Discrete Math (DMAT)
Course Syllabus

		WHAT	HOW
DAY 1	**morning**	Introductions, seating assignments, pre-assessment, overview of course	Index cards, data sheets, 2 Handshake Problems
	afternoon	Basic set theory, fundamental counting principle, Venn diagrams, Principle of Inclusion-Exclusion	Subsets using M&M's
	evening	Cartesian product, functions	
DAY 2	**morning**	Quiz, introduction to Inductive Proofs, determining general term of a sequence	Tower of Hanoi, Number of subsets, Finite differences
	afternoon	Arithmetic and geometric series, sigma notation	
	evening	Developing formulas for the sum of a series, inductive proofs involving divisibility	Finite differences, results proven by induction
DAY 3	**morning**	Quiz, Euclidean algorithm, numbers in other bases	
	afternoon	Counting and numbering subsets, Pascal's triangle and its relationship to subsets	M&M's to count subsets of various sizes
	evening	Problems involving subsets (choosings), Investigating relationships in Pascal's triangle	
DAY 4	**morning**	Quiz, counting arrangements, factorial notation for arrangements, simplifying factorials	Bagel game
	afternoon	Problems involving arrangements, pigeonhole principle, indirect proof	Introduce indirect proof using colored index cards, and then 3 prisoners problem
	evening	Relationship between choosings and arrangements, factorial notation for choosings	M&M's
DAY 5	**morning**	Test, proving relationships involving factorials, especially the Pascal's triangle relationship	By algebraic simplification of factorials, and by induction,
	afternoon	Problems in combinatorics	
	evening	Problem sets	

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DAY 6	**morning**	Quiz, probability, birthday problem, Monte Hall Problem	
	afternoon	Combinatorics and probability, conditional probability	
	evening	Problem sets	
DAY 7	**morning**	Quiz, probability trees, law of large numbers, Monte Carlo simulations	Coin tossing, dice rolling
	afternoon	Binomial theorem, binomial probability distributions	Prove by induction
	evening	Hypergeometric probability distribution	
DAY 8	**morning**	Quiz, Intro to graph theory	
	afternoon	Isomorphic graphs, further graph theory	"Dots" and toothpicks
	evening	Introduce Konigsburg bridge problem, problem sets	
DAY 9	**morning**	Quiz, solution to Konigsburg, Eulerian graphs	Finding Eulerian trails on campus
	afternoon	Salesman's problem, Hamiltonian graphs, cheapest cycles	
	evening	Problem sets	
DAY 10	**morning**	Test, spanning trees	"Dots" and toothpicks
	afternoon	Minimum weight spanning trees, Kruskal's algorithm, directed graphs, project graphs, critical paths	
	evening	Problem sets	
DAY 11	**morning**	Quiz, bipartite and planar graphs, 3 utilities problem, Euler's formula for planar graphs	Develop by investigating several graphs
	afternoon	Colorings of graphs, chromatic number and applications to scheduling	
	evening	Problem sets	
DAY 12	**morning**	Quiz, 5 color theorem, 4 color theorem	
	afternoon	Binary trees, coding using binary trees and 1-time pads, tournaments, ranking preferences	Students will encode messages and have others decode, Telephone Game in Binary
	evening	Problem sets	

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DAY 13	**morning**	Quiz, matrix operations, identity matrix, inverse matrix	
	afternoon	Coding using matrices, matrices applied to network analysis, dominance matrices	Students will code messages using a matrix, and have other students decode
	evening	Problem sets	
DAY 14	**morning**	Quiz, Euclidean algorithm and linear Diophantine equations	
	afternoon	General solution for Diophantine equation, applications	
	evening	Problem sets	
DAY 15	**morning**	Modulo systems	
	afternoon	Parent conferences	