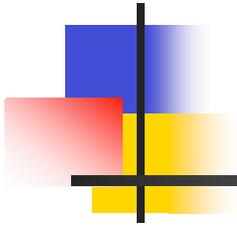
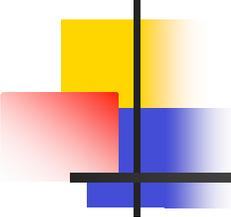


# Games and Critical Thinking



Volker Ecke, Christine von Renesse,  
Julian Fleron, Philip Hotchkiss

*Discovering the Art of Mathematics*  
*Westfield State College, MA*



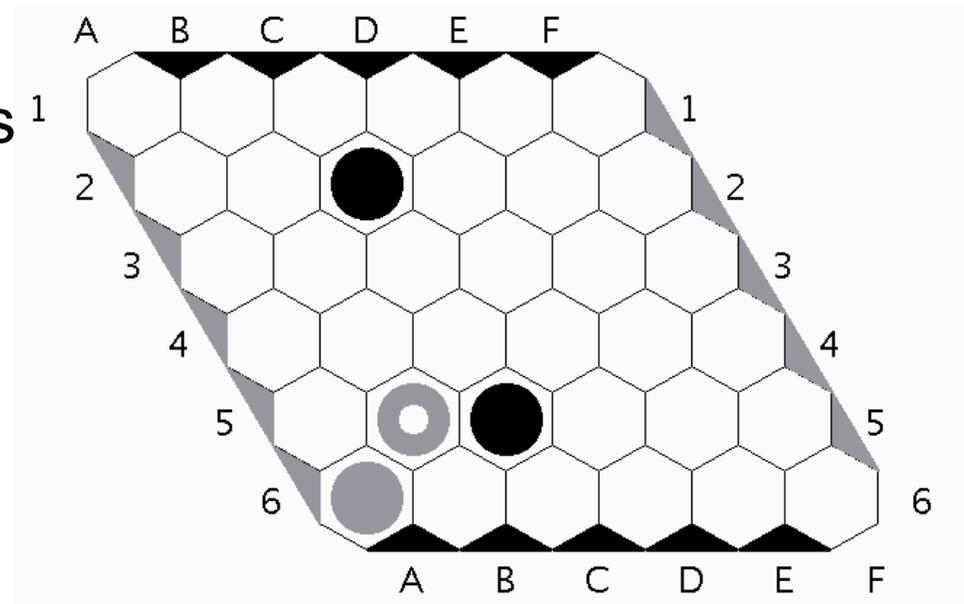
# Overview

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- Rules of *Hex*
- *Hex* Explorations
- Mathematics for Liberal Arts
- Course: *Explorations of Mathematics*
- Book project: *Discovering the Art of Mathematics (NSF)*

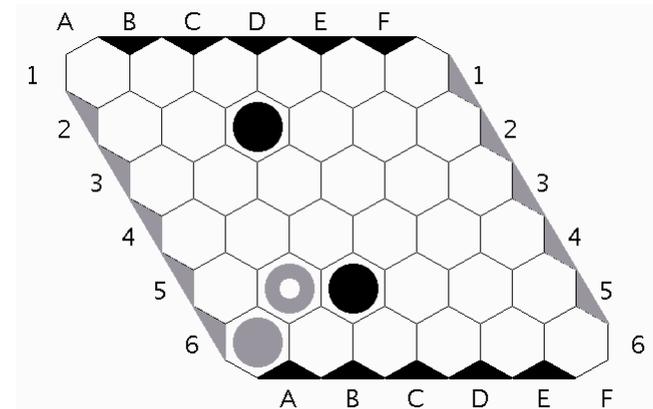
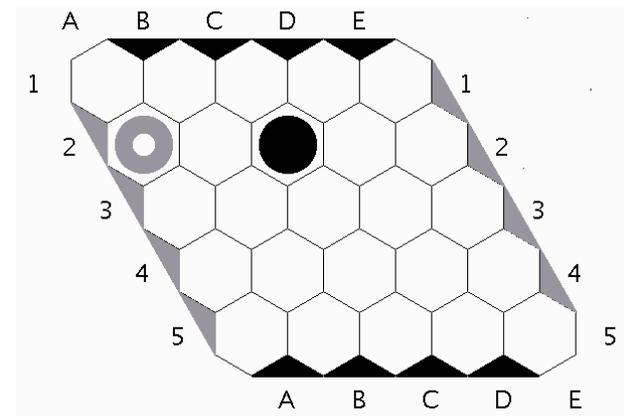
# Rules of *Hex*

- Game board with Hexagons (any size)
- Two players taking turns
- Black: connect up/down
- Gray: connect left/right
- Place in any open hexagon
- Whoever connects first, wins.

