Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 7, Issue, 12, pp.23592-23595, December, 2015

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

OPTIMIZING LEAGUE MANAGEMENT USING SQUARE MATRIX RELATION

***Gogo, Tamuno-Omie**

Department of Computer Science, Ken Saro-Wiwa Polytechnic, Bori, School of Applied Sciences, Nigeria

ARTICLE INFO

Article History:
Received 15th September, 2015
Received in revised form
07th October, 2015
Accepted 19th November, 2015
Published online 21st December, 2015

Key words:

League, Matrix, Match,
Team, Points, Spread Sheet.

ABSTRACT

This research work is headed towards deriving a relation between the number of teams and the total matches played in the entire season. The method uses the graphical approach using excels spread sheet and the diagonal square matrix. For league planners, it is relationships that will enable them plan the league effectively.

***Citation*:** Gogo, Tamuno-Omie, 2015. "Optimizing league management using square matrix relation", *International Journal of Current Research*, 7, (12), 23592-23595.

INTRODUCTION

There are several leagues in the world in several games and sporting events. This paper looks at what happens in the football league using the Nigeria globacom premier league as a case study. This serves as a meeting point among different sports or games that has the same characteristics and modus operandi with that of football.

Using the Spread Sheet mode

The Alphabets (A, B…Z) here represents the various teams in the league, the intersections will be used to determine the games played by the teams. For this purpose every game played will be mark (1) and not played will be (0) as shown below.

No of games on a pitch = No of teams – 1

$Ng = N_T - 1$ ……equation 1

Considering the games to be played, let's use square boxes to represent the pitches used by the individual teams as shown below:

****Corresponding author: Gogo, Tamuno-Omie,***
Department of Computer Science, Ken Saro-Wiwa Polytechnic, Bori, School of Applied Sciences, Nigeria.

P1 (A) = Pitch for Team A
P2 (B) = Pitch for Team B
P3 (C) = Pitch for Team C

In all the pitch, two games are played that is, no pitch plays neither less than or more that the required no matches and this will be stated.

No of Teams = N_T
No of Games on a pitch = N_g
No of Pitch = N_P

$\therefore N_T$ (Where all have their pitches)

Also Ng (on each pitch) = N_T - 1

Using the Diagonal matrix

Conditions

(when it is a point based league) from the league considered, there are certain must that cannot be ruled out or over they are:

1. No team will play itself
2. All teams must play two matches which will be home and away making it two legs.
3. All teams must have their own pitch.

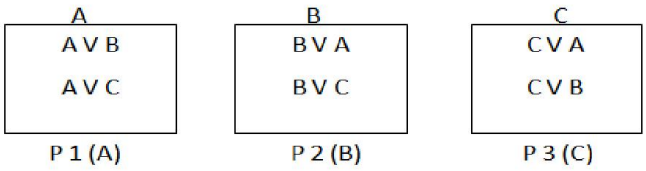


Figure 1. Team and Pitch representation

0 1 1 1 1
1 0 1 1 1
1 1 0 1 1
1 1 1 0 1
1 1 1 1 0

Figure 2. Diagonal Matrix

Table 1. League Table with number of matches

	A	B	C	D
A	0	1	1	1
B	1	0	1	1
C	1	1	0	1
D	1	1	1	0

Considering the conditions, the matrix will be marked as below

Table 2. Excel form of Diagonal Matrix

	A	B	C	D
A	0	1	1	1
B	1	0	1	1
C	1	1	0	1
D	1	1	1	0

Ordinarily looking at the table, it is clear the number of matches played (P) and not played(NP). So if we have more or less than the above number of teams, the league management team will be drawing tables whenever the number of teams increases or decreases that could be a rigorous exercise, i.e. from the above tables, we could see that for:

One Team, No of matches = 0
Two Teams, No of matches = 2
Three Teams, No of matches = 6

Equations

From our equation one above, we know that

$Ng = N_T - 1$

The -1 state that, a team cannot play itself whatsoever the case may be. For that,

Let N_T be the number of teams.

From the graph, it is seen that, using the table below.

