1. **Learning Objectives:**
   In this unit, students will create a simple but complete version of Pac-Man game while expanding knowledge of the AgentSheets software program. Students will apply basic and advanced design process to identify objects “agents” and interactions “operations”. Throughout this unit, students will be introduced to computational thinking patterns and skills, including basic object interaction, creating object instances, rule based programming, and message sending. Over the course of the unit, the difficulty of the game with ghosts with random movement will be contrasted to the difficulty of the game with ghosts with artificial intelligence.

   In this lesson, students will make a new AgentSheets worksheet, new agents including four views of a Pac-Man agent and the background agent and will be able to move the Pac-Man agent in all directions. The image of the Pac-Man will change with each direction change.

2. **Standards:**
   ISTE (International Society for Technology in Education) NETS (National Educational Technology Standards)
   - #1a apply existing knowledge to generate new products
   - #4b plan and manage activities to develop a solution or complete a project.
   - #4d use multiple processes and diverse perspectives to explore alternative solutions.
   - #6c troubleshoot systems and applications.

   ISTE NETS are referred to by CDE Performance Standards for Teachers #7- Technology, which states, “The teacher will have demonstrated the ability to instruct students in basic technology skills. He/She will: … instruct students in basic technology skills by imbedding them in their standards-based, content instruction (7.5.3)”

   Please check with your district’s technology department to see if there are additional standards at the district or school level.

3. **Anticipatory Set / Modeling: 5 minutes**
   Quickly demonstrate Pac-Man – state the objective of the game and allowed moves. Select one student to play Pac-Man while it is being projected on overhead for others to see.
   Give historical context of game:
   **Overview**
4. Teaching: 10 minutes
   Overview of project and Agentsheets
   Discuss Rubric for grading. Distribute copy to students (optional). Explain how student’s projects will be graded at the end of the unit.

   Describe components of AgentSheets while projecting for students to see:
   - Gallery- where agents are
   - Worksheet – where game is created
   - Behavior – how to tell each agent what to do

   Introduce computational thinking patterns in Pac-Man:
   - **Collision**: Pac-Man collides with ghosts.
   - Artificial Intelligence using **Collaborative Diffusion**
   - the **Hill Climb**ing algorithm

   Have students decide what the nouns (the agents) and the verbs (the operations) of Pac-Man are. We will begin by creating the most prominent noun today – Pac-Man, and his movements. Other agents will be created throughout the unit.

5. Guided Practice / Monitoring: 30 minutes
   Demonstrate how to open AgentSheets program, create a new project, and a new agent. Have students make Pac-Man agent and background agent.
   **Create a Project and the first agents: Pac-Man and Background**
   Check for understanding.

   Allow time for students to create 4 views of Pac-Man (facing right, left, up and down) using the run duplication script
   **Run Duplication 4 Way Rotation**

   Demonstrate how to make a new worksheet.
   **Create a Worksheet**
   Have students wallpaper the worksheet with the background agent.

   Students should save the worksheet and check with the reset button to see if it worked.
   **IMPORTANT: Saving the Worksheet**

   Students are then to place Pac-Man on worksheet with pencil tool. Then have students run the program to see what happens (nothing yet!)
   **Play Test: Controlling Pacman**
   Check for understanding.

   Program Pac-Man agent behavior. Demonstrate how to edit the behavior of the new agent and have students make Pac-Man agent movements correspond to the arrow keys.
Program a Cursor-Controlled Pac-Man
Pac-Man should be able to move in all four directions and the image of Pac-Man should change as he moves

Note: When making similar rules, it is best to make one rule and copy it using the duplicate feature of AgentSheets.
ADD LINK HERE

Ask students to re-run the program to see if movement works.
Play Test: Controlling Pacman
Check for understanding.

6. Closure: 5 minutes
Restate the scope of the project. Tomorrow we will be creating the game board (background, wall and pellet agents) and ghost agents with random movement behavior.

7. Extension/Remediation – students can edit their agent’s depiction and behavior at any time. Encourage students to spend a short time on the initial creation and edit later as desired. Optional activity: Have students go to the Scalable Game Design Arcade to play other Pac-Man games to generate ideas for how they would like to design their games.