

Glaisher

A game for two players by **Ken Shoda**

INTRODUCTION

Players separate and move their stacks in order to connect the opposite sides of the board. The mechanics for separation and movement of stacks are dictated by integer partitions with distinct parts, i.e., splitting numbers into sets of different smaller numbers. Players might recognize this mechanism from Kakuro puzzles. The game is therefore named after mathematician James Glaisher, who devised a theorem about integer partitions.

MATERIAL

- Hexagonal board with 5 hexes per side (total of 61 hexes)
- 75 double-sided pieces with one side red and the other side yellow (a few more are included in case you lose some).

PREPARATION

Decide the colour (red or yellow) for each player.

Each player takes 18 pieces with his/her colour facing up.

Each player starts by making three 6-stacks, i.e., stacks six pieces high as shown in Figure 1.

Starting positions are marked with white dots.

The remaining pieces are kept in a shared reserve.

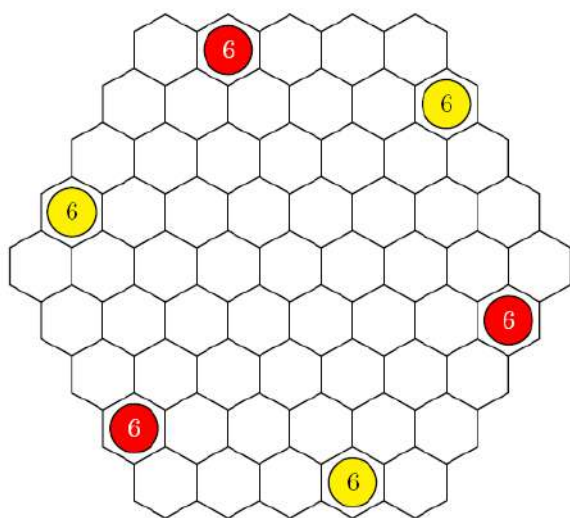


Figure 1: Starting position – The number indicates the height of each stack

OBJECTIVE

Connect any pair of opposite sides of the board with a contiguous chain of stacks showing your colour.

A single piece is considered to be a stack of height 1 (1-stack).

Stacks on the game board are connected if they can be traced with series of edge adjacent friendly stacks.

The six corner hexes of the game board belong to both adjacent sides.

GAME PLAY

Players take turns by taking two actions in the following order. The details of these actions are described below.

1. Separate and move a stack.
2. Place a new piece.

Passing is not allowed. If you cannot do the first action “separate and move a stack”, then you lose immediately.

1. Separate and Move a Stack

Choose one of your stacks and separate it into two or more smaller stacks, called “sub-stacks”, of different heights. You may not have sub-stacks of the same heights. Then, all sub-stacks must move straight in the same direction. Each sub-stack moves the number of hexes equal to its respective height (Figure 2).

Your sub-stacks may jump over any in-between stacks but may not move outside the game board.

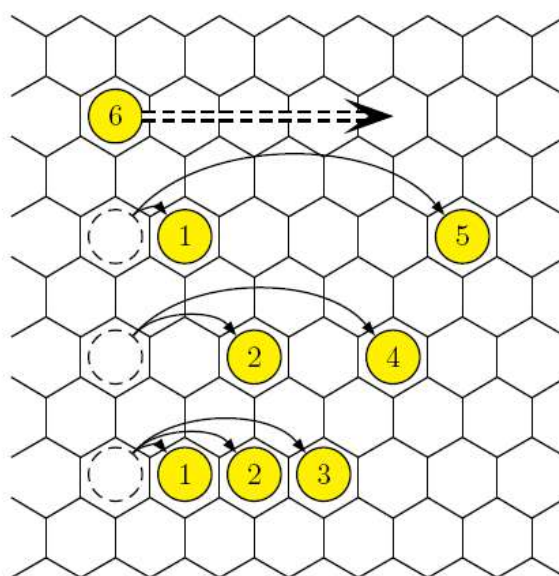


Figure 2: Separate and Move – Three possible separations for a 6-stack

Now, flip your opponent's stacks which occupy the destination hexes of your moving sub-stacks. Flip them entirely so that they become your stack with your colour up. Then move all sub-stacks. Some sub-stacks may be on top of your other stacks, creating taller stacks, and even effectively capturing opponent's stacks. There is no limit for the height of stacks.

The diagram shows a hexagonal grid with the following layout of numbered cells (rows from top to bottom):

- Row 1: Yellow(6), Yellow(2), Red(2), Red(5), Red(4)
- Row 2: Dashed outline, Yellow(3), Red(2), Red(5), Yellow(9)
- Row 3: Dashed outline, Yellow(2), White(?), White(?), Red(4)
- Row 4: Dashed outline, Yellow(3), Yellow(4), Yellow(3), Red(5), Red(4)

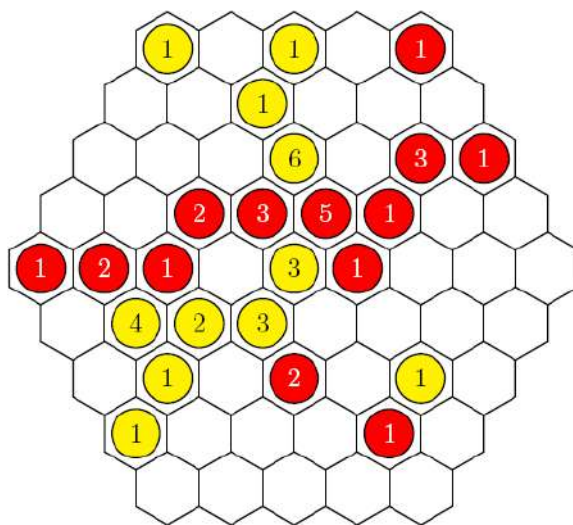
Path-finding details:

- Solid Arrows (Valid Path):**
 - From Row 1, Yellow(2) to Row 2, Yellow(3)
 - From Row 2, Yellow(3) to Row 3, Yellow(2)
 - From Row 3, Yellow(2) to Row 4, Yellow(3)
 - From Row 4, Yellow(3) to Row 4, Yellow(4)
 - From Row 4, Yellow(4) to Row 4, Yellow(3)
- Dashed Arrows (Rejected Path):**
 - From Row 2, Yellow(3) to Row 3, White(?)
 - From Row 3, White(?) to Row 2, Red(5)
- Label:** "No!" is placed near the dashed arrows, indicating they are not part of the solution.

2. Place a new piece

The newly placed piece is considered to be a stack of height 1.

When a player connects any two opposite side of the game board, that player wins immediately (Figure 4). Also if a player cannot separate and move any of his/her stacks, then that player loses immediately.



ADVANCED GAME

The board starts empty. At the beginning of the game, there is a set-up phase. Both players take turns to place their three 6-stacks, one stack per turn, on any empty hex on the board. After 6 turns (3 turns each), the initial set-up phase is over and players start the game as normal.

NOTES

1- and 2-stacks cannot be separated. Thus, they cannot be moved.

3- and 4-stacks have only one possibility of separation, i.e., 2-1 or 3-1, respectively. Thus having 2- or taller stacks next to opponent's 3- or 4-stacks blocks its movement of that direction.

6- or taller stacks can be separated into three sub-stacks.

10- or taller stacks can be separated into four sub-stacks.

11- or taller stacks at the centre of the board are permanently immobile because any separation requires 5- or taller sub-stacks.

You can see a summary of Separate-and-Move for up to 9-stacks printed on the game board.