The Cartesian Plane

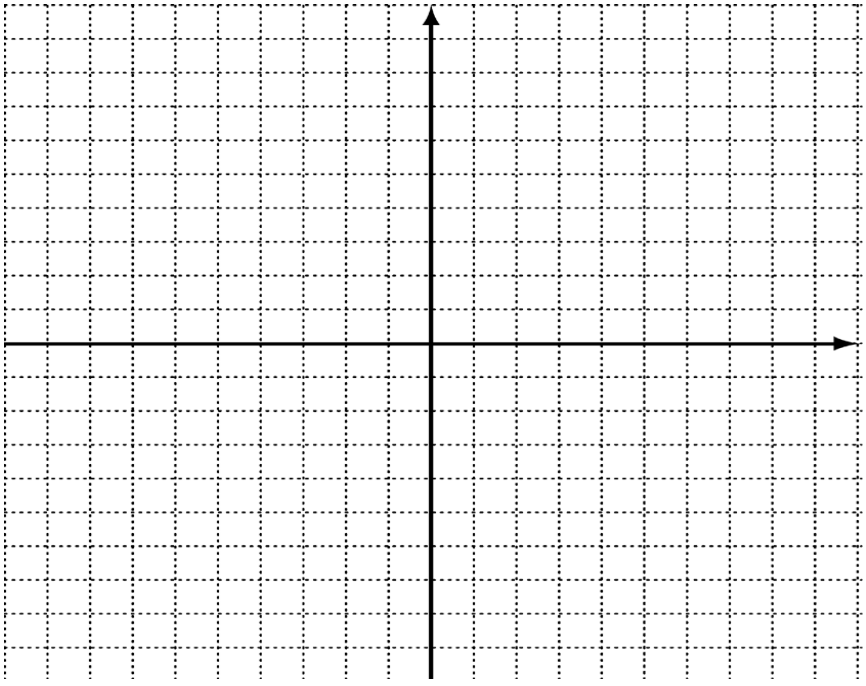
In this chapter, we will begin looking at the relationships between two variables. Typically one variable is considered to be the **INPUT**, and the other is called the **OUTPUT**. The input is the value that is considered first, and the output is the value that corresponds to or is matched with the input. The input/output designation may represent a cause/effect relationship, but that is not always the case.

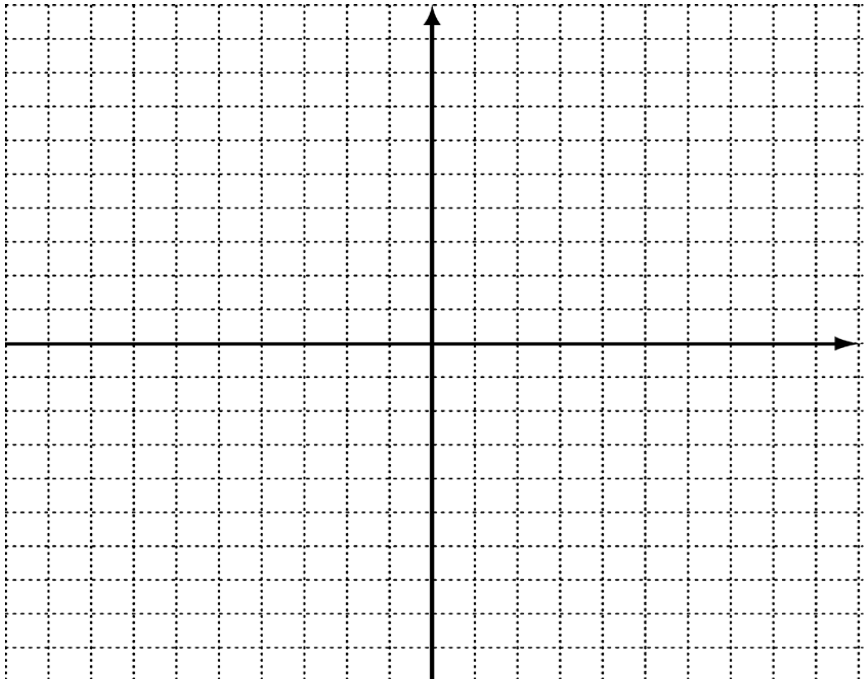
Ordered Pairs

Example 1: Ordered Pairs (input value, corresponding output value)

Input	Output	Ordered Pairs (input, output)
4	-3	
5	8	
		(0, -4)
		(-3, -5)

Example 2: The Rectangular Coordinate System (Cartesian Coordinate System)





Plot and label the points.

