

BRONX COMMUNITY COLLEGE
Of the City University of New York
DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

SYLLABUS: CSI30 DISCRETE MATHEMATICS 1

3 credits / 3 hours

PREREQUISITE: MTH 06 and ENG 02 and RDL 02 if required

TEXT: Discrete Mathematics and its Applications, Seventh Edition,
 by Kenneth H. Rosen, published by McGraw-Hill 2012

Goals of the course:

CSI 30 is an introduction to mathematical methods in computer science. It begins with basic concepts of mathematical logic, continues with an introduction to algorithms and programming, and concludes with an introduction to counting techniques and probability. The emphasis is on computational, hands-on experience. The material on set theory reinforces and complements parallel topics covered in Precalculus (MTH 30). It is highly recommended that MTH 30, if required, and CSI 30 are taken in the same semester.

Objectives: A successful student in this course will learn to:

1. Understand the idea of an algorithm and computer program;
2. Write and analyze simple programs;
3. Understand the use of formal logic in mathematics and programming;
4. Understand basic concepts of set theory, particularly those of a function;
5. Use basic combinatorial counting techniques, particularly permutations and combinations;
6. Understand basic concepts of probability theory, and the way counting techniques are used there.

Chapters and sections	Suggested in-class examples	Suggested Homework
Chapter 1 The Foundations: Logic and Proofs (5 weeks)		
1.1 Propositional Logic.	Examples All	12-16/1, 3, 7, 9, 13, 17, 19, 25, 27, 31, 37, 43
1.2 Translating English sentences. System specifications. Boolean Searches. Logic Puzzles.	Examples 1-8	22-24/5, 7, 11, 13, 17, 21
1.3 Propositional Equivalences	Examples All	35/1-21 (odd)
1.4 Predicates and Quantifiers	Examples 1-18, 20-24, 28	53 /1-27 (odd), 31, 33, 35, 53, 55
1.5 Nested quantifiers.	Examples 1-15	64/1, 3, 5, 9, 15, 25, 27, 33
1.6 Rules of Inference. Fallacies.	Examples 1-11	78/1-9 (odd)
Chapter 2 Basic Structures: Sets, Functions, Sequences, Sums (3 weeks)		
2.1 Sets, power sets, Cartesian products.	Examples 1-19	125/1-9 (odd), 15-23 (odd), 27, 31, 35
2.2 Set operations. Set identities.	Examples 1-15	136/1, 3, 13, 25
2.2 Computer representations of sets.	Examples 18, 19, 20	137/52-55(all)
2.3 One-to-one and onto functions.	Examples 1-17	152/1-7 (odd)
2.3 Inverse and composition of functions. Graphs. Some important functions.	Examples 18-30	152/9, 12, 13, 15, 23, 31, 36, 43
2.6 Matrix Arithmetic. Transposes and powers of matrices. Zero-one matrices.	Examples 1-9	183/1, 3, 5, 19, 20, 26, 27

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Chapters and sections	Suggested in-class examples	Suggested Homework
Chapter 3 Algorithms (1 week)		
3.1 Algorithms. Pseudocode. Searching algorithms	Examples 1-3	202/1, 3, 5
3.1 Sorting. Greedy algorithms.	Examples 4-6	202/2, 7, 13, 19, 35
Chapter 4 Number Theory and Cryptography (2 weeks)		
4.1 Division. The division algorithm.	Examples 1-4	244/1, 9
4.1 Modular arithmetic.	Examples 5-6	244/21, 29
4.5 Applications of congruences (hashing functions). Pseudorandom numbers.	Examples 1-3	292/3, 5
4.3 Primes. Fundamental Theorem of Arithmetic. The Infinitude of Primes. The Euclidean Algorithm.	Examples 1-5, 16	272/3, 15, 17, 33
4.2 Representations of integers.	Examples 1-7	254/1, 3, 5, 7
4.2 Algorithms for integer operations. Modular exponentiation.	Examples 8, 10, 12	254/25
Chapter 6 Counting (3 weeks)		
6.1 Basic counting principles	Examples 1-14	396/1-17 (odd)
6.1 More complex counting problems. Exclusion inclusion principle. Tree diagrams.	Examples 15-23	396/19-33 (odd)
6.3 Permutations and combinations.	Examples 1-15	413/1-19 (odd), 20
6.4 Binomial coefficients. Pascal's triangle.	Examples 1-4	421/1-9 (odd), 12, 13
Chapter 7 Discrete Probability (1 week)		
7.1 Introduction to probability	Examples 1-9	451/1-27 (odd)

RK/2003; Revised Nov 2006/JP/SP Fall 2007, CO'S Fall 2008, NN 2012