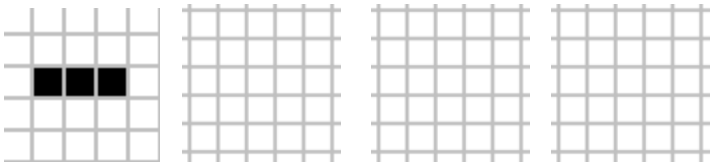
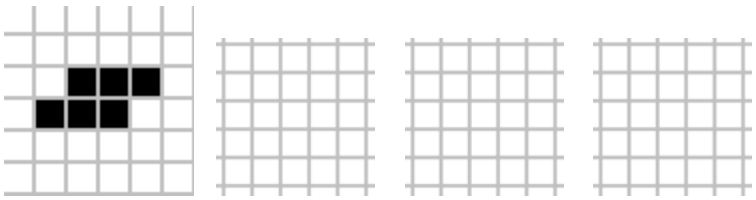
Date(s):	**Unit 5 Lab X**	**Conway's Game of Life**
Prerequisite Knowledge: Coordinates		
Enduring Understanding: **AAP-2 -** The way statements are sequenced and combined in a program determines the computed result. Programs incorporate iteration and selection constructs to represent repetition and make decisions to handle varied input values.		
Learning Objective(s): **LO AAP-2.G** - Express an algorithm that uses selection without using a programming language **LO AAP-2.M** - Create algorithms		
Standard: **9-12.CT.7** - Design or remix a program that utilizes a data structure to maintain changes to related pieces of data.		
Differentiation: Pair work, Group share outs, Visual Diagramming		

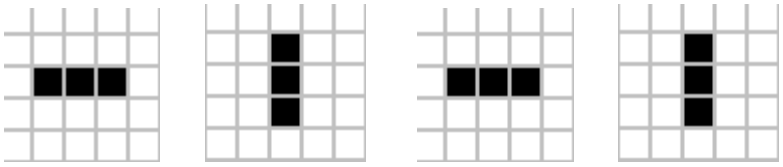
AIM: How do we analyze and express a game algorithm? **SWBAT**: Express an algorithm that uses selection without using a programming language	**Notes/Q's/CFUs/CM**
WARM UP (3 MINS): Offline warmup: Teacher - On graph paper, scrap, personal whiteboard, draw the below in the area. Label it gen 0 (short for generation 0). Leave room at least for a 3x3 grid. Have enough room for 4 generations from 0 to 3. gen 0 gen 1 gen 2 gen 3  gen 0 gen 1 gen 2 gen 3  Students - Draw the two shapes and grids to prepare for the activity and then familiarize yourself with the rules of the game 1. Any live cell with two or three live neighbors survives. 2. Any dead cell with three live neighbors becomes a live cell.	Notes: Students may not give themselves enough room, so make sure the grid is big enough, maybe 5x5 each just in case. Q: What is a cell? A: Each grid can be considered a cell. Each box is a cell. Q: Do we need to number the cells? A: You do not need to number the cells. Q: Are live cells black or white? A: Live cells are black. Q: What constitutes a neighbor? Does diagonal neighbors count? A: There are 8 neighbors. Diagonals do count so all the cells surrounding the current cell you are at. CM: Use the status of cells in the previous generation. So, if you're determining gen 1, look at the dead and alive cells in gen 0. So changes in gen 1 do not affect your grid 1.

3. All other live cells die in the next generation. Similarly, all other dead cells stay dead.

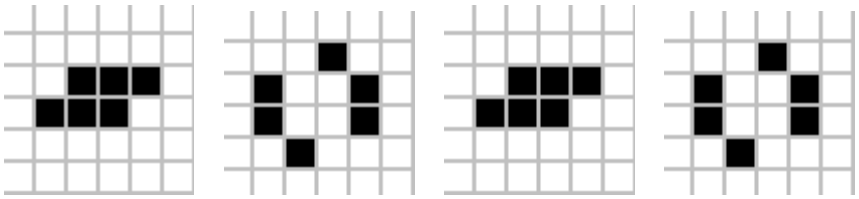
ACTIVITY PART 1 (15-20 MINS)

Teacher - Go over the rules and answer any questions. Announce to start at each cell and apply the rules. Mark the current cell alive in the next gen grid according to the rules. Students should have the result below. Circulate and provide guidance during activity.

gen 0 gen 1 gen 2 gen 3

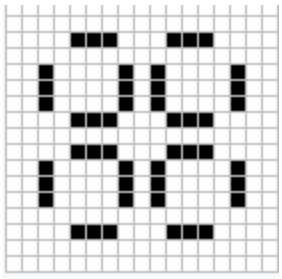


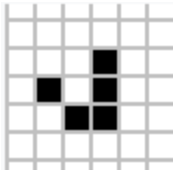
gen 0 gen 1 gen 2 gen 3



Students - Work in groups of 2 to complete up to gen 3. Only one person in group has the marker. Class share out of results.

