

EDF 6432 Final Project
Criterion-Referenced Assessment: Linear Relationships and Equations

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PART A - ASSESSMENT FOUNDATION

1. Context

Instructional Setting

The assessment is designed for an 8th Grade Algebra 1 classroom within a private middle school setting emphasizing rigorous instruction, differentiated learning, and conceptual understanding through multiple mathematical representations

Student Population

The classroom includes:

- general education students
- one student with Limited English Proficiency (LEP)
- one student with a Specific Learning Disability (SLD)

The instructional environment supports differentiated instruction, individualized accommodation planning, and flexible assessment supports designed to provide equitable access while maintaining rigorous grade-level expectations and conceptual understanding.

Unit of Instruction

Linear Relationships and Equations

Topics Covered

- solving and interpreting linear equations
- proportional reasoning
- graphing linear relationships
- interpreting functions
- analyzing multiple representations of linear relationships, including tables, graphs, equations, and verbal models

Assessment Type

Criterion-Referenced Assessment

Purpose of Assessment

The purpose of this assessment is to measure student mastery of foundational Algebra 1 concepts related to linear relationships and equations following a unit of instruction. Assessment results will be used to evaluate conceptual understanding, mathematical reasoning, communication of problem-solving strategies, and student readiness for advanced Algebra 1 applications while informing future instructional decisions within the classroom.

2. Standards and Instructional Objectives

2.1 - Florida B.E.S.T. Standards

The following Florida B.E.S.T. Mathematics Standards for Grade 8 Algebra 1 will serve as the foundation for the assessment objectives, objective test items, and performance-based task related to linear relationships and equations.

- **MA.8.AR.2.1** Given a linear equation in one variable with rational number coefficients, determine and verify the solution algebraically.
- **MA.8.AR.3.1** Given a table, graph, or equation, determine whether a linear relationship exists and interpret the rate of change and initial value within a real-world context.
- **MA.8.AR.3.2** Represent linear relationships using tables, graphs, equations, and verbal descriptions, and translate between these representations.
- **MA.8.AR.3.4** Analyze and compare multiple representations of linear functions in order to solve mathematical and real-world problems.
- **MA.8.AR.4.1** Apply knowledge of linear equations and proportional relationships to model and solve real-world mathematical situations involving rates of change and comparisons between quantities.

Alignment to Assessment Design

These standards were selected because they directly support the instructional objectives and assessment structure for the unit “Linear Relationships and Equations.” The standards emphasize:

- solving and interpreting linear equations
- proportional reasoning
- graphing and functions
- multiple mathematical representations
- real-world mathematical modeling
- analysis and justification of solutions

These standards also align closely with the planned performance-based task in which students compare two cellphone plans using tables, graphs, equations, and written explanations to determine the better value under varying conditions.

2.2 - Instructional Objectives

Objective	Aligned Standard	Instructional Objective
Objective 1	MA.8.AR.2.1	Given linear equations involving one variable, students will solve equations using inverse operations and justify each step using accurate mathematical reasoning and communication.
Objective 2	MA.8.AR.3.1	Given graphs, tables, equations, and real-world scenarios, students will interpret slope as rate of change and apply this understanding to solve mathematical problems.
Objective 3	MA.8.AR.3.2	Given tables, graphs, equations, and verbal descriptions representing linear relationships, students will compare, analyze, and communicate

		relationships between tables, graphs, equations, and verbal descriptions in order to justify mathematical conclusions.
Objective 4	MA.8.AR.3.4	Given equations, graphs, and tables, students will determine whether a relationship is proportional and justify their conclusions using mathematical evidence.
Objective 5	MA.8.AR.4.1	Given real-world scenarios and linear equations, students will construct, interpret, and explain graphs of linear equations in order to solve and justify real-world mathematical solutions.

