**MODEL INPUTS:**

|  |  |
| --- | --- |
| ***DESCRIPTION*** | ***VALUE*** |
| **TOTAL PLAYERS** | **60** |
| **STAR PLAYERS** | **30** |
| **IN-EXPERIENCED PLAYERS** | **30** |
| **MANAGERS** | **3** |
| **PHYSIOS** | **3** |
| **TEAMS** | **3** |

**INPUTS USED IN THE MODEL IMPLEMENTATION:**

|  |  |
| --- | --- |
| ***INPUT*** | ***DESCRIPTION*** |
| ***t*** | **Represents teams, t=1,…,3** |
| ***s*** | **Represents star players, s=1,…,30** |
| ***i*** | **Represents in-experienced players, i=1,…,30** |
| ***m*** | **Represents managers, m=1,..,3** |
| ***p*** | **Represents physios, p=1,…,3** |
| ***Cst*** | **Represents cost per star-player for a team (in Millions)** |
| ***Cit*** | **Represents cost per in-experienced player for a team (in Millions)** |
| ***Cmt*** | **Represents cost per manager for a team (in Millions)** |
| ***Cpt*** | **Represents cost per physio for a team (in Millions)** |

**VARIABLES USED IN THE MODEL IMPLEMENTATION:**

|  |  |
| --- | --- |
| ***VARIABLE*** | ***DESCRIPTION*** |
| ***Xst*** | **Binary variable indicating whether star player *s* is assigned to team *t*** |
| ***Yit*** | **Binary variable indicating whether in-experienced player *i* is assigned to team *t*** |
| ***Mmt*** | **Binary variable indicating whether manager *m* is assigned to team *t*** |
| ***Ppt*** | **Binary variable indicating whether physio *p* is assigned to team *t*** |

**OBJECTIVE:**

The objective for DREAMTEAM sports consultancy is to minimize the total allocation cost from a pool of 60 players, 3 managers and 3 physios to the 3 teams, satisfying all the requirements proposed by respective teams.

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**CONSTRAINTS:**

Finally, we present the constraints which are subjected to different team combination requirements and budget limitations proposed by respective teams along with the assignment constraints.

**Assignment constraints:**

1. Assignment of 30 star players to any of the 3 teams.

For each star player *s = 1,…,30* :

Note: Assignment is not mandatory.

1. Assignment of 30 in-experienced players to any of the 3 teams.

For each in-experienced player *i*= 1,…,30:

Note: Assignment is not mandatory.

1. Assignment of 3 managers to any of the 3 teams.

For each manager *m*= 1,..,3:

Note: Assignment is mandatory to any of the 3 teams.

1. Assignment of 3 physios to any of the 3 teams.

For each physio *p*= 1,..,3:

Note: Assignment is mandatory to any of the 3 teams.

**Team Budget constraints:**

1. Maximum Budget limit for Team A
2. Maximum Budget limit for Team B
3. Maximum Budget limit for Team C

**Team Combination constraints:**

1. Maximum in-experienced players required for team A
2. Maximum in-experienced players required for team B
3. Maximum in-experienced players required for team C
4. Maximum Mid-fielders required for Team A: t=1, s=10,..,18 and i=10,..,18
5. Maximum Mid-fielders required for Team B: t=2, s=10,..,18 and i=10,..,18
6. Maximum Mid-fielders required for Team C: t=3, s=10,..,18 and i=10,..,18
7. Minimum Star players required for Team A:
8. Minimum Star players required for Team B:
9. Minimum Star players required for Team C:
10. Minimum in experienced players required for Team C:
11. Minimum Striker required for Team A: t=1, s=1,..,9 and i=1,..,9
12. Minimum Striker required for Team B: t=2, s=1,..,9 and i=1,..,9
13. Minimum Striker required for Team C: t=3, s=1,..,9 and i=1,..,9
14. Minimum Mid fielder required for Team A: t=1, s=10,..,18 and i=10,..,18
15. Minimum Mid fielder required for Team B: t=2, s=10,..,18 and i=10,..,18
16. Minimum Mid fielder required for Team C: t=3, s=10,..,18 and i=10,..,18
17. Minimum Defenders required for Team A: t=1, s=19,..,27 and i=19,..,27
18. Minimum Defenders required for Team B: t=2, s=19,..,27 and i=19,..,27
19. Minimum Defenders required for Team C: t=3, s=19,..,27 and i=19,..,27
20. Minimum Number of Players Required for Team A: t=1, s=1,…,30 and i=1,…,30
21. Minimum Number of Players Required for Team B: t=2, s=1,…,30 and i=1,…,30
22. Minimum Number of Players Required for Team C: t=3, s=1,…,30 and i=1,…,30
23. Minimum Goal Keepers required for Team A: t=1, s=28,..,30 and i=28,..,30

31- Minimum Goal Keepers required for Team B: t=2, s=28,..,30 and i=28,..,30

32- Minimum Goal Keepers required for Team C: t=3, s=28,..,30 and i=28,..,30

The Team Allocation Model provides an optimal allocation of players, managers and physios to the 3 teams. The main decision that the model needs to make is to allot different category players of specific types to the 3 teams. These allocations are done in such a way that it minimizes the total allocation cost to build the 3 teams.

The Team Allocation Model is an integer linear program with binary values having a set of constraints which are mainly the requirements placed by the 3 teams and the mandatory allocation constraints. All these made the Model a large-scale application with 200 decision variables and 100 constraints making the most of the data solver limit.

A picture containing screenshot

Description automatically generated

Figure.1. A Portion of the Team Allocation Model spreadsheet.

(Note: The fields highlighted in the input table marks the allocation of players to certain team)

The input for the model would be the 3 teams and the price tag for individual players. Each Category and type of players have a certain price tag for teams to obtain their services.

The allocation is done by meeting the objectives below:

* Minimize the overall allocation cost for the 3 teams.
* Build a team within certain budget proposed by the 3 teams.
* Satisfy the team combination requested by the 3 teams.

The optimized result shows the allocation of players to different teams as highlighted in the spreadsheet, satisfying all the constraints and minimizing the total cost.