Astonishing Math Improving Your Chances of Winning the Locker Game

National Council of Teachers of Mathematics
Annual Meeting and Exposition
April 27, 2018
Washington, D.C.

Jim Matthews
Siena College
Loudonville, NY
matthews@siena.edu

Warm Up Problems

1. Evaluate ln (2) to the nearest thousandth.

2. (N + 1) ÷ (N/2 + 1) = 2 – (?????)

3. $\lim_{x \to \infty}$ (ln (2 - $\frac{1}{x/2-1}$)

4. How many ways can you arrange the integers 1..8?

5. How many cycles (clock faces) can you make with the integers 1..8?

The Twenty Locker Problem

There is a twenty member team with players p_1, p_2, p_3, … p_{20} and each player has a jersey with her number on it. The jerseys have been randomly placed in twenty lockers, one jersey per locker. The players may talk amongst themselves before the game begins but they are not allowed to communicate with each other in any way once the game starts.

When the game begins, the players one by one are allowed to enter the locker room and open ten lockers. A player is successful if she finds the jersey with her number on it. After a player opens her ten lockers, she closes the lockers (leaving them in the same state as when she entered), exits the locker room, and the next player is allowed to enter.

For the team to win the game, all twenty players must be successful. The challenge is for the team to develop a locker selection strategy that maximizes the probability of the team winning.

What strategy should be used?

The Twenty Locker Problem

Strategies:
A.

B.

C.

D.

Analysis:
A.

B.

C.

D.

The Thirty Locker Problem

Analysis:
A.

B.

C.

D.

The Forty Locker Problem

Analysis:
A.

B.

C.

D.

The N = 2k Locker Problem

Analysis:

Conclusion:

The P (success) never falls below _____