3. Table of Specifications

The following Table of Specifications serves as the blueprint for the objective portion of the assessment. The assessment is criterion-referenced and aligned to the instructional objectives, Florida B.E.S.T. standards, and intended cognitive levels. The objective assessment is designed to measure student understanding through a variety of item formats while emphasizing comprehension, application, and analysis of linear relationships and equations.

Objective Test Blueprint

Content Outline	Knowledge	Comprehension	Application	Analysis	Total # of Items	Total Points	Weight (%)
1. Solving Linear Equations Given linear equations involving one variable, students will solve equations using inverse operations and justify each step using accurate mathematical reasoning and communication.	1 MC 1 pt	1 Fill-in 2 pts.	1 MC 3 pts	—	3	6 pts	17%
2. Proportional Relationships Given equations, graphs, and tables, students will determine whether a relationship is proportional and justify their reasoning using mathematical evidence.	—	1 MC 2 pts.	1 Matching 3 pts	—	2	5 pts	14%
3. Graphing Linear Relationships Given graphs, tables, equations, and real-world scenarios, students will interpret slope as rate of change and apply this understanding to solve mathematical problems.	1 T/F 1 pt	1 Matching 2 pts	2 MC 3 pts each	—	4	9 pts	25%
4. Functions and Multiple Representations Given multiple representations of linear relationships, students will compare, analyze, and communicate relationships among representations in order to justify mathematical conclusions.	—	1 MC 2pts	1 Fill-in 3 pts	1 MC 4 pts	3	9 pts	25%
5. Real-World Mathematical Modeling Given real-world scenarios and linear equations, students will construct, interpret, and explain graphs in order to solve and justify mathematical solutions.	—	—	1 MC 3 pts	1 MC 5 pts	2	8 pts	19%
TOTALS	2 Items	4 Items	6 Items	2 Items	14 Items	37 pts	100%

Estimated Completion Time: Approximately 45 minutes

Planned assessment composition includes approximately:

- 8 multiple-choice items
- 2 matching items
- 2 fill-in-the-blank items
- 1 true/false item
- 1 analysis-focused multiple-choice item.

Item Type Key:

MC = Multiple Choice

T/F = True/False

Fill-in = Short Answer

The performance-based assessment is designed to evaluate students' ability to apply and communicate their understanding of linear relationships within an authentic real-world context. Students will analyze, model, justify, and communicate mathematical conclusions using multiple representations.

Performance-Based Task Blueprint

Content Outline	Knowledge	Comprehension	Application	Analysis	Total # of Items	Total Points
Cell Phone Plan Comparison Task Students will compare two cellphone plans using tables, graphs, equations, and written explanations to determine which plan provides the best value under different usage conditions and defend their conclusions using mathematical evidence and written reasoning.	—	—	Graphing, Equation Creation, Representation Analysis	Written Justification, Mathematical Reasoning, Conclusion Defense	1	23 pts
TOTALS					1	23 pts

Estimated Completion Time: Approximately 15 minutes

Primary Cognitive Levels Assessed:

- Application
- Analysis

Skills Assessed:

- interpreting slope as rate of change
- graphing linear relationships
- constructing equations
- analyzing multiple representations
- communicating mathematical reasoning
- justifying conclusions using mathematical evidence

4. Overall Assessment Summary

Assessment Component	Points	Weight (%)
Objective Test	37 pts.	62%
Performance-Based Task	23 pts.	38%
TOTAL	60 pts.	100%

Estimated Total Assessment Time: Approximately 60 minutes

PART B - ASSESSMENT CONSTRUCTION

5. Objective Assessment

5.1 General Test Directions

Student Name: _____ Date: _____

Directions:

This assessment measures your understanding of linear relationships and equations. Read each question carefully and select or write the best answer.

The assessment contains a variety of item types, including multiple-choice, matching, fill-in-the-blank, and true/false questions. Follow the directions provided within each question and show mathematical work when appropriate.

For written responses, provide complete answers and use mathematical evidence to support your reasoning.

