

COULD THE PRICE OF FOOD BE LINEAR?

Performance Standard 8D.H

Write a real-world word problem with two variables in the answer accordingly:

- *Mathematical knowledge*: create word problems that meet given conditions and represent linear relationships.
- *Strategic knowledge*: use appropriate strategies to create the word problem.
- *Explanation*: explain completely and clearly what was done and why it was done.

Procedures

1. ***In order to use algebraic concepts and procedures to represent and solve problems (8D)***, students should experience sufficient learning opportunities to develop the following:
 - Create word problems that meet given conditions and represent linear relationships.Note: Students should have experience with linear relationships and writing their own problems prior to this assessment.

Family and Consumer Science classes in commercial food production include information about the relationship of the quantity produced to the cost of each item produced. Students must be able to more clearly see the relationship between variable and fixed costs and linear relationships between the data. This assessment aligns with the National Standards for Family and Consumer Sciences Education, Standard 8.6 (Demonstrate implementation of food service management functions.)
2. Provide each student a copy of the “Could the Price of Food Be Linear?” task sheet and the rubric. Have students review and discuss the task and how the rubric will be used to evaluate it. Students should also have a straight edge or ruler available for use.
3. Have the students work individually to solve the following problem. Do not help them with their thinking.
 - Write a word problem that meets the following criteria:
 - It represents how the quantity of food produced affects the total cost to produce a product (fixed costs plus ingredients, packaging, etc.) in a food service establishment. This includes cost per item and fixed costs (rent, equipment, utilities, etc.) for production.
 - The answer to the word problem is an equation in terms of two variables represented in the situation.
 - The two variables are related in a linear relationship.
 - When one variable has a value of zero, the other does not; so the two variables are not just directly proportional.
 - Draw the graph of the linear relationship present in the problem. Describe how this graph represents the relationship in your problem.
 - Provide a solution to the problem that you wrote. Explain your reasoning.
4. Evaluate each student’s work using the rubric and its guide to determine the performance level. Give each student a score in each of the three categories, scoring each part of the problem separately. Minor errors in computation include making errors in the actual addition or multiplication or rounding incorrectly. Major errors include using the wrong operation or formulas.

The key idea is for students to understand linear relationships well enough to identify situations where linear relationships occur in the real world and write a coherent word problem that reflects that understanding. Make sure that the scenario the students write produces a word problem that is solvable and that the relationship represented meets the criteria of being linear and not just a situation where you have direct proportionality (i.e., the line would not pass through the origin when graphed).

If students produce a word problem that is solvable but the situation is one where the variables are directly proportional, they should receive a score of 2 for mathematical knowledge, since they did not meet all the requirements of the task. Asking the student to graph the relationship and to solve her/his problem should aid the student in identifying errors in the word problem and aid the teacher in determining if the student understood the task and could complete it with a problem that met all the conditions.

The explanations should include how they found these answers as well as why these answers are correct.

Examples of Student Work

- [Meets](#)
- [Exceeds](#)

Time Requirements

- One class period

Resources

- Copies of the “Could the Price of Food Be Linear?” task sheet
- Straight edge or ruler
- Mathematics Rubric

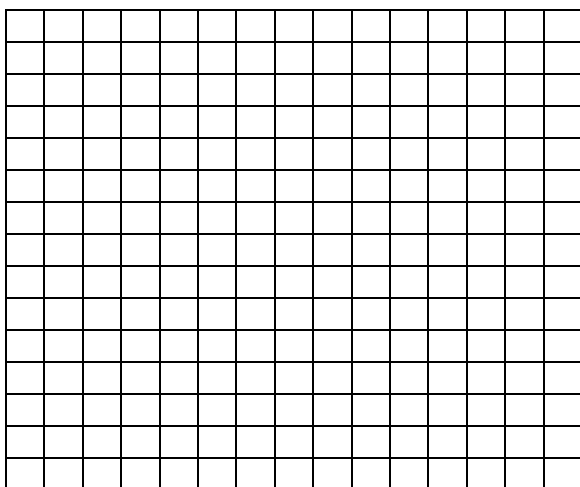
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Student Task Sheet

A. Write a word problem that meets the following criteria:

- It represents how the quantity of food produced affects the total cost of producing a product (fixed costs plus ingredients, packaging, etc.) in a food service establishment. This includes cost per item and fixed costs (rent, equipment, utilities, etc.) for production.
- The answer to the word problem is an equation in terms of two variables represented in the situation.
- The two variables are related in a linear relationship.
- When one variable has a value of zero, the other does not; so the two variables are not just directly proportional.

B. Draw the graph of the linear relationship present in determining the cost of a food item. Describe how this graph represents the relationship in your problem.



C. Provide a solution to the problem that you wrote. Explain your reasoning.

MATHEMATICS RUBRIC

NAME _____ DATE _____

- Exceeds standard (must receive a 4 in each area)
- Meets standard (must receive all 3's or a combination of 3's and 4's)
- Approaches standard (must receive all 2's or any combination which may include a 3 or a 4)
- Begins standard (has no 3's or 4's but not all 1's)
- Absent (has all 1's and 0's)

	Mathematical Knowledge	Strategic Knowledge	Explanation
4	<ul style="list-style-type: none"> • Wrote the right answer. • Used math words correctly to show understanding of how math works. • Worked it out with no mistakes. • Used the right math words and labeled the answers. 	<ul style="list-style-type: none"> • Identified all the important parts of the problem, and knew how they went together. • Showed all the steps used to solve the problem. 	<ul style="list-style-type: none"> • Wrote what was done and why it was done. • If a drawing was used, all of it was explained in writing.
3	<ul style="list-style-type: none"> • Knew how to do the problem, but made small mistakes. 	<ul style="list-style-type: none"> • Identified most of the important parts of the problem. • Showed most of the steps used to solve the problem. 	<ul style="list-style-type: none"> • Wrote mostly about what was done. • Wrote a little about why it was done. • If a drawing was used most of it was explained in writing.
2	<ul style="list-style-type: none"> • Understood a little, but made a lot of big mistakes. 	<ul style="list-style-type: none"> • Identified some of the important parts of the problem. • Showed some of the steps used to solve the problem. 	<ul style="list-style-type: none"> • Wrote some about what was done or why it was done but not both. • If a drawing was used, some of it was explained in writing.
1	<ul style="list-style-type: none"> • Tried to do the problem, but didn't understand it. 	<ul style="list-style-type: none"> • Identified almost no important parts of the problem. • Showed almost none of the steps used to solve the problem. 	<ul style="list-style-type: none"> • Wrote or drew something that didn't go with the answer. • Wrote an answer that was not clear.
0	<ul style="list-style-type: none"> • No answer attempted. 	<ul style="list-style-type: none"> • No strategy shown. 	<ul style="list-style-type: none"> • No written explanation.
Score			