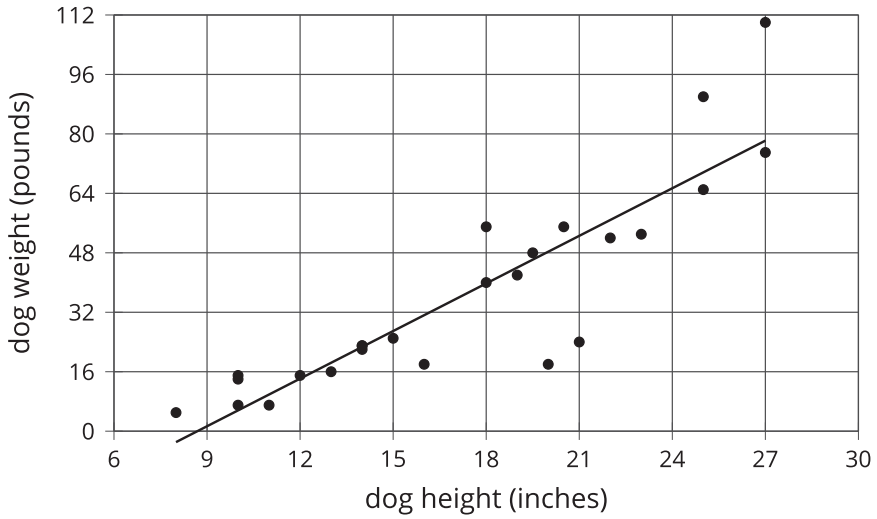
Unit 6 Family Support Materials

Associations in Data

Section A: Does This Predict That?

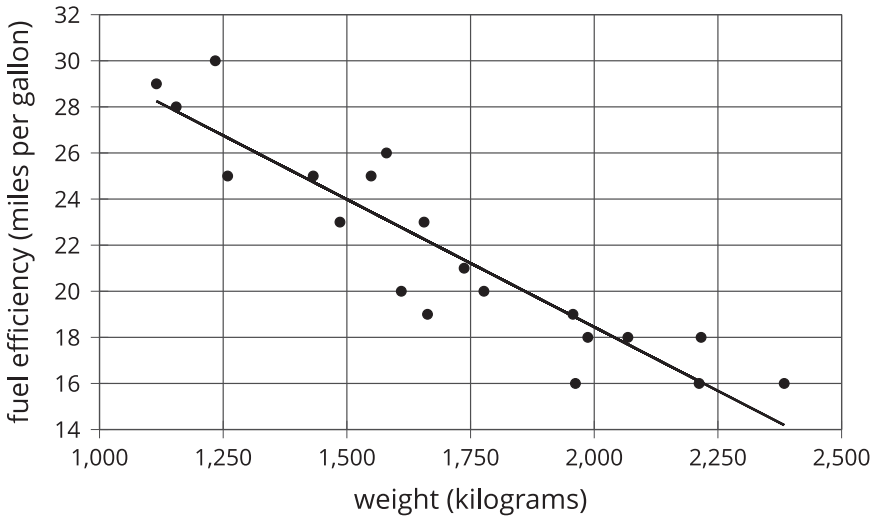
This week your student will work with **scatter plots**. Scatter plots show us how two different variables are related. In this example, each plotted point corresponds to a dog, and its coordinates tell us the height and weight of that dog. The point on the lower left of the graph, for example, might represent a dog that is 8 inches tall and weighs about 5 pounds. The plot shows that, generally speaking, taller dogs weigh more than shorter dogs.



Since a larger value for one characteristic (height) generally means a larger value for the other characteristic (weight), we say that there is a **positive association** between dog height and dog weight.

In the next example, each point corresponds to a car, and its coordinates tell us the weight (kilograms) and fuel efficiency (miles per gallon) of the car.

CC BY NC Illustrative Mathematics, based on IM 6–8 Math, CC BY Open Up Resources.

