Leinster Water Polo - Fixtures Builder

An overview of the Python code behind turning club competition entries in to a fixtures list

By Duncan Mullaney - October 2021

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Process Overview

COMPETITION	U13 MIXED	U15 GIRLS	U15 BOYS	U17 GIRLS	U17 BOYS	U19 GIRLS	U19 BOYS	LLMenD2	LLMenD3	Ladies Sen.
NDWSC	x	x	x	x	x	x	x	x	x	x
CLONTARF	x	x		x			x		x	
SANDYCOVE										
DROGHEDA	x	x	x		x	x	x	x	x	x
HALF MOON	x	x	x		x				x	
ST VINCENTS	x								x	
TRINITY										
GUINNESS	x								x	
UCD									x	
NEWRY										

Competitions | Participating teams

```
['U13 MIXED']    ['NDWSC', 'CLONTARF', 'DROGHEDA', 'HALF MOON', 'ST VINCENTS', 'GUINNESS']
['U15 GIRLS']    ['NDWSC', 'CLONTARF', 'DROGHEDA', 'HALF MOON']
['U15 BOYS']     ['NDWSC', 'DROGHEDA', 'HALF MOON']
['U17 GIRLS']    ['NDWSC', 'CLONTARF']
['U17 BOYS']     ['NDWSC', 'DROGHEDA', 'HALF MOON']
['U19 GIRLS']    ['NDWSC', 'DROGHEDA']
['U19 BOYS']     ['NDWSC', 'CLONTARF', 'DROGHEDA']
['LLMenD2']      ['NDWSC', 'DROGHEDA']
['LLMenD3']      ['NDWSC', 'CLONTARF', 'DROGHEDA', 'HALF MOON', 'ST VINCENTS', 'GUINNESS', 'UCD']
['Ladies Sen.']  ['NDWSC', 'DROGHEDA']
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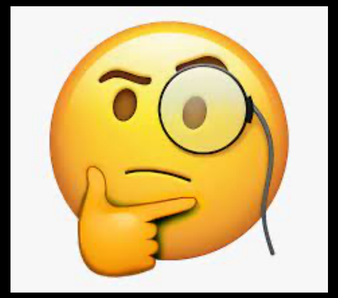
U15 Girls -> 4 teams -> 4C2 = 6 games

?



1	CLONTARF	vs.	HALF MOON
2	NDWSC	vs.	HALF MOON
3	NDWSC	vs.	DROGHEDA
4	DROGHEDA	vs.	CLONTARF
5	DROGHEDA	vs.	HALF MOON
6	CLONTARF	vs.	NDWSC

