

Poster text:

Sprouts are good for you

Purpose: Students will play Sprouts, collect data about their games, organize their data in tables, discover and describe linear relationships, make conjectures, and develop strategies based on their data and analysis.

Prior Knowledge Required: Previous experience with variables and linear relationships.

Context: A middle school or early high school pre-algebra or algebra course.

[Description and rules of the game – see below]

[Large example in color – see photo]

[Student worksheet with space, table, and worksheet questions – see below]

Questions for Discussion:

- Write an expression for the minimum number of moves when you start with n spots.
- Do the same for the maximum number, and for the numbers of spots, edges, and regions.
- What relationships can you find among these expressions?
- ~~Does the position of the original n points affect the game in any way? For example, does it change the set of legal moves, the length of the game, or which player will win?~~
- Describe all possible sets of free degrees at the end of the game.
- Which player has a better chance of winning – the first or the second? Is your answer the same no matter how many spots you start with? Can you describe a strategy that will help you to win more than half your games? To win every game?
- ~~How many possible moves does each player have at each stage?~~

Extensions:

How does the game change if...

- no loops are allowed?
- all edges have to be straight?
- you make two spots on each new edge instead of one?
- each spot starts with four, five, six, or more free degrees?
- you play on a cylinder (the left and right sides of the paper are connected)?
- you play on a torus (both pairs of opposite sides are connected)?

Make your own variant of Sprouts and teach your friends.

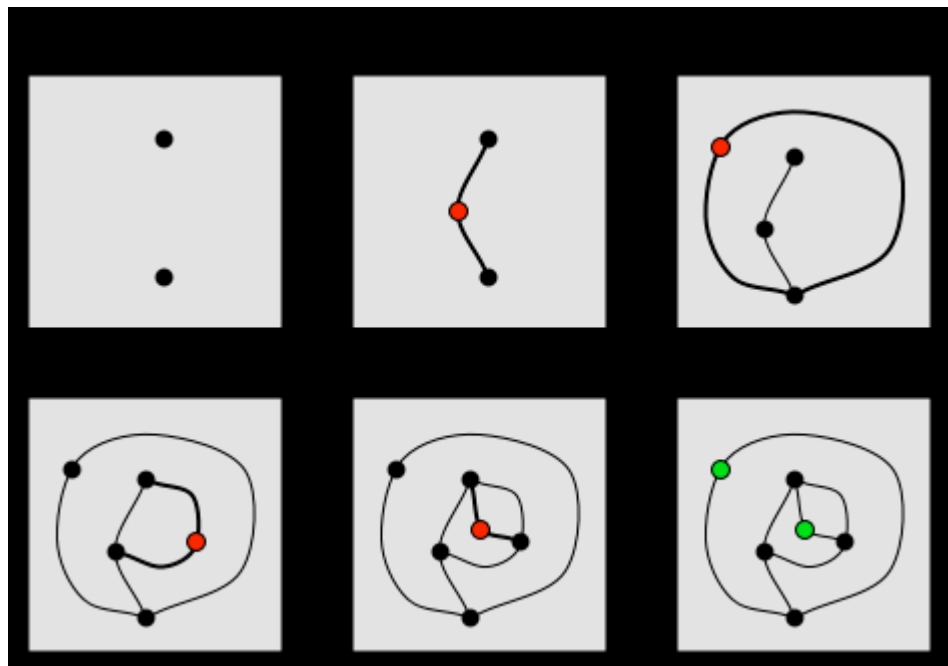
Sprouts

Sprouts is played by two players beginning with a set number of spots.

Rules:

- 1. Players take turns drawing an edge between spots or connecting a spot to itself.**
- 2. The connecting edge may not cross any other edge.**
- 3. The player then adds a spot on the connecting edge.**
- 4. A spot with 3 connecting edges is considered “dead” and may not have any more edges connected to it.**
- 5. The player who makes the last move win.**

Sample 2-spot game:



First Player: _____
Second Player: _____

Beginning Number of Spots: _____

Play your game here:

Move	Spots	Edges	Regions*	Live Points	Sum of Free Degrees **
0					
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					

*A region is enclosed by edges or the region surrounding the whole game.

**Sum of Free Degrees: The total of the Free Degrees of all the spots. The Free Degree of a spot is the number of edges a spot can still receive.

Answer these questions on a separate piece of paper:

1. How do the entries in your table change from one move to the next?
2. Will every game end? Why or why not? Does your table give you any insights?
3. Can you spot some relationships among the numbers of spots, edges, and regions?
4. If you start with 3 spots, how many moves is the shortest possible game? The longest?
5. If you start with n spots, how many moves is the shortest possible game? The longest?
6. If you start with 3 spots, what's the fewest spots that will exist at the end? The most?
7. If you start with n spots, what's the fewest spots that will exist at the end? The most?
8. If you start with 3 spots, what's the fewest edges that will exist at the end? The most?
9. If you start with n spots, what's the fewest edges that will exist at the end? The most?
10. If you start with 3 spots, what's the fewest regions that will exist at the end? The most?
11. If you start with n spots, what's the fewest regions that will exist at the end? The most?
12. Is it possible for a game to end if a spot has 2 free degrees?