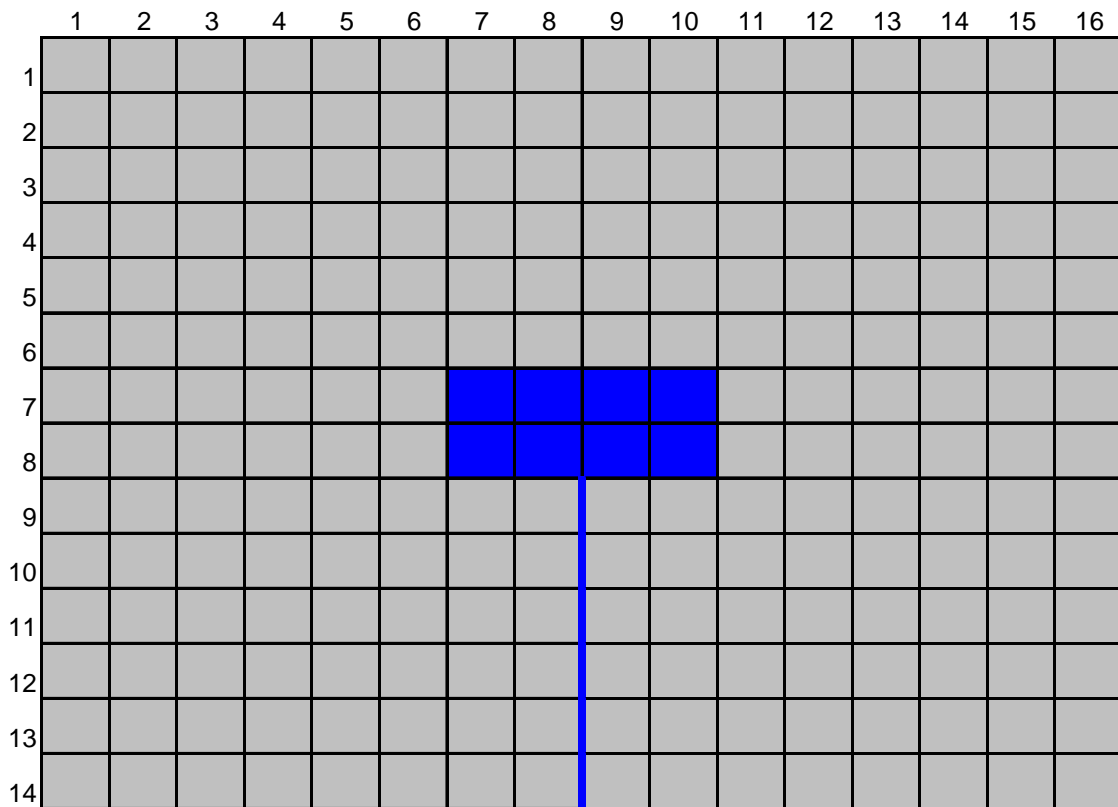


BILLABONG - RULES (modified slightly for CS405)

BILLABONG is a strategy race game. Each player controls a team of five kangaroos all of the same color, either Red or Green. The billabong is the lake in the center of the board, and the stream flowing into the billabong is the start/finish line for the race. The winner is the player who first gets ALL his kangaroos across the start line, around the billabong in a clockwise direction, and then across the finish line. The game starts with the players taking turns to place one kangaroo anywhere on the board until all have been placed. Red moves first. Movement rules will be described shortly.

The board is shown below. It is 16 squares across and 14 squares down. We will denote kangaroos by "r", "R", "g", or "G" to stand for red or green. A lowercase letter means the kangaroo has not yet crossed the starting line, while an uppercase letter means the kangaroo has crossed the starting line.



To specify a location on the board we will use a coordinate system of x,y. The square in the upper left hand corner is in location 1,1. The square in the lower right hand corner is in location 16,14. Note that this follows the origin for graphic systems, not the origin for mathematics (where 0,0 is the lower left corner instead of upper left).

Walking Turns

Players take turns in the usual way, and may move just ONE of their kangaroos. The chosen kangaroo may WALK one square in any direction provided it moves to a vacant square. The player's turn ends when the kangaroo has been moved one square.

