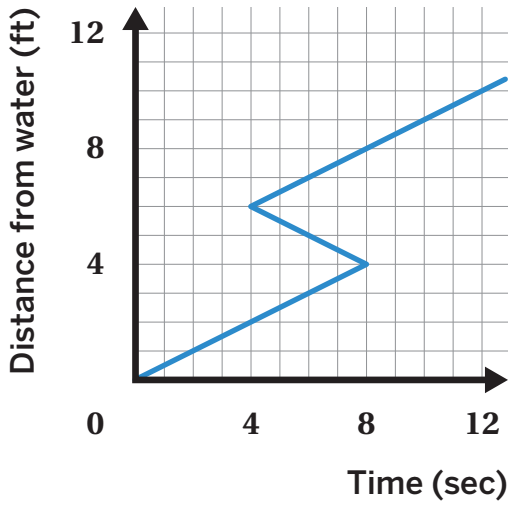
Functions

Accelerated 7
Unit 5

Synthesis

Carlos drew this graph to represent a new turtle's journey.

Explain what story the graph is telling at 6 seconds and why it does not make sense.

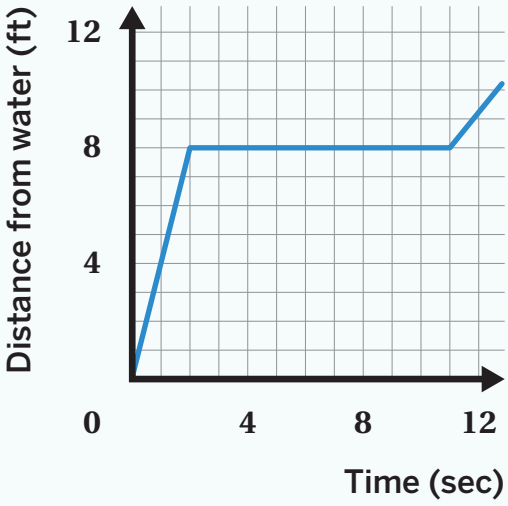


Summary

A story can be told using a graph. Analyzing a point on a graph or pieces of a graph can help to interpret part of the story.

For example, this graph represents a turtle's journey across sand. A turtle walks for 2 seconds until it is 8 feet from the water, rests for 9 seconds, and then continues walking.

The point $(6, 8)$ represents the turtle's distance of 8 feet from the water after 6 seconds.



Synthesis

How can you determine whether a table could represent a function? Use the examples from this lesson if they help with your thinking.

Rule 1

Input	Output
35	25
723	713
−4	−14
53	43
723	713

Rule 2

Input	Output
15	7
18	7
262	7
−3	7
82.3	7

Rule 3

Input	Output
hi	J
my	Z
name	F
is	T
Arturo	P

Rule 4

Input	Output
H	Hailey
J	Jada
M	Mai
H	Hamza
M	Madison

Summary

A **function** is a rule that assigns exactly one output to each possible input. The output of a function depends on the input. Another way to say this is that the output is a *function* of the input.

Could represent a function

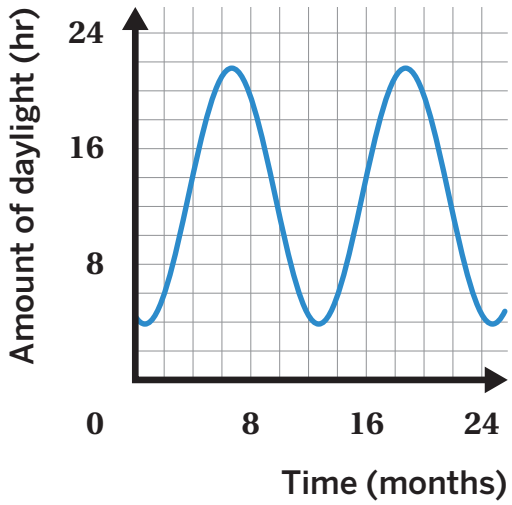
Input	Output
15	7
10	7
20	8
5	9

Does not represent a function

Input	Output
10	6
10	7
20	8
5	9

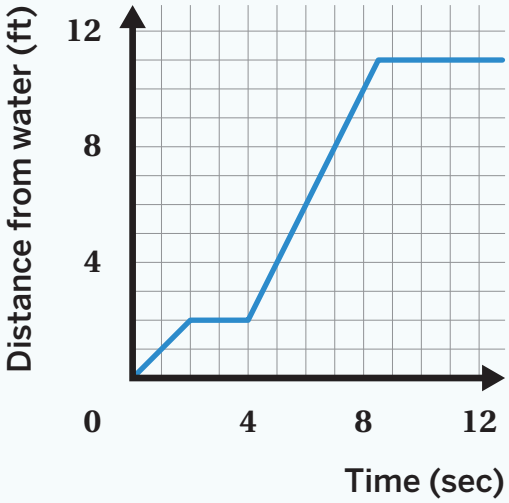
Synthesis

This graph shows the relationship between the time of year and the amount of daylight for Fairbanks, Alaska. Is the amount of daylight a function of time? Explain your thinking.

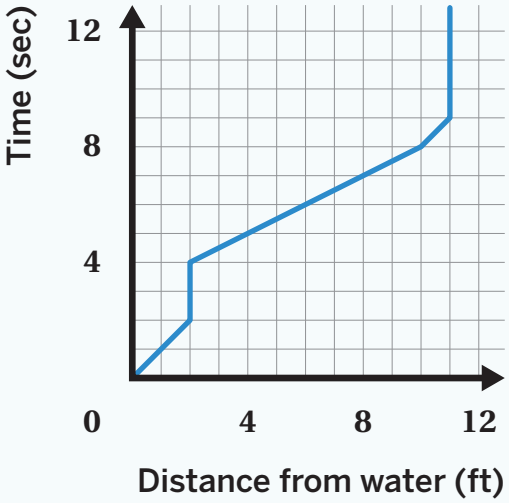


Summary

Graphs of functions will not have multiple y-values for the same x-value because each input will have only one output.



