ORF 522
Linear Optimization

Lecture 1

The Resource Allocation Problem

The Linear Programming Problem

oblem.

with aluminum framing
hung wood-framed window.

m frame production.
me production.
duction and assembly.

es of 200 units.

	Hrs/batch		Hrs avail
	Door	Window	
Plant 1	1	0	4
Plant 2	0	2	12
Plant 3	3	2	18
Profit/batch	$3,000	$5,000	

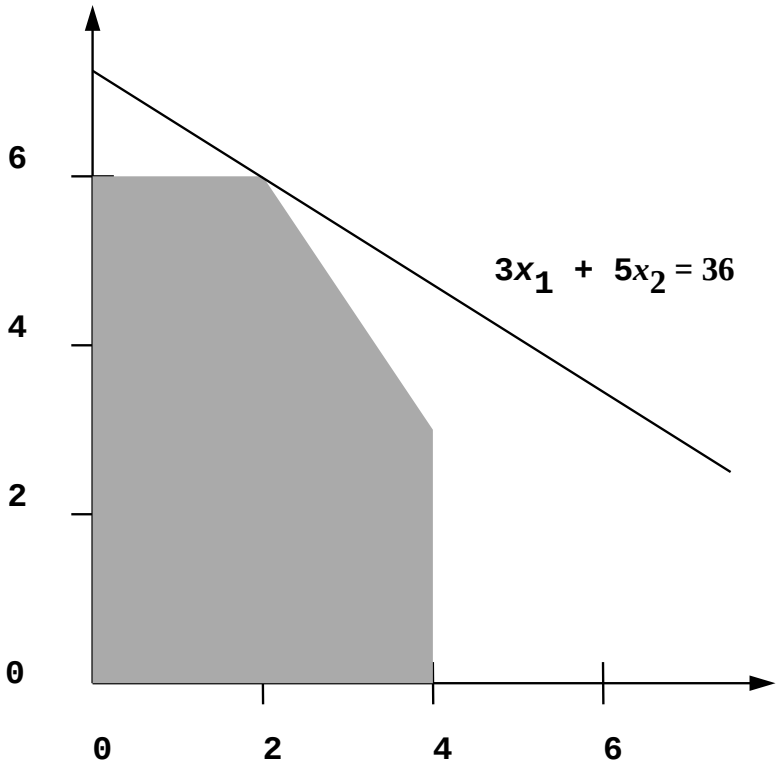
oblem

ing Problem:

$$
\begin{array}{lrcrcrl}
\text{maximize} & 3x_1 & + & 5x_2 & & & \\
\text{subject to} & x_1 & & & \leq & 4 & \\
 & & & 2x_2 & \leq & 12 & \\
 & 3x_1 & + & 2x_2 & \leq & 18 & \\
 & & & x_1, \ x_2 & \geq & 0 & .
\end{array}
$$

oblem

tion:



oblem

```
1 >= 0;
2 >= 0;

ofit: 3 * Batches1 + 5 * Batches2;

P1_Hrs_Avail:   Batches1 <= 4;
P2_Hrs_Avail: 2*Batches2 <= 12;
P3_Hrs_Avail: 3*Batches1 + 2*Batches2 <= 18;



ches1, Batches2, profit;



optimal solution found.
s, objective 36
2
6
```

source Allocation Problem

```
ces; # Was plants in window prod
ties; # Was products to produce

l  {Resources};
_profit {Activities};
e {Resources, Activities};

ctivities} >= 0;

rofit:
 in Activities} unit_profit[j] * amt[j];

 capacity {i in Resources}:
 in Activities} usage[i,j] * amt[j]
                              <= avail[i];
```

```
ces := Plant1 Plant2 Plant3;
ties := Door Window;

l :=
    4
   12
   18


_profit :=
    3
    5


e: Prod1 Prod2 :=
     1     0
     0     2
     3     2
```

s

```
l window2.mod;
 window2.dat;

e;
 optimal solution found.
ns, objective 36

lay amt, profit;
```

6

g

$$
\begin{array}{lrcl}
\text{maximize} & c_1x_1 + c_2x_2 + \cdots + c_nx_n & & \\
\text{subject to} & a_{11}x_1 + a_{12}x_2 + \cdots + a_{1n}x_n & \leq & b_1 \\
& a_{21}x_1 + a_{22}x_2 + \cdots + a_{2n}x_n & \leq & b_2 \\
& \vdots & & \\
& a_{m1}x_1 + a_{m2}x_2 + \cdots + a_{mn}x_n & \leq & b_m \\
& x_1,\ x_2,\ \ldots\ x_n & \geq & 0.
\end{array}
$$

have thousands of variables and constraints.

doesn’t work in high dimensions.

plementable algorithms to solve these problems.

ill be devoted to study of such algorithms.

lems don’t quite fit the LP paradigm.

ties in either the objective function, the constraints, or both.

e will extend the algorithms we develop for LP to some of these more general