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Unit 8.6, Family Resource

Unit 6 Summary

Prior Learning	Grade 8, Unit 6	High School
Grade 6 ● Plotting points in the coordinate plane ● Looking at shape, center, spread, and outliers of data in one variable **Grade 8, Unit 3** ● Graphing linear functions	● Analyze numerical data in two variables using scatter plots and fitted lines. ● Use two-way tables, bar graphs, and segmented bar graphs to analyze categorical data. ● Describe associations between two variables.	● Model bivariate data with nonlinear functions. ● Use correlation coefficients to describe associations.

Organizing Numerical Data

Lists, sorted tables, scatter plots, and dot plots are all ways we can organize numerical data.

Scatter plots show us how two different variables are related.

This is data for an ice cream stand collected on temperature and number of customers over time.
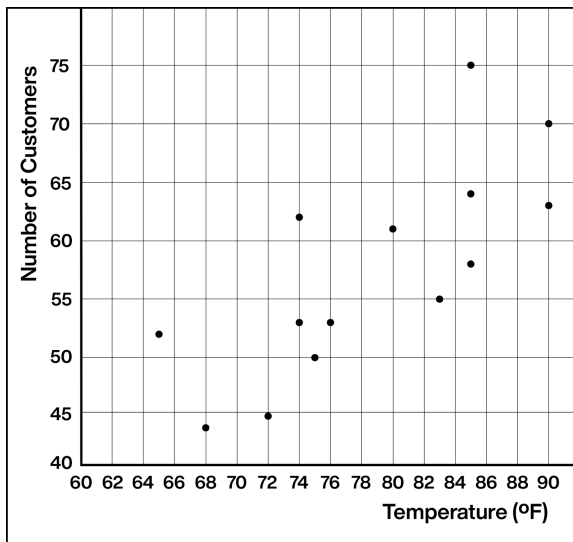
With a scatter plot, we can investigate visual patterns and make predictions.

Some questions scatter plots can help answer:

● Is there an association between the outside temperature and the number of customers at an ice cream store?

● What is the predicted number of customers if the temperature is $78\,°$F?

Analyzing Numerical Data
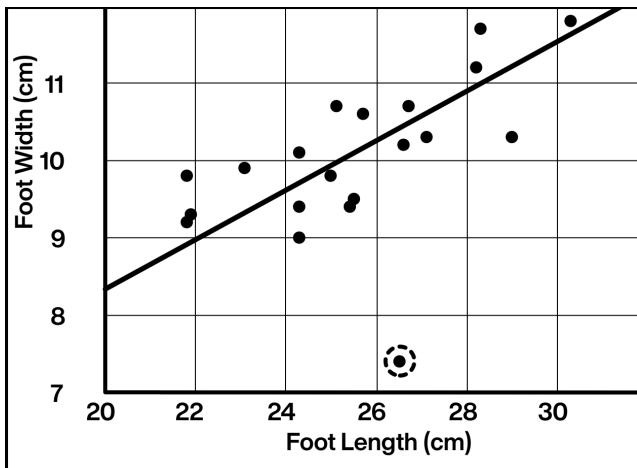
We say that there is a **positive association** between foot length and foot width because in general, longer feet are wider than shorter feet.

The line drawn on the graph shows the overall trend and can help us find the predicted foot width for a given foot length.

Points that are not close to the line and to most of the data are called **outliers**.

Categorical Data

When we collect data by counting things in various categories, such as tall or short, we call that categorical data. To help organize categorical data, we can use two-way tables and bar graphs.

This table shows states of mind of athletes during a meet and whether or not they meditated beforehand.

23 of the people who meditated were anxious. Only 21 of the people who did not meditate were anxious.

Does this mean that meditation has no impact or even a slight negative association with mood?

	Meditated	Did Not Meditate	Total
Calm	45	8	53
Anxious	23	21	44
Total	68	29	97

It can be more helpful to examine the percentages (called *relative frequencies*) in each category.

Of the people who meditated, 66% were calm. 28% of the people who did not meditate were calm.

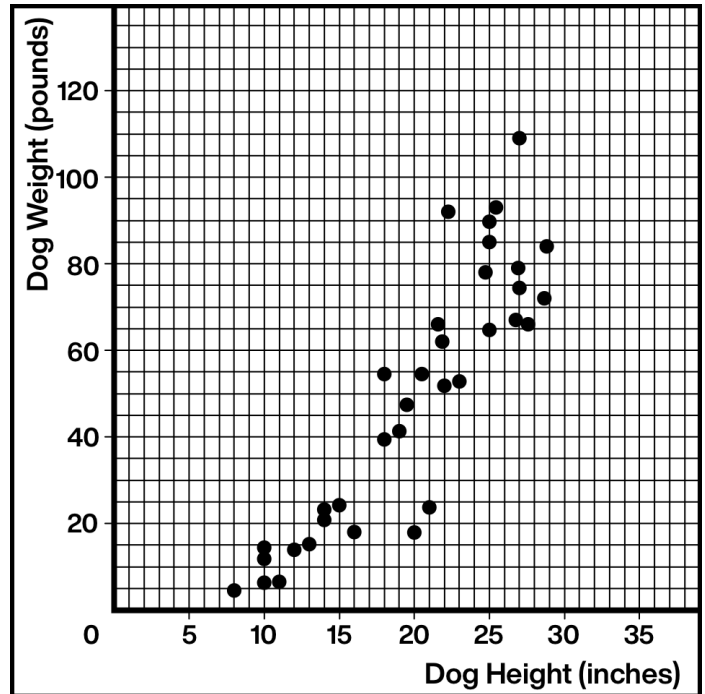The group that meditated has a lower percentage of athletes who are anxious.