A. (-4, 2)

B. (3, 8)

C. (0, -5)

D. (-6, -4)

E. (5, 0)

F. (2, -8)

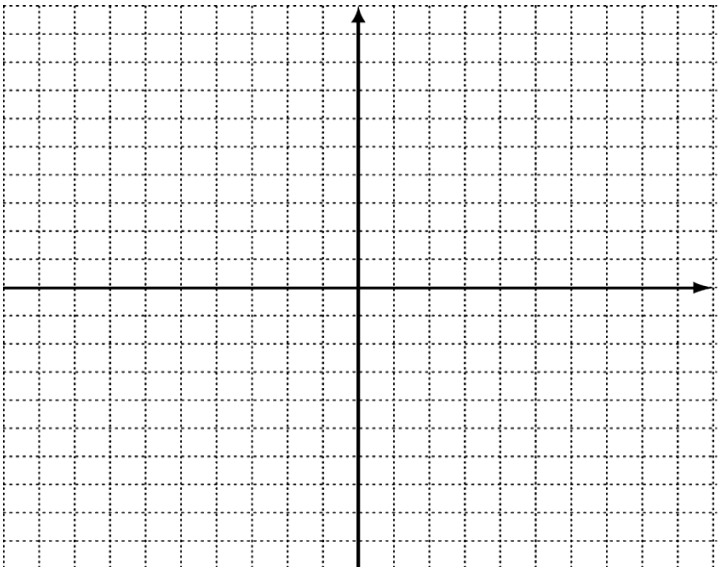
G. (0, 0)

Quadrants

Quadrant	Coordinates
I	(+, +)
II	(–, +)
III	(–, –)
IV	(+, –)

You Try

1.



Plot and label the points.

A. (6, -3)

B. (1, 9)

C. (-4, 0)

D. (-2, -8)

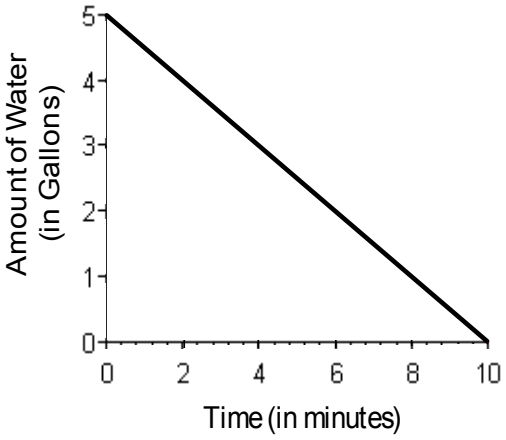
E. (0, 5)

Interpreting a Graph

Behavior of Graphs		
Increasing	Decreasing	Constant

Interpreting a Graph

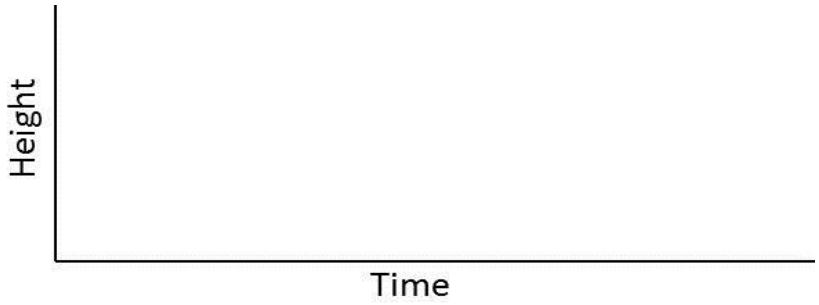
Example 1: The graph below shows the amount of water in a tub as time elapses.