Input (water polo clubs' entries)

COMPETITION	U13 MIXED	U15 GIRLS	U15 BOYS	U17 GIRLS	U17 BOYS	U19 GIRLS	U19 BOYS	LLMenD2	LLMenD3	Ladies Sen.
NDWSC	x	x	x	x	x	x	x	x	x	x
CLONTARF	x	x		x			x		x	
SANDYCOVE										
DROGHEDA	x	x	x		x	x	x	x	x	x
HALF MOON	x	x	x		x				x	
ST VINCENTS	x								x	
TRINITY										
GUINNESS	x								x	
UCD									x	
NEWRY										

Polygon Analysis

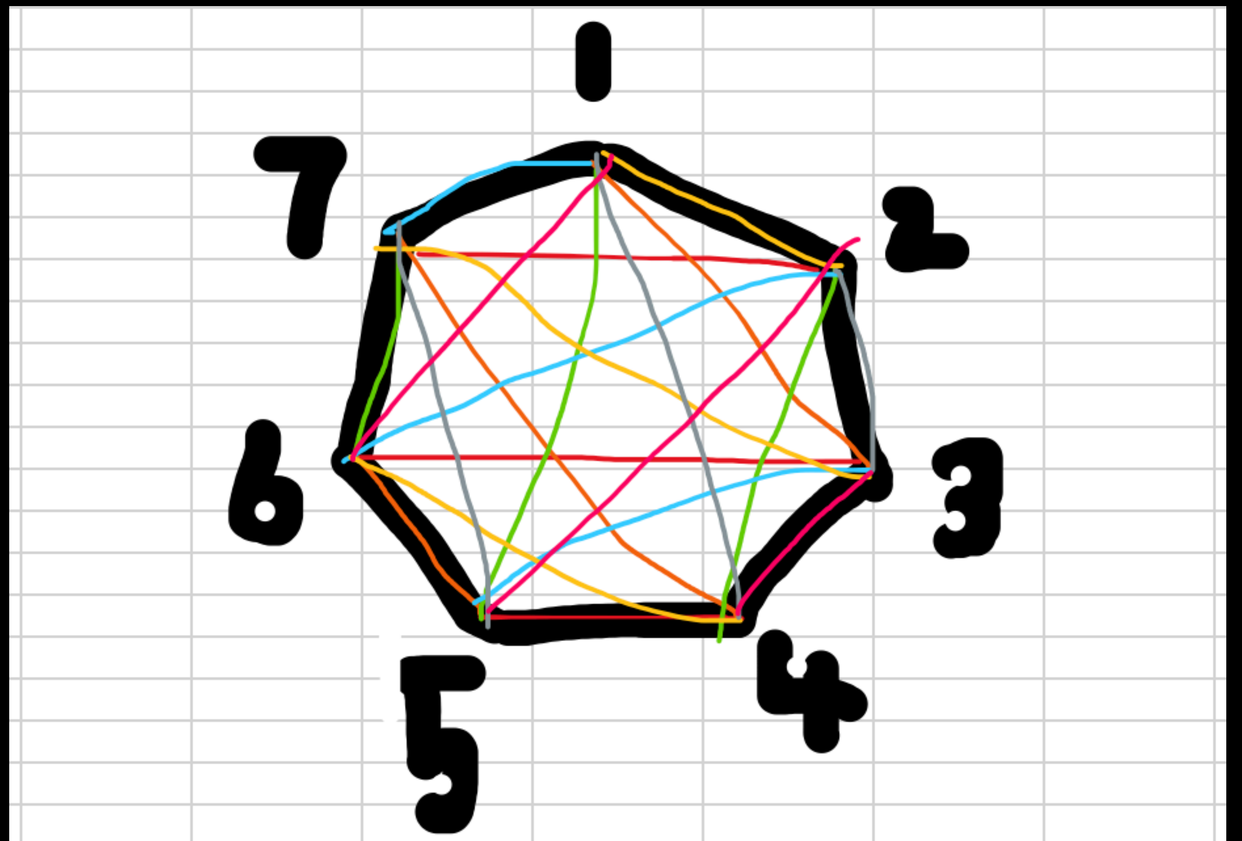
A “polygon” based method of generating a list of games in a round robin fashion was used (http://intermath.org/round-robin-tournament/).

Take the following example, for a competition with 7 teams participating, draw a polygon with one team at each vertex (1, 2, 3…).

Ignoring team 1, draw lines joining teams at opposite sides, e.g. join 7 and 2, 6 and 3, 5 and 4. This set of pairs makes up the first round of games.

Repeat this process, ignoring team 2 this time. The pairs will be (1,3), (7,4) and (6,5).

Repeat this for each vertex, until 7C2 pairings (i.e. 21) have been made (see table).



(7,2)	(1,3)	(2,4)	(3,5)	(4,6)	(5,7)	(6,1)
(6,3)	(7,4)	(1,5)	(2,6)	(3,7)	(4,1)	(5,2)
(5,4)	(6,5)	(7,6)	(1,7)	(2,1)	(3,2)	(4,3)

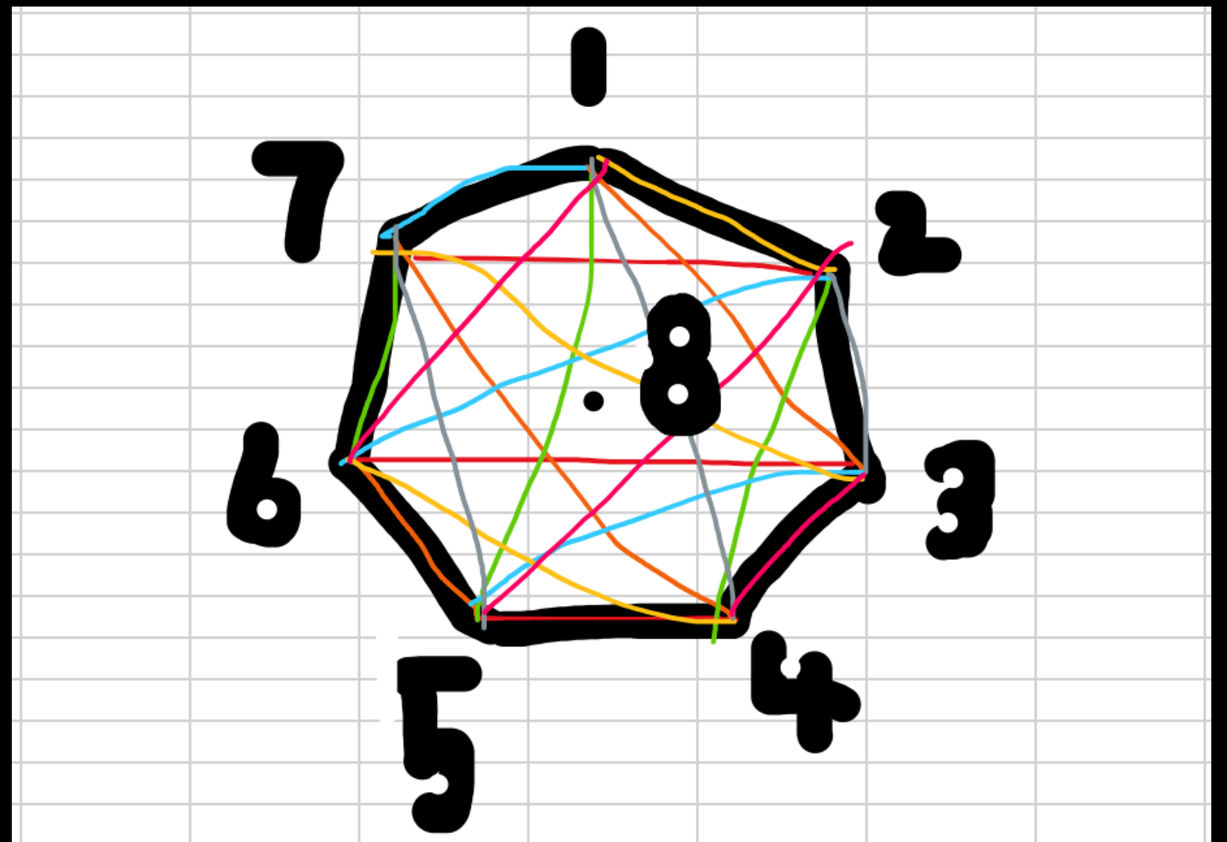
7.

Polygon Analysis

Similarly for a competition with 8 teams, draw the same polygon but with the eighth team in the centre.

Repeat this process, but instead of ignoring a team each time, pair this team with 8, such that the final pair will be (1,8) or (2,8) or (3,8) etc…