Challenge: If students finish early, provide the below as additional challenge patterns.





Notes: Have students mark each space with an X or color in the box in the next gen grid while looking at the previous gen. For example, when determining gen 1, look at the current status in gen 0.

CM: Students may think the grouping of three cells means that is a "neighbor". However, make sure they treat each cell individually and to only look at the 8 surrounding cells pertaining to that specific cell.

Q: What happens to a dead cell with 2 neighbors? What happens to a live cell with 2 neighbors?
A: The current status is carried over into next gen.

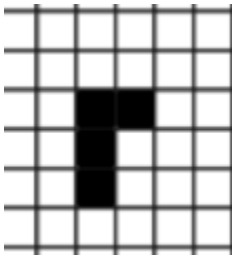
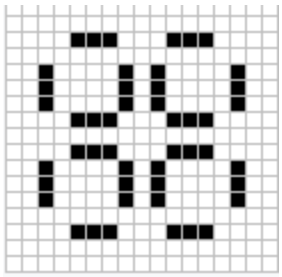
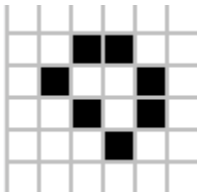
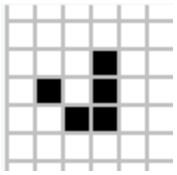
Q: When does a dead cell become alive?
A: If there are 3 neighbors.

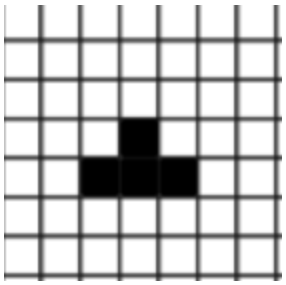
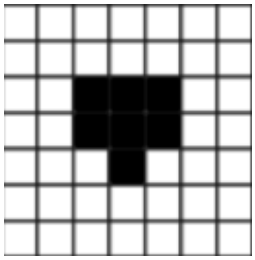
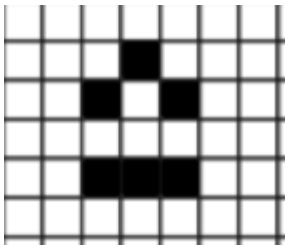
CM: Students may only focus on the live cells only. Should tell them to at least check the dead cells ALL around a live cell to be certain.

LESSON (3-5 MINS)

Teacher - Introduce and describe Conway's Game of Life.
https://en.wikipedia.org/wiki/Conway%27s_Game_of_Life

Demo notes: Besides pointing out the patterns, make sure to point out what

Describe the algorithm and predict outcomes of sample starting grids. Make note of popular patterns to students - still-life, oscillators, and spaceships. Demo Snap or online version. Students - Take any notes and modify their current work. Solidify understanding of the game rules.	happens to stragglers and random live cells during initial setup.
ACTIVITY PART 2 (10-15 MINS) Teacher - Provide more complex patterns for students to work on. Draw at least up to gen 3.    Make sure to have students draw up to gen 5 for this spaceship  Students: In pairs again, work on the additional patterns provided. Alternate who has the marker. Keep track of work in activity part 2 to be handed in.	Notes: Remind students to write their names on the paper or the whiteboard. They can take pictures of their work as long as they have their names written. They will upload pictures of their work. Q: The third pattern (loaf) doesn't seem to be changing. A: That is correct, that is a still-life pattern Q: Is this fourth pattern (glider) suppose to move in a down right direction? A: Yes, correct. Not all patterns oscillate in place.
ASSESSMENT (5 MINS)	Assessment: Students can independently follow an algorithm

Independently answer, given this pattern (at gen 0), what is the pattern after 2 generations? You may use handwritten aid as we did in class (no computational/online tools).  **Answer:** gen 1 provided for reference. gen 1 gen 2 (correct solution)  	and predict its outcome at the end of class.
HOMEWORK: n/a	