NEW JERSEY CENTER
FOR TEACHING & LEARNING

Progressive Mathematics Initiative® (PMI®)
MATH6432: Learning and Teaching Algebra I

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Course Credit: 4.0 NJCTL credits

Dates & Times:
This is a 4-credit, self-paced course, covering 13 modules of content. The exact number of hours that you can expect to spend on each module will vary based upon the module coursework, as well as your study style and preferences. You should plan to spend approximately 15 hours per credit working online, and up to 30 hours per credit working offline.

Graduate Student Handbook: www.njctl.org/graduate-handbook/

COURSE DESCRIPTION:
This course is for teachers who intend to become middle school &/or high school mathematics teachers. It provides teachers with the background knowledge, at an introductory college level, of algebra. This course includes topics taken from the high school Common Core State Standards for Mathematics (CCSS) and the New Jersey State Standards for Mathematics. The topics of this course are also taught in developmental college courses, to which a high percentage of entering college freshmen are assigned. As such, this course will also prepare college teachers who teach those courses. All future study of mathematics requires a full understanding of these topics, which include Numbers, Operations & Expressions; Equations; Graphing Linear Equations; Systems of Linear Equations; Solving & Graphing Linear Inequalities; Solving Absolute Value Equations & Inequalities; Quantitative Reasoning; Functions; Exponential Functions; Polynomials; Quadratic Equations; Non-linear Functions; and Data & Statistical Analysis.

STUDENT LEARNING OUTCOMES:
Upon completion of the course, the student will be able to:
  1. Demonstrate an understanding of mathematics concepts of Algebra I, including how to teach them, detailed in the module learning outcomes below.

2. Integrate PMI materials (including presentations, labs, practice problems, etc.) to support student learning and deliver effective instruction.
3. Create a social constructivist learning environment through the use of formative assessment questions, interpreting the results of this assessment to effectively facilitate student-led discussions that support deeper understanding of the content.
4. Integrate multiple attempts to demonstrate student mastery of content knowledge, as encouraged/fostered by the PMI pedagogy.
5. Implement learning plans that are aligned to Common Core standards and allow for differentiation based on the needs of learners.

TEXTS, READINGS, INSTRUCTIONAL RESOURCES:
Required Texts:
- This course uses a free digital textbook accessible at: https://njctl.org/courses/math/algebra-i/
- Participants will download SMART Notebook presentations, homework files, labs, and teacher resources from the PMI Algebra I course

Recommended Readings:
- Related articles within short answer prompts

COURSE REQUIREMENTS:
In order to receive a Passing grade, the participant must complete the following course requirements:
1. Activities: A number of different learning activities will ensure participant engagement and learning in the course. These include:
   - Engage in video module lessons which demonstrate minimized direct instruction followed by frequent formative assessment
   - Completion of formative assessments aligned to learning objectives which include detailed analysis when answered incorrectly.
   - Interaction with module discussion boards that allow conversation with peers and course instructors about the module's content, delivering that content to students. Discussion boards also serve as a place to ask and answer questions related to the module's content.
2. Short Answer Assignment: Each module requires one (1) original response to a given prompt. These prompts are typically based upon course lessons and require teachers to analyze, reflect, and make connections between the module's content and their own classroom practice.
3. Mastery Exercises: For each module, these multiple-choice question quizzes assess the content knowledge gained in a module. Participants have the opportunity to retake; random questions are pulled from a larger question bank on each attempt ensuring varied questions.
4. Virtual Labs: In each module, a virtual lab write-up will be submitted. Virtual labs are interactive lab simulations that promote discovery-based student learning through real-world applications and analysis.

5. Module Exam: One is completed at the end of each module. It is a culminating exam consisting of multiple choice and free response questions aligned to the standards and objectives of the module.
6. Reflection Paper: At the end of the course, participants are required to reflect on the knowledge taught in the course, make connections, and compare/contrast their current pedagogy with new strategies gained in this assignment.
7. Final Exam: At the end of the course, a comprehensive exam consisting of Multiple Choice and Free Response questions assesses the content knowledge learned throughout the course.