Repeat this for each vertex, until 8C2 pairings (i.e. 28) have been made.



(7,2)	(1,3)	(2,4)	(3,5)	(4,6)	(5,7)	(6,1)
(6,3)	(7,4)	(1,5)	(2,6)	(3,7)	(4,1)	(5,2)
(5,4)	(6,5)	(7,6)	(1,7)	(2,1)	(3,2)	(4,3)
(1,8)	(2,8)	(3,8)	(4,8)	(5,8)	(6,8)	(7,8)

8.

So the challenge is, with computer code, turn A in to B.

Play Matrix

A

(1,1)	(2,2)	(3,3)	(4,4)	(5,5)	(6,6)	(7,7)
(1,1)	(2,2)	(3,3)	(4,4)	(5,5)	(6,6)	(7,7)
(1,1)	(2,2)	(3,3)	(4,4)	(5,5)	(6,6)	(7,7)

B

(7,2)	(1,3)	(2,4)	(3,5)	(4,6)	(5,7)	(6,1)
(6,3)	(7,4)	(1,5)	(2,6)	(3,7)	(4,1)	(5,2)
(5,4)	(6,5)	(7,6)	(1,7)	(2,1)	(3,2)	(4,3)

This is called the “Play Matrix”

PM Processing & Shifting

You will notice the following in the play matrix:

- in row 1, the first coordinate has been shifted by 1 cell, and the second coordinate has been shifted by 6 (i.e. [1,6]).
- In row 2, the first coordinate has been shifted by 2 cells, and the second coordinate has been shifted by 5 (i.e. [2,5]).
- In row 3, the first coordinate has been shifted by 3 cells, and the second coordinate has been shifted by 4 (i.e. [3,4]).

(1,1)	(2,2)	(3,3)	(4,4)	(5,5)	(6,6)	(7,7)
(1,1)	(2,2)	(3,3)	(4,4)	(5,5)	(6,6)	(7,7)
(1,1)	(2,2)	(3,3)	(4,4)	(5,5)	(6,6)	(7,7)

(7,2)	(1,3)	(2,4)	(3,5)	(4,6)	(5,7)	(6,1)
(6,3)	(7,4)	(1,5)	(2,6)	(3,7)	(4,1)	(5,2)
(5,4)	(6,5)	(7,6)	(1,7)	(2,1)	(3,2)	(4,3)

…so there is a clear pattern here that can be utilised.

Shift Matrix

(1,1)	(2,2)	(3,3)	(4,4)	(5,5)	(6,6)	(7,7)
(1,1)	(2,2)	(3,3)	(4,4)	(5,5)	(6,6)	(7,7)
