MATH 121 SEQUENCE OF TOPICS

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

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, 7, 15, 19 1.6 Rules of Inference 1, 3, 5, 7, 11, 13, 15, 17, 21, 29, 33, 35 1.8 Proof Methods and Strategy 3, 5, 9, 11, 13, 15, 17, 21, 29, 33, 345 2.1 Sets 1, 3, 7, 9, 11, 13, 15, 21, 31, 33, 37 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, 5, 17, 91, 31, 51, 23, 25, 27a, 31, 33, 41, 42, 45, 47, 53, 71, 73abc 2.4 Sequences & Summations 1, 3, 5, 1, 7, 91, 13, 14, 15 4.1 Divisibility & Modular Arithmetic 2, 3, 5, 7, 9, 13bdfh, 15, 17, 21, 22, 27, 29abc, 31, 32, 32, 35 4.2 Integer Representations & Algorithms 1, 3, 5, 17, 25, 27, 29, 33 (use the approach of Exampter Methods in S, 5, 7, 9, 11, 15, 17, 21, 23, 25, 31, 35, 39, 43, 57, 59 5.1 <	§	Торіс	ASSIGNMENT
1.3Propositional Equivalences1, 5–15 odd, 21, 27, 31, 35, 50, 51, 52, 531.4Predicates & Quantifiers1, 5, 7, 9, 11, 13, 15, 19, 25, 29, 33, 35, 391.5Nested Quantifiers1, 3, 5, 9, 11, 15, 17, 19, 23, 25, 27, 31, 37, 39, 411.6Rules of Inference1, 3, 5, 7, 15, 191.7Introduction to Proofs1, 3, 5, 9, 11, 13, 15, 17, 21, 29, 33, 351.8Proof Methods and Strategy3, 5, 9, 11, 13, 15, 21, 31, 33, 372.1Sets1, 3, 7, 9, 11, 13, 19, 21, 23, 27, 28, 29, 33, 35, 41, 43, 452.2Set Operations3, 5, 7, 9, 15a, 17, 19a, 21, 25, 33, 41, 53, 55, 572.3Functions1, 3, 5, 7, 9, 13, 15, 23, 25, 27a, 31, 33, 41, 42, 45, 47, 53, 71, 73abc2.4Sequences & Summations1, 3, 9, 13cegh, 15abd, 17aceg, 29, 31, 33, 45, 462.6Matrices1, 2, 3, 4, 7, 9, 11, 13, 14, 153.1Divisibility & Modular Arithmetic2, 3, 5, 7, 9, 13, 15, 17, 21, 22, 27, 29abc, 31, 32, 354.2Integer Representations & Algorithms1, 3, 5, 15, 17, 25, 27, 29, 33 (sue the approach of Example 14 if preferred)5.1Mathematical Induction5, 7, 9, 11, 13, 15, 19–37 odd, 41, 51, 53, 57, 755.2Strong Induction & Well-Ordering3, 5a, 7, 9, 15, 17, 19, 21, 23, 25, 37, 39, 43, 47, 575.3Inclusion-Exclusion1–19 odd, 235.4Healtons & Combinations3, 5ace, 7, 11, 15, 17, 19, 21, 23, 25, 93, 57, 755.3Representing Relations1, 37, 9, 11, 13, 14, 15, 19, 21, 23, 25, 275.4The Basics of Counting1, 3, 7, 9, 11, 13, 14, 15, 19, 21, 23, 25, 27 <td>1.1</td> <td>Propositional Logic</td> <td>1, 3, 5, 7, 11, 13, 17, 19, 25, 29, 33, 35, 39, 41</td>	1.1	Propositional Logic	1, 3, 5, 7, 11, 13, 17, 19, 25, 29, 33, 35, 39, 41
1.4Predicates & Quantifiers1, 5, 7, 9, 11, 13, 15, 19, 25, 29, 33, 35, 391.5Nested Quantifiers1, 3, 5, 9, 11, 15, 17, 19, 23, 25, 27, 31, 37, 39, 411.6Rules of Inference1, 3, 5, 7, 15, 191.7Introduction to Proofs1, 3, 5, 9, 11, 13, 15, 17, 21, 29, 33, 351.8Proof Methods and Strategy3, 5, 9, 11, 13, 15, 21, 31, 33, 372.1Sets1, 3, 7, 9, 11, 13, 19, 21, 23, 27, 28, 29, 33, 35, 41, 43, 452.2Set Operations3, 5, 7, 9, 15a, 17, 19a, 21, 25, 33, 41, 53, 55, 572.3Functions1, 3, 5, 7, 9, 13, 15, 23, 25, 27a, 31, 