Materials Allowed:

- Pencil
- Graph paper
- Straightedge or ruler

Estimated Completion Time:

- Objective Test: Approximately 45 minutes
- Performance-Based Task: Approximately 15 minutes
- Total Assessment Time: Approximately 60 minutes

Good luck and do your best!

5.2 Objective Assessment Questions

Item 1 (1 point)

Solve the equation.

$$3x + 5 = 17$$

- A. 2 C. 6
- B. 4 D. 12

Item 2 (2 points)

Solve the equation.

$$5x - 8 = 12$$

$$x = \underline{\hspace{2cm}}$$

Item 3 (3 points)

A school club sells tickets to a fundraiser for \$8 each. The club earned a total of \$96 from ticket sales. The situation can be represented by the equation: **$8x = 96$**

What does x represent?

- A. The number of tickets sold C. The total money earned
B. The cost of one ticket D. The number of club members

Item 4 (2 points)

Which equation represents a proportional relationship?

- A. $y = 3x$ C. $y = x - 5$
B. $y = 3x + 2$ D. $y = 2x + 7$

Item 5 (3 points)

Directions: Match each equation to the correct classification.

Equations

1. $y = 5x$
2. $y = 2x + 3$
3. $y = 0.5x$
4. $y = x - 7$

Classifications

- A. Proportional Relationship B. Not Proportional

Item 6 (1 point)

Directions: Determine whether the following statement is true or false. The slope of a line represents the rate of change between two variables.

True

False

Item 7 (2 points)

Directions:

Match each graph description with the correct slope classification.

1. Line rises left to right
2. Horizontal line
3. Line falls left to right
4. Vertical line

- A. Positive slope C. Negative slope
B. Zero slope D. Undefined slope

Item 8 (3 points)

A line passes through the points (2,4) and (5,10).

What is the slope?

- A. 2 C. 5
B. 3 D. 6

Item 9 (3 points)

The equation $y = 4x + 3$ has a slope of:

- A. 3 C. 7
B. 4 D. 12

Item 10 (2 points)

Which representation shows the same relationship as $y = 2x$?

- A. Table where y increases by 2 when x increases by 1
B. Table where y increases by 3 when x increases by 1
C. Table where y remains constant
D. Table where y decreases by 2 when x increases by 1

Item 11 (3 points)

Complete the table.

x	y
1	3

2 | 6
3 | 9
4 | _____

Item 12 (4 points)

A graph, table, and equation are shown to represent the same relationship.

A student claims: "The graph and equation match, but the table does not." What should the student do first?

- A. Compare corresponding values from the table and equation
- B. Rewrite the graph
- C. Ignore the table
- D. Change the equation

Item 13 (3 points)

A gym charges a \$20 registration fee and \$5 per visit.

Which equation models the total cost?

- A. $y = 20x + 5$
- B. $y = 5x + 20$
- C. $y = 25x$
- D. $y = 20 + 25x$

Item 14 (5 points)

Two equations model different payment plans:

Plan A:

$$y = 4x + 10$$

Plan B:

$$y = 6x$$

For which value of x will Plan B cost less?

- A. $x = 2$
 - B. $x = 5$
 - C. $x = 10$
 - D. $x = 20$
-

6. Performance-Based Assessment

Item 15 (23 points total)

Performance-Based Task: Cell Phone Plan Comparison Challenge

Student Directions: A student is trying to decide which cellphone plan offers the better value based on monthly data usage. The student has narrowed the options to the following two plans:

Plan A

Monthly Fee: \$10

Data Cost: \$4 per gigabyte (GB)

Plan B

Monthly Fee: \$25

Data Cost: \$2 per gigabyte (GB)

Your task is to analyze both plans and determine which plan provides the better value under different usage conditions.

Complete all parts of the task and show your mathematical reasoning.

Part A: Write Equations (4 points)

Write a linear equation to represent the total monthly cost for each plan.