GRADE DISTRIBUTION AND SCALE:
Grade Distribution:

Module Exams	70%
Final Exam	10%
Labs	6%
Short Answer Assignments	6%
Mastery Exercises	6%
Reflection Paper	2%

Grade Scale:

A	93 – 100
A-	90 – 92
B+	86 – 89
B	83 – 86
B-	80 – 82
C+	77 – 79
C	73 – 76
C-	70 – 72
D	60.0 – 69.9
F	59.9 or below

GRADING RUBRIC:
The following rubric is used to score:
● Short Answer Assignment – 6% of grade
● Reflection Paper – 2% of grade

The minimum possible score for this rubric is 4 points, and the score will be converted to the minimum grade available in this module (which is zero unless the scale is used). The maximum score of 25 points will be converted to the maximum grade.

Intermediate scores will be converted respectively and rounded to the nearest available grade. If a scale is used instead of a grade, the score will be converted to the scale elements as if they were consecutive integers.

	Meets Expectation	**Approaches Expectation**	**Below Expectation**	**Limited Evidence**
	7 points	*5 points*	*3 points*	*1 point*
Content	● Demonstrates excellent knowledge of concepts, skills, and theories relevant to topic.	● Demonstrates fair knowledge of concepts, skills, and theories.	● Demonstrates incomplete or insubstantial knowledge of concepts, skills, and theories.	● Demonstrates little or no knowledge of concepts, skills, and theories.
Depth of Reflection	● Content is well supported and addresses all required components of the assignment.	● Content is partially supported; addresses most of the required components of the assignment.	● Content contains major deficiencies; addresses some of the required components of the assignment.	● Content is not supported and/or includes few of the required components of the assignment.
Evidence and Practice	● Response shows strong evidence of synthesis of ideas presented and insights gained throughout the entire course. The implications of these insights for the respondent's overall teaching practice are thoroughly detailed, as applicable.	● Writing is mostly clear, concise, and well organized with good sentence/paragraph construction. Thoughts are expressed in a coherent and logical manner. There are no more than five spelling, grammar, or syntax errors per page of writing.	● Response is missing some components and/or does not fully meet the requirements indicated in the instructions. Some questions or parts of the assignment are not addressed. Some attachments and additional documents, if required, are missing or unsuitable for the purpose of the assignment.	● Response excludes essential components and/or does not address the requirements indicated in the instructions. Many parts of the assignment are addressed minimally, inadequately, and/or not at all.
	4 points	*3 points*	*2 points*	*1 point*
Writing Quality	● Writing is well-organized, clear, concise, and focused; no errors.	● Some minor errors or omissions in writing organization, focus, and clarity.	● Some significant errors or omissions in writing organization, focus, and clarity.	● Numerous errors in writing organization, focus, and/or clarity.

The following rubric is used to score:
- Labs – 6% of grade

The minimum possible score for this rubric is 2 points, and the score will be converted to the minimum grade available in this module (which is zero unless the scale is used). The maximum score of 14 points will be converted to the maximum grade.

Intermediate scores will be converted respectively and rounded to the nearest available grade. If a scale is used instead of a grade, the score will be converted to the scale elements as if they were consecutive integers.

	Meets Expectation	Approaches Expectation	Below Expectation	Limited Evidence
	7 points	*5 points*	*3 points*	*1 point*
Completeness	• Lab write-up is complete with no missing fields.	• Lab write-up has 1-2 missing fields.	• Lab write-up has 3-5 missing fields.	• There are more than 5 missing fields on the lab write-up.
Calculations	• All answers are calculated correctly.	• Most answers are calculated correctly, but there are 1-2 minor calculation errors.	• Most answers are calculated correctly, but there are multiple minor calculation errors, or 1-2 gross miscalculations.	• There are calculation errors throughout the lab.

