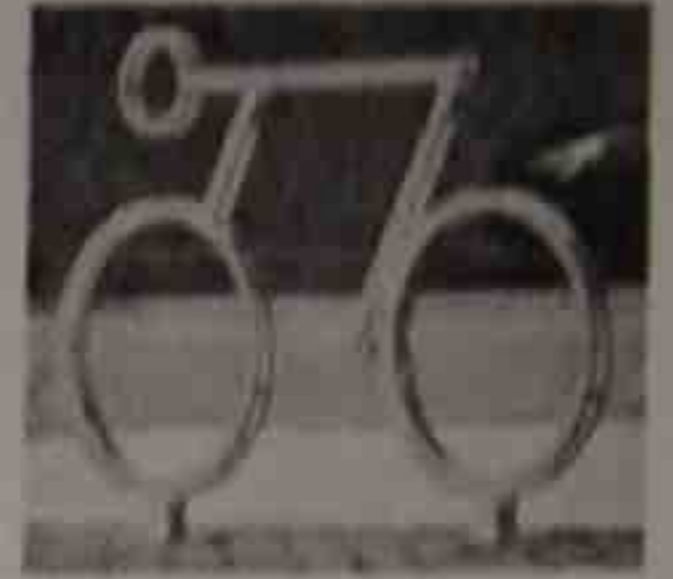


## 2.5 Exploring Inverse Functions

SWBAT explore inverse functions through an applicable real-life application.

Chandler and Isaac both like to ride bikes for exercise. They were discussing whether or not they have a similar pace so that they could plan a time to bike together. Chandler said she bikes about 12 miles per hour (or 12 miles in 60 minutes). Isaac looked confused and said he does not know how many miles he bikes in an hour because he calculates his pace differently.



- Using Chandler's information, determine the independent (x) and dependent (y) variables.

