Round-Robin Sports Scheduling

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Introduction

Types of Tournaments:

Round-Robin Tournament

If we have *n* teams then each team plays exactly *k* times against all other teams.

Elimination Tournament

Tournament will have *n* rounds where in each round some players will be eliminated and survived team will proceed to next rounds till we have one survivor team left.

King of the Hill

A Player/Team stays in the game until they loose to strong opponent.

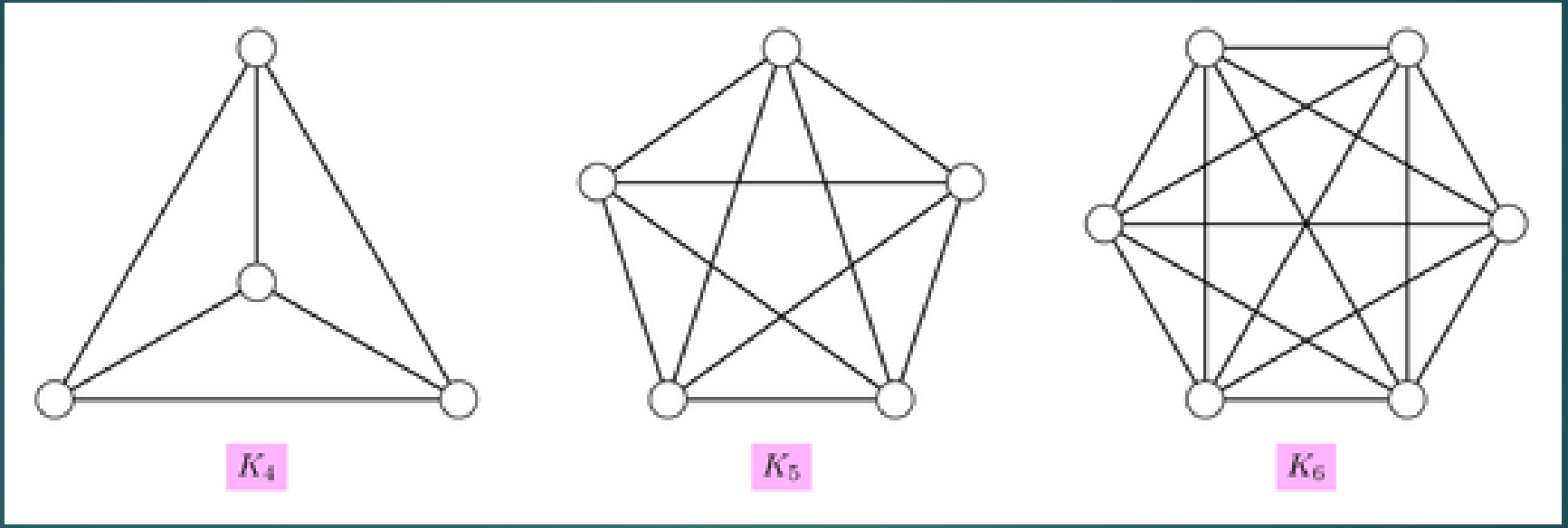
Real World Problem

How to schedule Round-Robin Tournament when we have n Teams to participate for k times?

Here we try to solve Single Round Robin Tournaments (k=1).

Solution

We use COMPLETE GRAPHS for Graph construction and Graph Coloring to find solution.



Vertices represent Team names.
Edges represent Game between two teams.

Some Formulas we need to keep in mind

How many games can be played?

n(n-1)/2

This will be edges to our graph

What will be the Chromatic number?

n-1

How many teams can play in same week?

n/2

Same color comes under same week.

How many weeks can we conduct our games?

no of games / no of plays per week

EXAMPLE 1

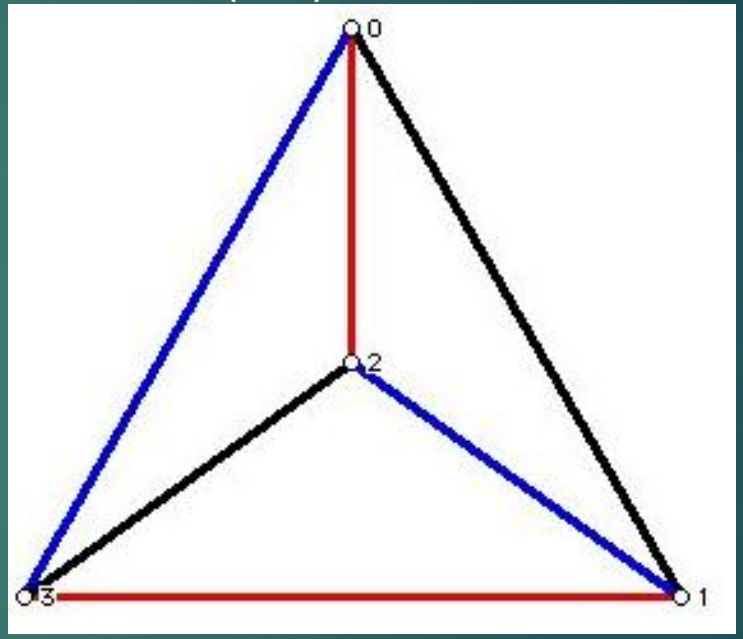
Let us Take 4 Teams (Even Teams) and will try to schedule

