

Lesson: Displaying data and recognizing trends.

Eighth Grade Objective: 4.01 Collect, organize, analyze, and display data (including scatterplots) to solve problems.

Lesson:

Examining data is a good way to find trends, make predictions and determine if there is a relationship between two (or more) things. However, looking at data in table form can be overwhelming. This is why we translate tabular data (data that is in table form) into graphical data. When examining data with two variables, it can make sense to use a scatterplot, as long as the two variables are related (or if you want to determine if they are related).

Scatterplots are simply ordered pairs plotted on a coordinate plane. Like any other graph, it is important that you choose a scale and interval that are appropriate for the data. If your data points go from 0 – 500, your scale needs to start at or below the smallest number and go to at least the highest number. In this example, choosing an interval of one is impractical. You may want to choose an interval of 10 or 50. It is not necessary to have the same scale and interval on both the x- and y-axes, but having the same interval on both axes does make finding the slope easier.

Find an appropriate scale and interval for the following sets of data:

x	7	8	9	10	11
y	14	16	18	20	22

Possible scale: 0 – 24 on both axes; possible interval: counting by 2's

x	-5	4	13	-9	10
y	-10	6	9	-3	-8

Possible scale: -15 – 15 on both axes; possible interval: counting by 1's

Keep in mind, in the two examples above, the answers listed are possible solutions. There are a wide variety of appropriate answers. Just make sure that your scale includes ALL the numbers in the data sets.

It is important to determine which variable gets placed on the x-axis and which gets placed on the y-axis. The variable that is placed on the x-axis is the independent variable. The variable that is placed on the y-axis is the dependent variable. The data on the y-axis depends on the data on the x-axis. You can think of it as the x variable controls the y variable.

Determine which is the independent (x) variable and which is the dependent (y) variable:

The height of a ball thrown straight up into the air and the time it takes for it to fall back to the ground.

The two variables are time and height. The height of the ball depends on the time from when it was thrown, therefore, the height is the dependent variable and the time is the independent variable.

The amount of sugar dissolved in a cup of water at different temperatures.

The variables are temperature and amount of dissolved sugar. The temperature of the water controls how much sugar can be dissolved, therefore temperature is the independent variable and amount of dissolved sugar is the dependent variable.

Once we know our scale and interval and which variable belongs on each axis, we are ready to begin graphing.

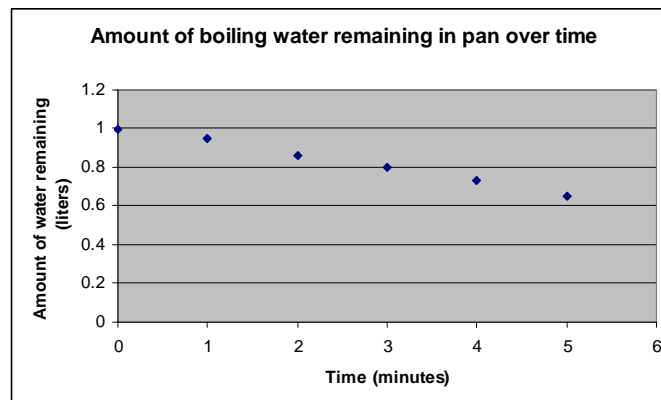
Graph the following data. Be sure to use an appropriate scale and interval and label both the x and y axes.

Time (minutes)	Amount of boiling water remaining in pan (liters)
0	1
1	0.95
2	0.86
3	0.8
4	0.73
5	0.65

First, let's determine which variable is independent and which is dependent. If a pan is left on the stove, the amount of time controls how much water remains. Time is independent (x), amount is dependent (y).

On the x axis, we can use the scale 0-6 and the interval 1. On the y axis we can use the scale 0 - 1.2 and the interval 0.2.

Now we just plot the ordered pairs.



Notice that in the example above, as the time (x) increases, the amount (y) decreases. Our graph has a negative trend. Other words you will hear to describe this are negative relationship or

negative correlation. If you look at the scatterplot, the data points appear to be going down when looking from left to right. This is another way you can tell the points have a negative relationship.

If the independent variable increases and at the same time the dependent variable increases, the relationship between the points is positive. On a scatterplot, the data points will appear to be moving upward when looking from left to right.

If the independent variable and the dependent variable seem to both increase and decrease in no particular pattern, it is possible that the data points are not related. You may hear this referred to as “no correlation”. This is easiest to see on a scatterplot – the points will be randomly scattered throughout the graph.

Try these on your own!

Graph the following sets of data and determine what type of relationship, if any, exists. Make sure you decide which variable is independent and which is dependent and choose an appropriate scale and interval.

1.

Time (hours)	Distance Walked (miles)
0	0
1	3
2	7
3	10
4	14

2.