1. What is the input variable? _____
2. What are the units of the input variable? _____
3. What is the output variable? _____
4. What are the units of the output variable? _____
5. Is water entering or leaving the tub? _____
6. How much water is in the tub after 2 minutes? _____
7. How much water is in the tub after 5 minutes? _____
8. One gallon of water remains in the tub after _____ minutes.
9. Interpret the meaning of the ordered pair (4, 3).

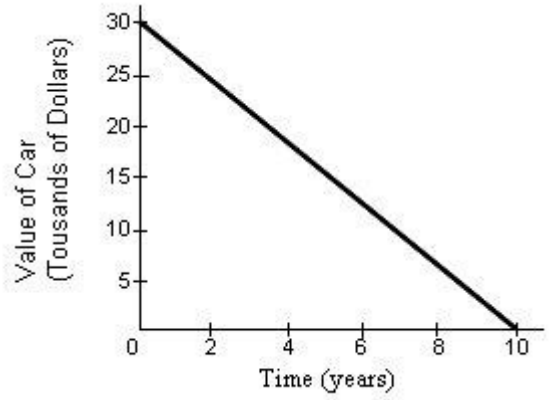
Constructing a Graph from Context

Example 2: A golfer hits a golf ball. Draw a graph to represent the height of the ball over time.



You Try

2.



1. What is the input variable? _____
2. What are the units of the input variable? _____
3. What is the output variable? _____
4. What are the units of the output variable? _____
5. What is the value of the car after 10 years? _____
6. What was the purchase price of the car? _____
7. Interpret the meaning of the ordered pair (7, 9).

Constructing a Graph from Data

Criteria for a Good Graph

1. The horizontal axis should be properly labeled with the name and units of the input variable.

2. The vertical axis should be properly labeled with the name and units of the output variable.

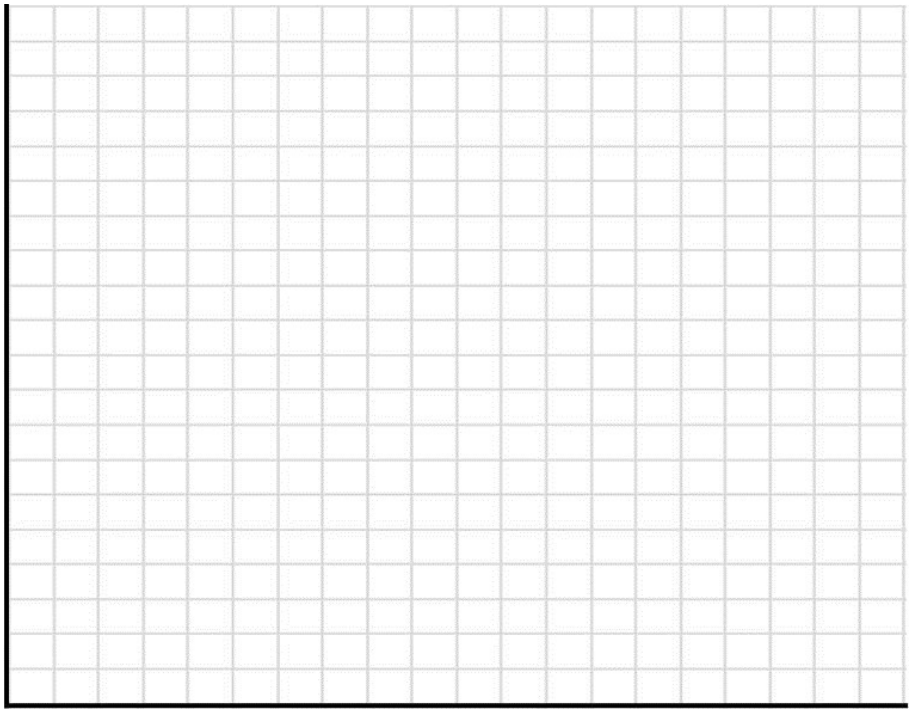
3. Use an appropriate scale.
   - Start at or just below the lowest replacement value.
   - End at or just above the highest replacement value.
   - Scale the graph so the adjacent tick marks are equal distance apart.
   - Use numbers that make sense for the given data set.
   - The axes meet at (0,0) Use a "//" between the origin and the first tick mark if the scale does not begin at 0.