In the figure below, the red kangaroo at coordinate 2,2 can move to 1,1 or 2,1 or 3,1 or 1,2 or 3,2 or 1,3 or 2,2. It cannot move to 3,3 since that is occupied by another kangaroo.

	1	2	3
1			
2		R	
3			R

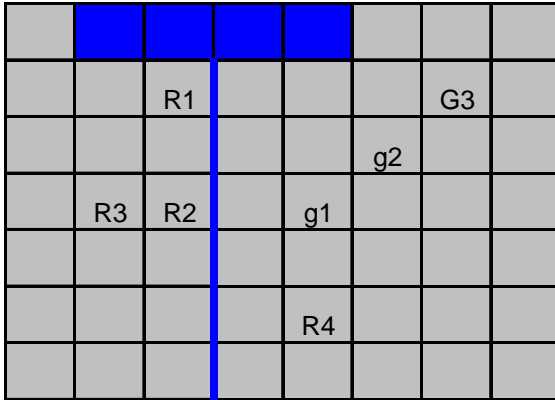
Jumping Turns

Instead of walking, the chosen kangaroo may jump one or more of the other kangaroos which may be of ANY color. To jump another kangaroo, which is called the "pivot" kangaroo, the pivot must lie on the same row, column, or diagonal as the jumping kangaroo. The chosen kangaroo may continue to jump other pivot kangaroos IN THE CURRENT TURN. In each single jump the jumping kangaroo must land an EQUAL distance on the other side of the pivot and on the same row, column, or diagonal. In addition there are four other rules about jumping as follows:

1. The chosen kangaroo may only jump ONE pivot kangaroo in each jump of the turn.
2. The kangaroo must not land on top of another kangaroo.
3. The kangaroo must not jump off the board.
4. The kangaroo must not jump across any part of the billabong. But note that the four diagonals with squares that join at the corners of the billabong do not pass across the billabong.

Illegal Jumps

The figure below illustrates various illegal jumps:



The kangaroo marked "g1" cannot jump:

R4: because it would go off the board

R2: because it would jump more than one kangaroo (R3)

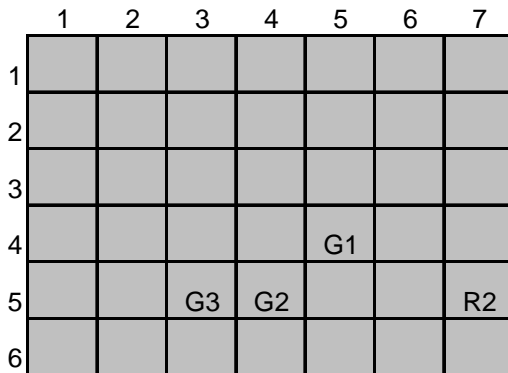
R1: because it would jump over part of the billabong

g2: because it would land on kangaroo G3

The Referee Kangaroo

One of the kangaroos in the game is colored black. This is a "referee" kangaroo that is used as a placeholder to mark the original location of the jumping kangaroo. When a kangaroo is beginning its jump, the referee is placed into the starting square of the jumping kangaroo. If the player loses track of his jumps he can make a fresh start because the referee marks the starting point. The player is NOT allowed to decide to move another of his kangaroos after starting his turn.

Since the referee is a kangaroo it may be jumped as a pivot. This is illustrated below:



In one turn the kangaroo G1 can jump over G2 to 3,6 then jump G3 to 3,4 then jump the referee to 7,4 and finally jump R2 to end up at 7,6.

Starting and Finishing the Game

Recall that we stated that to start the game each player takes a turn to place one of his kangaroos on ANY vacant square. Why don't they start lined up along the starting line? They could, but you have seen how kangaroos can jump a whole series of pivot kangaroos, so clearly it is sometimes possible for a kangaroo to make a lot of progress around the billabong in a single turn. There is often an advantage in starting well back from the starting line because that might allow big jumps to be made. When all the kangaroos have been placed on the board, movement can start.

Each kangaroo must cross the start line, travel around the billabong, and will eventually cross the finish line. When a kangaroo finishes the course it is picked up and placed in the billabong to "cool off". It plays no further part in the game.