33, 41, 42, 45, 47, 53, 71, 73abc2.4Sequences & Summations1, 3, 9, 13cegh, 15abd, 17aceg, 29, 31, 33, 45, 462.6Matrices1, 2, 3, 4, 7, 9, 11, 13, 14, 153.1Divisibility & Modular Arithmetic2, 3, 5, 7, 9, 13bdfh, 15, 17, 21, 22, 27, 29abc, 31, 32, 354.2Integer Representations & Algorithms1, 3, 5, 6, 7, 9, 10, 11, 17, 19, 21, 23, 24, 314.3Primes & Greatest Common Divisors1, 3, 5, 17, 25, 27, 29, 33 (use the approach of Example 14 if preferred)5.1Mathematical Induction5, 7, 9, 11, 15, 12, 23, 25, 31, 35, 39, 43, 57, 595.2Strong Induction & Well-Ordering3, 5, 9, 12, 13 + supplement on next page6.1The Basics of Counting3, 7, 9, 11, 13, 15, 19–37 odd, 41, 51, 53, 776.3Permutations & Combinations3, 5ace, 7, 11, 15, 17, 19, 25, 29, 35, 37, 417.4A Introduction to Discrete Probability1–27 odd, 35, 378.5Inclusion-Exclusion1–19 odd, 239.1<	1.2	Applications of Propositional Logic	3, 7, 9, 11, 21
1.5Nested Quantifiers1, 3, 5, 9, 11, 15, 17, 19, 23, 25, 27, 31, 37, 39, 411.6Rules of Inference1, 3, 5, 7, 15, 191.7Introduction to Proofs1, 3, 5, 9, 11, 13, 15, 17, 21, 29, 33, 351.8Proof Methods and Strategy3, 5, 9, 11, 13, 15, 21, 31, 33, 372.1Sets1, 3, 7, 9, 11, 13, 19, 21, 23, 27, 28, 29, 33, 35, 41, 43, 452.2Set Operations3, 5, 7, 9, 15a, 17, 19a, 21, 25, 33, 41, 53, 55, 572.3Functions1, 3, 5, 7, 9, 15a, 17, 19a, 21, 25, 33, 41, 53, 55, 572.4Sequences & Summations1, 3, 9, 13cegh, 15bdd, 17aceg, 29, 31, 33, 41, 42, 45, 47, 53, 71, 73abc2.4Sequences & Summations1, 3, 9, 13cegh, 15abd, 17aceg, 29, 31, 33, 45, 462.6Matrices1, 2, 3, 4, 7, 9, 11, 13, 14, 153.1Divisibility & Modular Arithmetic2, 3, 5, 7, 9, 13bdfh, 15, 17, 21, 22, 27, 29abc, 31, 32, 354.2Integer Representations & Algorithms1, 3, 5, 6, 7, 9, 10, 11, 17, 19, 21, 23, 24, 314.3Primes & Greatest Common Divisors1, 5, 5, 15, 17, 25, 27, 29, 33 (use the approach of Example 14 if preferred)5.1Mathematical Induction5, 7, 9, 11, 13, 15, 19–37 odd, 41, 51, 53, 57, 755.2Strong Induction & Well-Ordering3, 5, 36, 7, 9, 15, 17, 19, 21, 23, 25, 37, 415.3Permutations & Combinations3, 5ace, 7, 11, 15, 17, 19, 21, 23, 25, 37, 415.4Inclusion-Exclusion1–19 odd, 235.5Inclusion-Exclusion1–19 odd, 235.4Representing Relations3, 7, 9, 15, 17, 21, 23, 25, 29, 35, 41, 45, 55, 575.3 <td>1.3</td> <td>Propositional Equivalences</td> <td>1, 515 odd, 21, 27, 31, 35, 50, 51, 52, 53</td>	1.3	Propositional Equivalences	1, 515 odd, 21, 27, 31, 35, 50, 51, 52, 53
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 2.4 Matrices 1, 2, 3, 4, 7, 9, 11, 13, 14, 15 2.1 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, 15, 17, 25, 27, 29, 33 (use the approach of Example 14 if preferred) 5.1 Mathematical Induction 5, 7, 9, 11, 13, 15, 19, 37 odd, 41, 51, 53, 75, 75 5.2 Strong Induction & Well-Ordering 3, 5ace, 7, 11, 15, 17, 19, 35 6.3 Permutations & Combinations 3, 5ace, 7, 11, 15, 17, 19, 21, 23, 25, 37, 31, 37, 41 7.1 An Introduction to Discrete Probability 1–27 odd,	1.4	Predicates & Quantifiers	1, 5, 7, 9, 11, 13, 15, 19, 25, 29, 33, 35, 39
