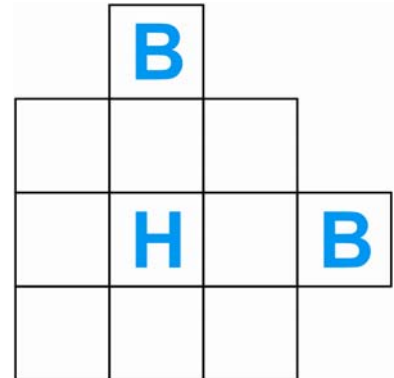


# Can A Happy Hopper Escape?

NAME \_\_\_\_\_

Imagine a hopper stranded on a three-by-three-square island. The island can be left safely via two bridges (labeled B). To play this game, you will need a chip (a “happy hopper”) with an arrow marked on the top.



To begin the game, place the happy hopper (with the arrow pointing up) on the home (H) square. For each turn, toss a coin twice. On the first toss, rotate the hopper according to whether the coin lands head up or tail up (see below). On the second toss, move the hopper.

### First Toss

Heads: Rotate the arrow 90° counterclockwise

Tails: Rotate the arrow 90° clockwise

### Second Toss

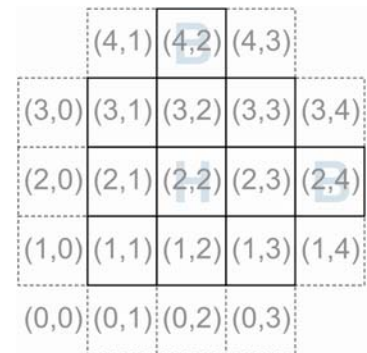
Heads: Move the chip one square in the direction of the arrow without turning it

Tails: Move the chip one square in the direction *opposite* the arrow without turning it

Play until the happy hopper lands on a bridge or hops into the sea.

- Does the happy hopper have a fair chance to escape by way of a bridge? Make your prediction before playing.

Play the game at least five times. Record the sequence of squares on which the happy hopper lands in the table below. Use ordered pairs (rows, columns) as shown in the figure at the right.



GAME	SEQUENCE OF SQUARES
1	
2	
3	
4	
5	

- Is the game fair?

3. Suppose that the island has two more bridges attached to squares (2, 1) and (0, 2). How would this modification change the chances of escape? Make a prediction.

Play the game at least five times, and again record the results.

GAME	SEQUENCE OF SQUARES
1	
2	
3	
4	
5	

4. Examining your data, do you think the game is fair?
5. Investigate a five-by-five island with two bridges. How does this extension change the chances for the happy hopper's escape?
6. For a five-by-five island, how many bridges would you add, and where would you place them, to make the game fair?