Plan A Equation:

Plan B Equation:

Part B: Complete the Table (4 points)

Use your equations to complete the table below.

Data Usage (GB)	Plan A Cost (\$)	Plan B Cost (\$)
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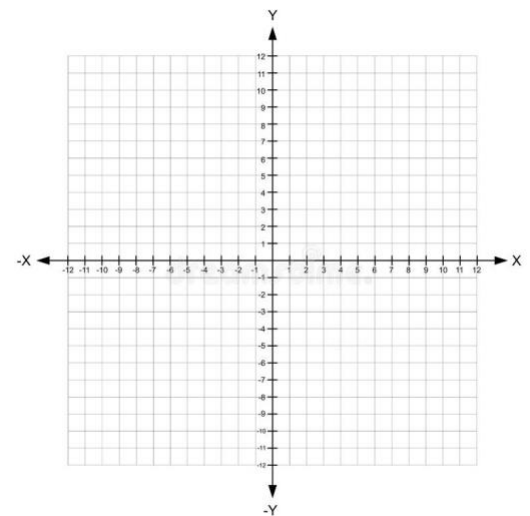
0		
5		
10		
15		

Part C: Graph the Relationships (5 points)

Using the provided coordinate plane, graph both equations.

Label:

- Plan A • x-axis (Data Usage in GB)
- Plan B • y-axis (Monthly Cost in Dollars)



Part D: Analyze the Results (4 pts)

Answer the following questions using complete sentences.

- At approximately how many gigabytes of data usage do the two plans cost the same amount?

- Which plan is the better value for customers who use less than 8 GB of data each month?

- Which plan is the better value for customers who use more than 8 GB of data each month?

Part E: Justify Your Recommendation (6 points)

Imagine a customer typically uses 12 GB of data each month. Which plan would you recommend?

Use evidence from: your equations, your table, and your graph to support your recommendation.

7. Performance Task Rubric

Cell Phone Plan Comparison Task (23 Points)

Criteria	Exemplary	Proficient	Developing	Beginning	Points
Equation Development	Both equations are correct and accurately represent the cellphone plans.	One minor error is present.	Multiple errors are present.	Equations are missing or demonstrate little understanding.	4
Table Completion	All values are correct and support later analysis.	One minor computational error.	Multiple computational errors.	Table is incomplete or largely incorrect.	4
Graph Construction	Both relationships are correctly graphed, labeled, and scaled.	Minor graphing or labeling errors.	Several graphing errors.	Graph is missing or largely incorrect.	5
Mathematical Analysis	Responses accurately identify and explain plan comparisons using mathematical evidence.	Reasoning is mostly correct.	Partial understanding demonstrated.	Limited understanding demonstrated.	4
Recommendation and Justification	Recommendation is mathematically correct and fully supported using equations, tables, and graphs.	Recommendation is supported but lacks complete evidence.	Recommendation includes limited evidence.	Recommendation is unsupported or incorrect.	6

Total Possible Points: 23

8. LEP and SLD Modifications/Accommodations

The assessment was designed for a classroom that includes one student with Limited English Proficiency (LEP) and one student with a Specific Learning Disability (SLD) in mathematics. The following accommodations are intended to provide equitable access to the assessment while maintaining the rigor and integrity of the instructional objectives and Florida B.E.S.T. standards.

LEP Student Support

To support the LEP student, the assessment will include modified directions, mathematics vocabulary support, visual representations through graphs and tables, and access to an approved bilingual glossary to all students.

Accommodation Area	Modification
Directions	Simplified language and shortened sentence structure
Vocabulary	Mathematics vocabulary support sheet and bilingual glossary
Visual Supports	Graphs, tables, and diagrams provided when appropriate
Assessment Access	Clarification of directions without altering content

Example of Simplified Assessment Directions

Original Direction: Read each question carefully and select or write the best answer.

Modified LEP Direction: Read each question carefully. Choose the best answer or write your answer in the space provided. Show your work when needed. Use the graphs and tables to help you answer the questions.

