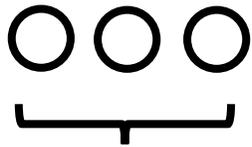


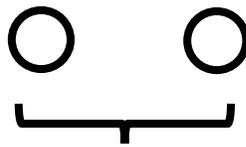
There will be 4 stations this week, each at a different table. Children are encouraged to move between tables at their own pace and are welcome to spend as much or as little time on each problem as they choose. Parents that stay with their child are asked to help them think about the problem without giving away the answer to them or anyone else at the table.

Station 1: Ducks in a Row

Take 15 pennies and line them up in a row. With a partner, take turns removing 1, 2, or 3 pennies at a time. However if you remove 2 or 3 pennies, they must be consecutive, meaning there can be no spaces between them. The player who takes the last penny wins!



Consecutive



Non-consecutive

Station 2: Inchworm

There are 2 piles of 7 pennies each. Players take turns taking a single penny from one of the piles, or a penny from each pile. The player who cannot move loses.

Students: try to find a winning strategy. To describe a winning strategy, you have to explain what the winning player should do in order to win, no matter what the opponent does. Once you find a winning strategy, challenge the teacher at your table to a game!

Extra game: Sneaky Inchworm.

In addition to the moves described above, players are allowed to take a penny from the first pile and place it on the second pile or vice versa.

Station 3: Matches

A box contains 15 pennies. Players take turns removing no more than half the pennies in the box. The player who cannot move loses (in other words, if there is only 1 penny left you lose).

If you have an odd number of pennies (for example 5), the number you can take is rounded down (in this case 2). This means whenever there is one penny left, the next person to move loses because half of 1 rounded down is 0!

Students: try to find a winning strategy. To describe a winning strategy, you have to explain what the winning player should do in order to win, no matter what the opponent does. If you find this easy, try increasing the number of pennies.

Extra Game: Sum to 23

For this game start with 0 pennies. Each player takes turns adding either 1, 2 or 4 pennies. Whoever adds exactly the 23rd penny wins (you can't go over)!

Station 4: Two Pile Nim

There are 2 piles of pennies, 1 with 7 pennies and 1 with 10 pennies. Players take turns taking as many pennies as they want from just one pile. The player who cannot move (because there are no pennies left) loses.

Students: try to find a winning strategy. To describe a winning strategy, you have to explain what the winning player should do in order to win, no matter what the opponent does.

Extra Game: Puppies and Kittens

There is a pile of puppies and a pile of kittens. Players take turns taking as many puppies as they want, or as many kittens as they want, or an equal number of puppies and kittens. The player who cannot move, because there are no puppies or kittens left, loses.