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, 15a, 17, 19a, 21, 25, 33, 41, 53, 55, 57 2.4 Sequences & Summations 1, 3, 9, 13cegh, 15abd, 17aceg, 29, 31, 33, 41, 42, 45, 47, 53, 71, 73abc 2.4 Sequences & Summations 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, 15, 17, 25, 27, 29, 33 (use the approach of Example 14 if preferred) 5.1 Mathematical Induction 5, 7, 9, 11, 15, 17, 19, 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, 5ace, 7, 11, 15, 17, 19, 21, 23, 25, 37, 31, 41, 45, 53, 57 5.3 Inclusion-Exclusion 1-27 odd, 35, 37 6.4 Heriden and Their Properties 1, 3, 7, 9, 11, 13, 14, 15, 19, 21, 23, 25, 29, 35, 41, 45, 55, 57	1.5	Nested Quantifiers	
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, 15a, 17, 19a, 21, 25, 33, 41, 53, 55, 57 2.4 Sequences & Summations 1, 3, 9, 13(segh, 15abd, 17aceg, 29, 31, 33, 41, 42, 45, 47, 53, 71, 73abc 2.4 Sequences & Summations 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, 13, 15, 19–37 odd, 41, 51, 53, 57, 55 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, 23, 25, 37, 34, 44, 47, 53, 57 6.4 Hartouction to Discrete Probability 1–27 odd, 35, 37 7.5 Inclusion-Exclusion 1–19 odd, 23 9.1 Relations and Their Proper	1.6	Rules of Inference	1, 3, 5, 7, 15, 19
2.1Sets1, 3, 7, 9, 11, 13, 19, 21, 23, 27, 28, 29, 33, 35, 41, 43, 452.2Set Operations3, 5, 7, 9, 15a, 17, 19a, 21, 25, 33, 41, 53, 55, 572.3Functions1, 3, 5, 7, 9, 13, 15, 23, 25, 27a, 31, 33, 41, 42, 45, 47, 53, 71, 73abc2.4Sequences & Summations1, 3, 9, 13cegh, 15abd, 17aceg, 29, 31, 33, 45, 462.6Matrices1, 2, 3, 4, 7, 9, 11, 13, 14, 152.1Divisibility & Modular Arithmetic2, 3, 5, 7, 9, 13bdfh, 15, 17, 21, 22, 27, 29abc, 31, 32, 354.2Integer Representations & Algorithms1, 3, 5, 15, 17, 25, 27, 29, 33 (use the approach of Example 14 if preferred)5.1Mathematical Induction5, 7, 9, 11, 15, 21, 23, 25, 31, 35, 39, 43, 57, 595.2Strong Induction & Well-Ordering3, 5, 9, 12, 13 + supplement on next page6.1The Basics of Counting3, 7, 9, 11, 13, 15, 19–37 odd, 41, 51, 53, 57, 756.2The Pigeonhole Principle1, 3, 5, 7, 9, 15, 17, 19, 356.3Permutations & Combinations3, 5ace, 7, 11, 15, 17, 19, 21, 22, 29, 35, 37, 417.1An Introduction to Discrete Probability1–27 odd, 35, 377.3Relations and Their Properties1, 3, 7, 9, 15, 17, 21, 23, 25, 23, 54, 44, 753, 579.3Representing Relations1, 3, 7, 9, 11, 13, 14, 15, 19, 21, 23, 25, 279.5Equivalence Relations3, 7, 9, 15, 17, 21, 23, 25, 29, 35, 37, 39, 45, 45, 55, 579.4Graph & Graph Models3, 7, 9, 15, 17, 21, 23, 25, 23, 34, 35, 37, 39, 45, 61, 63, 7110.1Graphs & Graph Models3, 7, 9, 11, 13, 14, 15, 19, 21, 23, 25, 33, 35, 37, 39, 45,	1.7	Introduction to Proofs	1, 3, 5, 9, 11, 13, 15, 17, 21, 29, 33, 35
