

Algebraic Problem-Solving Writing Task

In this assignment, you will apply your understanding of algebraic expressions and equations to develop, solve, and interpret mathematical models for real-world situations.

The Assignment

Part 1: Creating and Solving Algebraic Models

Choose ONE of the following scenarios to model algebraically:

Scenario A: Savings Plan

You're planning to save money for a major purchase. You currently have an initial amount saved, and will deposit a fixed amount each month. Create and solve an equation to determine how many months it will take to reach your target amount.

Scenario B: Cell Phone Plan Comparison

You're comparing two cell phone plans:

- Plan A: \$45 per month with unlimited talk/text and 15GB of data
- Plan B: \$25 per month with unlimited talk/text plus \$10 per GB of data used

Create and solve an equation to find the amount of data usage where both plans would cost the same amount.

Scenario C: Mixture Problem

A chemist needs to mix a solution with a specific concentration. She has two existing solutions with different concentrations. Create and solve an equation to determine how much of each solution she should mix to achieve her target concentration and volume.

For your chosen scenario:

1. Define your variables clearly, stating what each represents and its units
2. Write an algebraic equation or set of equations that models the scenario
3. Solve the equation(s) step-by-step, showing all your work
4. Interpret your solution in the context of the original scenario

Part 2: Analyzing Equations

Consider this equation:

$$3(2x - 5) = 6x - 4(x + 1) - 2$$

1. Solve this equation step-by-step, showing all your work
2. Determine whether this equation has one solution, no solution, or infinitely many solutions
3. Verify your conclusion by substituting values back into the original equation
4. Explain how you can tell from the equation's structure what type of solution it will have

Part 3: Real-World Application and Reflection

1. Create your own real-world scenario that can be modeled using a multi-step equation (different from the scenarios in Part 1)
2. Write the algebraic equation for your scenario
3. Solve your equation, showing all steps
4. Explain what mathematical operations correspond to which aspects of the real-world situation
5. In 1-2 paragraphs, reflect on how algebraic equations help us model and solve problems in daily life. Discuss when they are most useful and what their limitations might be.

Your submission should include:

- Clear definitions of variables for all problems
- Well-organized mathematical work showing all steps
- Complete explanations connecting mathematical solutions to their real-world interpretations
- Proper mathematical notation throughout

This assignment is worth 20 points. Your work will be assessed on mathematical accuracy, clarity of explanations, proper application of algebraic concepts, and the quality of your real-world applications and reflection.

Rubric:

Criteria	Proficient	Developing	Not Evident	Points
Creating and Solving Algebraic Models	Correctly defines variables with appropriate units. Creates an accurate algebraic model that properly represents the scenario. Solution process is clear, complete, and error-free. Interpretation of results is thorough and contextually appropriate.	Variables are defined but may lack clarity. Algebraic model captures key aspects of scenario but may have minor flaws. Solution process contains minor errors. Interpretation is present but may lack depth.	Variables are undefined or incorrectly defined. Algebraic model poorly represents the scenario. Solution process contains significant errors. Interpretation is missing or inappropriate.	___/7
Equation Analysis	Correctly solves the equation with clear, step-by-step work. Accurately determines the solution type. Verification is thorough and supports the conclusion. Explanation of how to predict solution type is mathematically insightful.	Solution contains minor errors or skips some steps. Determination of solution type is correct but verification may be incomplete. Explanation of how to predict solution type shows basic understanding.	Solution contains major errors or is incomplete. Incorrectly determines solution type. Verification is missing or flawed. Explanation shows significant misconceptions.	___/5

Real-World Application and Reflection	Creates a realistic, original scenario that naturally leads to a multi-step equation. Solution process is correct and clearly shown. Connections between mathematical operations and scenario aspects are insightful. Reflection demonstrates deep understanding of mathematical modeling's value and limitations.	Scenario is somewhat realistic but may feel contrived. Solution contains minor errors. Some connections between math and scenario are made but may lack insight. Reflection shows basic understanding of mathematical modeling.	Scenario is unrealistic or too simplistic. Solution contains major errors. Connections between math and scenario are weak or missing. Reflection lacks substance or contains significant misconceptions.	___/8
Total				___/20