The remaining types of assignments are not scored using a rubric. These assignments are scored using percentage correct to assign a letter grade. The assignments in this manner are as follows:
- Mastery Exercises – 6% of grade
- Module Exams – 70% of grade
- Final Exam – 10% of grade

Mastery Exercises can be retaken as many times as desired to ensure a high score. Due to the nature of these assignments, each time they are taken, they will be composed of unique questions pulled randomly from a larger question bank.

Module and Final Exams are scored using a curve, which allows us to keep content exams rigorous. Module Exams can be retaken one time. Final Exams cannot be retaken.

ACADEMIC STANDING:
NJCTL has established standards for academic good standing within a student's academic program. Students enrolled in any NJCTL online course must receive an 80 or higher to successfully complete a course and receive credit for that course. An 80 is equivalent to a GPA

of 2.7 or B-. Additionally, students in an endorsement program must receive a cumulative GPA of 3.0 for all courses combined in order to successfully complete the program.

ACADEMIC INTEGRITY:
Students must assume responsibility for maintaining honesty in all work submitted for credit and in any other work designated by the instructor of the course. Academic dishonesty includes cheating, fabrication, facilitating academic dishonesty, plagiarism, reusing /repurposing your own work, unauthorized possession of academic materials, and unauthorized collaboration.

CITING SOURCES WITH APA STYLE:
All students are expected to follow proper writing and APA requirements when citing in APA (based on the APA Style Manual, 6th edition) for all assignments.

DISABILITY SERVICES STATEMENT:
We are committed to providing reasonable accommodations for all persons with disabilities. Any student with a documented disability requesting academic accommodations should contact the Dean of Students, Melissa Axelsson, for additional information to coordinate reasonable accommodations for students with documented disabilities (melissa@njctl.org).

NETIQUETTE:
Respect the diversity of opinions among the instructor and classmates and engage with them in a courteous, respectful, and professional manner. All posts and classroom communication must be conducted in accordance with the student code of conduct. Think before you push the Send button. Did you say just what you meant? How will the person on the other end read the words?

Maintain an environment free of harassment, stalking, threats, abuse, insults or humiliation toward the instructor and classmates. This includes, but is not limited to, demeaning written or oral comments of an ethnic, religious, age, disability, sexist (or sexual orientation), or racist nature; and the unwanted sexual advances or intimidations by email, or on discussion boards and other postings within or connected to the online classroom.

If you have concerns about something that has been said, please let your instructor know.

CLASS SCHEDULE:

Module	Module Learning Outcomes	Assignments
1 – Numbers, Operations, & Expressions **Algebra I**	- Classify numbers in the real number system. - Identify and combine like terms. - Evaluate an expression for given values. - Put terms in order by the degree of a variable.	- Short Answer - Lab - Mastery Exercises - Module Exam
2 – Equations **Algebra I**	- Solve equations that contain the same variable on both sides. - Transform a formula to a different form of that equation. - Find the value of unknown quantities using Literal Equations and Substitution.	- Short Answer - Lab - Mastery Exercises - Module Exam