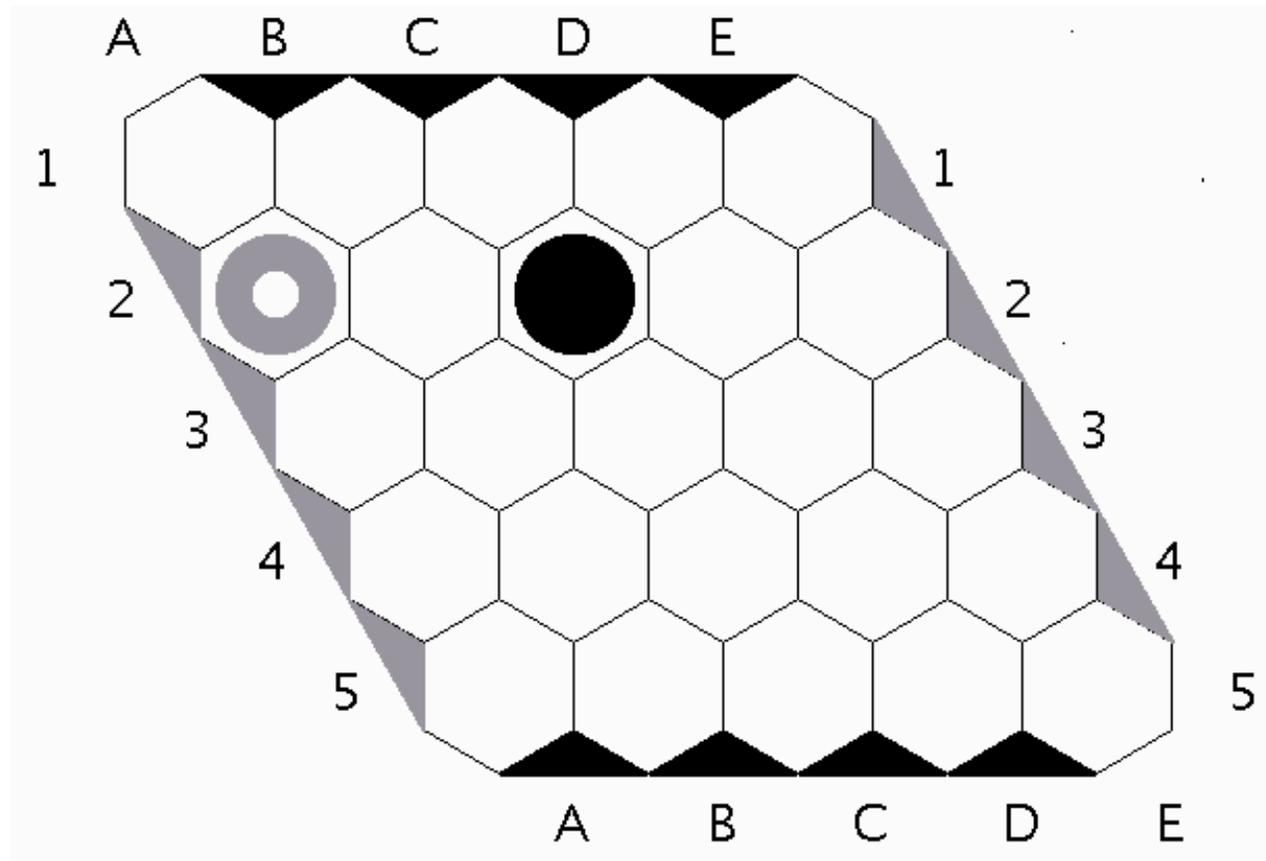


# Exploration (Example 1.2)

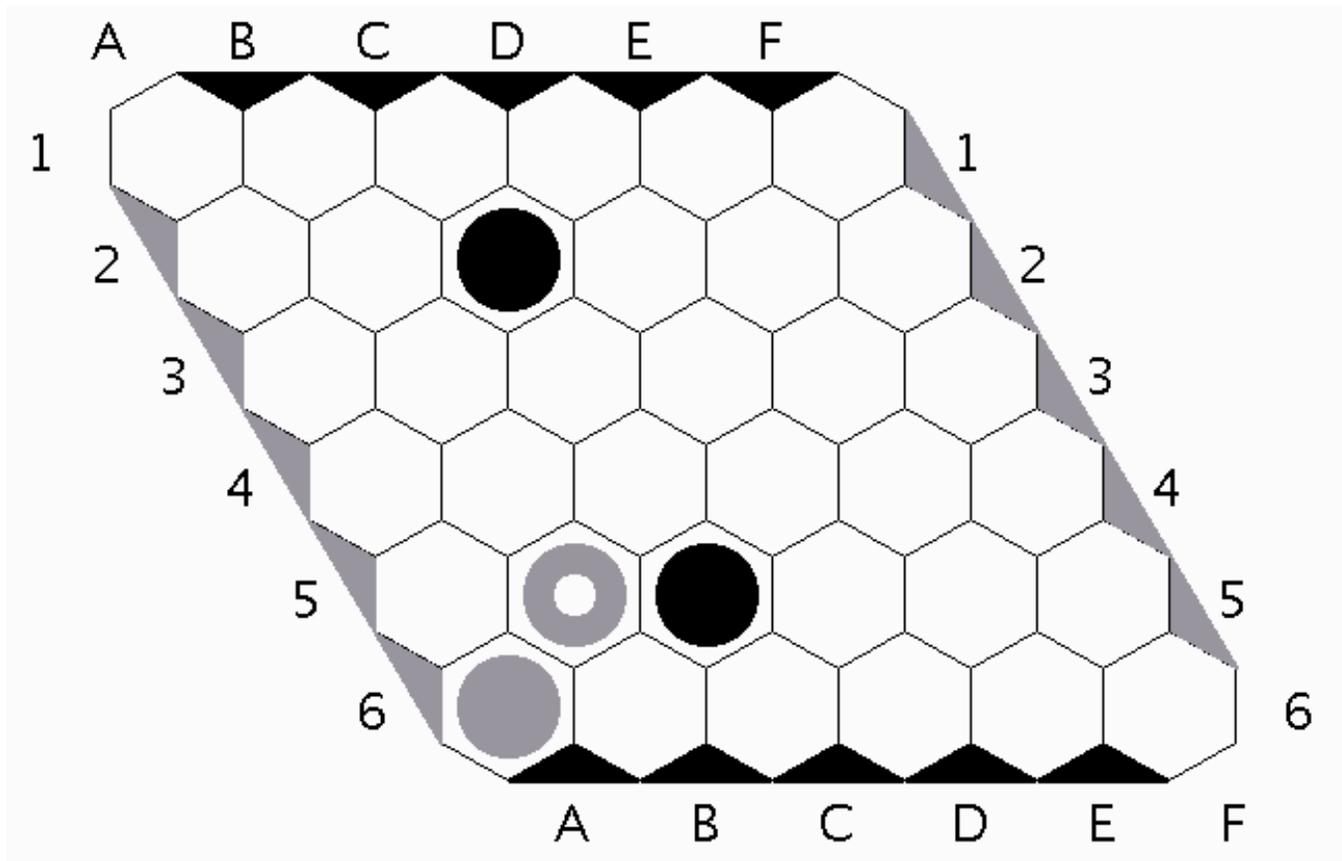
- Playing for black, where would you place the next stone?
- Playing for gray, how would you counter this move?
- Can you predict who will win?