Figure 3. Teams and Matches

No of Teams	No of matches
1	0
2	2
3	6
4	12

This can also go this way;

Teams (1)=>(1-1)*1= 0
Teams (2)=> (2-1)*2 = 2
Teams (3) => (3-1)*3 = 6
Teams (4) => (4-1)*4 = 12
Teams (5) => (5-1)*5 = 20

If we relate the above operation with symbols and taking corresponding equation, we can further deduce that,

(N_T-1) ……equation(3)

OR

We can say that by substituting the above equation 1 will be; If each team plays away and home games, then

$Ng = (N_T - 1)*N_T$ ……..equation(4)

$Ng = N_T^2-N_T$

But there are two sets of games to be played by all the teams, namely; Away and Home games

Therefore, the total games will be;

Away games (Ag)= $(N_T^2-N_T)$

Home games (Hg)= $(N_T^2-N_T)$

Also,

Total games(Tg)=Ag +Hg

$Tg=[(N_T^2-N_T)+ (N_T^2-N_T)]$ …….... equation(5)

$Tg=2[(N_T^2-N_T)]$ ……equation(6)

RESULTS

Figure 4. Teams and corresponding games

Teams	Games
1	1, $2[(1^2)-1] = 0$
2	2,$2[(2^2)-2] = 4$
3	3, $2[(3^2)-3] = 12$
4	4, $2[(4^2)-4] = 24$
5	5, $2[(5^2)-5] = 40$

If we have 20 teams, as it is in the EPL, then

Total games that will be played by all the teams from the beginning to the end of the league will be;

$$Tn = 2[(n * n) - n]$$

$$Tn = 2[(n^2) - n]$$

If n = 20 teams

T_n=2[(20*20)-20]
T_n=760games

Individual team will play

Ig=Tn/n

Ig=760/20

Ig=38 games per team

Points To be earned by each team

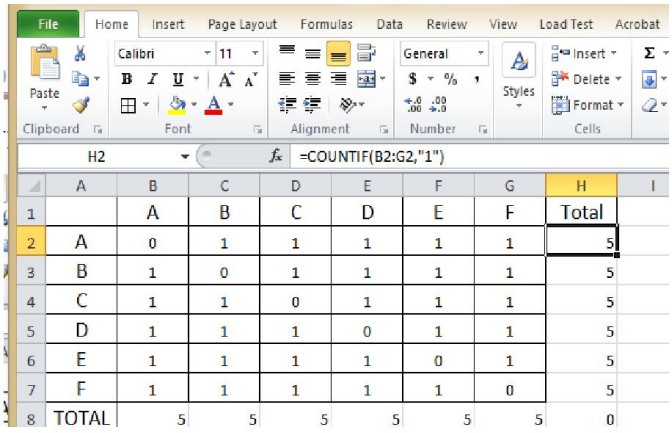
There are several ways of earning points, they are; winning a match to earn the maximum point for winning or drawing a match to earn half or stipulated point for drawing a match. For the purpose of this work, I will discuss the case when a team wins all matches without drawing or losing. From the above relation we have Ig as individual total number of games played, then we will also have the following;

Let the Total Number of Matches Played by a team be = Ig
The point earned by a winning team=xp

1 match = xp
2 matches= xp + xp = 2xp
3 matches= xp + xp + xp= 3xp
Therefore: n number of Matches= Ig * xp
Example
For a team that wins all matches in the Nigerian Professional League;
Ig = 38
xp = 3

Therefore, maximum points will be;
Max Points = Ig * xp
Max Points = 38 * 3
Max Points = 114points

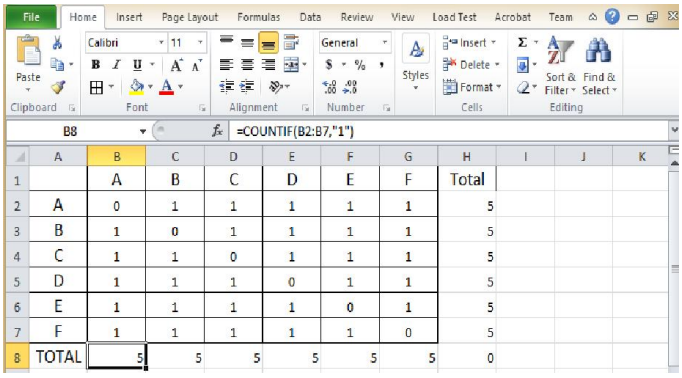
Using the excel spreadsheet



	A	B	C	D	E	F	G	H
1		A	B	C	D	E	F	Total
2	A	0	1	1	1	1	1	5
3	B	1	0	1	1	1	1	5
4	C	1	1	0	1	1	1	5
5	D	1	1	1	0	1	1	5
6	E	1	1	1	1	0	1	5
7	F	1	1	1	1	1	0	5
8	TOTAL	5	5	5	5	5	5	0

