

Games Night!
November 8, 2016



TULSA GIRLS'
MATH CIRCLE

See if you can find a winning strategy. Your strategy should work regardless of the opponent's moves.

Does it matter who plays first?

Would it help to figure out a strategy for a smaller version of the game?

Can your game end in a draw?

1. **Puppies and Kittens:**

We start with a pile of 7 kittens and 10 puppies. Two players take turns; a legal move is removing any number of puppies or any number of kittens or an equal number of both puppies and kittens. The winner is the last player who makes a legal move.

Extension: For what starting values of k kittens and p puppies will player 1 win?

2. **Sum to 15:**

There are nine cards on a table labeled by numbers 1 through 9. Aubrey and Ella take turns choosing one card. The player that has collected a set of cards with the property that the sum of numbers on three cards out of the total set is 15, wins. There's a tie if none of the players has a set of cards with this property at the end of the game.

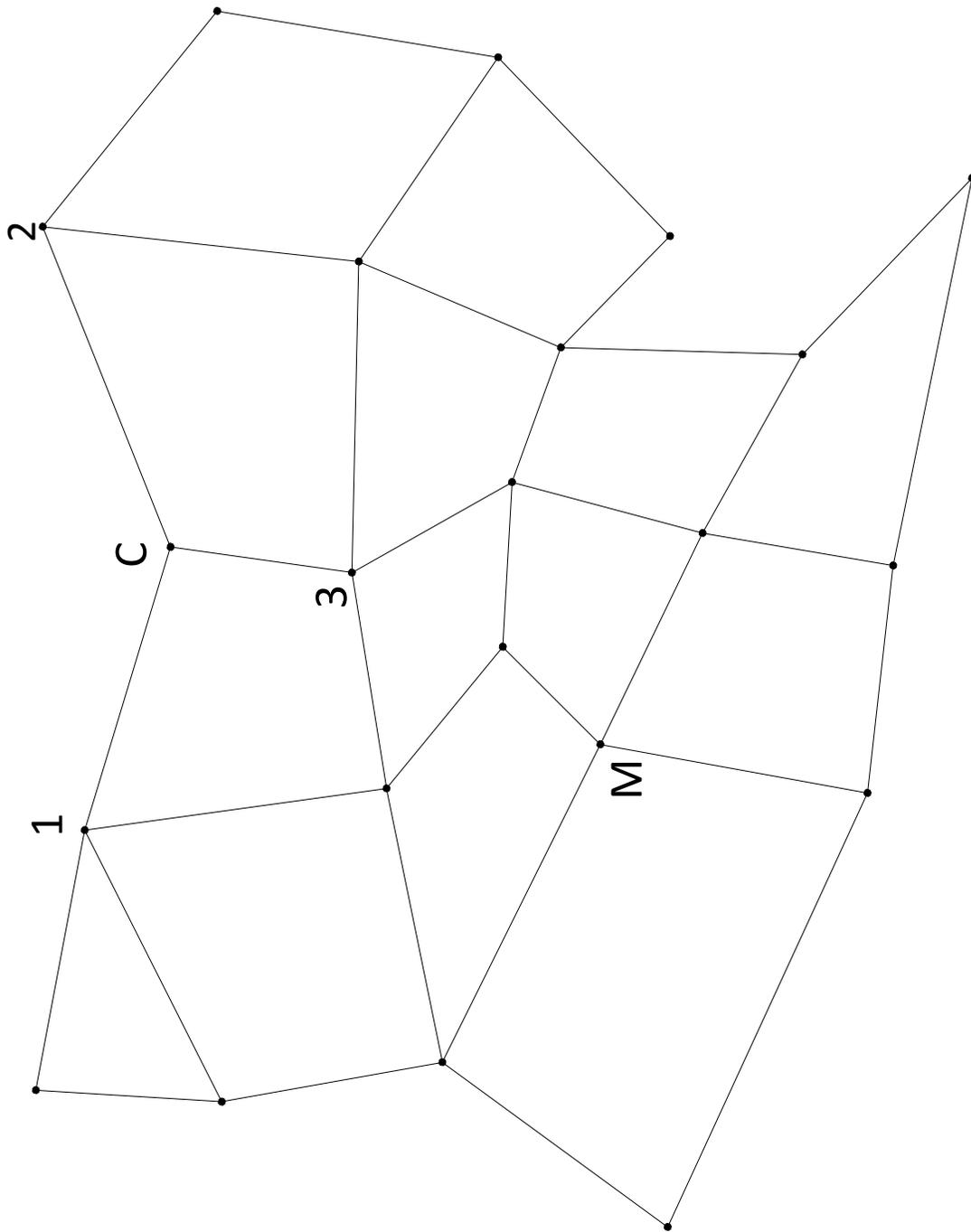
3. **Cat and Mouse:** (Adapted from Ravi Vakil's excellent book, *A Mathematical Mosaic*.)

A very polite cat chases an equally polite mouse. They take turns moving on the grid depicted below. Initially, the cat is at the point labeled C; the mouse is at M. The cat goes first, and can move to any neighboring point connected to it by a single edge. Thus the cat can go to points 1, 2, or 3, but no others, on its first turn. The cat wins if it can reach the mouse in 15 or fewer moves. Can the cat win?

"Puppies and Kittens" and "Cat and Mouse" from Paul Zeitz,

<http://www.mathteacherscircle.org/assets/session-materials/PZeitMathematicalGames.pdf>

"Sum to 15" from Tatiana Shubin, <http://www.mathteacherscircle.org/assets/session-materials/TShubinmathgames.pdf>



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