$$x = \text{time} = \text{independent}$$

$$y = \text{miles biked} = \text{dependent}$$

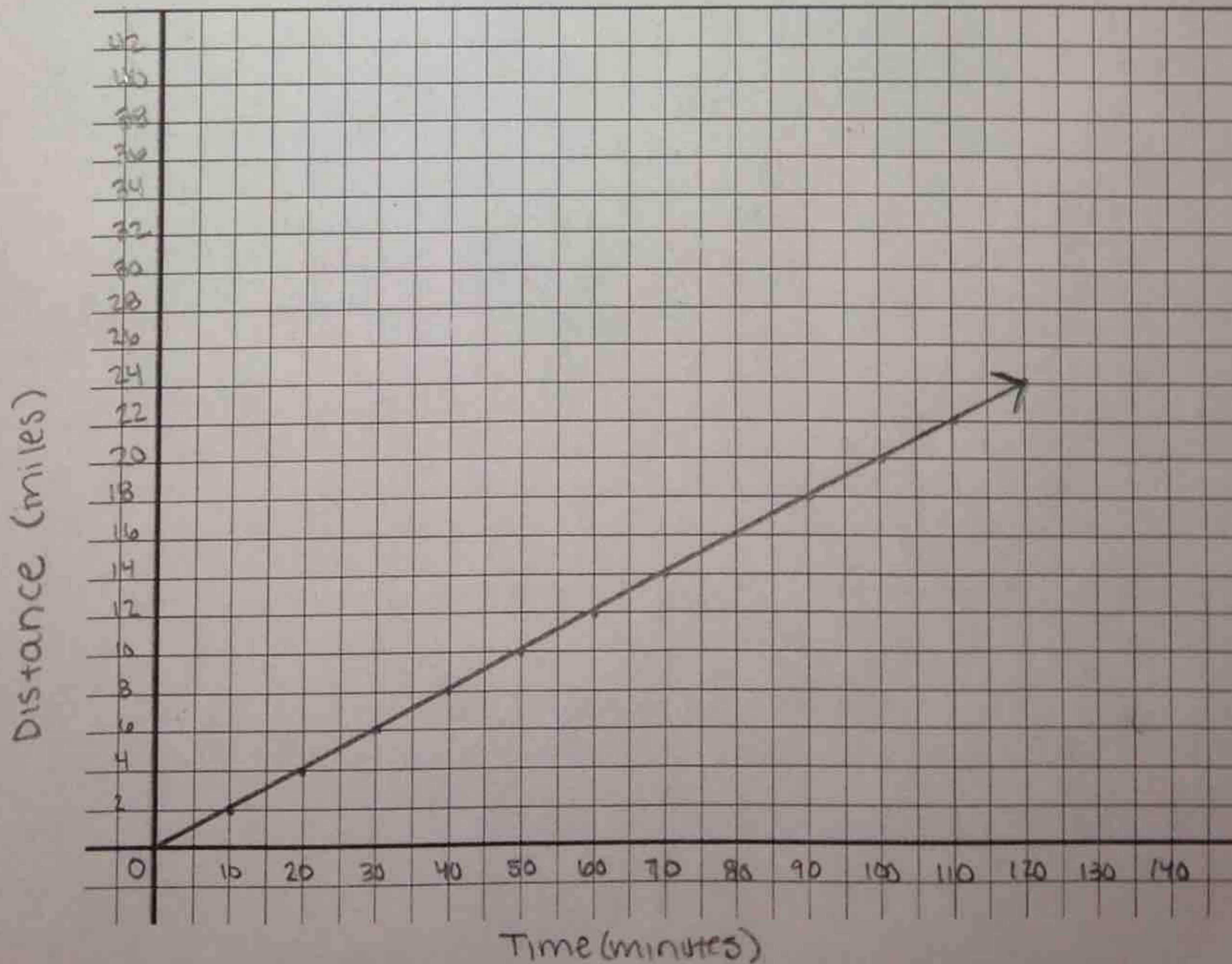
- Since Chandler uses time to determine the distance she travels, determine how far she will go in 1 minute? 5 minutes? 10 minutes? 20 minutes? 30 minutes? t minutes?

t (min)	1	5	10	20	30	60	t
d(t)	0.2	1	2	4	6	12	$\frac{t}{5}$

- Write the equation for Chandler's pace using time (in minutes) as the independent variable and distance (in miles) as the dependent variable.  $d(t) =$

$$d(t) = \frac{t}{5}$$

- Sketch a graph for this situation whose domain goes from (0,120).



Isaac says he calculates his pace differently. He explains that he bikes a five-minute mile, meaning that for every five minutes he bikes, he has travels one mile.

5. How is this different than how Chandler describes her rate?

6. Who goes at a faster rate? Explain.

They bike at the same rate.  $\frac{12 \text{ miles}}{1 \text{ hr}} = \frac{12 \text{ miles}}{60 \text{ min}} = \frac{1 \text{ mile}}{5 \text{ min}}$