Mathematics Vocabulary Support Sheet

Use this sheet to help you understand important mathematics vocabulary used throughout the assessment.

Equation: A mathematical statement showing that two expressions are equal.

Variable: A letter or symbol that represents an unknown value.

Slope: The rate of change between two quantities.

Graph: A visual representation of a mathematical relationship.

Proportional Relationship: A relationship with a constant rate of change that passes through the origin.

Rate of Change: How much one quantity changes compared to another quantity.

Linear Relationship: A relationship represented by a straight line.

Justify: To explain your answer using mathematical evidence.

Function: A relationship in which each input has exactly one output.

Evidence: Mathematical work, calculations, graphs, tables, or explanations used to support a conclusion.

SLD Student Support

To support the student with a Specific Learning Disability (SLD) in mathematics, assessment items may be presented in smaller chunks, organizational supports will be provided, extended time will be available, and directions may be read aloud when permitted by the student's accommodation plan.

Accommodation Area	Modification
Presentation	Assessment items chunked into smaller sections
Organization	Graph paper and organizational supports provided
Time	Extended time according to accommodation plan
Environment	Preferential seating and reduced distractions
Monitoring	Frequent check-ins to ensure understanding
Response Options	Opportunities for verbal explanation when appropriate

Example of a Chunked Assessment Item

Original Item:

Two payment plans are represented below.

Plan A: $y = 4x + 10$

Plan B: $y = 6x$

For which value of x will Plan A cost less?

Modified Presentation:

Step 1

Identify the equation for each plan.

Plan A: _____

Plan B: _____

Step 2

Substitute $x = 2$ into each equation.

Plan A Cost: _____

Plan B Cost: _____

Step 3

Compare the costs.

Which plan costs less?

Answer: _____

Additional SLD Supports

- Extended time as specified in the student's accommodation plan.
- Assessment sections presented in smaller chunks to reduce cognitive load.
- Access to graph paper and organizational supports.
- Preferential seating during assessment administration.
- Frequent monitoring to ensure understanding of assessment procedures and expectations.
- Opportunities to verbally explain reasoning when appropriate and permitted.

These accommodations are intended to support student access while preserving the validity, rigor, and intended learning outcomes of the assessment.

9. Review and Revisions

The assessment was reviewed and revised throughout the development process to improve alignment, clarity, rigor, and accessibility.

Several revisions were made during the design process, including:

- Refining instructional objectives to ensure measurable behaviors and stronger alignment with Florida B.E.S.T. standards.
- Revising the Table of Specifications to better balance cognitive levels, item types, and weighted scores.
- Strengthening alignment between instructional objectives, assessment items, and the performance-based task.
- Revising item wording to improve clarity and reduce ambiguity.
- Expanding the performance-based task to include mathematical modeling, graphing, analysis, and written justification.
- Refining accommodations for LEP and SLD learners to provide equitable access while maintaining assessment rigor.

Following these revisions, the final assessment reflects a criterion-referenced approach designed to measure student mastery of linear relationships and equations through multiple assessment formats and cognitive levels.

AI Assistance Log

Date	AI Tool	Purpose	Human Revision
5-15-26	ChatGPT	To organize our brainstorming of assessment structures and performance task ideas	Group refined scope, objectives, and instructional context
5-23-26	ChatGPT	Looked over our development of instructional objectives and Table of Specifications planning	Group reviewed Bloom's alignment, adjusted assessment scope, and refined objective wording based on suggestions
5-23-26	ChatGPT	To confirm Florida B.E.S.T. standards alignment to the assessment focus and performance task	Group evaluated standards relevance and selected standards appropriate for the Algebra 1 instructional setting
5-29-26	ChatGPT	To review instructional objectives and consult through the addition of conditions, mathematical reasoning language, and alignment to Bloom's Taxonomy	Group reviewed objective revisions, selected appropriate wording, and ensured alignment with Algebra 1 content and assessment expectations

Note: AI was used as a planning, organizational, and instructional design support tool. All assessment decisions, objective revisions, standards selections, and final project content were reviewed, evaluated, modified, and approved by group members prior to inclusion in the project.

