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Lesson 1: Brutus Bites Back
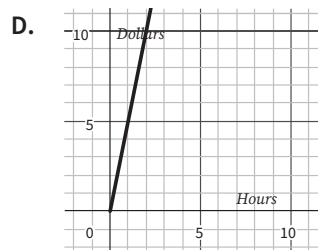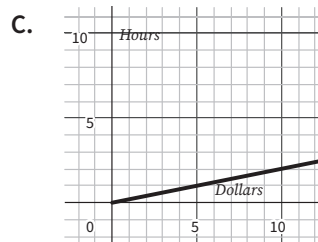## Develop Understanding

Jump Start

Which One Doesn't Belong?

Decide which of the representations below doesn't belong and write your reason for selecting it.

A.   Yasmin earns 5 dollars each hour that she babysits.

B.

Hours	Dollars Earned
1	5
2	10
3	15
4	20

C.

D.

Learning Focus

Model a relationship between two quantities by using either quantity as the input variable.

How does changing the inputs change the table? The graph? The equation?

Open Up the Math
Launch, Explore, Discuss

A couple years ago, Carlos and Clarita started earning money by taking care of pets while the pets' owners are away. Due to their amazing mathematical analysis and their loving care of the cats and dogs that they take in, Carlos and Clarita have made their business very successful. To keep the hungry dogs fed, they must regularly buy Brutus Bites, the favorite food of all the dogs.

Carlos and Clarita have been searching for a new dog food supplier and have identified two possibilities. The Canine Catering Company, located in their town, sells 7 pounds of food for $5. Customers buy the food in bulk so they can purchase any amount. The amounts of food purchased
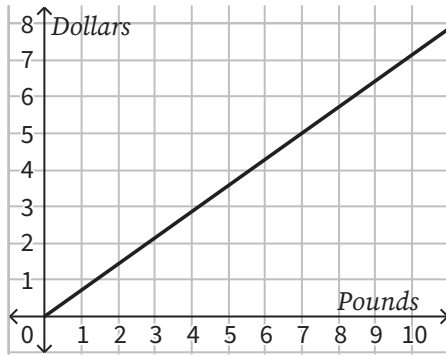
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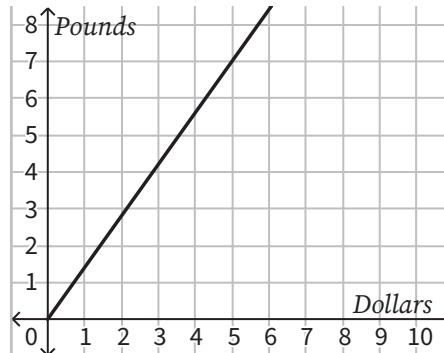
often include fractions of a pound, such as 2.6 pounds or 3.9 pounds.

Carlos thought about how much they would pay for a given amount of food and drew this graph:

1. Make a table, and write the equation of the function that Carlos graphed using D for dollars and P for pounds.

Clarita thought about how much food they could buy for a given amount of money and drew this graph:

2. Make a table, and write the equation of the function that Clarita graphed using D for dollars and P for pounds.

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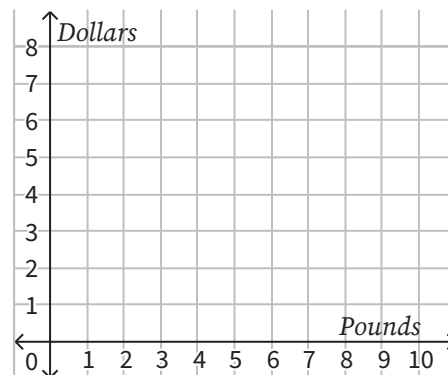
3. Write a question that would be most easily answered by Carlos's graph. Write a question that would be most easily answered by Clarita's graph. What is the difference between the two questions?

4. What is the relationship between the two functions? How do you know?

Looking online, Carlos found a company that will sell 8 pounds of Brutus Bites for $6 plus a flat $5 shipping charge for each order. The company advertises that they will sell any amount of food at the same price per pound.

5. Model the relationship between the price and the amount of food with a table, graph, and equation using Carlos's approach.

   Carlos's approach:

6. Model the relationship between the price and the amount of food with a table, equation, and graph using Clarita's approach.
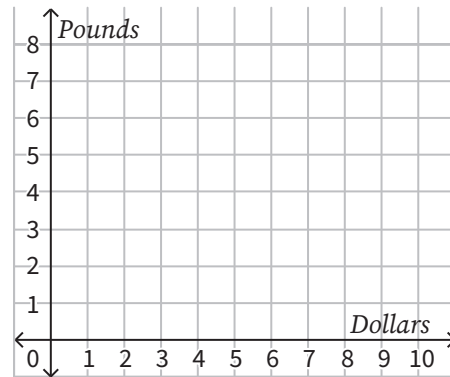
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Clarita's approach:

7. What is the relationship between these two functions? How do you know?

8. Use function notation to write the relationship between the functions.

Ready for More?

Which company should Clarita and Carlos buy their Brutus Bites from? Why?

Takeaways

Features of a linear function and its inverse:

Adding Notation, Vocabulary, and Conventions

Notation for inverse functions:

Vocabulary

- independent variable / dependent variable
- input-output pair
- **inverse function**

- linear function
- rate of change (slope)
- slope

Bold terms are new in this lesson.

Lesson Summary

In this lesson, we explored two different ways of viewing a relationship between two quantities. We examined how changing the input quantity changes the output quantity and the relationship between the two functions that are formed using story context, tables, graphs, and equations. We identified features of linear inverse functions that can be seen in each of the representations.

Retrieval

1. **a.** Solve for x in the following problem: $9 = \dfrac{3}{5}x$

   b. Complete the sentence by identifying the operation you used to "undo" the equation:

   Undo multiplying by $\frac{3}{5}$ by _____ or _____.

2. Calculate the indicated function values in the following problems.

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$f(x) = x^2 + 3x + 5$

a. Find $f(3)$.   **b.** Find $f(a + b)$.

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$f(x) = x^2 + 3x + 5$

a. Find $f(3)$.   **b.** Find $f(a + b)$.