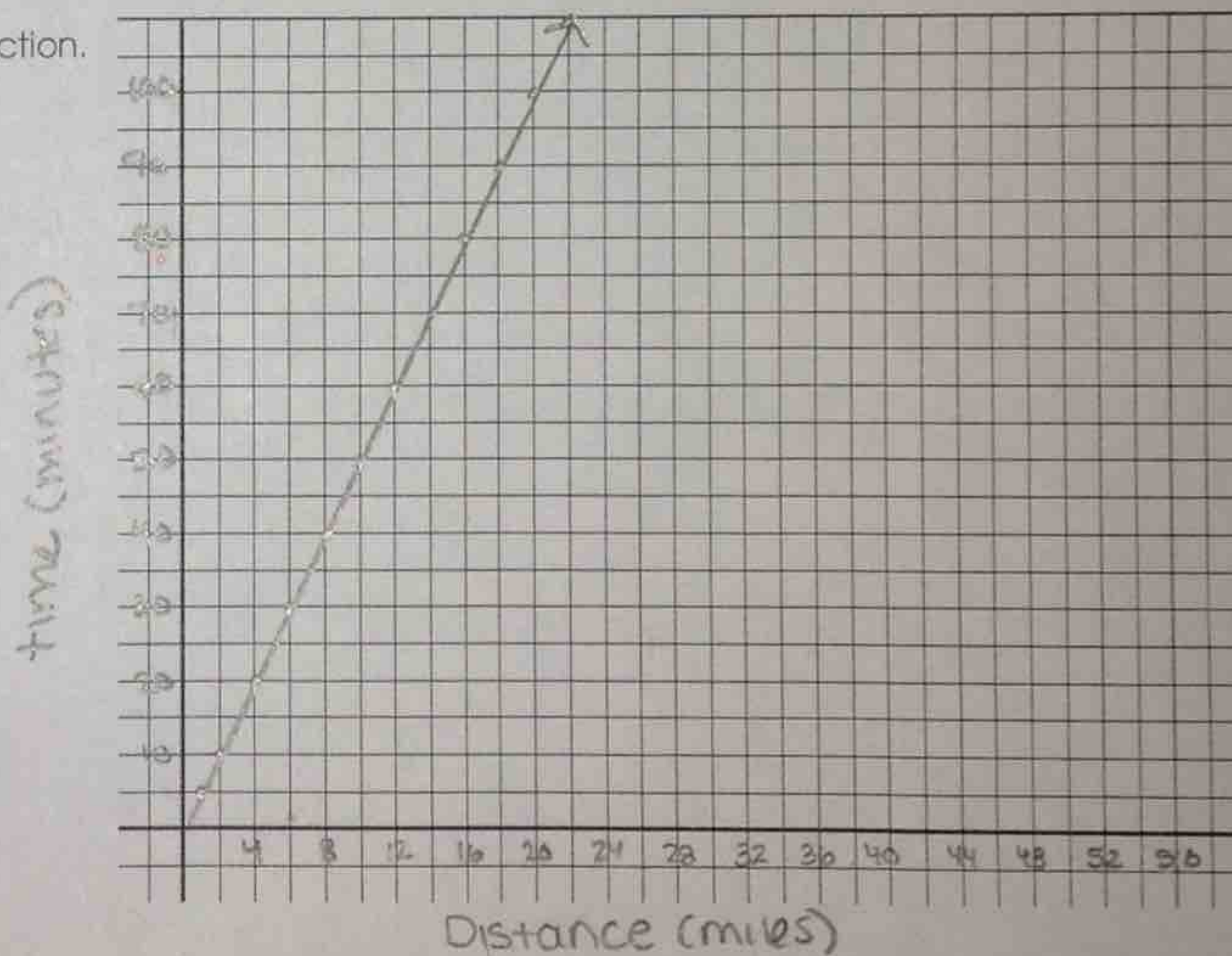
7. Since Isaac uses distance to determine how long he has ridden, determine how long it will take him to travel 1 mile? 2 miles? d miles? (complete the table)

d	1	2	4	5	6		d
t(d)	5	10	20	25	30		5d

8. Write the equation for Isaac's pace using miles as the independent variable and minutes as the dependent variable. t(d) =

$$t(d) = 5d$$

9. Sketch a graph of Isaac's function. As always, be sure to label.



You may have noticed that Isaac and Chandler actually bike at the same pace, which means their functions would be exactly the same if they had not 'switched' their independent and dependent variables around from each other. When this happens, functions are said to be inverse functions of each other. When this happens, the original function can be written as  $f(x)$  and the inverse function can be written as  $f^{-1}(x)$ .

10. Using the equations, tables, and graphs, make a list of observations of what happens when you have two functions that are inverses of each other.

- ordered pairs are switched in a table
- slopes are reciprocals (i.e. 2 vs  $\frac{1}{2}$ )

11. Why do you think inverse functions have these characteristics?

Because they represent the same values, but the way you present them are switched.