

**LAGUARDIA COMMUNITY COLLEGE
CITY UNIVERSITY OF NEW YORK
DEPARTMENT OF MATHEMATICS, ENGINEERING AND COMPUTER SCIENCE**

MAT123 —MODERN PROBLEM SOLVING

3 credits, 6 hours

Prerequisite: Placement (MATHX Score 40-59) or MAT095

Catalog Description:

This course introduces selected topics and techniques in mathematics that help solve quantitative problems arising in applications addressed in other fields of study, like those in the Humanities and Social Sciences. For each topic studied, emphasis will be placed first on the mathematical model and then on some significant applications. Students will be provided with substantial support in the basic logical and algebraic underpinnings that are required to navigate the course activities. Inquiry into the applications will motivate problem-solving exercises requiring constructs from areas such as algebra, geometry, probability and statistics, computer science, set theory and logic.

Purposes and Goals:

MAT123 is a co-requisite model course, designed to allow students who require MAT096 and a Pathways Common Core Quantitative Reasoning Course to exit developmental mathematics and earn college credit within one semester. There will be strong emphasis on conceptual understanding and developing quantitative reasoning skills necessary for modern problem solving and applications. Because research shows that pedagogy is as important as curriculum for student success, instructors will employ a variety of instructional methods (e.g., lecture, guided groupwork, and graded/nongraded formative assessments/feedback). The course is recommended for all majors that list MAT107 as their Pathways Common Core QR option. MAT123 is designated for Inquiry and Problem Solving Competency Assessment with Written Ability.

Performance Objectives:

Upon completion of this course, the student should be able to:

1. Use the four-step problem solving process to analyze non-routine problem situations and identify/evaluate potential solutions.
2. Model quantitative relationships in a situation using algebraic equations or inequalities.
3. Identify the set that results from a series of set operations.
4. Use counting functions to solve counting problems and calculate probabilities.
5. Use inquiry and problem-solving skills to make decisions, even when some factors are uncertain, summarize conclusions in a written report (I&PS/WA).
6. Solve network problems requiring a shortest path or minimum spanning tree.
7. Solve simple problems related to personal finance.

Instructional Objectives:

The instructor is expected to:

1. Familiarize students with the four-step problem solving process: Inquiry and contextual understanding; modeling and solution planning; solution generation and selection; feasibility and reasonableness testing.
2. Enable students to represent quantitative relationships using algebraic language.
3. Introduce students to sets and set operations.
4. Provide students with the skills to solve counting problems and calculate probabilities.
5. Provide students with the inquiry and problem solving skills to make decisions, even when some quantitative factors are uncertain; summarize conclusions in a written report (I&PS/WA).
6. Introduce Graphs and Networks,
7. Explain investing options and compound and simple interest

Passing Grade Policy/Attendance:

In order to pass this course, you must have an average total score of at least 60%. You are expected to attend all class meetings; more than 12 hours of unexcused absence could result in failure of the course. Students are also responsible for demonstrating active engagement in on-line and paper-based homework activities as well as individual and group classwork.

Academic Integrity:

This class will be conducted in compliance with LaGuardia Community College's academic integrity policy. For further information visit <https://www.laguardia.edu/asc/Academic-Standing-FAQs/>. The complete policy may be found starting on page 77 of the LaGuardia Community College Student Handbook for 2018-2019.

Evaluation:

Homework and Lab Exercises	15%
(Collaborative) Mini-Projects	15%
Inquiry and Problem-Solving Essay	5%
Quizzes	20%
Midterm	20%
Final Examination	25%

Note on Inquiry and Problem Solving Core Competency Assessment:

In this course students are required to complete and deposit on ePortfolio an assignment designed to assess Inquiry and Problem Solving Core Competency. Instructions for depositing and sample assignments are available on the MEC Department website

Course Materials: MAT123 is an OER course. The text materials are free to students.

- Principle Text: *Math in Society*, ed. David Lippmann, edition 2.4, OER
<http://www.opentextbookstore.com/mathinsociety/2.4/mathinsociety.pdf>

Math in Society is a free, open textbook. This book is a survey of contemporary mathematical topics, most non-algebraic, appropriate for a college-level quantitative literacy topics course for liberal arts majors. Emphasis is placed on the applicability of the mathematics. Core material for each topic is covered in the main text, with additional depth available through exploration exercises appropriate for in-class, group, or individual investigation.