Number of edges or Number of games can be played will be n(n-1)/2 = 6

Chromatic Number will be n-1 = 3

Games per week will be n/2 = 2

Number of weeks can be played
6/2 = 3



Solution

	Week 1 (Blue)	Week 2 (Red)	Week 3 (Black)
Match 1	**0 3**	**0 2**	**0 1**
Match 2	**2 1**	**3 1**	**3 2**

EXAMPLE 2

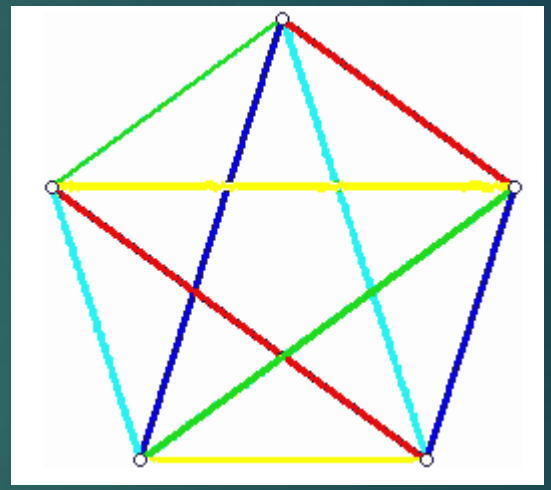
Let us Take 5 Teams (Odd Teams) and will try to schedule
Here a team won't play a game in a week and this concept is called '*bye*'

Number of edges or Number of games can be played will be n(n-1)/2 = 10

Chromatic Number will be n-1 = 4

Games per week will be n/2 = 2 + 1(won't)

Number of weeks can be played
10/2 = 5



Solution

	Week 1	Week 2	Week 3	Week 4	Week 5
Match 1					
Match 2					
bye					

EXAMPLE 3

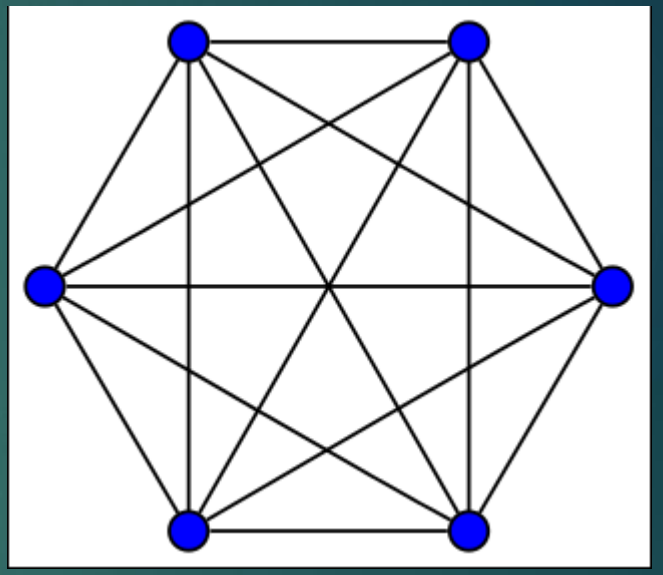
Let us Take 6 Teams (Even Teams) and will try to schedule

Number of edges or Number of games can be played will be n(n-1)/2 = 15

Chromatic Number will be n-1 = 5

Games per week will be n/2 = 3

Number of weeks can be played
15/3 = 5



Solution

	Week 1	Week 2	Week 3	Week 4	Week 5
Match 1					
Match 2					
Match 3			????????		

