MATH 111: SURVEY OF MATHEMATICS

I. Sets and Set Operations
Students will be able to:
1. Describe sets verbally using appropriate mathematical terms (e.g., inclusive) and be able to write sets in roster form and set-builder notation.
2. Determine whether an object is an element of a set.
3. Determine whether a set is finite or infinite.
4. Determine whether two sets are equal, equivalent, or neither.
5. Determine the cardinal number of a set.
6. Determine whether sets are the empty set or the universal set.
7. Determine whether sets are subsets, proper subsets, or neither.
8. Develop a general formula for finding the number of distinct subsets of a given set and be able to use the formula.
9. Find the complement of a set and the intersection and union involving two or more sets.
10. Draw and use Venn diagrams to solve problems involving the intersection and union of sets.
11. Draw and use Venn Diagrams to verify the equality of sets.
12. Apply Venn diagrams to solve practical problems.

II: Logic
Students will be able to:
1. Translate verbal sentences into symbolic form (and vice versa) using logical connectives \(\sim, \land, \lor, \leftrightarrow, \rightarrow\).
2. Use the concept of 'necessary and sufficient' to write the negation of statements containing universal quantifiers.
3. Determine the most dominant connective in a statement that contains more than one connective.
4. Construct truth tables involving compound statements with two or three variables.
5. Determine the truth value of a compound sentence.
6. Determine whether a compound statement is a tautology, logically false, or neither and to determine whether a tautology is an implication.
7. Use elementary logic to solve problems involving graphs (e.g., pie charts) and other practical problems (e.g., determining loan qualifications).
8. Write logically equivalent statements using DeMorgan's laws or the contrapositive.
9. Write the converse, inverse, and contrapositive of a condition statement.
11. Write short deductive proofs using logical symbolism.
12. Use Euler diagrams to determine the validity of syllogistic arguments.

III. Probability
Students will be able to:
1. Find the empirical probability from contrived data and data gathered experimentally.
2. Find the theoretical probability of a single event occurring, including probabilities of 0 and 1.
3. Finding the odds for and against an event occurring and finding the probability of an event given the odds.
4. Draw a tree diagram to illustrate the possible outcomes of an experiment.
5. Use the basic counting principle to determine the number of possible outcomes.
6. Find the theoretical probability with and without replacement.
7. Determine whether given situations are mutually exclusive and find the theoretical probability.
8. Determine whether events are independent.
9. Find the conditional probability of an event, given that another event has occurred, by using a tree diagram or by reading a two-way table.
10. Find the permutation of an ordered arrangement of a set of objects, including duplication of objects, using a calculator.
11. Find the combination of a set of objects using a calculator.
12. Solve probability problems using combinations and binomial combinations.

IV. Graphing, Linear Programming, and Matrices
Students will be able to:
1. Graph a straight line and determine the slope and intercepts using an equation or its graph.
2. Find the solution of two lines graphically, numerically, and algebraically in mathematical and applied situations (e.g., break-even point).
3. Perform elementary matrix operations (add, subtract, and multiply).
4. Use matrices to solve a system of equations.
5. Graph linear inequalities and determine the solution set of a system of linear inequalities.
6. Use linear programming to solve practical problems.