



The Candy Sharing Game

Shippensburg Area Math Circle
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The Candy Sharing Game is all about sharing candy and finding out who ends up with what. Here are the rules to follow:

- The players should sit in a circle.
- Each circle has a leader who starts the game by distributing the candy among the players. Some players may start out with more candy than others, and some players may start out with none. The leader gets to decide.
- During the game, players should keep their candy in front of them for everyone to see.
- When the leader says “Share!”, everyone who has two or more pieces of candy gives one piece to the person on their left and one piece to the person on their right. They should use both arms to do this at the same time. Players with one or zero pieces of candy do nothing.
- After the sharing is done, the leader will say “Share!” again. This process repeats until the group sees a pattern appear in the game.
- When a pattern is observed, the game ends. Here are some things that might happen:
 1. The game might stop because no one is passing candy anymore. We call this a **terminator**.
 2. The game might settle down so that even though everyone is passing candy, the amount of candy that each player has is always the same. We call this a **fixed point**.
 3. A repeating pattern might appear in the way the candy is shared. We call this a **cycle**.
- When a game ends, a new leader is chosen and another game can begin.

The Challenges

1. Find a way to start the game and end with a terminator.
2. Find a way to start the game and end with a fixed point.
3. Find a way to start the game and end with a cycle.

The Explorations

1. What is the smallest amount of candy that we can use to design a game that does not end with a terminator?
2. What is the smallest amount of candy that we can use so that no matter how the candy is divided among the players at the beginning, the game will not end with a terminator?
3. What is the smallest amount of candy we can use to design a game that ends with fixed point?
4. What is the smallest amount of candy that we can use so that no matter how the candy is divided among the players at the beginning, the game will end with a fixed point?
5. What is the largest amount of candy we can use if we want a game that ends in a cycle?