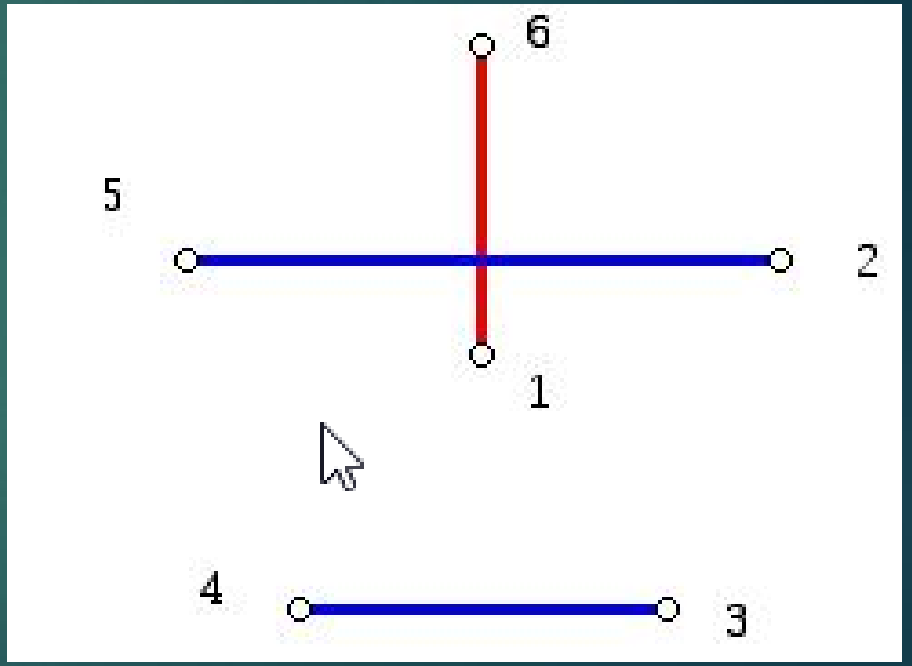
We get 2 disjoint triangles for two weeks and can't find solution for it.

Alternative way to schedule 6 teams in round robin tournament

Week 1

We number the teams from 1 to n.
For 6 Teams (Even teams) we create a table by making a team fixed.
In our case we fix Team 1 position in (1,1)

1	2	3
6	5	4



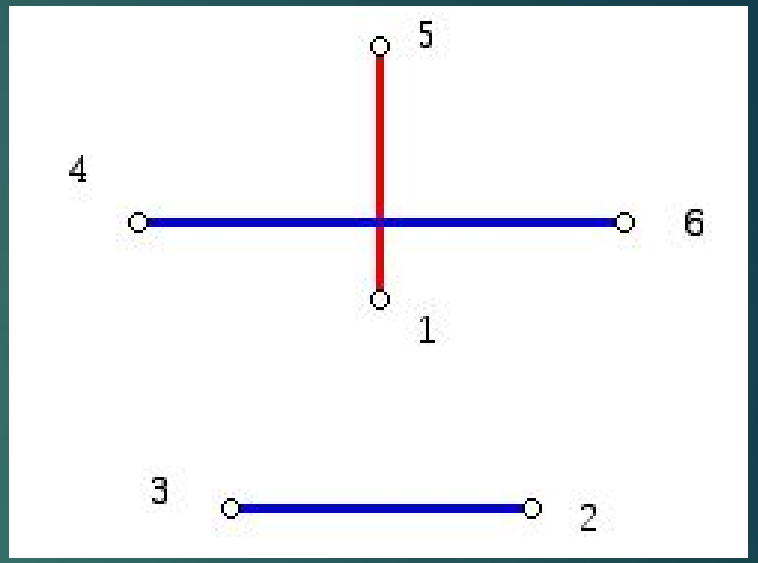
Solution for Week 1

6 1
5 2
4 3

We rotate the remaining teams (2,3,4,5,6) by 1 time in clockwise direction.

Week 2

1	6	2
5	4	3



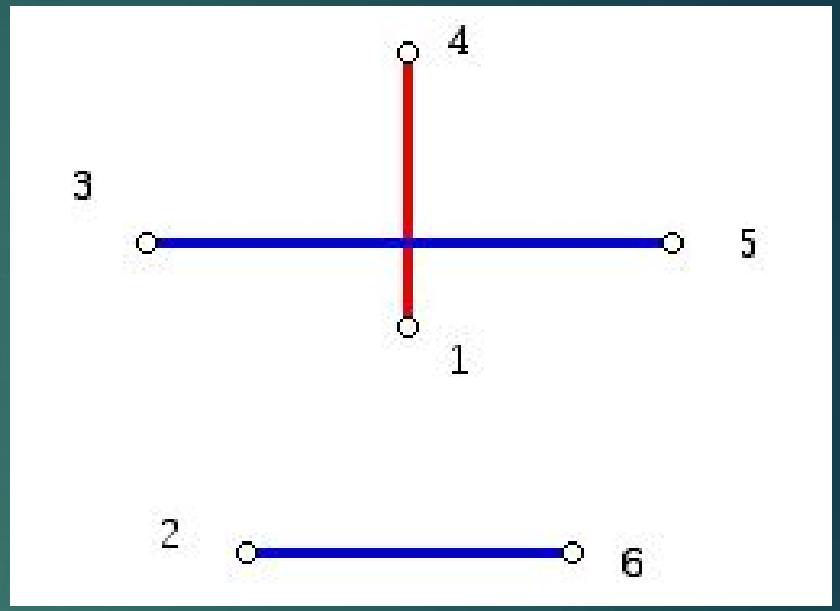
Solution for Week 2

5 1
4 6
3 2

Again we rotate the remaining teams (2,3,4,5,6) by 1 time in clockwise direction.