Fig. 5. The total first leg games by all teams

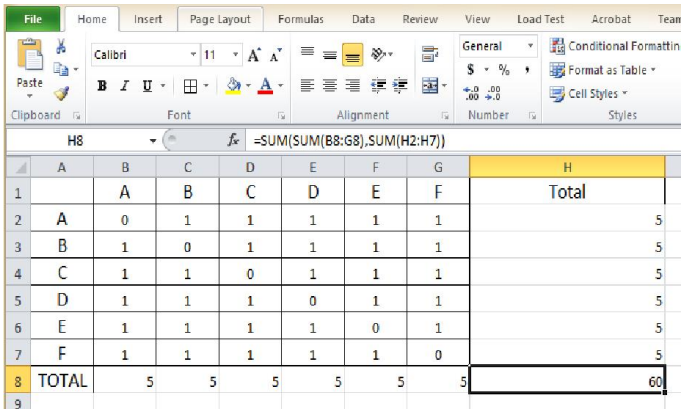
The first leg games by all teams is the summation of all 1s and the total is given as shown above using the function:=COUNTIF(H2:H7,"1")



	A	B	C	D	E	F	G	H
1		A	B	C	D	E	F	Total
2	A	0	1	1	1	1	1	5
3	B	1	0	1	1	1	1	5
4	C	1	1	0	1	1	1	5
5	D	1	1	1	0	1	1	5
6	E	1	1	1	1	0	1	5
7	F	1	1	1	1	1	0	5
8	TOTAL	5	5	5	5	5	5	0

Fig. 6. The total second leg games by all teams

The second leg games by all teams are also the summation of all 1s and the total is given as shown above using the function: =COUNTIF(B2:B7,"1")



	A	B	C	D	E	F	G	H
1		A	B	C	D	E	F	Total
2	A	0	1	1	1	1	1	5
3	B	1	0	1	1	1	1	5
4	C	1	1	0	1	1	1	5
5	D	1	1	1	0	1	1	5
6	E	1	1	1	1	0	1	5
7	F	1	1	1	1	1	0	5
8	TOTAL	5	5	5	5	5	5	60
9								

Fig. 7. the total first and second leg games by all teams

The total games played by all teams is the sum total of the first and second leg games as shown above using the function; =SUM(SUM(B8:G8),SUM(H2:H7))

In the table below, let the alphabets represents the individual teams in the league. All matches not to be played are represented with zero(0) and games to be played with one(1) Using the countif() in excel, the total number of first leg games will be 19 games that is, the count takes only the ones and leave the zeros therefore as shown, each team plays 19 games first leg and 19 games second leg to give us 38 games and the total games played across the league becomes 2[(20*20)-20]

First leg: =COUNTIF (RANGE,"1")

Second leg: =COUNTIF (RANGE,"1")

Total games=SUM(SUM(RANGE),SUM(RANGE))

Conclusion

An equation to efficiently manage a league in the sporting organization has been achieved. The number of teams can vary as years go by also the point distribution can also be reviewed, the use of this derived function will go a long way helping the management in making some decisions that can improve the

functioning of the league. This can also be used as a class demonstration in the learning of Spreadsheet application.

REFERENCES

http://www.math10.com/en/algebra/arithmetic-progression.html
http://www.mathsisfun.com/algebra/matrix-introduction.html
http://www.mathcentre.ac.uk/resources/uploaded/mc-ty-apgp-2009-1.pdf
https://support.office.com/en-us/article/COUNTIF-function-e0de10c6-f885-4e71-abb4-1f464816df34
How to use Excel COUNTIFS and COUNTIF with multiple criteria
https://www.ablebits.com/office-addins-blog/2014/07/10/excel-countifs-multiple-criteria/

****