Western Technical College

10804133 Math & Logic

Course Outcome Summary

Course Information

Description	Students will apply problem-solving techniques from discrete mathematics. Topics include symbolic logic, basic set theory, algebra, base number systems, and Boolean algebra.
Career Cluster	Collegiate Transfer
Instructional Level	Associate Degree Courses
Total Credits	3
Total Hours	54

Textbooks

No textbook required.

Learner Supplies

Scientific calculator - $10-20. **Vendor:** Campus Shop. Required.

Webcam. **Vendor:** Campus Shop. Required for Online class only.

Success Abilities

1.   Cultivate Passion: Expand a Growth-Mindset

2.   Live Responsibly: Develop Resilience

3.   Live Responsibly: Foster Accountability

4.   Refine Professionalism: Improve Critical Thinking

Course Competencies

1. Solve applied algebraic problems.

Assessment Strategies

1.1.   Oral, Written or Graphic Assessment

Criteria

You will know you are successful when

1.1.   you simplify algebraic expressions.
1.2.   you solve algebraic equations.
1.3.   you represent or interpret the applied problems algebraically.
1.4.   you illustrate the solutions mathematically using charts, graphs, diagrams etc..

Learning Objectives

1.a.   Identify the given and unknown parameters of a problem.
1.b.   Determine the operations that represent the situation described in an applied problem.
1.c.   Construct an equation or equations that accurately represents the relationships given in a problem.
1.d.   Simplify the expressions within an algebraic equation.
1.e.   Solve linear equations and report answers as decimals and fractions.
1.f.   Interpret the answer to an applied problem and draw relevant conclusions.

2. Utilize heuristic tools for problem solving.

Assessment Strategies

2.1.   Oral, Written or Graphic Assessment

Criteria

You will know you are successful when

2.1.   you differentiate among heuristic tools; i.e. draw a diagram, make a list, eliminate possibilities, look for sub-problems, or work backwards.
2.2.   you identify the root of the problem.
2.3.   you justify choice of heuristics when solving problems.
2.4.   you apply the heuristics to the problem.
2.5.   you solve the problem.
2.6.   you document the process you used to solve the problem.

Learning Objectives

2.a.   Identify the desired information or outcome of the problem.
2.b.   Determine the information needed to solve the problem.
2.c.   Apply one or more heuristics to determine the desired solution.
2.d.   Test the solution to ensure that the desired outcome is achieved.
2.e.   Explain and/or outline the heuristic used to arrive at your conclusion.

3. Convert between place value number systems.

Assessment Strategies

3.1.   Oral, Written or Graphic Assessment

Criteria

You will know you are successful when

3.1.   you convert from base N to decimal.
3.2.   you convert from decimal to base N.
3.3.   you convert between computer number systems (binary, octal and hexadecimal).

Learning Objectives

3.a.   Identify the number system being used in a given situation.
3.b.   Determine the place value for each position in a given number with any base.
3.c.   Evaluate the combined value of all digits in a number in any base to determine total value.
3.d.   Determine the correct representation, given any base, of the integer part of a number.
3.e.   Determine the correct representation, given any base, of the fractional part of a number.
3.f.   Apply 3- and 4-digit grouping techniques to convert between octal, hexadecimal, and binary numbers.

4. **Apply number systems to problem solving.**

Assessment Strategies
4.1.   Oral, Written or Graphic Assessment

Criteria

You will know you are successful when

4.1.   you differentiate among different number systems.
4.2.   you analyze the root of the problem.
4.3.   you justify the choice of the number system for solving the problem.
4.4.   you apply the number system to solving the problem.
4.5.   you solve the problem.
4.6.   you document the process you used to solve the problem.

Learning Objectives
4.a.   List the number systems commonly used in computer sciences.
4.b.   Identify the digits used within a given number system.
4.c.   Determine the most appropriate number system to use for a specific application.
4.d.   Interpret the value of a positive or negative number by identifying the sign bit.
4.e.   Identify the two's complement of a binary number.
4.f.   Use the two's complement to perform binary arithmetic.

5. **Apply principles of set theory.**

Assessment Strategies
5.1.   Oral, Written or Graphic Assessment

Criteria

You will know you are successful when

5.1.   you use set theory notation.
5.2.   you use appropriate set terminology.
5.3.   you apply set properties to solve problems.
5.4.   you apply the concept of cardinality.
5.5.   you draw a Venn diagram.
5.6.   you use Venn diagram to solve problems.
5.7.   you document the process you use to solve the problem.

Learning Objectives
5.a.   Determine the number of elements in a set.
5.b.   Use set notation to represent finite and infinite sets.
5.c.   Define new sets using intersection, union, and complements of given sets.
5.d.   Create Venn diagrams that represent the relationship between sets.
5.e.   Use Venn diagrams to find simplest representations of sets.
5.f.   Use set notation to define sets given a Venn diagram.

6. **Analyze logic circuits.**

Assessment Strategies
6.1.   Oral, Written or Graphic Assessment

Criteria

You will know you are successful when

6.1.   you identify symbols that represent various logic gates.
6.2.   you determine the output of a logic circuit when given the input parameters.
6.3.   you create a logic circuit that corresponds to a given logic statement.
6.4.   you reduce logic circuits to simplest form.

Learning Objectives
6.a.   Recognize the function of the logic symbols for OR, AND, and NOT.
6.b.   Determine the output, given all inputs, for each logic symbol.
6.c.   Determine the output, given all inputs, for a complete logic circuit.
6.d.   Write the logic statement that corresponds to a given logic circuit.

6.e.   Create a logic circuit that represents a logic statement.
6.f.   Apply Boolean logic principles to simplify complex logic circuits.

7.   Apply symbolic logic principles.

Assessment Strategies

7.1.   Oral, Written or Graphic Assessment

Criteria

You will know you are successful when

7.1.   you differentiate among logical operators; i.e. and, or, x-or, and not.
7.2.   you differentiate between conditional and biconditional using various logical methods; i.e. truth table, matrix logic, Boolean algebra.
7.3.   you apply logic methods to solve problems.
7.4.   you verify the solution to the problem.

Learning Objectives

7.a.   Determine whether a logic statement is true or false given a condition for each parameter.
7.b.   Create a complete truth table for a given logic statement.
7.c.   Recognize the similarities and differences between traditional and Boolean algebra.
7.d.   Use Boolean algebra to simplify logic statements.
7.e.   Create a Karnaugh map to simplify a given logic statement.
7.f.   Verify that Boolean algebra and Karnaugh maps for a logic statement yield equivalent simplified statements.