- Blackboard

The on-line class sessions will be conducted on Blackboard Collaborate during scheduled hours. Additional course materials, assignments, recordings of select class discussions, and instructional videos will be also be available on Blackboard. Practice exercises and additional videos will be available online at <https://myopenmath.com>. Your instructor will provide you with the information necessary to enroll.

- Technology

A scientific calculator is necessary for this course. You will be expected to use it during class sessions, quizzes and exams. During our virtual “Lab Hour” your instructor will introduce you to a spreadsheet-based application package, such as Excel, to be used for problem solving that involves real life data and/or simulations

Comments:

The “distance learning” format we are employing creates many challenges, especially regarding to evaluating student work. In certain instances, a student may be asked to demonstrate his/her understanding of the work he/she submits. In such instances, the instructor may ask any student for a written or oral (live video session) clarification or explanation of solutions to an assignment, including homework, quizzes, and exams.

Course Outline

	Topics	Reading/Exercises*	Assignments/ Assessments
Part I: Abstraction and Modeling			
1	Number sense & the language of Algebra Counting, measurement & pattern recognition Sequences: observations and predictions Abstractions and visualizations: Modeling with Functions and Graphs	Algebra Basics Quantitative Reasoning Pattern Recognition Order of Operations	Worksheet 1: Numeric sequences and patterns
Lab 1: The use of online applications systems			
2	Geometry basics Units and conversion, scaling Proportional modeling Estimation Space modeling and using Perspective	Fractions Basics Ratio and Proportions Units and Measurement Estimation	Worksheet 2: Proportional models and visualizations
Lab 2: Spreadsheet Basics			
3	Measuring and Representing Change over time Dynamic models and trends Growth and Decay: Linear and Nonlinear Applications: Finance, Government, Sports and/or the Arts	Rates Percent Operations Linear Equations Growth Models	Quiz 1
Lab 3: Calculation and Graphing with Spreadsheets			
4	Intro to Boolean Logic Truth Tables Formal and Informal Reasoning Logical Paradoxes	Logic Cryptography	Mini-Project 1
Lab 4: Project Presentation			
Part 2: Uncertainty, Predictions and Problem-Solving			
5	Polya's four-step Problem Solving approach Critical Thinking and Scientific Method Sources of uncertainty and error Probability Basics	Translating Word Expressions into Algebraic Notation Problem Solving Statistics, Probability	Quiz # 2
Lab 5: Obtaining Data from the Internet			
6	Introduction to sets: Notations and Operations Venn Diagrams Counting strategies and functions Using sets to calculate probabilities	Sets Describing Data Counting Methods	Worksheet 3: Logic and Sets
Lab 6: Storing data, Organizing data, Transforming Data into Information			

7	Decision Tables Expected Value and Risk Applications: Finance, Government, Sports and/or the Arts	(L)Finance (L)Statistics	Midterm Exam
	Lab 7: Midterm Review		
8	What-if Analysis Decision Trees and Decision-Making Applications: Finance, Government, Sports and the Arts		Problem-Solving Essay (I&PS/WA)
	Lab 8: Spreadsheet Statistics		
9	Simulation and Forecasting Applications: Finance, Government, Sports and/or the Arts		Worksheet 4: Probability Quiz # 3
	Lab 9: Spreadsheet Simulation		
Part 3: Consensus and Conflict Resolution			
10	Graph Models Social Networks Applications: Finance, Government, Sports and/or the Arts		Mini Project #3
	Lab 10: Manipulating Graph Models		
11	Modeling Fairness, Voting Systems Allocation of Resources		Quiz # 4
	Lab 11: Project Presentations		
12	Game Theory Cooperation and Competition Applications: Finance, Government, Sports and/or the Art		Worksheet 5: Graphs, Voting, Games
	Lab 12: Final Review		
13	Final Exam		

* All readings/exercises are suggested and are available on our online class platform.
Your instructor may assign additional readings/exercises.
Worksheets/Mini Projects are provided by the course instructor