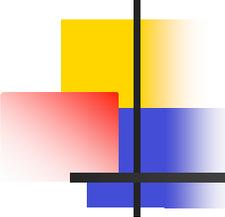


# Suggestions for black...?



# How about this one?





# Mathematics for Liberal Arts

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Challenges with Students at Westfield State College:

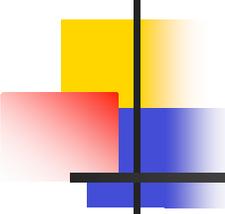
- Weak prior content knowledge
- Negative prior experiences with mathematics (math anxiety)
- Low motivation to succeed
- “Math has nothing to do with my life”
- Traditional looking topics trigger disconnect

# *“Explorations of Mathematics”*

Model of our classrooms

- Small group tables
- Exploration precedes explanation
- Whole group discussion (math talk)
- Games as motivation
- Competitiveness forces critical thinking
- Avoids triggers for math anxiety





## Other topics:

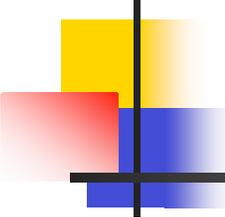
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### Games and Puzzles:

- Hex, ConHex, Stymie
- Nim (1, 2, 3 piles)
- Straight-cut Origami
- Rubik's Cube
- Sudoku, Kakuro, Radon Puzzles

### Music and Dance:

- Counting rhythms and palindromes
- Math. Analysis of Musical Scales
- Compos. Fractal Music
- Symmetry in Dance
- Permutations in Contra Dancing



# *Discovering the Art of Mathematics Project (NSF)*

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- Develop a Library of ten inquiry-based learning guides
- Connecting with the “Arts” in “Liberal Arts”
- Mathematics as an intellectual pursuit
- Materials: Number Theory, Knot Theory, The Infinite, Games and Puzzles, Music and Dance, Patterns, ...
- Beta-testers ?!
- See <http://artofmathematics.wsc.ma.edu/>

[Knot Theory](#)

[Number Theory](#)

[The Infinite](#)

[Geometry](#)

[Calculus](#)

[Patterns](#)

[Music](#)

[Games](#)

[Reasoning](#)

[Art and Sculpture](#)

[Home](#)

# Discovering the Art of Mathematics



Escher tessellation

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This material is also based on work supported by Project PRIME which was made possible by a generous gift from Mr. Harry Lucas.

