Name ___________________________________

56:272 Integer Programming & Network Flows
Quiz #2 – September 10, 2003

Three professional baseball teams are trying to find places for six available players within their remaining salary limits of $35 million, $20 million, and $26 million, respectively. The following table shows how valuable each player would be to each team on a scale of 0 to 10, and the player's current annual salary (in $millions).

We want to find a maximum total score allocation of players to teams that fits within salary limits (assuming that the three teams cooperate in finding the solution, rather than competing).

Define Decision Variables

$$X_{ij} = \begin{cases} 1 & \text{if player i is assigned to team j} \\ 0 & \text{otherwise} \end{cases}$$

and problem parameters

$Value_{ij}$ = value of player i to team j

$Salary_i$ = annual salary (in $millions)

$Limits_j$ = salary limit (in $millions) of team j

1. Write the expression for the objective function of this problem, using the above symbolic parameters and variables:

$$\text{Maximize} \quad \sum_{i=1}^{3} \sum_{j=1}^{6}$$

2. Write the budget constraint for team #3, using the above symbolic parameters and variables:

3. Write one of the "multiple choice" constraints, e.g. the constraint that specifies that player #1 cannot be selected by more than one team.

4. Suppose that players 3 and 5 are bitter rivals and should not be members of the same team. This restriction will require ____ linear constraints. Write one of them here:

5. In general, the optimal value of the integer LP will be (circle: $\geq$ or $\leq$) the optimal value of its LP relaxation.

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6. The location problem in this week's homework (in which branch banks were to be located) is an example of a *set* _______________ *problem*.

7. The total number of linear constraints of this problem is ________.

8. Write *one* of these linear constraints, where X_A is a binary variable indicating that a branch bank is located in county A, etc.