

# 02\_Mastering Reasoning and Justification with Linear Equations

Content Area: **Math**  
Course(s):  
Time Period: **Semester**  
Length: **3-4 Weeks**  
Status: **Published**

## **General Overview, Course Description or Course Philosophy**

---

This course is designed for senior students who must participate in the NJDOE Portfolio Appeal Process because they have not successfully completed the math portion of the NJ High School Graduation Assessment Requirement. In this course, students will receive targeted instruction in mathematics based on their needs as reflected in state-wide standardized testing. They will be prepared for a fall retake of the math section of the NJGPA as well as a variety of alternative assessments and then prepare a portfolio of constructed response tasks to show their proficiency in the subject. This course is mandatory for those identified students. Grades will be reflected as P/F.

## **OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS**

---

### **Unit Goals:**

- Develop the ability to construct autonomous chains of reasoning to justify or refute propositions related to linear equations.
- Enhance critical thinking and mathematical communication skills through rigorous analysis and argumentation.
- Create a comprehensive portfolio demonstrating mastery of reasoning and justification in the context of linear equations.

### **Enduring Understandings:**

- Chains of reasoning are powerful tools for establishing the validity of propositions and conjectures.
- Linear equations exhibit predictable patterns and relationships that can be systematically analyzed.
- Effective mathematical communication is essential for articulating logical arguments and conclusions.

### **Essential Questions:**

- How can we construct logical chains of reasoning to support or challenge propositions about linear equations?
- What are the key characteristics and behaviors of linear equations, and how can they be used to justify conjectures?
- How does the ability to autonomously reason and communicate mathematical arguments contribute to problem-solving skills?

## CONTENT AREA STANDARDS

---

MA.8.EE.B	Understand the connections between proportional relationships, lines, and linear equations.
MA.8.EE.B.5	Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.6	Attend to precision.
MA.G-GPE.B	Use coordinates to prove simple geometric theorems algebraically
MA.G-GPE.B.5	Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).

## RELATED STANDARDS (Technology, 21st Century Life & Careers, ELA Companion Standards are Required)

---

LA.RST.9-10.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
LA.RST.9-10.7	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
WRK.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
TECH.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.

## STUDENT LEARNING TARGETS

---

Refer to the 'Declarative Knowledge' and 'Procedural Knowledge' sections.

### Declarative Knowledge

---

Students will understand:

- Characteristics and properties of linear equations in one and two variables.
- Construction of autonomous chains of reasoning.
- Propositions and conjectures related to linear equations.
- Logical argumentation and intermediate conclusions in reasoning chains.

### Procedural Knowledge

---

Students will be able to:

- Define linear equations and recognize their components.
- Explore the importance of reasoning in mathematical discussions.
- Formulate propositions and conjectures about linear equations.
- Analyze and classify propositions based on their complexity and implications.
- Identify logical steps and intermediate conclusions in a chain of reasoning.
- Build chains of reasoning to support or refute propositions.
- Analyze and prove propositions about linear equations in one variable.
- Develop autonomous reasoning chains to justify or challenge these propositions.
- Compile detailed explanations, propositions, reasoning chains, and justifications.
- Reflect on the problem-solving process and the importance of logical argumentation.

## **EVIDENCE OF LEARNING**

---

Refer to the 'Formative Assessments' and 'Summative Assessments' sections.

### **Formative Assessments**

---

- Formative assessments at the end of each week to evaluate procedural knowledge and understanding.
- Weekly quizzes assessing declarative knowledge and reasoning skills.

### **Summative Assessments**

---

- Mid-unit and end-unit tasks showcasing autonomous reasoning and logical argumentation.
- Culminating portfolio assessment evaluating the depth of understanding, clarity of explanations, and application of reasoning concepts to linear equations.

## **RESOURCES (Instructional, Supplemental, Intervention Materials)**

---

- [Illustrative Mathematics Modeling Prompts](#)
- [NJCTL](#)
- [IXL](#)
- Sample questions and constructed response tasks aligned with the NJSLA Algebra I Type II, Sub-Claim C Evidence Statements.
- Rubrics for assessing constructed response tasks

## **INTERDISCIPLINARY CONNECTIONS**

---

- Career Readiness
  - Utilize critical thinking to make sense of problems and persevere in solving them.

## **ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS**

---

See link to Accommodations & Modifications document in course folder.