

04_Mastering Multi-Step Contextual Problem Solving with Linear Functions

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 proficiency in solving complex, multi-step contextual word problems using linear functions.
- Apply course-level knowledge and skills to real-world scenarios requiring function analysis and manipulation.
- Create a comprehensive portfolio showcasing mastery of problem-solving techniques and linear function applications.

Enduring Understandings:

- Linear functions offer powerful tools for modeling and solving diverse real-world problems.
- Effective problem-solving involves systematic approaches, mathematical reasoning, and clear communication.
- Analyzing and interpreting function behavior enhances our understanding of real-world situations.

Essential Questions:

- How can linear functions be used to model and solve multi-step contextual problems across various domains?
- What are the key components and properties of linear functions, and how do they impact real-world applications?
- How does the application of course-level knowledge and skills enhance our ability to address complex, real-world problems?

CONTENT AREA STANDARDS

MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.4	Model with mathematics.
MA.F-IF.B	Interpret functions that arise in applications in terms of the context
MA.A-SSE.B.3	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
MA.F-BF.A.1a	Determine an explicit expression, a recursive process, or steps for calculation from a context.
MA.A-CED.A.1	Create equations and inequalities in one variable and use them to solve problems.
MA.F-BF.B.3	Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $kf(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology.

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 functions.
- Function analysis: domain, range, intercepts, and behavior.
- Modeling real-world scenarios using linear functions.
- Problem-solving strategies for complex, multi-step contextual problems.
- Interpretation of solutions in the context of original problems.
- Function composition, decomposition, and transformation.

Procedural Knowledge

Students will be able to:

- Define linear functions and understand their characteristics.
- Model real-world scenarios using linear functions.
- Analyze linear functions for domain, range, intercepts, and behavior.
- Identify patterns and trends in linear function graphs.
- Develop systematic problem-solving strategies.
- Translate word problems into linear equations and inequalities.
- Solve and interpret solutions in the context of original problems.
- Compose and decompose linear functions to model complex scenarios.
- Apply function transformations to real-world contexts.
- Model and solve problems in fields such as finance, economics, science, and engineering.
- Interpret and communicate solutions within specific contexts.

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 problem-solving skills.

Summative Assessments

- Mid-unit and end-unit tasks showcasing complex problem-solving and linear function applications.
- Culminating portfolio assessment evaluating the depth of understanding, clarity of explanations, and application of linear function concepts in various contexts.

RESOURCES (Instructional, Supplemental, Intervention Materials)

- [Illustrative Math Units](#)
- [Illustrative Math Modeling Prompts](#)
- [IXL](#)
- Sample questions and constructed response tasks aligned with the NJSLA Algebra Type III, Sub-Claim

D 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.
- Model and solve problems in fields such as finance, economics, science, and engineering.

ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS

See link to Accommodations & Modifications document in course folder.