

8 Analyzing Puzzles and Games

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Day 8

FOM 11

1.7 Analyzing Puzzles And Games

Both inductive and deductive reasoning are useful for determining a strategy to solve a puzzle or win a game.

Example 1: Use four 9's in a math equation that equals 100.

$$\boxed{99 + \frac{9}{9}} = 100 \quad 99.99$$

$$99 + 1 = 100 \quad \checkmark$$

Example 2: The following figure is made up of 12 sticks. Can you move just two sticks and create seven squares?



Example 3: Put the numbers 1 to 8 in each square so that each side adds to the middle term.

12 →	1	5	6
12 →	8	12	4
12 →	3	7	2

	13	

	14	

	15	

1 2 3 4 5 6 7 8

Chapter 1.7: Analyzing Puzzles and Games

A) Game of Nim:

In this version of Nim, arrange nine pennies in three rows as shown below. Players take turns removing one or more pennies provided they all come from the SAME ROW. For example, a player could take one penny from the top row, or all the pennies in the bottom row. The person who is forced to take the last penny is the loser.

If the first player makes a correct first move, and continues to play rationally, he can always win. If he fails to make this move, his opponent ~~by~~ by playing rationally, can always win.

- 2 player 17 chips
- Remove 1, 2 or 3 each time
 - You lose if you remove the last one!



Can you discover the winning first move?

a) After playing multiple games, can you find some patterns that guarantee a victory? Draw these patterns down.

$$\begin{array}{c} 4 \\ (1) \\ 3 \end{array} + \begin{array}{c} 4 \\ (2) \\ 2 \end{array} + \begin{array}{c} 4 \\ (3) \\ 1 \end{array} + \begin{array}{c} 4 \\ (2) \\ 2 \end{array} + 1$$

b) Write down the steps player 1 needs to follow to guarantee a victory.

Assignment: Sec 1.7, p. 55 # 5, 7, 9 plus ~~Magic Square - Koenig's Puzzle~~