

GUIDELINES FOR WRITING PROJECTS

PETER MAYR

The following issues came up in the previous assignment of describing the strategies for Poison. Be careful about them in future projects as well.

- (1) Somebody else will read your writing! Don't be satisfied that you understand what you wrote. Try to address an imagined reader (your colleague, friend, ...) and explain the material to them.
 - (a) After you've typed the project, read it yourself and check for typos, gaps, ...!
 - (b) Read it again one or two days after you've written it. Can you still follow all your arguments? If not, you need to put in more explanations.

(2) Every article needs a title, name of author and date.

(3) Explain the problem.

(4) Define all words and mathematical concepts that you need. Not every reader knows the notation that you use (especially if you just made it up like "opposite number").

(5) Formulate your main point as a theorem in a few sentences so that is visible at the first glance. A theorem should be

- (a) as self-contained as possible. The reader should be able to understand what it's about without having to read all the stuff before. A bad example:

Theorem. *If $n - 1$ is a multiple of 3, then Player 2 wins.*

What is this about? Tic-tac-toe,...? What is n ?

- (b) precise, but also efficient, for example:

Theorem. *If Poison starts with $3n + 1$ stones for any $n \in \mathbb{N}_0$, then player 2 can always win; otherwise ...*

(6) Whenever you use variables n, x, \dots , write what you can plug in for them. Are they integers, reals, ...? Be careful about quantifiers. Do you want your statement for all n or for some n ?

Example: Poison is a game with n stones for n an arbitrary natural number.

(7) Give an argument why your theorem is true in full generality.

Examples that your result works for special choices are not a proof. Showing that one player can win the game with 10 stones does not prove that your strategy works for any number of stones.

On the other hand, explaining how to win a game with 10 stones is basically as long and complicated as explaining the strategy for $3n + 1$ stones.

(8) If possible, reduce your problem to some easier problem or some case where you already know the solution.

Example: Suppose you already showed that player 2 can always win a game that starts with $3n + 1$ stones (for any $n \in \mathbb{N}_0$). Next you want to explain what happens in a game with $3n + 2$ stones: If player 1 removes 1 stone, then player 2 has $3n + 1$ stones to choose from. You can now refer to your previous argument to explain what will happen.

RUBRIC FOR THE WRITE-UP FOR POISON

Presentation: 1 point each for

- Title, author, date;
- description of the game;
- formulating a theorem using `\begin{theorem} ... \end{theorem}`
- formulating a proof using `\begin{proof} ... \end{proof}`

Mathematical correctness

- 2 points for stating the correct outcomes of the game in all cases;
- 4 points for giving the correct strategies for each case and showing that they lead to victory.