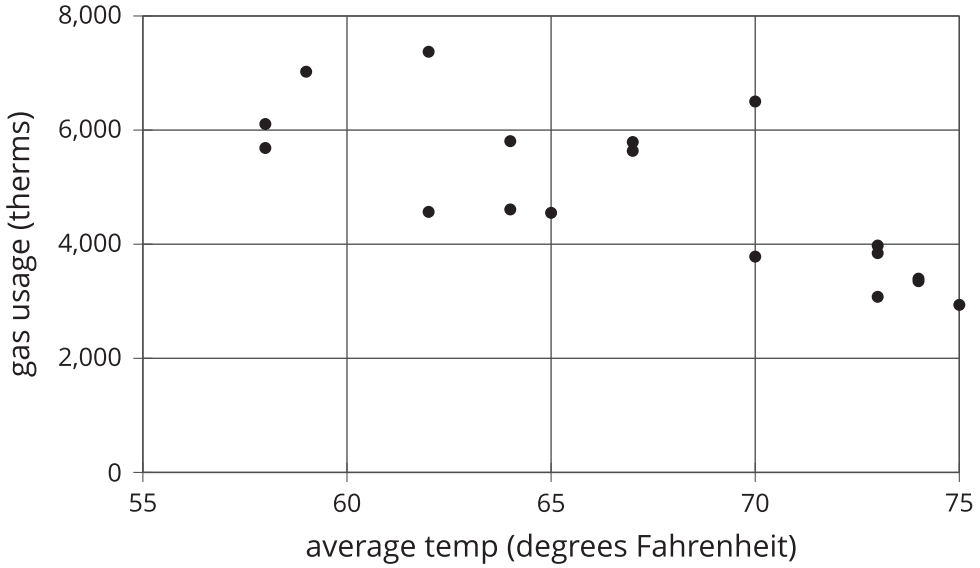


This time, we see that larger values for one characteristic (car weight) generally go along with lower values for the other characteristic (fuel efficiency), and so we say that there is a **negative association** between car weight and fuel efficiency.

CC BY NC Illustrative Mathematics, based on IM 6–8 Math, CC BY Open Up Resources.

Here is a task to try with your student:

This scatter plot shows the relationship between average temperature and gas usage in a building.



1. How many points in the graph describe the building on 70-degree days? Approximately how much gas was used on each of these days?
2. Do the variables in the gas usage for a building scatter plot show a positive association or a negative association?
3. On a 78-degree day, would the building be most likely to use (a) 1,800 therms of gas, (b) 4,200 therms of gas, or (c) 5,800 terms of gas?

Solution:

1. There are 2 points that describe gas usage for 70-degree days. On one of those days, the building used a little less than 4,000 therms of gas. On the other, the building used a little more than 6,000 therms.
2. Since less gas is used on warmer days, there is a negative association.
3. Following the trend in the graph, the building would likely use about 1,800 therms on a 78-degree day. You may draw in a line as in the dog and car scatter plots to help see this.

CC BY NC Illustrative Mathematics, based on IM 6–8 Math, CC BY Open Up Resources.

Section C: Associations in Categorical Data

This week your student will use **two-way tables**. Two-way tables are a way of comparing two variables. For example, this table shows the results of a study of the relation between meditation and state of mind of athletes before a track meet.

	meditated	did not meditate	total
calm	45	8	53
agitated	23	21	44
total	68	29	97

23 of the people who meditated were agitated, while 21 of the people who did not meditate were agitated. Does this mean that meditation has no impact or even a slight negative association with mood? Probably not. When we look for associations between variables, it can be more informative to know the approximate percentages in each category, like this:

	meditated	did not meditate
calm	66%	28%
agitated	34%	72%
total	100%	100%

Of the people who meditated, about 66% were calm ($45 \div 68 \cong 0.66$), and about 34% were agitated ($23 \div 68 \cong 0.34$). When we compare that to the percentages for people who did not meditate, we can now see more easily that the group of people who meditated has a lower percentage of athletes who are agitated. The percentages in this table are called **relative frequencies**.

CC BY NC Illustrative Mathematics, based on IM 6–8 Math, CC BY Open Up Resources.

Here is a task to try with your student:

This table contains data about whether people in various age groups use their cell phone as their main alarm clock.

	use cell phone as alarm	do not use cell phone as alarm	total
18 to 29 years old	47	16	63
30 to 49 years old	66	21	87
50+ years old	31	39	70
total	144	76	220

1. Fill in the blanks in the table below with the relative frequencies for each row. These will tell us the percentage of people in each age group who use their phone as an alarm.

	use cell phone as alarm	do not use cell phone as alarm	total
18 to 29 years old	75%, since $\frac{47}{63} \cong 0.75$		100%
30 to 49 years old			
50+ years old			

2. Comparing just the 18-to-29-year-olds and the 30-to-49-year-olds, is there an association between cell phone alarm use and age?
3. Comparing the youngest age bracket with the 50+ age bracket, is there an association between cell phone alarm use and age?

CC BY NC Illustrative Mathematics, based on IM 6–8 Math, CC BY Open Up Resources.

Solution:

1.

	use cell phone as alarm	do not use cell phone as alarm	total
18 to 29 years old	75%, since $\frac{47}{63} \cong 0.75$	25%, since $\frac{16}{63} \cong 0.25$	100%
30 to 49 years old	76%, since $\frac{66}{87} \cong 0.76$	24%, since $\frac{21}{87} \cong 0.24$	100%
50+ years old	44%, since $\frac{31}{70} \cong 0.44$	56%, since $\frac{39}{70} \cong 0.56$	100%

2. No. The relative frequencies are very similar.
3. Yes. Using a cell phone as an alarm is associated with being in the younger age brackets. About 75% of 18-to-29 and 30-to-49-year-olds use their cell phone as an alarm, but only about 44% of people 50 years or older do.

CC BY NC Illustrative Mathematics, based on IM 6–8 Math, CC BY Open Up Resources.