

[illegible]

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Topics Need To learn	Nim	
	Misere Nim	
	Grundy	
	Blue-Red Hacken Bush	
	Green Hacken Bush	http://www.cs.cmu.edu/afs/cs/academic/class/15859-f01/www/notes/hack.html
Impartial Games	Games where both players have same moves from any given position.	
Partizan games	Players have different set of moves.	
Normal play rule	The last person to move wins.	
Misere Play Rule	The last person to move loses.	
Number of Winning Moves in Nim	The number of winning moves from an N-position is equal to the number of 1's in the leftmost column with an odd number of 1's. In particular, there is always an odd number of winning moves.	
Misere Nim Strategy	As long as there are two piles > 1 , keep on playing normally. When there is 1 pile > 1 , move such that odd number of piles of 1 remain. This works cause in optimal nim strategy, I will never leave exactly one pile > 1 .	
Minimal Excludent	minimal excludant, or mex, of a set of non-negative integers as the smallest non-negative integer not in the set	
Colon Principal	Used for Converting Tree Bush into a Stalk Bush. Branches of length a,b,c from a vertex is same as a stalk of a xor b xor c from vertex.	
Fusion Principal	The vertices on any circuit may be fused without changing the Sprague-Grundy value of the graph. Fusion will convert each edge into a loop. Each loop is same as 1 nim bar.	