

University of Colorado
Department of Mathematics

2020/21 Semester 2

Math 2001-003 Discrete Math

Writing Assignment 1

First Draft due for peer review Monday, Feb. 8, 2021, peer review sent back to author Wed. Feb. 10, 2021, final draft due uploaded to Canvas Friday Feb. 12, 2021

Another Game of Nim

Your job is to write an essay about a slightly different version of the game of Nim than the one we played the first day of class, January 12 and described in HW 1.

This time there are still two players, Player A and Player B. There are now **100** pennies in the middle of the table. Player A starts, and can take 1, 2 or 3 pennies from the pile of 100 pennies. Whatever pennies taken are out of play. Player B then has a turn, and can take 1, 2 or 3 pennies from the reduced pile, and these pennies are then out of play. It is then Player A's turn, and Player A can again have a choice of taking 1, 2, or 3 pennies from the pile, and these pennies are out of play. The game continues in this fashion. Whichever player takes the last few pennies in their taking of 1, 2, or 3 pennies will win the game.

Your job is to write an essay on the following topic, in 250 words or less:

1. What is the optimal strategy to win this game, and why?
2. Does the strategy depend on whether you go first or second?
3. If both players know the optimal strategy and use it, is there a guaranteed winner of Player A and Player B?
4. Does the strategy change if the number of pennies in the original pile increases to 101 pennies?

Your essay should have a title, an introduction, and be written in complete sentences. You should be precise, define your terms, and try to be as clear as possible. At the end, you should list any references that you rely on. Your essay should be written in LaTeX or MS Word so it can be easily read by your peer reviewer.

You will give the essay to your peer reviewer on Feb. 8, the peer reviewer will give an edited version back to you on Wednesday Feb. 10, and you will upload your final draft to Canvas on Friday, Feb. 12, 11:59 pm.