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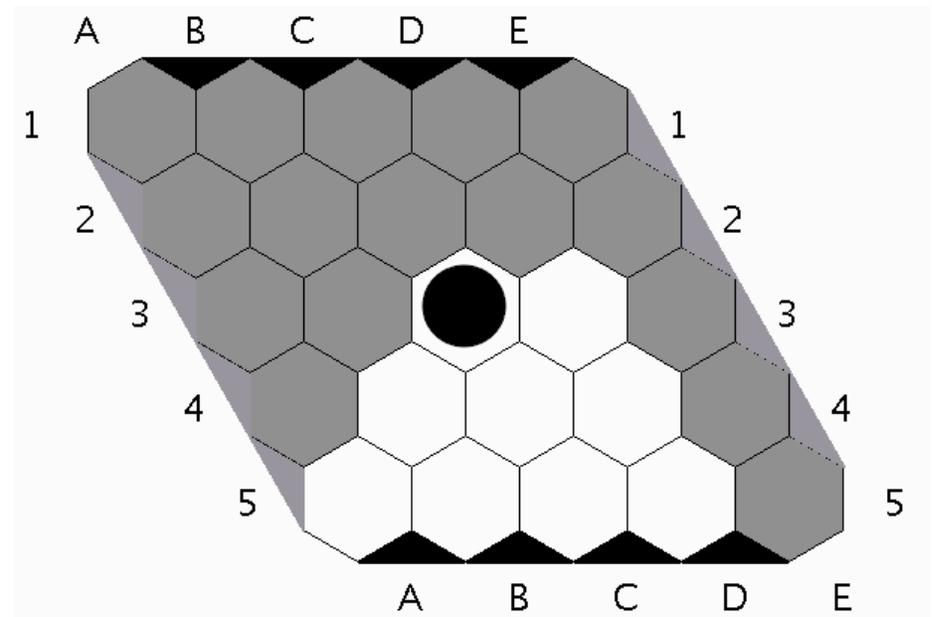
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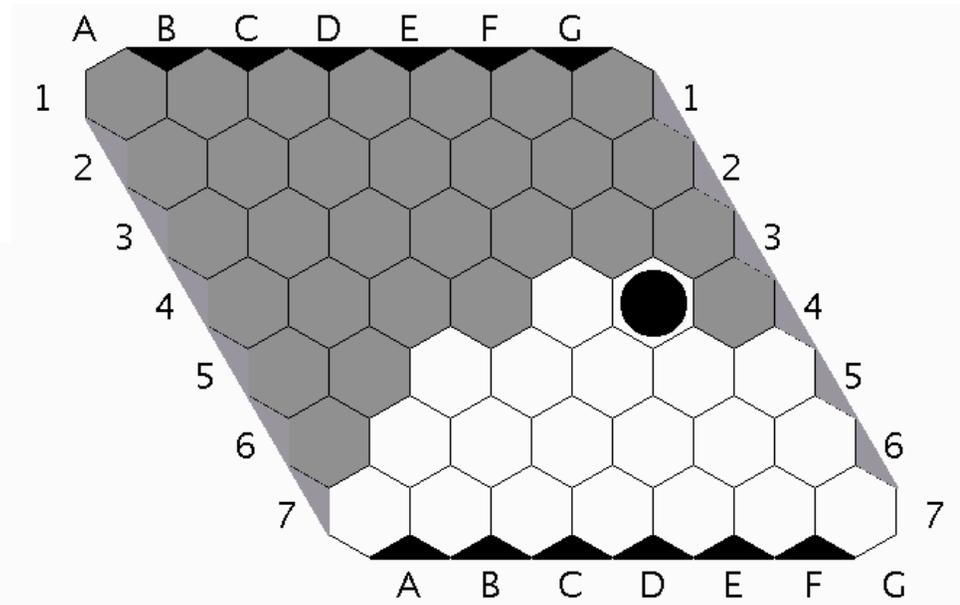
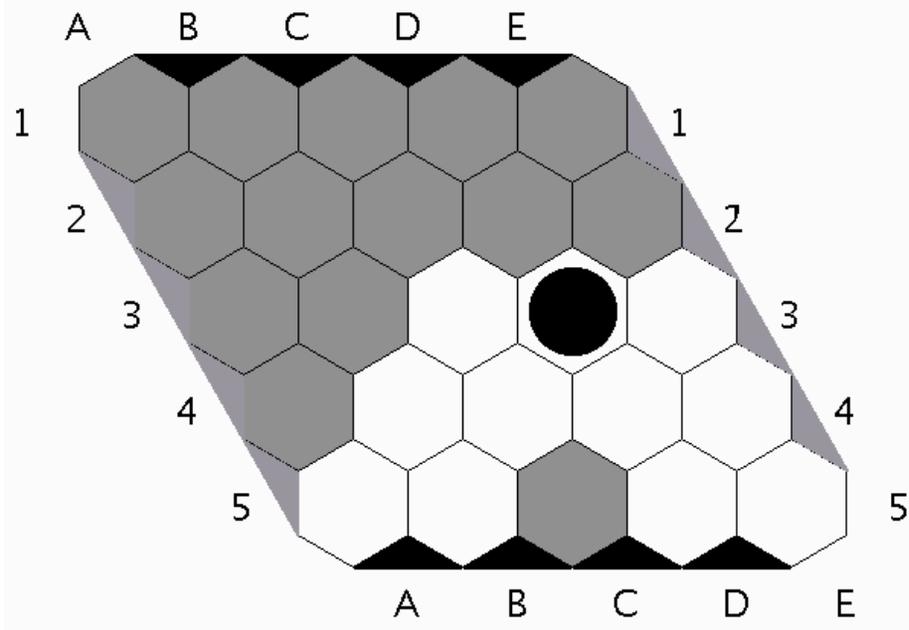
# Can Black be blocked?

## *Edge Templates:*

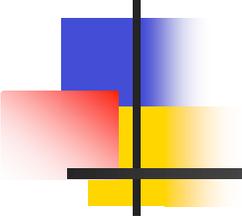
- Beginning of Proof
- Thinking of all possible moves and responses



# More edge templates



*Discovering the Art of Mathematics:*  
Games and Puzzles



**Thank you!**

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