41, 43, 452.2Set Operations $3, 5, 7, 9, 15a, 17, 19a, 21, 25, 33, 41, 53, 55, 572.3Functions1, 3, 5, 7, 9, 13, 15, 23, 25, 27a, 31, 33, 41, 42, 45, 47, 53, 71, 73abc2.4Sequences & Summations1, 3, 9, 13cegh, 15abd, 17aceg, 29, 31, 33, 45, 462.6Matrices1, 2, 3, 4, 7, 9, 11, 13, 14, 152.1Divisibility & Modular Arithmetic2, 3, 5, 7, 9, 13bdfh, 15, 17, 21, 22, 27, 29abc, 31, 32, 354.2Integer Representations & Algorithms1, 3, 5, 6, 7, 9, 10, 11, 17, 19, 21, 23, 24, 314.3Primes & Greatest Common Divisors1, 3, 5, 15, 17, 25, 27, 29, 33 (use the approach of Example 1 di forefered)5.1Mathematical Induction5, 7, 9, 11, 13, 15, 19-37 odd, 41, 51, 53, 75, 756.2Strong Induction & Well-Ordering3, 5, 9, 12, 13 + supplement on next page6.1The Basics of Counting3, 5, 7, 9, 15, 17, 19, 356.2The Pigeonhole Principle1, 3, 5, 7, 9, 15, 17, 19, 21, 25, 29, 35, 37, 41, 45, 153, 77, 756.3Permutations & Combinations3, 5ace, 7, 11, 15, 17, 19, 21, 25, 29, 35, 37, 31, 44, 47, 53, 577.1An Introduction to Discrete Probability-27 odd, 35, 377.3Representing Relations1, 3, 7, 9, 17, 21, 23, 25, 29, 35, 41, 45, 55, 577.4Relations and Their Properties1, 3, 7, 9, 11, 13, 14, 15, 19, 21, 23, 25, 277.5Equivalence Relations3, 5, 7, 9, 11, 137.1Graphs & Graph Models3, 5, 7, 9, 11, 137.2Special Types of Graphs-111 odd, 18, 21, 23, 25, 33, 35, 37, 39, 45, 61, 63, 71$	1.8	Proof Methods and Strategy	3, 5, 9, 11, 13, 15, 21, 31, 33, 37
2.3Functions1, 3, 5, 7, 9, 13, 15, 23, 25, 27a, 31, 33, 41, 42, 45, 47, 53, 71, 73abc2.4Sequences & Summations1, 3, 9, 13cegh, 15abd, 17aceg, 29, 31, 33, 45, 462.6Matrices1, 2, 3, 4, 7, 9, 11, 13, 14, 154.1Divisibility & Modular Arithmetic2, 3, 5, 7, 9, 13bdfh, 15, 17, 21, 22, 27, 29abc, 31, 32, 354.2Integer Representations & Algorithms1, 3, 5, 6, 7, 9, 10, 11, 17, 19, 21, 23, 24, 314.3Primes & Greatest Common Divisors1, 3, 5, 15, 17, 25, 27, 29, 33 (use the approach of Example 14 if preferred)5.1Mathematical Induction5, 7, 9, 11, 15, 21, 23, 25, 31, 35, 39, 43, 57, 595.2Strong Induction & Well-Ordering3, 5, 9, 12, 13 + supplement on next page6.1The Basics of Counting3, 7, 9, 11, 13, 15, 19–37 odd, 41, 51, 53, 57, 756.2The Pigeonhole Principle1, 3, 5, 7, 9, 15, 17, 19, 21, 25, 29, 35, 37, 417.1An Introduction to Discrete Probability1–27 odd, 35, 378.5Inclusion-Exclusion1–19 odd, 239.1Relations and Their Properties1, 3, 7, 9, 17, 19, 31, 44, 47, 53, 579.3Representing Relations3, 57, 9, 11, 13, 14, 15, 19, 21, 23, 25, 279.5Equivalence Relations3, 7, 9, 11, 13, 14, 15, 19, 21, 23, 25, 279.5Equivalence Relations3, 5, 7, 9, 11, 1310.2Special Types of Graphs1–11 odd, 18, 21, 23, 25, 33, 35, 37, 39, 45, 61, 63, 7110.3Representing Graphs & Graph Isomorphism1–29 odd, 33, 39–49 odd, 63, 7110.4Connectivity1–29 odd, 33, 39–49 odd, 63, 71 <td>2.1</td> <td>Sets</td> <td></td>	2.1	Sets	
