Wisconsin Indianhead Technical College

10804133 Mathematics and Logic

Course Outcome Summary

Course Information

Alternate Title	Math & Logic
Description	Students will apply mathematical problem solving techniques. Topics will include symbolic logic, sets, algebra, Boolean algebra, and number bases.
Instructional Level	Associate Degree
Total Credits	3.00
Total Hours	48.00

Types of Instruction

Instruction Type	Credits/Hours
Classroom Presentation (Lecture/Demonstration/Discussion)	3/48

Course History

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Last Approval Date	6/13/2014

Purpose/Goals

This course outcome summary includes competencies and performance standards for Mathematics and Logic. This course is part of the General Studies Core offered throughout the Wisconsin Technical College System (WTCS). The course competencies are consistent among the colleges and are at baccalaureate level to accommodate student success in transfer to four-year colleges.

Pre/Corequisites

Prerequisite   Successful score on placement test or 10834109 Pre-Algebra

Course Competencies

1.   **Solve applied algebraic problems**
     Domain   Cognitive   *Level*   Applying   *Status*   Active

Assessment Strategies

1.1.   Oral, Written or Graphic Assessment

Criteria

Performance will meet expectations 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.   Evaluate mathematical expressions
1.b.   Simplify algebraic expressions
1.c.   Solve algebraic equations (e.g. proportions, linear, quadratic, rational, polynomial)
1.d.   Rearrange formulas for a specified variable
1.e.   Build mathematical models to represent applied problems
1.f.   Apply mathematical models to problems to find solutions
1.g.   Solve problems using systems of equations
1.h.   Solve problems using systems of inequalities (linear programming)
1.i.   Apply graphing techniques to solve problems

2.   Utilize heuristic tools for problem solving
Domain   Cognitive   Level   Applying   Status   Active

Assessment Strategies

2.1.   Oral, Written or Graphic Assessment

Criteria

Performance will meet expectations when:

2.1.   you differentiate among heuristic tools (examples may include draw a diagram, make a list, eliminate possibilities, look for sub-problems, work backwards, etc.)
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.   Examine problem-solving strategies (e.g. guess and check, solve a simpler problem, build a chart or table, look for a pattern, draw a diagram, work backwards, make a list, build a mathematical model, etc.)
2.b.   Identify the root of a problem along with accompanying constraints
2.c.   Generate a list of appropriate problem-solving strategies for a given situation
2.d.   Apply appropriate strategies to solve a problem
2.e.   Verify solutions by checking for reasonableness
2.f.   Document the problem solving process, including steps that did not lead to the problem's solution

3.   Convert between place value number systems
Domain   Cognitive   Level   Applying   Status   Active

Assessment Strategies

3.1.   Oral, Written or Graphic Assessment

Criteria

Performance will meet expectations 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.   Convert from decimal to any other base (N)

3.b.   Convert from any base (N) to decimal
3.c.   Convert between computer number systems (binary, octal, hexadecimal)

4.   Apply number systems to problem solving
Domain   Cognitive   *Level*   Applying   *Status*   Active

Assessment Strategies
4.1.   Oral, Written or Graphic Assessment

Criteria

Performance will meet expectations 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.   Compare positional and non-positional number systems
4.b.   Identify the characteristics of numeral, position and base in a place-value number system
4.c.   Write numbers in expanded notation
4.d.   Represent numbers in computer memory (e.g. integers, decimals, signed numbers, scientific notation)
4.e.   Perform arithmetic operations in different bases
4.f.   Apply number systems to solving problems
4.g.   Document the problem solving process, including steps that did not lead to the problem's solution

5.   Apply principles of set theory
Domain   Cognitive   *Level*   Applying   *Status*   Active

Assessment Strategies
5.1.   Oral, Written or Graphic Assessment

Criteria

Performance will meet expectations 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.   Use set notation to describe numbers of a set (e.g. set builder notation)
5.b.   Use appropriate set terminology (e.g. member, cardinality, subset, universal set, complement)
5.c.   Determine cardinality of a set using addition principle, multiplication principle, permutations and/or combinations
5.d.   Perform union, intersection, difference and complement operations on sets
5.e.   Apply the order of operations to set operators
5.f.   Apply basic set properties (e.g. commutativity, associativity, distributivity, DeMorgan's Laws) to sets
5.g.   Use Venn diagrams to illustrate sets and set relationships
5.h.   Apply principles of set theory to solve problems
5.i.   Document the problem solving process, including steps that did not lead to the problem's solution

6.   Apply symbolic logic principles
Domain   Cognitive   *Level*   Applying   *Status*   Active

Assessment Strategies
6.1.   Oral, Written or Graphic Assessment

Criteria

Performance will meet expectations when:

6.1.   you differentiate among logical operators (i.e. and, or, x-or, and not)
6.2.   you differentiate between conditional and biconditional using various logical methods (i.e. truth table, matrix logic, Boolean algebra, etc.)
6.3.   you apply logic methods to solve problems
6.4.   you verify the solution to the problem

Learning Objectives

6.a.   Identify logical statements
6.b.   Distinguish between simple and compound statements
6.c.   Write the negation of a logical statement (e.g. The opposite of "less than" is "greater than or equal to".)
6.d.   Write compound statements in symbolic logic using conjunctions, disjunctions and/or negation.
6.e.   Determine the truth value of logic statements built with logic operators (e.g. AND, OR, NOT, NAND, NOR, EOR/XOR)
6.f.   Distinguish between conditional and biconditional statements
6.g.   Determine the truth value of conditional and biconditional statements
6.h.   Apply the properties of logic (e.g. associativity, commutativity, DeMorgan's Laws, distributive property) to simplify logic statements
6.i.   Determine the validity of logic arguments using tools such as truth tables, matrix logic, Venn diagrams
6.j.   Apply logic methods to Boolean algebra (e.g. truth tables, circuits, logic gates)
6.k.   Simplify networks using Boolean algebra and Karnaugh maps
6.l.   Apply logic methods to solve problems (e.g. logic arguments, computer circuits, simplifying networks, flow charts, computer programming)
6.m.   Document the problem solving process, including steps that did not lead to the problem's solution