Performance Based Assessment
Pizza, Pizza!

I. ASSESSSMENT TASK OVERVIEW & PURPOSE:
This task ties together several topics from Algebra I and AFDA using a real world context. These include dependent and independent variables, domain and range, making a table of values, finding an equation of a line, graphing points, making a prediction based on a model, and solving a system of equations.

II. UNIT AUTHOR:
Christine Belcher

III. COURSE:
 AFDA

IV. CONTENT STRAND:
Functions, Statistics

V. OBJECTIVES:
The student will
- Identify the domain and range of a real world situation.
- Represent functions using multiple forms.
- Detect patterns in data and represent arithmetic functions algebraically.
- Solve a system of two linear equations.
- Write an equation of a line using given information.

VI. REFERENCE/RESOURCE MATERIALS:
Pizza, Pizza! Handout
Assessment list/Rubric
Graph paper
Graphing calculator (optional)

VII. PRIMARY ASSESSMENT STRATEGIES:
Assessment List/Rubric (attached)
Accommodations: Some students may need additional time to complete the task.

VIII. EVALUATION CRITERIA:
- Assessment List/Rubric (attached)
- Benchmark/Key (attached)

IX. INSTRUCTIONAL TIME:
90 minutes

Pizza, Pizza!

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Functions, Statistics

Mathematical Objective(s)

This task ties together several topics from AFDA using a real world context. These include dependent and independent variables, domain and range, making a table of values, finding an equation of a line, graphing points, making a prediction based on a model, identifying a direct variation situation, and solving a system of equations.

Related SOL

AFDA.1 (Analyze functions)
AFDA.3 (Line of best fit)

NCTM Standards List all applicable NCTM standards related to each task/activity. Example:
- Understand relations and functions and select, convert flexibly among, and use various representations for them
- Understand the properties of linear functions.
- Use symbolic algebra to represent and explain mathematical relationships.
- Apply and adapt a variety of appropriate strategies to solve problems;
- Communicate mathematical thinking coherently and clearly to peers, teachers, and others

Additional Objectives for Student Learning (include if relevant; may not be math-related):
N/A

Materials/Resources
- Pizza, Pizza! Handout
- Assessment list/Rubric
- Graph paper
- Graphing calculator (optional)
- Textbook
- Notebook

Assumption of Prior Knowledge

This task is appropriate after the student has finished units on graphing linear equations and solving systems of equations. It allows the teacher to assess students' knowledge of a body of material that is used throughout the year. The student should have knowledge of the following topics: dependent and independent variables, domain and range, making a table of values,

finding an equation of a line, graphing points, and making a prediction based on a model. Although some students may not have a deep knowledge of all of the topics, many of the questions have multiple strategies, so they can still achieve partial success.

The context in this task involves comparing two pricing structures for purchasing pizza; similar tasks could include the pricing of cell phone plans, or car lease payment plans.

Introduction: Setting Up the Mathematical Task

- Introduction of task: In this activity you will investigate two pricing structures for pizzas.
- You will have one 90 minute class period to complete the task.
- Ask: How many of you have ever ordered pizza for a party at your house? How many of you have ever had pizza at a club or church meeting?
- Ask: Do you think pizza shops give special deals to school groups or church groups?
- Ask: What kind of deals might pizza shops give to certain groups?
- Students will work in groups of 2 or 3 to complete the task.
- Students may use their textbooks and notebooks to refresh their memories.
- If students get stuck, they should discuss possible strategies in their groups.
- About 20 - 30 minutes before it is time to turn in papers, ask students about the methods they used for questions 4, 6, 13, and 14. For each of these, ask students to come to the board to demonstrate/describe their method. Ask if anyone found the answer in a different way; let another student demonstrate/describe their method.
- Students will then have time to finish up any problems they were stuck on.

Student Exploration

After the introduction of the task,

- The students should be working in small groups to complete the task. St
- Students who have forgotten the meanings of terms should ask their partners or look up the terms in their book or notebook.
- The teacher may allow student to use graphing calculators to view the various representations of the data – graph, function, and table.