APPENDIX A

Item Development Matrix

Item	Objective Alignment	Bloom's Cognitive Level	Item Type
1	Objective 1 – Solve linear equations using inverse operations and justify reasoning.	Knowledge	Multiple Choice
2	Objective 1 – Solve linear equations using inverse operations and justify reasoning.	Comprehension	Fill-in-the-Blank
3	Objective 1 – Solve linear equations using inverse operations and justify reasoning.	Application	Multiple Choice
4	Objective 4 – Determine whether a relationship is proportional and justify conclusions.	Comprehension	Multiple Choice
5	Objective 4 – Determine whether a relationship is proportional and justify conclusions.	Application	Matching
6	Objective 2 – Interpret slope as rate of change and apply understanding to solve problems.	Knowledge	True/False
7	Objective 2 – Interpret slope as rate of change and apply understanding to solve problems.	Comprehension	Matching
8	Objective 2 – Interpret slope as rate of change and apply understanding to solve problems.	Application	Multiple Choice
9	Objective 2 – Interpret slope as rate of change and apply understanding to solve problems.	Application	Multiple Choice
10	Objective 3 – Compare and analyze linear relationships using multiple representations.	Comprehension	Multiple Choice
11	Objective 3 – Compare and analyze linear relationships using multiple representations.	Application	Fill-in-the-Blank
12	Objective 3 – Compare and analyze linear relationships using multiple representations.	Analysis	Multiple Choice
13	Objective 5 – Construct, interpret, and explain graphs of linear equations in real-world contexts.	Application	Multiple Choice
14	Objective 5 – Construct, interpret, and explain graphs of linear equations in real-world contexts.	Analysis	Multiple Choice
15	Objectives 2, 3, and 5	Application and Analysis	Performance-Based Task

APPENDIX B

Answer Key and Item Rationales

Question 1

Correct Answer: B

Rationale: Measures student knowledge of solving one-step and two-step linear equations using inverse operations.

Question 2

Correct Answer: $x = 4$

Rationale: Measures student comprehension of solving linear equations without the support of answer choices.

Question 3

Correct Answer: A

Rationale: Measures students' ability to apply variables within a real-world mathematical context.

Question 4

Correct Answer: A

Rationale: Measures understanding of proportional relationships represented by equations in the form $y = kx$.

Question 5

Correct Answers:

1 → A 3 → A

2 → B 4 → B

Rationale: Measures students' ability to classify equations as proportional or non-proportional relationships.

Question 6

Correct Answer: True

Rationale: Measures knowledge of slope as rate of change.

Question 7

Correct Answers:

1 → A 3 → C

2 → B 4 → D

Rationale: Measures comprehension of slope characteristics and graphical representations.

Question 8

Correct Answer: A

Rationale: Measures students' ability to calculate slope from two coordinate points.

Question 9

Correct Answer: B

Rationale: Measures understanding of slope-intercept form and identification of slope.

Question 10

Correct Answer: A

Rationale: Measures students' ability to compare multiple representations of the same linear relationship.

Question 11

Correct Answer: 12

Rationale: Measures students' ability to identify and extend patterns within a linear relationship.

Question 12

Correct Answer: A

Rationale: Measures analysis of multiple mathematical representations and identification of inconsistencies.

Question 13

Correct Answer: B

Rationale: Measures application of linear equations within a real-world context.

Question 14

Correct Answer: A

Rationale: Measures students' ability to compare linear models and determine the most cost-effective option.

Question 15

Correct Answer: See Performance Task Rubric.

Rationale: Measures students' ability to construct equations, complete tables, graph linear relationships, analyze mathematical information, communicate reasoning, and justify conclusions using evidence.