

USE YOUR BRAIN

STRATEGIC CHALLENGE



Sprouts: A game you can play anywhere!

WITH JUST A PENCIL AND PAPER YOU CAN CHALLENGE ANYONE TO A FUN STRATEGY GAME!

The Problem

You start by drawing some dots on a paper. You should draw at least two, but probably more. The more dots the longer the game and the bigger the paper you'll need. The object is to force your opponent to have no moves. Here are the rules:

- A move is to draw a line that starts and ends in a dot. It can be the same dot or a different one.
- A line you draw doesn't have to be straight, but you can't cross any other lines or dots.
- A single dot can only be touched by lines 3 times. If a dot already touched three times, you can't use it on either end of a new line.
- After you draw a line, you put a dot on it.

A Sample

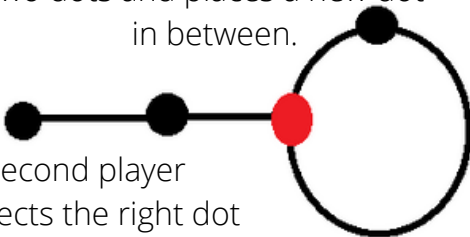
Red dots have 3 connections



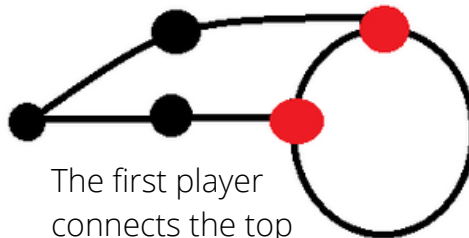
Here is the start of a simple game



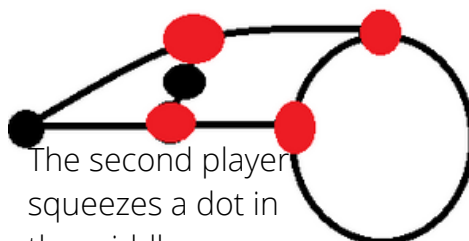
The first player connects the two dots and places a new dot in between.



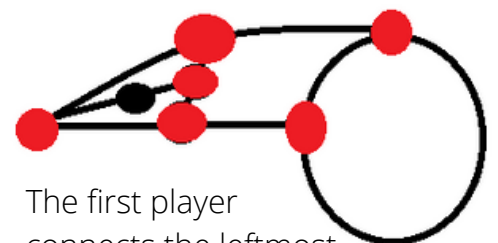
The second player connects the right dot to itself and adds a dot on top



The first player connects the top dot to the dot on the left, adding a dot between.



The second player squeezes a dot in the middle.



The first player connects the leftmost dot to the new dot in the middle making a new dot completely surrounded by lines. The only place it can connect is to itself, but it already has two lines and connecting to itself would make 4. The second player can't move, so the first player wins!

Interesting things about Sprouts

- Sprouts was invented about 50 years ago at Cambridge University.
- Sprouts has been studied by mathematicians and used to test how computers can handle combinations of outcomes.
- Sprouts has no luck and no ties, meaning it can be played perfectly.
- For a 2 dot game, that isn't too hard. There are only 17 different ways the game can develop. You have a good memory, you can learn them all. Played perfectly, the second player will always win a 2 dot game even though 11 of the ways the game can end lead to a player 1 victory!
- This changes when you add more dots. Every dot added increases the maximum number of turns the game lasts by 3 turns and adds many, many more possibility. You might be able to memorize all of the possible moves in a 3 or 4 dot games, but by 5 dots it becomes impossible. This is where you will need to form a strategy instead of just memorizing.
- Humans have only been able to calculate games of sprouts up to 7 dots (and it took a professor a month to do it), but computers have been able to calculate all of the outcomes of games of Sprouts up to 44 dots!
- Want to play a game with 50 dots? Well, I hope you have a big paper or some sidewalk chalk. A game of this size could take 149 moves which is pretty long but even if you took a minute for each move you'd still be done in 2 and a half hours. Just because a computer can't calculate it doesn't mean you can't play it! But you'll probably have much more fun with a game from 4-6 dots. Too many choices can lead to what gamers call analysis paralysis, where people take forever to make a move because they try to calculate everything that could possibly happen.
- How do we know it can't take 150 moves? Well, Sprouts has a lot of interesting math. The minimum number of turns, number of possible first moves, and maximum number of turns are calculable using equations. The player that wins with perfect play also changes according to a pattern: Every time the number of dots reaches a multiple of 3, the winning player changes. So the second player wins with 1 or 2 dots, but the first player wins with 3,4,5, than the second player wins with 6,7,8.
- Sometimes the shapes your games will look like things. Mathematicians studying Sprouts named many of the game states after bugs.