(1,1)	(2,2)	(3,3)	(4,4)	(5,5)	(6,6)	(7,7)

(7,2)	(1,3)	(2,4)	(3,5)	(4,6)	(5,7)	(6,1)
(6,3)	(7,4)	(1,5)	(2,6)	(3,7)	(4,1)	(5,2)
(5,4)	(6,5)	(7,6)	(1,7)	(2,1)	(3,2)	(4,3)

This pattern gives rise to an associated “Shift Matrix”

… [[1,6] , [2,5] , [3,4]]

This matrix can be used as an instruction to shift the first coordinate in the first row by 1 and the second coordinate in the first row by 6, then the first coordinate in the second row by 2 and the second coordinate in the second row by 5, and so forth…

1.1/xxx

Print to Excel file

(7,2)	(1,3)	(2,4)	(3,5)	(4,6)	(5,7)	(6,1)
(6,3)	(7,4)	(1,5)	(2,6)	(3,7)	(4,1)	(5,2)
(5,4)	(6,5)	(7,6)	(1,7)	(2,1)	(3,2)	(4,3)

Once the above play matrix format has been achieved, the next step is to use it to print a list of games like so to an excel file output

The code creates a new sheet for each competition (in this case “U13 MIXED”), and prints the team that each pairing corresponds to

	A	B	C	D
1	1	HALF MOON	vs.	DROGHEDA
2	2	DROGHEDA	vs.	CLONTARF
3	3	ST VINCENTS	vs.	GUINNESS
4	4	ST VINCENTS	vs.	HALF MOON
5	5	CLONTARF	vs.	GUINNESS
6	6	DROGHEDA	vs.	GUINNESS
7	7	NDWSC	vs.	DROGHEDA
8	8	CLONTARF	vs.	NDWSC
9	9	CLONTARF	vs.	HALF MOON
10	10	ST VINCENTS	vs.	CLONTARF
11	11	DROGHEDA	vs.	ST VINCENTS
12	12	HALF MOON	vs.	NDWSC
13	13	NDWSC	vs.	GUINNESS
14	14	HALF MOON	vs.	GUINNESS
15	15	NDWSC	vs.	ST VINCENTS
16				
17				
18				
19				
20				
21				
22				
23				

U13 MIXED | U15 GIRLS | U15 B

Code: 1/xx

