## Multiple-Teams Competitions - Types of Movements

In a multiple teams-of-four competition each team meets all the other teams, or as many teams as time will allow. The movement must ensure that matches between teams are complete with two pairs of one team meeting the two pairs of another team playing the same boards. Playing the same boards is essential in the matches between two teams. Using the same boards in matches that are otherwise independent is desirable but not essential. It does give all teams similar opportunities to make large swings on suitable hands.

## A American Whist Movement

This is the most frequently used movement for multiple teams-of-four competitions. The NS pairs remain at their home tables whilst the EW pairs move around the room keeping their same relative positions. Pairs and boards move in the same direction but the EW pairs move at twice the speed of the boards characterised by the instruction from the TD:

> "Pairs down two, dropping the boards off one".

After the first encounter between two teams the boards start their journey from one home table towards the other home table. The EW pair that will play the boards at that second table will have just completed part of another match at a table the same distance behind but, moving at twice the speed of the boards, will arrive with the boards for the second half of the match. The match between the two teams can then be completed.

In Round 3: $\quad$ NS5 plays EW 2 with Boards 19-21
(EW 2 are 3 places up from their home table whilst EW 5 are a further 3 places up at Table 8)
By Round 6 The boards have moved down 3 places to Table 2 and EW5 have moved down 6 places also to Table 2.

The match between the two teams is completed.
It works well for an odd number of tables, with the EW pairs visiting all the other tables in a double circuit of the room before returning to their home table to compare scores.

This movement is symmetrical. Matches starting in the first round are completed in the last round; those starting in the $2^{\text {nd }}$ round are completed in the penultimate round etc. By starting in unusual positions, some movements can be split into smaller stanzas each of which is symmetrical and consisting of complete matches. Thus an 11 table movement can comprise a stanza of $4 \times 3$ boards followed by a stanza of $6 \times 2$ boards allowing the play of a convenient 24 boards.

A similar technique could be used for an even number of teams but only when an incomplete movement is acceptable.

## B Stagger Movement

The complete movement would need to have an odd number of rounds including one in which teams play head-to-head matches sharing boards. A "Stagger" movement uses the same principle but shares boards throughout.

Boards are set out on the low numbered tables ( 1 to n ) with duplicates on the higher numbered half ( $\mathrm{n}+1$ to 2 n ). If only one set of boards is available, the boards are set out separately on relay tables.and shared. The same instructions are given at the end of each round "EW down two; boards down one (cyclically" is used. When the moving pairs have competed against all the teams displaced an even number of places from their home tables the movement is repeated with a new set of boards whilst they visit the remaining tables.

This is a completely different type of movement. The circuit is reduced to an odd number by designating one table as the Appendix Table. It is preferable to select a team that does not include slow players as it will be sharing boards with each of the other teams in turn.

For the first round the EW pairs are sent to tables so that pairs numbered adjacently are spaced two tables apart. A checklist is essential.

EW pairs move up one table and the boards move down one table (similar to a Mitchell Movement). One team in each round then arrives at its home table when the team plays a head-to-head match with the Appendix Table sharing boards. Unfortunately the Appendix Movement does not work if the reduced circuit is a multiple of 3 . In practice, this means it cannot be used for 4,10 or 16 teams.

## C Circulation Movement for Four tables

Each team meets the other teams in head-to-head matches in three separate stanzas. In each stanza a set of eight boards is circulated around the four tables.

## Analysis of Movements for Teams of Four

NS pairs remain at their home tables whilst the EW pairs and the boards move cyclically retaining the same relative position to each other. Movements must ensure that the boards played at Table $x$, between the resident NS pair of Team $x$ and the travelling EW pair of Team $y$, arrive at Table $y$ simultaneously with the EW pair of Team $x$.
.a) Notation
R Number of Tables around which the boards move.
$\mathrm{S}_{\mathrm{x}} \quad$ Start Table of EW pair of Team x
$\mathrm{S}_{\mathrm{y}} \quad$ Start Table of EW pair of Team y
p Number of tables that EW pairs move at the end of each round.
b Number of tables that boards move at the end of each round.
$\mathrm{m} \quad$ Number of rounds before EW pair of Team $x$ arrives at Table $y$
$\mathrm{n} \quad$ Number of rounds before EW pair of Team y arrives at Table x
b) All arithmetic is integral and modulo R. The definitions of the operations of addition, subtraction and multiplication are obvious. Division is not used in the analysis. This is preferable to making a complicated definition of this operation
c) Basic Formulae for all movements.

1) EW pair of Team $x$ starts at $S_{x}$ and after $m$ rounds arrives at Table $y$

$$
S_{x}+m p=y
$$

2) EW pair of Team $y$ starts at $S_{y}$ and after $n$ rounds arrives at Table $x$

$$
\mathrm{S}_{\mathrm{y}}+\mathrm{np}=\mathrm{x}
$$

3) The boards at Table $y$ during Round $m$ arrive at Table $x$ for Round $n$

$$
y+(n-m) b=x
$$

Combining

$$
\mathrm{bx}(\operatorname{Eqn} 1)-\mathrm{bx}(\operatorname{Eqn} 2)+\mathrm{px}(\operatorname{Eqn} 3)
$$

4) We obtain
$\mathrm{b}\left(\mathrm{S}_{\mathrm{x}}-\mathrm{S}_{\mathrm{y}}\right)=(\mathrm{p}-\mathrm{b})(\mathrm{x}-\mathrm{y})$
c) American Whist Movement for an ODD number of tables (R)

Assume that each pair starts with a dummy Round 0 at its home table.
i.e. $S_{x}=x$ for all $x$.

So $b=p-b$ and thus $p=2 \times b$ In particular we select $\quad p=-2 \quad b=-1$
At the end of each round, EW pairs are instructed to move down two places whilst the boards are moved down one table. EW pairs move in the same direction as the boards but twice as fast.
d) Thurner Appendix Movement for an EVEN no of tables ( $\mathrm{R}+1$ )

One team is selected as an Appendix. The EW pairs of the remaining odd number of teams start at carefully selected positions and move around the reduced circuit. During each round one EW pair will arrive at its home table. That team then plays a head -to-head match against the Appendix Team sharing the boards that have just arrived at that table. For this movement the instruction at the end of a round is that usually employed with Mitchell movements (EW Pairs up one, Boards down one).

Setting $\mathrm{p}=+1, \mathrm{~b}=-1$ and starting with Team 1 sharing with the Appendix Team $\left(\mathrm{S}_{\mathrm{y}}=\mathrm{y}=1\right)$
We obtain (Eqn 3)

$$
\left(S_{x}-1\right)=-2(x-y) \quad \text { i.e. } \quad S_{x}=3-2 x
$$

$\mathrm{EW}_{\mathrm{x}}$ moves up one table each round and thus reaches its own table after T moves,

$$
\text { then } x=(3-2 x)+T \quad \text { i.e. } \quad T=3(x-1)
$$

This gives a unique solution for each value of x if R and 3 are relatively prime. The Thurner Appendix movement cannot be used when $R$ is a multiple of 3 (eg 4, 10 or 16 teams)