45, 47, 53, 71, 73abc2.4Sequences & Summations1, 3, 9, 13cegh, 15abd, 17aceg, 29, 31, 33, 45, 462.6Matrices1, 2, 3, 4, 7, 9, 11, 13, 14, 154.1Divisibility & Modular Arithmetic2, 3, 5, 7, 9, 13bdfh, 15, 17, 21, 22, 27, 29abc, 31, 32, 354.2Integer Representations & Algorithms1, 3, 5, 6, 7, 9, 10, 11, 17, 19, 21, 23, 24, 314.3Primes & Greatest Common Divisors1, 3, 5, 15, 17, 25, 27, 29, 33 (use the approach of Example 14 if preferred)5.1Mathematical Induction5, 7, 9, 11, 15, 21, 23, 25, 31, 35, 39, 43, 57, 595.2Strong Induction & Well-Ordering3, 5, 9, 12, 13 + supplement on next page6.1The Basics of Counting3, 7, 9, 11, 13, 15, 19-37 odd, 41, 51, 53, 57, 756.2The Pigeonhole Principle1, 3, 5, 7, 9, 15, 17, 19, 356.3Permutations & Combinations3, 5ace, 7, 11, 15, 17, 19, 21, 25, 29, 35, 37, 417.1An Introduction to Discrete Probability1–27 odd, 35, 378.5Inclusion-Exclusion1–19 odd, 239.1Relations and Their Properties1, 3, 7, 9, 11, 13, 14, 15, 19, 21, 23, 25, 279.3Representing Relations3, 57, 9, 11, 1310.1Graphs & Graph Models3, 5, 7, 9, 11, 1310.2Special Types of Graphs1–11 odd, 18, 21, 23, 25, 33, 35, 37, 39, 45, 61, 63, 7110.3Representing Graphs & Graph Isomorphism1–29 odd, 33, 39–49 odd, 63, 7110.4Connectivity1–29 odd, 33, 39–49 odd, 63, 71	2.2	Set Operations	3, 5, 7, 9, 15a, 17, 19a, 21, 25, 33, 41, 53, 55, 57
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, 13, 15, 19–37 odd, 41, 51, 53, 57, 75 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, 23, 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, 11, 13, 14, 15, 19, 21, 23, 25, 27 9.5 Equivalence Relations 3, 5, 7, 9, 11, 13 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	2.3	Functions	
4.1Divisibility & Modular Arithmetic2, 3, 5, 7, 9, 13bdfh, 15, 17, 21, 22, 27, 29abc, 31, 32, 354.2Integer Representations & Algorithms1, 3, 5, 6, 7, 9, 10, 11, 17, 19, 21, 23, 24, 314.3Primes & Greatest Common Divisors1, 3, 5, 15, 17, 25, 27, 29, 33 (use the approach of Example 14 if preferred)5.1Mathematical Induction5, 7, 9, 11, 15, 21, 23, 25, 31, 35, 39, 43, 57, 595.2Strong Induction & Well-Ordering3, 5, 9, 12, 13 + supplement on next page6.1The Basics of Counting3, 7, 9, 11, 13, 15, 19–37 odd, 41, 51, 53, 57, 756.2The Pigeonhole Principle1, 3, 5, 7, 9, 15, 17, 19, 356.3Permutations & Combinations3, 5ace, 7, 11, 15, 17, 19, 21, 25, 29, 35, 37, 417.1An Introduction to Discrete Probability1–27 odd, 35, 378.5Inclusion-Exclusion1–19 odd, 239.1Relations and Their Properties1, 3, 7, 9, 11, 13, 14, 15, 19, 21, 23, 25, 279.3Representing Relations3, 5, 7, 9, 11, 13, 14, 15, 19, 21, 23, 25, 279.5Equivalence Relations3, 5, 7, 9, 11, 13, 14, 15, 19, 21, 23, 25, 279.5Equivalence Relations3, 5, 7, 9, 11, 1310.2Special Types of Graphs1–11 odd, 18, 21, 23, 25, 33, 35, 37, 39, 45, 61, 63, 7110.3Representing Graphs & Graph Isomorphism1–29 odd, 33, 39–49 odd, 63, 7110.4Connectivity1–29 odd, 33, 39–49 odd, 63, 71	2.4	Sequences & Summations	1, 3, 9, 13 cegh, 15 abd, 17 aceg, 29, 31, 33, 45, 46