```python
def getTeamsAndComps(a):
    import math
    import numpy as np
    import pandas as pd
    numRows = a.shape[0]
    numCols = a.shape[1]
    # print(numRows)
    # print(numCols)
    result = []
    compList = []
    teamList = []
    for i in range(1,numCols):
        teams = []
        comps = a[0][i]
        result.append([comps])
        for j in range(1,numRows):
            if pd.isnull(a[j][i]):
                teams = teams
            else:
                teams.append(a[j][0])
        result.append(teams)

    for i in range(0,len(result),2):
        compList.append(result[i])
    for i in range(1,len(result),2):
        teamList.append(result[i])
    return compList, teamList

```

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NDWSC	x	x	x	x	x	x	x	x	x	x
CLONTARF	x	x		x			x		x	
SANDYCOVE										
DROGHEDA	x	x	x		x	x	x	x	x	x
HALF MOON	x	x	x		x				x	
ST VINCENTS	x								x	
TRINITY										
GUINNESS	x								x	
UCD									x	
NEWRY										

```
['U13 MIXED']   ['NDWSC', 'CLONTARF', 'DROGHEDA', 'HALF MOON', 'ST VINCENTS', 'GUINNESS']
['U15 GIRLS']   ['NDWSC', 'CLONTARF', 'DROGHEDA', 'HALF MOON']
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['LLMenD3']     ['NDWSC', 'CLONTARF', 'DROGHEDA', 'HALF MOON', 'ST VINCENTS', 'GUINNESS', 'UCD']
['Ladies Sen.'] ['NDWSC', 'DROGHEDA']
```

1.1/xxx

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        comps = a[0][i]
        result.append([comps])
        for j in range(1,numRows):
            if pd.isnull(a[j][i]):
                teams = teams
            else:
                teams.append(a[j][0])
        result.append(teams)

    for i in range(0,len(result),2):
        compList.append(result[i])
    for i in range(1,len(result),2):
        teamList.append(result[i])
    return compList, teamList

```

COMPETITION	U13 MIXED	U15 GIRLS	U15 BOYS	U17 GIRLS	U17 BOYS	U19 GIRLS	U19 BOYS	LLMenD2	LLMenD3	Ladies Sen.
NDWSC	x	x	x	x	x	x	x	x	x	x
CLONTARF	x	x		x			x		x	
SANDYCOVE										
DROGHEDA	x	x	x		x	x	x	x	x	x
HALF MOON	x	x	x		x				x	
ST VINCENTS	x								x	
TRINITY										
GUINNESS	x								x	
UCD									x	
NEWRY										

```
['U13 MIXED']   ['NDWSC', 'CLONTARF', 'DROGHEDA', 'HALF MOON', 'ST VINCENTS', 'GUINNESS']
['U15 GIRLS']   ['NDWSC', 'CLONTARF', 'DROGHEDA', 'HALF MOON']
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['U19 BOYS']    ['NDWSC', 'CLONTARF', 'DROGHEDA']
['LLMenD2']     ['NDWSC', 'DROGHEDA']
['LLMenD3']     ['NDWSC', 'CLONTARF', 'DROGHEDA', 'HALF MOON', 'ST VINCENTS', 'GUINNESS', 'UCD']
['Ladies Sen.'] ['NDWSC', 'DROGHEDA']
```

1.1/xxx