This graph could represent a function because for every second, x, there is only one corresponding distance, y.



This graph does not represent a function because there are multiple corresponding times, y, for 2 feet and 11 feet.

Synthesis

Match each question with an appropriate equation and set of variables.

How many cups, c, do you need to stack to reach a basketball player with height h?	What is the height, h, of a stack of c cups?

A. Independent variable:
Number of cups
Dependent variable:
Height of stack

B. Independent variable:
Height of stack
Dependent variable:
Number of cups

C. Equation: $c = \frac{h - 10}{2}$

D. Equation: $h = 2c + 10$

Summary

In a function, the relationship between the independent and dependent variables can be represented with an equation.

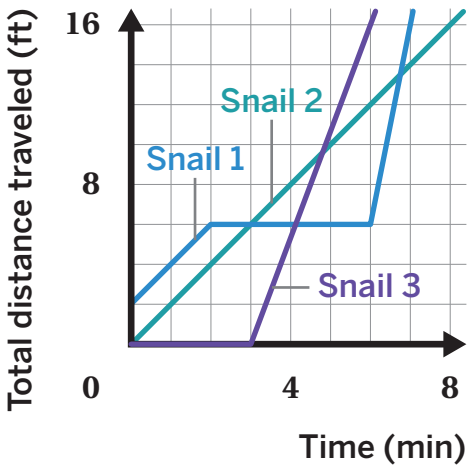
The value of a **dependent variable** is based on the value of another variable or set of variables. It is sometimes called the output.

The value of an **independent variable** is not based on the value of any other variable. It is sometimes called the input.

Synthesis

Three snails compete in a 16-foot race. The graph shows their distance vs. time relationships.

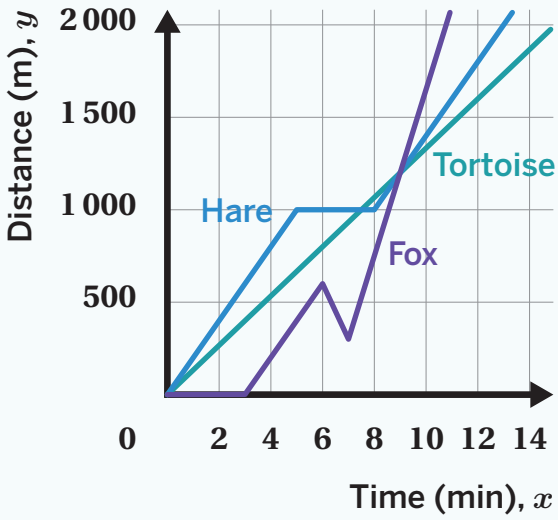
Describe everything you can about what is happening between 3 and 6 minutes.



Summary

The graph of a function can tell you what is happening in the situation the function represents. The intervals of a graph can be used to interpret and compare the context of multiple functions.

For example, this graph represents a race between a hare, a tortoise, and a fox. From 0 to 5 minutes, the hare is moving at a steady pace of 200 meters per minute and is in first place. At 9 minutes, the race is tied. The fox does not begin the race until three minutes have passed, but it speeds up at 7 minutes to a pace of 450 meters per minute. The fox wins the race at about 11 minutes.



Synthesis

What are some important things to consider when graphing a function that represents a real-world situation?

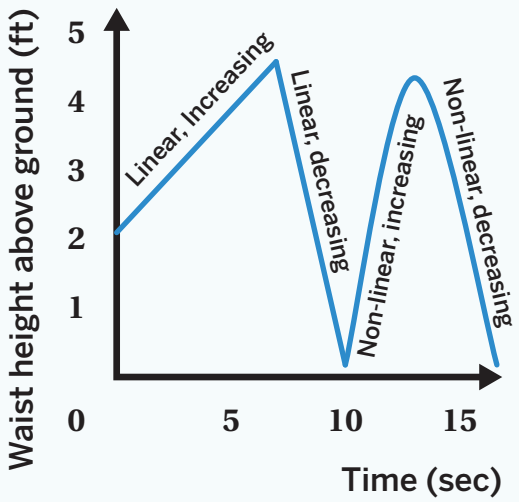
Summary

Graphs can be used to represent a context. When drawing a graph, carefully choose and label variables for the axes. Depending on the independent and dependent variables, distinct graphs can describe different aspects of the same story.

The intervals and the overall shape of a graph can be used to interpret the function.

For example, when part of the graph is:

- Going up from left to right, this part of the function is *increasing*.
- Going down from left to right, this part of the function is *decreasing*.
- A straight, non-vertical line, this part of the function is *linear*.
- Not a straight line, this part of the function is *non-linear*.



Synthesis

Choose two function representations below. What characteristic of a linear function do you need to know in order to compare how the two functions are changing? What characteristic of a linear function do you need to know in order to compare the initial values of the functions? How would you find these?

- Graph
- Table
- Equation
- Description

Summary

A **linear function** is a linear relationship that assigns exactly one output to every possible input. A linear function can be represented by a table, graph, equation, and verbal description.

When given more than one linear function — even if they are represented differently — the slope and y-intercept can be determined from each representation and used to compare the functions.

Synthesis

What are some advantages of using linear functions to model data?
What are some limitations?

Summary

Sometimes a line can be used to model given data for a function. Although a function might be non-linear, parts of the data might be modeled by a linear function which can be used to help make predictions.