31, 32, 354.2Integer Representations & Algorithms1, 3, 5, 6, 7, 9, 10, 11, 17, 19, 21, 23, 24, 314.3Primes & Greatest Common Divisors1, 3, 5, 15, 17, 25, 27, 29, 33 (use the approach of Example 14 if preferred)5.1Mathematical Induction5, 7, 9, 11, 15, 21, 23, 25, 31, 35, 39, 43, 57, 595.2Strong Induction & Well-Ordering3, 5, 9, 12, 13 + supplement on next page6.1The Basics of Counting3, 7, 9, 11, 13, 15, 19–37 odd, 41, 51, 53, 57, 756.2The Pigeonhole Principle1, 3, 5, 7, 9, 15, 17, 19, 356.3Permutations & Combinations3, 5ace, 7, 11, 15, 17, 19, 21, 25, 29, 35, 37, 417.1An Introduction to Discrete Probability1–27 odd, 35, 378.5Inclusion-Exclusion1–19 odd, 239.1Relations and Their Properties1, 3, 7, 9, 11, 13, 14, 15, 19, 21, 23, 25, 279.3Representing Relations3, 5, 7, 9, 11, 13, 14, 15, 19, 21, 23, 25, 279.4Equivalence Relations3, 7, 9, 15, 17, 21, 23, 25, 29, 35, 41, 45, 55, 5710.1Graphs & Graph Models3, 5, 7, 9, 11, 1310.2Special Types of Graphs1–11 odd, 18, 21, 23, 25, 33, 35, 37, 39, 45, 61, 63, 7110.3Representing Graphs & Graph Isomorphism1–29 odd, 33, 39–49 odd, 63, 7110.4Connectivity1–29 odd, 33, 39–49 odd, 63, 71	2.6	Matrices	1, 2, 3, 4, 7, 9, 11, 13, 14, 15
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, 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 1–29 odd, 33, 39–49 odd, 63, 71	4.1	Divisibility & Modular Arithmetic	
of Example 14 if preferred)5.1Mathematical Induction5, 7, 9, 11, 15, 21, 23, 25, 31, 35, 39, 43, 57, 595.2Strong Induction & Well-Ordering3, 5, 9, 12, 13 + supplement on next page6.1The Basics of Counting3, 7, 9, 11, 13, 15, 19–37 odd, 41, 51, 53, 57, 756.2The Pigeonhole Principle1, 3, 5, 7, 9, 15, 17, 19, 356.3Permutations & Combinations3, 5ace, 7, 11, 15, 17, 19, 21, 25, 29, 35, 37, 417.1An Introduction to Discrete Probability1–27 odd, 35, 378.5Inclusion-Exclusion1–19 odd, 239.1Relations and Their Properties1, 3, 7, 9, 27, 29, 35, 37, 39, 43, 44, 47, 53, 579.3Representing Relations3, 5, 7, 9, 11, 13, 14, 15, 19, 21, 23, 25, 279.5Equivalence Relations3, 5, 7, 9, 11, 1310.1Graphs & Graph Models3, 5, 7, 9, 11, 1310.2Special Types of Graphs1–11 odd, 18, 21, 23, 25, 33, 35, 37, 39, 45, 61, 63, 7110.3Representing Graphs & Graph Isomorphism1–29 odd, 33, 39–49 odd, 63, 7110.4Connectivity1–29 odd, 33, 39–49 odd, 63, 71	4.2	Integer Representations & Algorithms	1,3,5,6,7,9,10,11,17,19,21,23,24,31
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 9.4 Graphs & Graph Models 3, 5, 7, 9, 11, 13 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 1–29 odd, 33, 39–49 odd, 63, 71	4.3	Primes & Greatest Common Divisors	
