COMBINATORIAL GAMES AND PUZZLES
READING ASSIGNMENTS & PROBLEMS
WINTER 2011

(1) Read:
 • Preface and Chapter 0 of Albert et al.
 • *The History of Combinatorial Game Theory*, Richard Nowakowski
 • *Board Games (Chapter 6 of Mathematical Diversions, from the CD-ROM Mathematical Games)*, Martin Gardner
 • *Combinatorial Games: Selected Bibliography with a Succinct Gourmet Introduction*, Aviezri Fraenkel, available at the Dynamic Surveys Section of Electronic Journal of Combinatorics, http://www.combinatorics.org/

 Do:
 • Chapter 0, Albert et al., Problems 1-4

(2) Read:
 • Chapter 1 of Albert et al.

 Do:
 • Chapter 1, Albert et al., Problems 1-5 and 15 (Note that solving the open Clobber problem given in 1 will earn you an A for the course.)

(3) Read:
 • Chapter 2 of Albert et al.
 • Items on reserve and linked from webpage to help identify a game to research

 Do:
 • Chapter 2, Albert et al., Problems 1, 2(a), (b), (c), 4, and 5

(4) Read
 • Preface and Chapters 1-4 of Berlekamp

 Do:
 • Consider each of the chain counting problems given in Chapter 3 and be ready to play the winning strategy on each (without notes).

(5) Read:
 • Chapter 3, Albert et al.
 • Chapter 5, Berlekamp

 Do:
 • Chapter 3, Albert et al., Problems 1, 2, 3
 • Chapter 5 assigned chain counting problem

(6) Read
- Chapter 4.1 and 4.2, Albert et al. (this will be the first reading of several of this chapter)
- Chapters 6 and 7, Berlekamp

Do:
- Prep Problems 4.1 and 4.2, Albert et al.
- Generate a list of at least three questions from your reading of Chapter 4.1 and 4.2 of Albert et al.
- Problem 7.1 and 7.2 of Berlekamp. Please 'expand' on the text's solution by giving (the same but) a more developed solution.

(7) Repeat previous reading assignment. Make progress on your paper. Prepare for next week's Dots-and-boxes tournament.

(8) Read:
- Martin Gardner's "Nim and Tac Tix" from *Hexaflexagons and other Mathematical Diversions* (handout)
- Jorg Bewersdorff's "Nim: The easy winner!" from *Luck, Logic and White Lies* (handout)

Do: For each of the following nim positions determine the outcome class. If the position is a next player win, determine the first move for this player. Positions are: $(4, 5, 15), (3, 10, 9)$ and $(11, 15, 31, 29)$.

(9) Read:
- *The Game of Hex* from Martin Gardner's Mathematical Puzzles (handout)
- Parker Bros.' *Rules for Playing: Game of Hex* (handout)
- *Berge and the Art of Hex* by Ryan Hayward, for the Berge book : Bondy/Chvátal editors (handout)
- Preface and Chapter 1 of C. Browne

Do: Before looking at the solutions, consider the puzzles given in Figure 36 from Gardner's article and Figure 4 from Hayward's article. Be able to implement the winning strategy on each, even after the initial move.

(10) Read:
- Chapters 2 and 3 of C. Browne
- *Hex and combinatorics*, Ryan Hayward and Jack van Rijswijck. Discrete Mathematics **306** (2006) 2515-2528. (handout)
- (Mathematics majors and minors only) Sections 1-3 of *The game of Hex and the Brouwer Fixed-Point Theorem*, David Gale. (handout)

Do: Bring questions.

(11) Read:

- Chapters 4 and 5 of C. Browne (Please note that when reading these chapters and subsequent ones, you will find it useful to have a board to play on. In fact, it's a requirement.)

Do:
- Play and **record** four games on a 7×7 board.

(12) Read:
- Chapters 6 ,7 (skip 8) and 9 of C. Browne
- First three pages of *On Optimal Play in the Game of Hex*, G. Campbell. (Note that there are some interesting open questions in the article by G. Campbell.)

Do:
- Play and **record** two games on an 11×11 board.

(13) Read:
- Chapters 10, 11, and 12 of C. Browne
- Play and **record** two games on an 11×11 board.

(14) Read:
- W. Stromquist, Winning Paths in $N-$by-infinity hex. *Integers* **7** (2007), GO5, 3pp. (handout)