Monitoring Student Responses

- Students are expected to work together in small groups.
- Students are expected to use their textbooks and notebooks to look up terms they don't remember.
- All students in the group are to contribute to the conversation about the problems.
- If any groups finish early, extend the problem by asking: If the owner of the pizza shop needs to make at least 20% profit on each pizza to pay for overhead and salaries, which scenario is best for him and why?
- About 10 minutes before the end of class, revisit questions 13 and 14. Ask for different ways of solving than had been previously discussed; allow students to demonstrate at board.

Assessment List and Benchmarks

- Assessment List/Rubric attached.
- Benchmark attached.

Pizza, Pizza!

Scenario 1: A local pizza shop offers the following deal: The cost of a cheese pizza is $7.00; delivery is free. You are in charge of ordering cheese pizza for a party at your house.

Scenario 2: The pizza shop provides pizza for school and church activities at a reduced cost. If a church or school-related sport or club orders 2 or more pizzas, the shop charges only $6.00 per cheese pizza, along with a $5.00 delivery fee. You are in charge of ordering the pizzas for your club.

Create a graph and a model for each of the scenarios. Discuss your findings about the models and graphs; include discussion about the benefits and disadvantages of each method.

Assessment List for Pizza, Pizza

| Element	Point Value	Self	Teacher
Scenario 1: appropriate graph is provided and graph is correct	3		
Scenario 1: appropriate model is provided and model is correct	3		
Scenario 2: appropriate graph is provided and graph is correct	3		
Scenario 2: appropriate model is provided and model is correct	3		
Discussion includes correct general information, benefits and disadvantages of Scenario 1	3		
Discussion includes correct general information, benefits and disadvantages of Scenario 2	3		
Neatness and organization	3		
Total	21		

Rubric

Element	0	1	2	3
Scenario 1: appropriate graph is provided and the graph is made correctly.	The student has not provided an appropriate graph.	The student has selected a correct type of graph, but the graph is not correct.	The student has selected a correct type of graph, but the graph is only partially correct.	The student has selected a correct type of graph, and the graph is correct.
Scenario 1: appropriate model is provided and model is correct	The student has not selected a correct model.	The student selected a correct type of model but it is not correct.	The student selected a correct type of model but it is only partially correct.	The student selected a correct type of model and it is correct.
Scenario 2: appropriate graph is provided and the graph is made correctly.	The student has not provided an appropriate graph.	The student has selected a correct type of graph, but the graph is not correct.	The student has selected a correct type of graph, but the graph is only partially correct.	The student has selected a correct type of graph, and the graph is correct
Scenario 2: model is correct	The student has not selected a correct model.	The student selected a correct type of model but it is not correct.	The student selected a correct type of model but it is only partially correct.	The student selected a correct type of model and it is correct.
Scenario 1 discussion	Student has no elements of the discussion correct: general information, benefits, disadvantages	Student has one element of the discussion correct: general information, benefits, disadvantages	Student has two elements of the discussion correct: general information, benefits, disadvantages	Student has all three elements of the discussion correct: general information, benefits, disadvantages
Scenario 2 discussion	Student has no elements of the discussion correct: general information, benefits, disadvantages	Student has one element of the discussion correct: general information, benefits, disadvantages	Student has two elements of the discussion correct: general information, benefits, disadvantages	Student has all three elements of the discussion correct: general information, benefits, disadvantages
Neatness and Organization	The document was not neat or well organized	The document showed a minimal amount of neatness and organization.	The document was mostly neat and well organized.	The document was neat and well organized.

Scenario 1: A local pizza shop offers the following deal: The cost of a cheese pizza is $7.00; delivery is free. You are in charge of ordering cheese pizza for a party at your house.