Miles Driven	Gallons of Gas Left in Tank
0	15
25	14
53	13
78	12
105	11
136	10

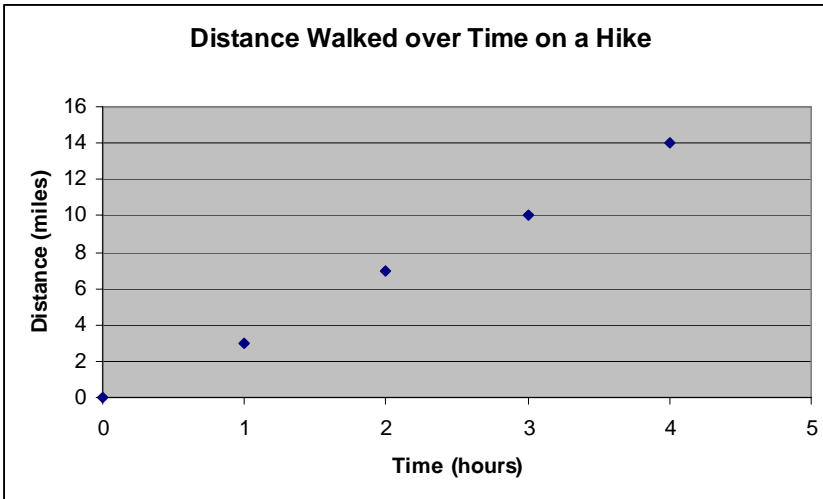
3.

Shoe Size	Time to Run 1 Mile (minutes)
6	9
7	12
8	8
9	10
9	7
10	10
13	9

Check your answers:

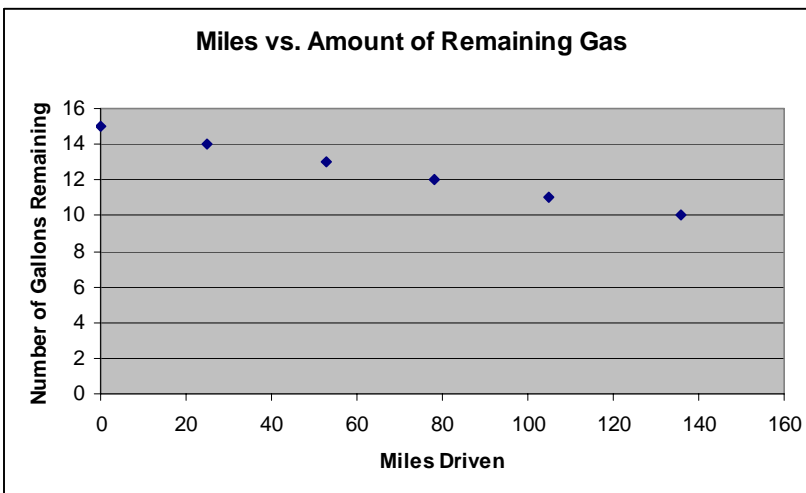
Remember, scales and intervals may vary. Your scale is ok if all the data points fit on the graph and the plotted points take up most of the width and the height of the graph (there's not a lot of unused space). Your interval is probably ok as long as you count by the same thing on each axis.

1.



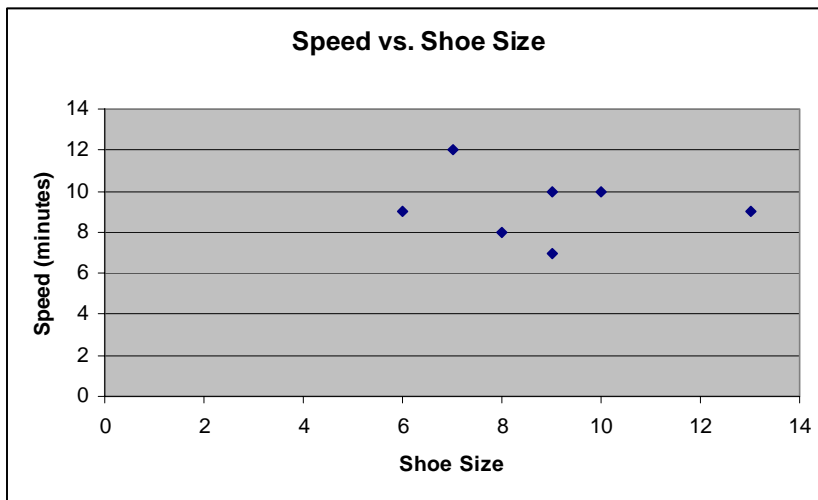
There is a positive relationship because as the time increases, so does the distance walked. You can also tell this by looking at the points on the scatterplot. The points move upward from left to right.

2.



There is a negative relationship because as the miles driven increase, the number of gallons of gas remaining decreases. You can also tell this by looking at the points on the scatterplot. The points move downward from left to right.

3.



There is no relationship between the data points. Shoe size does not affect speed, nor does speed affect shoe size.

Quiz yourself!

Graph the following and determine the type of relationship, if any, that exists.

1.

Day	Amount of Money in Checking Account
0	300
5	280
10	240
15	190
20	130
25	100
30	70

2.