6.1The Basics of Counting3, 7, 9, 11, 13, 15, 19–37 odd, 41, 51, 53, 57, 756.2The Pigeonhole Principle1, 3, 5, 7, 9, 15, 17, 19, 356.3Permutations & Combinations3, 5ace, 7, 11, 15, 17, 19, 21, 25, 29, 35, 37, 417.1An Introduction to Discrete Probability1–27 odd, 35, 378.5Inclusion-Exclusion1–19 odd, 239.1Relations and Their Properties1, 3, 7, 9, 27, 29, 35, 37, 39, 43, 44, 47, 53, 579.3Representing Relations1, 3, 7, 9, 11, 13, 14, 15, 19, 21, 23, 25, 279.5Equivalence Relations3, 7, 9, 15, 17, 21, 23, 25, 29, 35, 41, 45, 55, 5710.1Graphs & Graph Models3, 5, 7, 9, 11, 1310.2Special Types of Graphs1–11 odd, 18, 21, 23, 25, 33, 35, 37, 39, 45, 61, 63, 7110.3Representing Graphs & Graph Isomorphism1–29 odd, 33, 39–49 odd, 63, 7110.4Connectivity1–29 odd, 33, 39–49 odd, 63, 71	5.1	Mathematical Induction	5, 7, 9, 11, 15, 21, 23, 25, 31, 35, 39, 43, 57, 59
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 1–29 odd, 33, 39–49 odd, 63, 71	5.2	Strong Induction & Well-Ordering	3, 5, 9, 12, 13 + supplement on next page
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, 5, 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 1–29 odd, 33, 39–49 odd, 63, 71	6.1	The Basics of Counting	3, 7, 9, 11, 13, 15, 19 - 37 odd, 41, 51, 53, 57, 75
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 1–29 odd, 33, 39–49 odd, 63, 71	6.2	The Pigeonhole Principle	1, 3, 5, 7, 9, 15, 17, 19, 35
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 1–29 odd, 33, 39–49 odd, 63, 71	6.3	Permutations & Combinations	3, 5ace, 7, 11, 15, 17, 19, 21, 25, 29, 35, 37, 41
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 5	7.1	An Introduction to Discrete Probability	1–27 odd, 35, 37
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 1–10 odd, 18, 21, 23, 25, 33, 35, 37, 39, 45, 61, 63, 71	8.5	Inclusion-Exclusion	1–19 odd, 23
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 1–11 odd, 18, 21, 23, 25, 33, 35, 37, 39, 45, 61, 63, 71	9.1	Relations and Their Properties	1, 3, 7, 9, 27, 29, 35, 37, 39, 43, 44, 47, 53, 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	9.3	Representing Relations	1, 3, 7, 9, 11, 13, 14, 15, 19, 21, 23, 25, 27
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	9.5	Equivalence Relations	3, 7, 9, 15, 17, 21, 23, 25, 29, 35, 41, 45, 55, 57
63, 71 10.3 Representing Graphs & Graph Isomorphism 1-29 odd, 33, 39-49 odd, 63, 71 10.4 Connectivity	10.1	Graphs & Graph Models	3, 5, 7, 9, 11, 13
10.4 Connectivity	10.2	Special Types of Graphs	
	10.3	Representing Graphs & Graph Isomorphism	1–29 odd, 33, 39–49 odd, 63, 71
10.5 Euler & Hamilton Paths	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 $n \ge 3$ 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 $n \ge 0$.
- **3b** $a_n \leq 2^{n-1}$ for all $n \geq 1$.
- **4** For the sequence given for $n \ge 3$ by $b_n = b_{n-1} + b_{n-3}$, with $b_0 = b_1 = b_2 = 1$, prove the following:
 - **4a** $b_n \ge 2b_{n-2}$ for $n \ge 3$.
 - **4b** $b_n \ge \left(\sqrt{2}\right)^{n-2}$ for $n \ge 2$. (This will require use of #4a.)