4. All points should be plotted correctly, and the graph should make use of the available space.

Construct a Good Graph

Example 1: The stopping distance of a car depends on the speed at which it was travelling when the brakes were applied. The table below shows the distance it takes a car traveling at various speeds to come to a complete stop on clean, dry, level pavement.

Speed (miles per hour)	15	30	45	50	60	75
Stopping Distance (feet)	30	75	162	194	266	395



Example 2: Consider the following data set.

Years since 1990	Number of Debit Card Transactions (in millions)
0	127
2	204
5	829
8	3035
10	6655

What is the input variable? _____

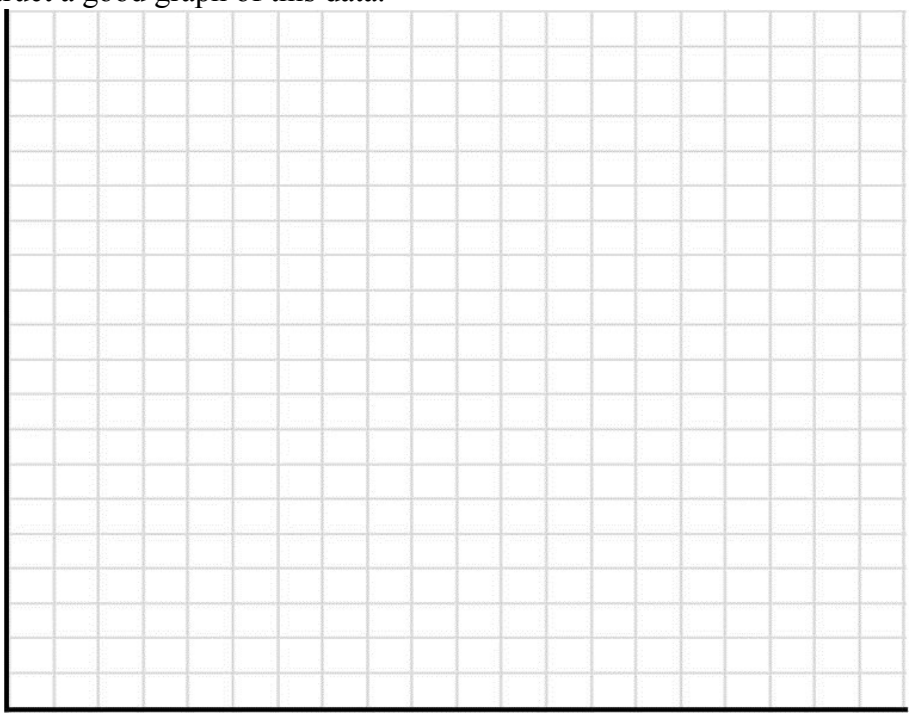
What is the output variable? _____

How many debit card transactions were made in 1995?_____

In what year were 204 million debit card transactions made?_____

In a complete sentence, interpret the meaning of the ordered pair (10, 127).

Construct a good graph of this data.



You Try

3. Consider the following data set.

Years since 1980	2	3	9	10	11
Number of Bases Stolen	78	58	72	62	46

a. What is the output variable? _____

b. How many bases were stolen in 1989? _____

c. In what year were 46 bases stolen? _____

d. In a complete sentence, interpret the meaning of the ordered pair (3, 58).

e. Construct a good graph of this data.