

[Homework can be handed in to me or to my mail box in the Math Lounge (opposite the Math main office). Please show your work to receive full credit.]

A. An intramural four-man basketball team is trying to choose its starting line-up from a six-man roster so as to maximize average height. The roster follows:

<i>Player</i>	<i>Number</i>	<i>Height*</i>	<i>Position</i>
Dave	1	10	Center
John	2	9	Center
Mark	3	6	Forward
Rich	4	6	Forward
Ken	5	4	Guard
Jim	6	-1	Guard

* In inches over 5'6".

The Starting line-up must satisfy the following constraints:

- i) At least one guard must start.
- ii) Either John or Ken must be held in reserve.
- iii) Only one center can start.
- iv) If John or Rich starts, then Jim cannot start.

Formulate this problem as an integer program.

B. Consider the plane purchasing problem from the lecture:

$$\begin{aligned}
 \max \quad & 5x_1 + 6x_2 \\
 \text{s.t.} \quad & x_1 + x_2 \leq 6, \\
 & 5x_1 + 9x_2 \leq 45, \\
 & x_1 \geq 0, \quad x_2 \geq 0, \quad \text{integer.}
 \end{aligned}$$

Apply the branch & bound algorithm to this IP to find an optimal solution. Branch on x_2 from the initial LP relaxation L_0 .

C. Consider the following IP in 2 variables:

$$\begin{aligned}
 \max. \quad & x_1 + x_2 \\
 \text{s.t.} \quad & -x_1 + 2x_2 \leq 0, \\
 & x_1 \leq 1, \\
 & 4x_2 \geq 1, \quad x_1, x_2 \text{ integer.}
 \end{aligned}$$

Apply the branch & bound algorithm to this IP to determine if it has an optimal solution and, if so, find an optimal solution.

D. Consider the following IP in 2 variables:

$$\begin{aligned}
 \max \quad & x_1 + 5x_2 \\
 \text{s.t.} \quad & 3x_1 + 2x_2 \leq 18, \\
 & -4x_1 + 3x_2 \leq 6, \\
 & x_1 \geq 0, \quad x_2 \geq 0, \quad \text{integer.}
 \end{aligned}$$

Apply the branch & bound algorithm to this IP to determine if it has an optimal solution and, if so, find an optimal solution.