

# A NATURAL DESIRE TO LEARN

A Natural Desire to Learn  
by Grace Davila Coates

Games and puzzles take advantage of children's natural desire to learn, to solve problems, and to make sense of the world around them. An engaging puzzle or game invites children (and adults) to think of a variety of possible solutions. This type of investigation requires divergent thinking, that is, the ability to create many alternatives from which to choose a solution.

Games and puzzles engage our spatial intelligence. They require us to think logically, to examine patterns in number or geometry, and to create strategies. We also engage in linear or sequential thinking as we learn new strategies for winning the games or solving the puzzles. Certain mathematical thinking, such as logical reasoning, differs from what happens in our brain when we create art, play music, or are active in sports. Yet, research shows that there are positive correlations between performing in each of those areas and increased achievement in mathematics.

## ODD AND EVEN ENDED NIM

**Materials:** 17 toothpicks or markers per two players

**How:** Place 17 toothpicks (or other markers) in a row. Play with a partner. Take turns picking up 1, 2, or 3 markers. Play until all of the markers are gone. At the end, the person who ends up with an odd number of markers wins.

This game can be played cooperatively. After you play several times, discuss strategies with your family for the best way to play the game. Family members can talk through their moves and share their thinking as they play.

A slight change in the game allows two players to collaborate in order that both may win: Start with 18 markers. Take turns picking up 1, 2, or 3 markers. At the end of the game, both players win if they have an odd number of markers. Try creating another Nim game where both players can win.

## NO TWIN NIM

**Materials:** 25 markers, or toothpicks per two players

**How:** Lay out a row of 12 markers. Play with a partner. Take turns removing 1, 2, or 3 markers from the row. You may not take the same number of markers removed by your partner on the previous move. The winner is the one who takes the last marker(s) or leaves the other player unable to move. Play several games with your family. Then discuss your ideas about the way the game works. Talk together and help each other work out a winning strategy for every player.

**Here are more variations:** 1) play with more people. 2) play with more markers. 3) allow players to take 1, 2, 3, or 4 markers with the same restrictions. 4) change the rules so that you lose when you take the last marker.

Playing NIM helps children develop an intuitive understanding of subtraction or "take-away." As players develop strategies for winning, they also are building a stronger sense of how numbers work. In some versions in which the players collaborate, the partners try to figure out a winning strategy together.

## ROYAL FAMILY PUZZLE

This puzzle can help to enhance mathematical reasoning using logic and the investigation of patterns. This activity uses a Latin Square arrangement. In Latin Squares, you can use any number of elements (numbers, letters and such) as long as each element appears only once in each row and column. In this case, you will be creating a Latin Square comprised of playing cards.

**Materials:** 4 Aces, 4 Kings, 4 Queens, and 4 Jacks from a deck of playing cards

**How:** The object of this investigation is to place the cards in a 4 by 4 matrix (4 rows and 4 columns), so that each row and each column contains exactly one Ace, one King, one Queen, and one Jack. The cards can be of any suit. Work with a friend to make a matrix (layout) that follows the rules. When you are done, you will have what is called a Latin Square. Make a record of your solution.

If you were to draw a line vertically down the middle and another horizontally across the middle, what cards would be in the four quarters of the arrangement?

What cards are in the 2 diagonals?

What other patterns do you notice?

Create the matrix (arrangement) in another way. What cards are in the quarters and in the diagonals now? Compare the patterns. How many different ways can you make the 4 by 4 matrix? How do you know each one is different?

Whether we are playing at NIM, creating Latin Squares, or rolling dice, games allow us to develop our logical thinking skills, to see and predict patterns, and to make connections between everyday life and mathematics.

**Everyone learns** What do families gain from playing games and solving puzzles together? Many report that the dynamics of their family conversations change in positive ways over time. Parents learn to ask better and more specific questions about their children's experiences in learning.

Children learn about numbers, simple and complex functions, as well as how they are interrelated when they add or subtract scores. Some games require multiplication or division, and others are based on probability. Although children use these informally in games, they will be better prepared when they are introduced later in the classroom.

When children insist on revisiting the same game or puzzle over and over, this differs from when they request the same favorite bedtime story. Each time they play the beloved game, they are hoping to try something new, or they strive to win with a new strategy. They may discover a new pattern or find a more economical way of solving the puzzle or problem. Games and puzzles enhance divergent thinking, which is the foundation of creative processes