# of pizzas ordered	Cost
1	7
2	14
3	21
8	56
Students may choose different values for the number of pizzas	Cost will vary according to the number of pizzas

Table of values is optional.
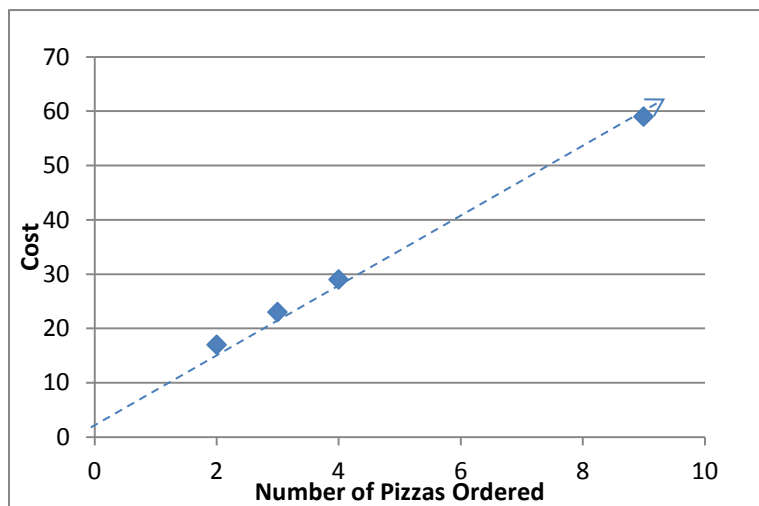
The points should not be connected because you cannot order a fraction of a pizza. The points may have a dotted line through them.

The graph should originate at the origin and be located only in the first quadrant.

Model: c = 7n where c = cost of pizzas and n = number of pizza with D = all integers greater than or equal to 0. $\{x | n \in Z \text{ and } n \geq 0\}$
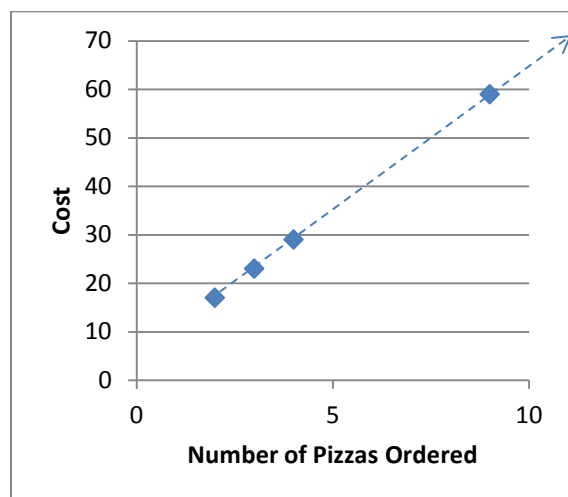
General information: The independent variable is the number of pizzas; the dependent variable is the cost. The model and graph illustrate a linear function with the limited domain of all integers greater than or equal to zero. The range is all integers greater than or equal to zero and also multiples of 7.

Benefits/disadvantages: You can order only one pizza (the other model requires two pizzas). If you are ordering 4 or fewer pizzas you are better off using this scenario, but if you are ordering 6 or more pizzas you are at a disadvantage using this scenario. The prices are the same if you order 5 pizzas.

Scenario 2: The pizza shop provides pizza for school and church activities at a reduced cost. If a church or school-related sport or club orders 2 or more pizzas, the shop charges only $6.00 per cheese pizza, along with a $5.00 delivery fee. You are in charge of ordering the pizzas for your club.

# of pizzas ordered	Cost
2	17
3	23
4	29
9	59
Students may choose different values for the number of pizzas	Cost will vary according to the number of pizzas

Table of values is optional.

The points should not be connected because you cannot order a fraction of a pizza. The points may have a dotted line through them.

The graph should originate at the (2, 17) and be located only in the first quadrant.

Model: C = 6n + 5; C is the cost of the pizzas, n is the number of pizzas ordered, D = all integers greater than or equal to 2. $\{x|x \in Z \ and \ x \geq 2\}$

General information: The independent variable is the number of pizzas; the dependent variable is the cost. The model and graph illustrate a linear function with the limited domain of all integers greater than or equal to two. The range is all integers greater than or equal to 17 that satisfy the relationship C = 6n + 5

Benefits/disadvantages: If you are ordering 6 or more pizzas you are better off using this scenario, but if you are ordering 4 or fewer pizzas you are at a disadvantage using this scenario. The prices are the same if you order 5 pizzas.