Module	Objectives	Assessments
3 – Graphing Linear Equations	- Graph a line using intercepts. - Graph horizontal and vertical lines. - Calculate the slope of a line when given a graph, or two points. - Describe how slope relates to horizontal and vertical lines. - Write and graph the equation of a line using point-slope form. - Write and graph the equation of a line using slope-intercept form. - Determine if a proportional relationship exists between sets of points. - Write and graph the equation of a line that has a proportional relationship. - Write the equation of a line based on the given information. - Solve problems using the equation of a line. - Determine whether or not a scatter plot has a linear relationship. - Draw the line of best fit to model the data in a scatter plot that has a linear relationship and use the line of best fit to solve problems.	- Short Answer - Lab - Mastery Exercises - Module Exam
4 – Systems of Linear Equations	- Graph systems of linear equations to find a solution. - Solve a system of equations by using substitution and elimination. - Translate real world problems into a system of linear equations and use the system of equations to solve problems.	- Short Answer - Lab - Mastery Exercises - Module Exam
5 – Solving & Graphing Linear Inequalities	- Write an inequality. - Solve one-step inequalities. - Solve two-step and multiple step inequalities. - Graph a single inequality on a number line. - Solve compound inequalities and graph them on a number line. - Explain the difference between disjunctions and conjunctions. - Graph a linear inequality that contains two variables in a coordinate plane. - Solve and graph a system of linear inequalities by graphing them in a coordinate plane.	- Short Answer - Lab - Mastery Exercises - Module Exam
6 – Solving Absolute Value Equations & Inequalities	- Solve absolute value equations. - Solve absolute value inequalities. - Write an absolute value equation or inequality to model real-world problems.	- Short Answer - Lab - Mastery Exercises - Module Exam
7 – Quantitative Reasoning	- Convert a unit of measurement to a different unit. - Convert rate of measurement to different rates. - Pick the appropriate type of unit for a desired measurement. - Construct a system of linear equations to model a given situation containing the same unit of measurement. - Pick the appropriate level of accuracy for a given situation.	- Short Answer - Lab - Mastery Exercises - Module Exam

8 - Functions	- Define a function and identify its domain and range. - Evaluate functions. - Write recursive and explicit formulas. - Perform operations with functions. - Combine functions and create composite functions. - Construct and interpret linear functions to solve application problems.	- Short Answer - Lab - Mastery Exercises - Module Exam
9 – Exponential Functions	- Identify exponential relationships from a table, a graph, and an equation. - Calculate growth rates and factors. - Identify exponential decay. - Simplify expressions using rules of exponents.	- Short Answer - Lab - Mastery Exercises - Module Exam
10 – Polynomials	- Describe and identify monomials, polynomials, and degrees. - Add and subtract polynomials. - Multiply a polynomial by a monomial. - Multiply two polynomials. - Recognize and factor monomials out of a polynomial. - Factor trinomials. - Factor a polynomial with 4 terms using the grouping method.	- Short Answer - Lab - Mastery Exercises - Module Exam
11 – Quadratic Equations	- Identify the parts of quadratics. - Calculate the axis of symmetry and vertex of a quadratic function when it is in standard form. - Find the zeros of a quadratic function by graphing it in a coordinate plane. - Solve quadratic equations using the zero product property. - Solve quadratic equations and polynomials by factoring. - Solve quadratic equations using square roots. - Solve quadratic equations by completing the square. - Determine the nature of the roots of a quadratic using the discriminant. - Solve quadratic equations using the quadratic formula. - Solve polynomial equations using u-substitution. - Solve application problems using methods for solving quadratic equations.	- Short Answer Assignment - Lab - Mastery Exercise - Module Exam

12 – Non-linear Functions	- Identify the graphs of the identity, squaring, absolute value, square root, and constant functions. - Solve systems of non-linear functions by graphing. - Graphically analyze the behavior of non-linear functions. - Graph quadratic functions that are written in standard form. - Graph quadratic functions that are written in x-intercept form. - Graph quadratic functions that are written in vertex form. - Determine the number of roots for a quadratic function when it is written in vertex form. - Calculate the roots of a quadratic function when it is written in vertex form. - Determine the transformations of a non-linear function from its parent function. - Determine the equation of a new function after its parent function went through a transformation. - Compare key features of linear, quadratic, and exponential functions.	- Short Answer - Lab - Mastery Exercise - Module Exam
13 – Data & Statistical Analysis	- Calculate the mean, mode, and median from a set of data. - Identify the type of graph being used to display data. - Display data using frequency tables, histograms, stem-and-leaf plots, box-and-whisker plots, and two-way frequency tables. - Choose the data display that is most appropriate for the set of data.	- Short Answer Assignment - Lab - Mastery Exercise - Module Exam
14 – Reflection & Final Exam	- Review of course topics - Zoom call with course instructor, if needed	- Reflection Paper - Final Exam