

# Play to Win with a Game of Nim

## Using Math to Find a Winning Strategy

by Kim Bartram and Lana Dyck

**Level:** All Grades

**Concepts:** Problem Solving, Number Sense, Strategy

### How to Play

*There are many variations to playing the game of Nim. Try these rules to start.*

Two players have a pile of 15 small objects between them.

The youngest player chooses who will go first.

Each player takes turns removing either 1, 2 or 3 objects from the pile.

The winner is the player who takes the final object from the pile.

### Math Thinking

*As you play the game, each player can say how many objects they are taking and how many objects are left in the pile. Ask questions like:*

Does it matter who goes first?

When can you tell if you are going to win or lose?

### Variations

Change the purpose of the game to the winner is the person who does **not** take the last object from the pile.

Change the number of objects in the pile.

Add more players to the game.

Reduce or increase the number of objects a player can remove from the pile.



### More Questions

*Try some of the variations, compare your experiences and ask more questions.*

How does your strategy change?

What do you wonder?

What patterns do you notice?

How can you guarantee you will win?

### For further exploration:

<https://plus.maths.org/content/play-win-nim>

<https://nrich.maths.org/1204>

<https://www.youcubed.org/resources/nim-games-3-12-video/>