## MthSc 119 - Final Exam Outline

1. Integers
2. divisibility
3. prime, composite, relatively prime
4. modular arithmetic
5. Statements
6. if-then, if and only if
7. and, or, not connectives
8. quantifiers
9. exists (there is)
10. for all (every)
11. compound statements
12. negations
13. Proofs and Counterexamples
14. direct proofs
15. if-then statements
16. if and only if statements
17. indirect proofs
18. contrapositive
19. proof by contrapositive
20. proof by contradiction
21. mathematical induction
22. standard form
23. strong form
24. formulas (equalities) vs. inequalities
25. recursive definitions
26. Boolean Algebra
27. operations
28. truth tables
29. logical equivalence
30. properties
31. tautology
32. Lists
33. multiplication principle
34. counting: with and without repetition
35. factorials
36. Sets
37. Venn diagrams
38. inclusion-exclusion principle
39. $|A \cup B|=|A|+|B|-|A \cap B|$
40. extension to more than two sets
41. applications
42. derangements
43. subsets
44. binomial coefficients
45. properties
46. binomial theorem
47. Pascal's triangle, Pascal's identity
48. formula
49. applications: lottery, card hands, probability
50. power set
51. set operations
52. union, intersection
53. difference, symmetric difference
54. Cartesian product
55. properties
56. associative, commutative, distributive
57. others
58. proofs of $A \subseteq B$ and $A=B$
59. showing set containment
60. using logical operations
61. using Venn diagrams
62. Relations
63. subsets of the Cartesian product
64. reflexive, irreflexive, symmetric, antisymmetric, transitive
65. inverse relation
66. equivalence relations
67. examples: modular arithmetic, subsets
68. reflexive, symmetric, transitive
69. partitions
70. equivalence classes
71. counting equivalence classes
72. subsets of a fixed size 2. anagrams
73. Functions
74. domain, image
75. inverse function
76. one-to-one, onto, bijection
77. counting functions
78. composition
