Math 121 Sequence of Topics

From *Discrete Mathematics and its Applications*, 8th Edition, by Rosen

§	Topic	Assignment
1.1	Propositional Logic	1, 3, 5, 7, 11, 13, 17, 19, 25, 29, 33, 35, 39, 41
1.2	Applications of Propositional Logic	3, 7, 9, 11, 21
1.3	Propositional Equivalences	1, 5–15 odd, 21, 27, 31, 35, 50, 51, 52, 53
1.4	Predicates & Quantifiers	1, 5, 7, 9, 11, 13, 15, 19, 25, 29, 33, 35, 39
1.5	Nested Quantifiers	1, 3, 5, 9, 11, 15, 17, 19, 23, 25, 27, 31, 37, 39, 41
1.6	Rules of Inference	1, 3, 5, 7, 15, 19
1.7	Introduction to Proofs	1, 3, 5, 9, 11, 13, 15, 17, 21, 29, 33, 35
1.8	Proof Methods and Strategy	3, 5, 9, 11, 13, 15, 21, 31, 33, 37
2.1	Sets	1, 3, 7, 9, 11, 13, 19, 21, 23, 27, 28, 29, 33, 35, 41, 43, 45
2.2	Set Operations	3, 5, 7, 9, 15a, 17, 19a, 21, 25, 33, 41, 53, 55, 57
2.3	Functions	1, 3, 5, 7, 9, 13, 15, 23, 25, 27a, 31, 33, 41, 42, 45, 47, 53, 71, 73abc
2.4	Sequences & Summations	1, 3, 9, 13cegh, 15abd, 17aceg, 29, 31, 33, 45, 46
2.6	Matrices	1, 2, 3, 4, 7, 9, 11, 13, 14, 15
4.1	Divisibility & Modular Arithmetic	2, 3, 5, 7, 9, 13bdfh, 15, 17, 21, 22, 27, 29abc, 31, 32, 35
4.2	Integer Representations & Algorithms	1, 3, 5, 6, 7, 9, 10, 11, 17, 19, 21, 23, 24, 31
4.3	Primes & Greatest Common Divisors	1, 3, 5, 15, 17, 25, 27, 29, 33 (use the approach of Example 14 if preferred)
5.1	Mathematical Induction	5, 7, 9, 11, 15, 21, 23, 25, 31, 35, 39, 43, 57, 59
5.2	Strong Induction & Well-Ordering	3, 5, 9, 12, 13 + supplement on next page
6.1	The Basics of Counting	3, 7, 9, 11, 13, 15, 19–37 odd, 41, 51, 53, 57, 75
6.2	The Pigeonhole Principle	1, 3, 5, 7, 9, 15, 17, 19, 35
6.3	Permutations & Combinations	3, 5ace, 7, 11, 15, 17, 19, 21, 25, 29, 35, 37, 41
7.1	An Introduction to Discrete Probability	1–27 odd, 35, 37
8.5	Inclusion-Exclusion	1–19 odd, 23
9.1	Relations and Their Properties	1, 3, 7, 9, 27, 29, 35, 37, 39, 43, 44, 47, 53, 57
9.3	Representing Relations	1, 3, 7, 9, 11, 13, 14, 15, 19, 21, 23, 25, 27
9.5	Equivalence Relations	3, 7, 9, 15, 17, 21, 23, 25, 29, 35, 41, 45, 55, 57
10.1	Graphs & Graph Models	3, 5, 7, 9, 11, 13
10.2	Special Types of Graphs	1–11 odd, 18, 21, 23, 25, 33, 35, 37, 39, 45, 61, 63, 71
10.3	Representing Graphs & Graph Isomorphism	1–29 odd, 33, 39–49 odd, 63, 71
10.4	Connectivity	
10.5	Euler & Hamilton Paths	

§5.2 Supplementary Exercises

1 Use strong induction to prove that any integer greater than 1 is divisible by a prime number.

2 The **Lucas sequence** (ℓ_n) is defined as follows: $\ell_1 = 1$, $\ell_2 = 3$, and $\ell_n = \ell_{n-1} + \ell_{n-2}$. Prove that $\ell_n \leq \left(\frac{7}{4}\right)^n$ for all $n \geq 1$.

3 For the sequence given for $n \geq 3$ by $a_n = a_{n-1} + a_{n-2} + a_{n-3}$, with $a_0 = a_1 = a_2 = 1$, prove the following:

3a a_n is odd for all $n \geq 0$.

3b $a_n \leq 2^{n-1}$ for all $n \geq 1$.

4 For the sequence given for $n \geq 3$ by $b_n = b_{n-1} + b_{n-3}$, with $b_0 = b_1 = b_2 = 1$, prove the following:

4a $b_n \geq 2b_{n-2}$ for $n \geq 3$.

4b $b_n \geq \left(\sqrt{2}\right)^{n-2}$ for $n \geq 2$. (This will require use of #4a.)