet Problem

- 1) Optimize cost  $f^n$
- 2) Constraints

Goal → minimize the cost of food but we need to meet the daily minimum nut. requirement



Foods : Apple, Banana, Orange, Eggs, Carrot  
Nutritions : Vitamin C, Protein, Iron

Food		Protein	Vit. C	Iron	Price
<del>Food</del>	<del>£</del>	<del>0.4</del>	<del>6</del>	<del>0.4</del>	<del>8</del>
Apple	1	1.2	10	0.6	10
Banana	1	0.6	3	0.4	3
Orange	1	0.6	1	0.2	20
Eggs	2	12.2	0	2.6	15
Carrot	1	70	50	12	
Min Req.					

Protein in g/unit

Vit. C in mg/unit

Iron in mg/unit

Price in £

### Modelling

Variables : A, B, O, E, C → carrot  
                   ↙    ↘    ↙    ↘  
                   Apple Banana    orange    eggs

= # of units of food daily req.

Cost function →  $Z = 8A + 10B + 3O + 20E + 15C$

we need to  
minimize this fn

Constraints →  $0.4A + 1.2B + 0.6O + 0.6E + 12.2C$

∴  $0.4A + 1.2B + 0.6O + 0.6E + 12.2C \geq 70$



$$6A + 10B + 30O + E + 0C \geq 50$$

$$0.4A + 0.6B + 0.4O + 0.2E + 2.6C \geq 12$$

$$A, B, O, E, C \geq 0$$

This Model is LPP Model

→ Linear eq<sup>ns</sup>

→ Objective f<sup>ns</sup>

### Product Min Problem

Products A & B

Resources R<sub>1</sub> & R<sub>2</sub>

for each unit of product A, we require 1 unit of R<sub>1</sub> & 3 units of R<sub>2</sub>

for each unit of product B → 1 unit R<sub>1</sub>, 2 units of R<sub>2</sub>

Manufacture has

5 unit of R<sub>1</sub> & 12 Unit of R<sub>2</sub> } Availability

Maximize Profit

Profit on A is ₹6 per unit

" " B " ₹5 " "

Goal is to maximize the profit



Products	$R_1$	$R_2$	Profit (per unit)
A	1	3	6
B	1	2	5

Available :      5                      12

$x$  = # of units of A produced  
 $y$  = # of units of B produced
 
 $\left. \begin{array}{l} \text{Decision} \\ \text{Variables} \end{array} \right\}$

$Z = 6x + 5y$   
 $\hookrightarrow$  Maximize  
 subject to constraints

$x + y \leq 5$   
 $3x + 2y \leq 12$   
 $x, y \geq 0$

Objective function

}

}

LP Model

Non-negativity restrictions  
(Always in LP)

Variables  $\rightarrow$  Decision Variables  $\rightarrow$  in LP  
 eg,  $x, y$  above