Week 3

1	5	6
4	3	2



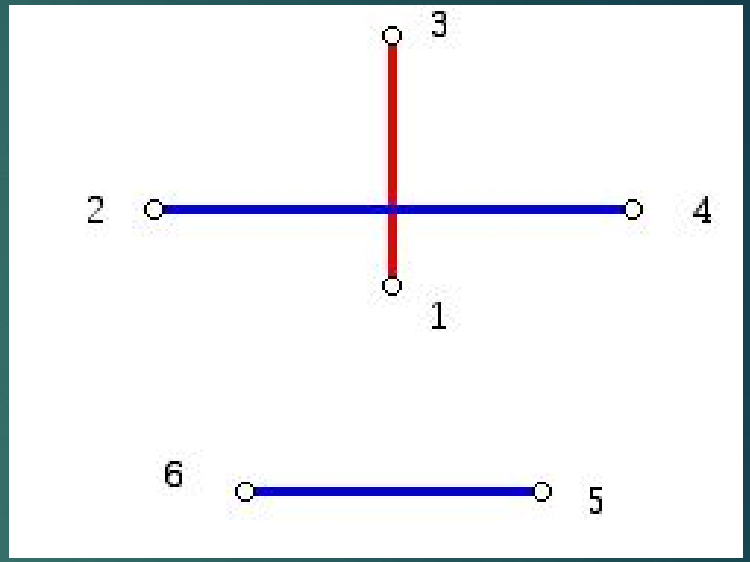
Solution for Week 3

4 1
3 5
2 6

Again we rotate the remaining teams (2,3,4,5,6) by 1 time in clockwise direction.

Week 4

1	4	5
3	2	6



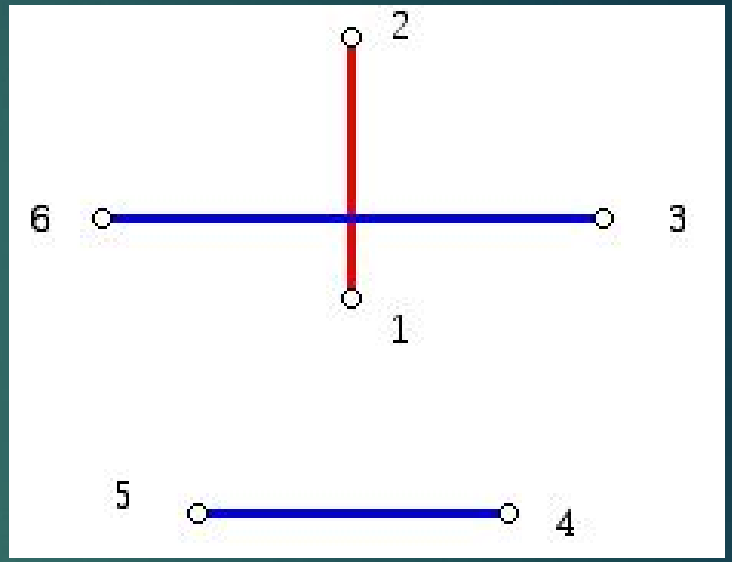
Solution for Week 4

3 1
2 4
6 5

Again we rotate the remaining teams (2,3,4,5,6) by 1 time in clockwise direction.

Week 5

1	3	4
2	6	5



Solution for Week 5

2 1
6 3
5 4

Again rotating the remaining teams (2,3,4,5,6) by 1 time in clockwise direction results in the Week 1 table.

1	2	3
6	5	4

Solution for 6 Team Round-Robin Tournament

	Week 1	Week 2	Week 3	Week 4	Week 5
Match 1	6 1	5 1	4 1	3 1	2 1
Match 2	5 2	4 6	3 5	2 4	6 3
Match 3	4 3	3 2	2 6	6 5	5 4

In our Alternative solution,

if we have Odd Teams, then we use *bye* concept here by adding dummy Team ‘0’

When a Team from 1 to 7 asked to play with Team 0, then that Team n will have *bye* state.

0	1	2	3
7	6	5	4

Here We fix Team 0.

Conclusion

QUERIES???

THANK YOU