Hints on Play

Because the winner must finish the course with ALL his kangaroos, it is very important to keep all the kangaroos "in touch." That is, try not to leave one far behind. If you do, the "tail end Charlie" will not find any pivot kangaroos to jump and will have to walk all the way home. By that time, your opponent may have won the game. Remember that the referee, being a kangaroo, can be jumped. Obviously this will require that at least one of the individual jumps will be in a backward direction. Blocking tactics are often important to prevent an opponent from making a lot of progress on his next turn.

Move Notation

For purposes of the AI game tournament we will use the following notation to specify moves.

A walking move consists of the letter "W" followed by a space, the source coordinate of the kangaroo to move separated by a comma, followed by a space, followed by the destination coordinate of the new location. For example:

W 2, 2 3, 2

Results in moving from:

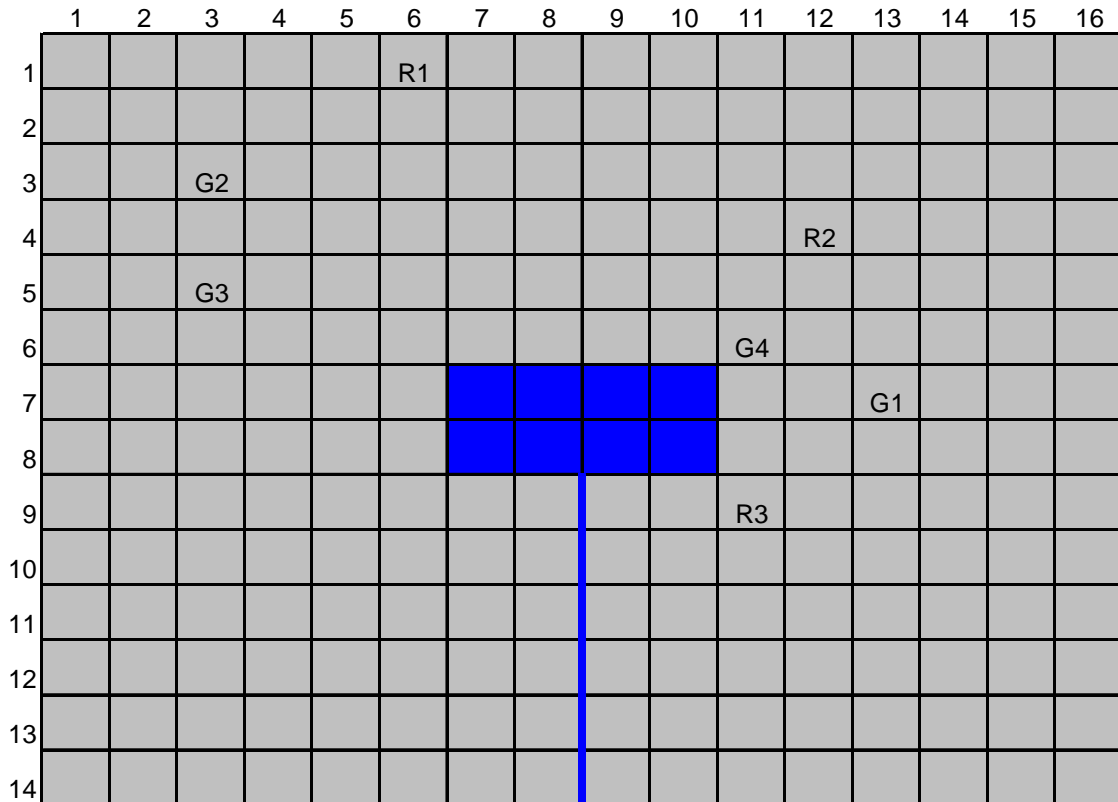
	1	2	3
1			
2		G1	
3			G2

to

	1	2	3
1			
2			G1
3			G2

A jumping move consists of the letter "J" followed by a space, the source coordinate of the jumping kangaroo, followed by a list of coordinates of pivot kangaroos in the event of multiple jumps. Note that we specify the coordinates of pivot kangaroos, not landing coordinates.

For example, given the board as shown below:



The following move would jump kangaroo G3 all the way around the billabong:

J 3,5 3,3 6,1 12,4 13,7 11,6 13,7 11,9

This will land the kangaroo at 7,9 where it will then be removed and placed in the billabong since it has crossed the finish line.

Note that we don't have to make all these jumps. We could also just stop after jumping G2:

J 3,5 3,3

This would place kangaroo G3 at coordinate 3,1.