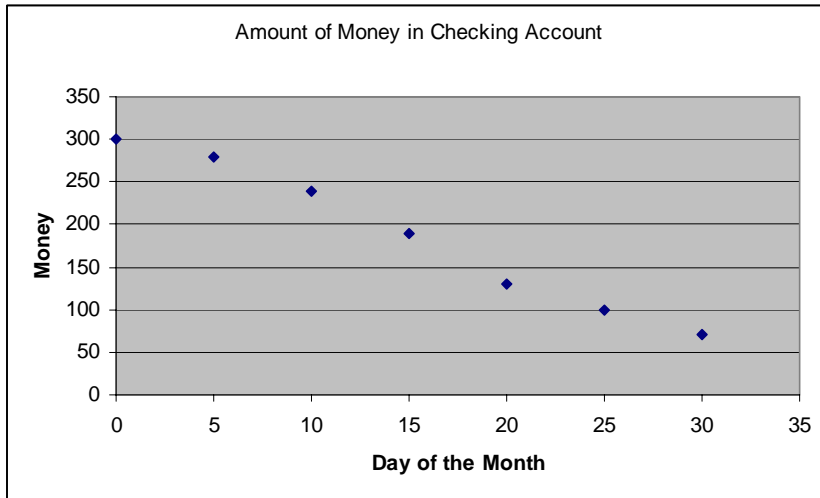
Annual Income	Years of Education
\$14,000	8
\$16,000	9
\$22,000	12
\$28,000	14
\$35,000	16
\$47,000	18

3.

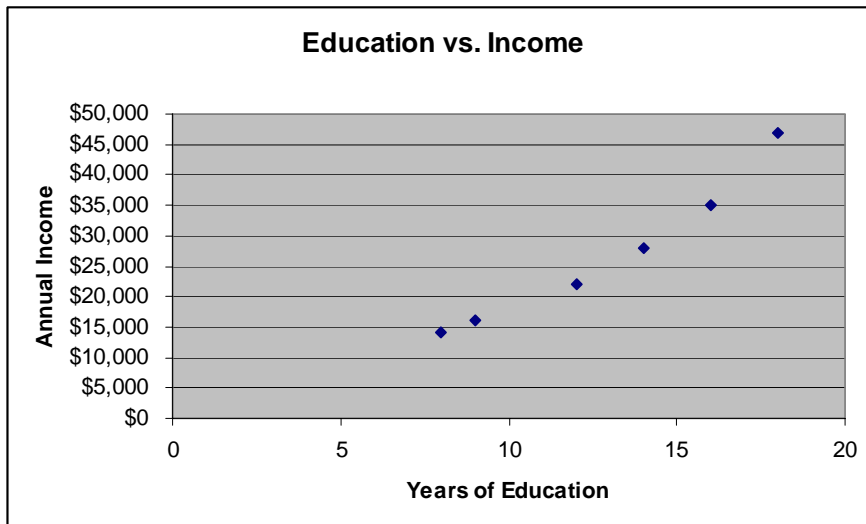
Weight (lbs)	Batting Average
195	0.3
205	0.275
180	0.25
160	0.325
230	0.3

Check your answers:

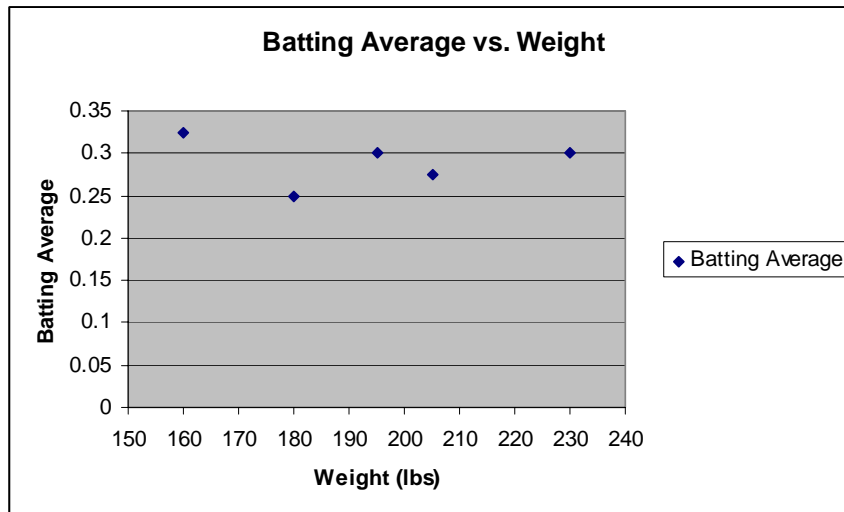
1. A negative relationship exists.



2. There is a positive trend when comparing years of education to income. Even though the table was written with the variables in the other order, annual income is influenced by years of education, making years of education independent and income dependent.



3. There is no relationship between weight and batting average.



Extensions: use your graphing calculator to graph scatterplots:

<http://mathbits.com/MathBits/TISection/statistics1/scatterplot.htm>