	Meditated	Did Not Meditate
Calm	66%	28%
Anxious	34%	72%
Total	100%	100%

Try This at Home

Organizing Numerical Data

This scatter plot shows the heights and weights of 35 dogs.
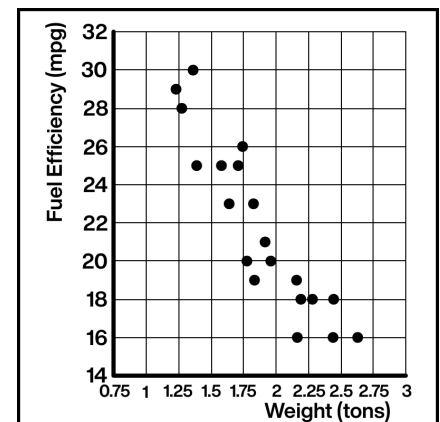
1.1 Add a point to represent a dog that is 15 inches tall and weighs 35 pounds.

1.2 Add a point to represent a dog that weighs 100 pounds.

1.3 How many dogs in the set are about 25 inches tall? Explain how you know.

1.4 What is the heaviest weight for a dog in the set? Explain how you know.

(Scatter plot: Dog Weight (pounds) on vertical axis ranging 20 to 120; Dog Height (inches) on horizontal axis ranging 0 to 35.)

Analyzing Numerical Data

Here is data on the weight of 21 cars and their fuel efficiency (miles driven for each gallon of gas).

2.1 How many cars have a fuel efficiency that is greater than 22 miles per gallon? Explain your thinking.

2.2 Do the variables in the scatter plot show a positive association or a negative association? Explain your thinking.

2.3 What is the predicted fuel efficiency of a car that weighs 1.5 tons?

2.4 Add an outlier to the scatter plot. Explain why this point is an outlier.

(Scatter plot: Fuel Efficiency (mpg) on vertical axis ranging 14 to 32; Weight (tons) on horizontal axis ranging 0.75 to 3.)

Categorical Data

This data is about people in various age groups and whether they use their cell phone as their alarm clock.

|	Uses Cell Phone as Alarm	Does Not Use Cell Phone as Alarm	Total
18 **to** 29 **Years Old**	47	16	63
30 **to** 49 **Years Old**	66	23	87
50 + **Years Old**	31	39	70
Total	144	78	220

3.1 Fill in the blanks with the relative frequencies for each row in the table below. In other words, calculate the percent of people in each age group who use their phone as an alarm.

|	Uses Cell Phone as Alarm	Does Not Use Cell Phone as Alarm	Total
18 **to** 29 **Years Old**	75%		100%
30 **to** 49 **Years Old**			
50 + **Years Old**			

3.2 Is there an association between cell phone alarm use and age for 18-to 29-year-olds and 30-to 49-year-olds? Explain your thinking.

3.3 Is there an association between cell phone alarm use and age for the youngest age bracket and the $50+$ age bracket? Explain your thinking.

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Solutions:

1.1
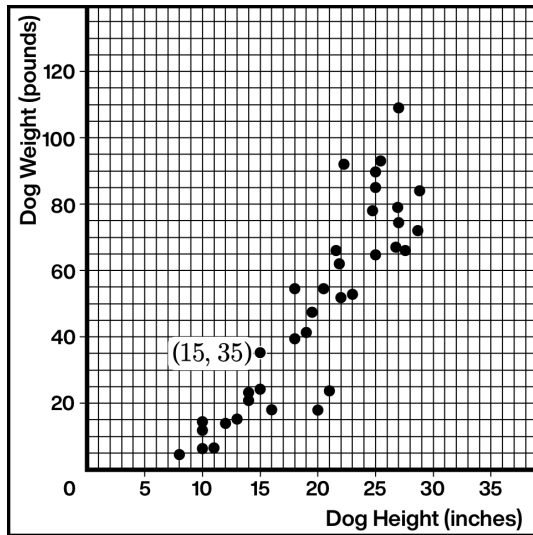
1.2 A point that represents a dog with a weight of 100 pounds will have a y-value of 100, such as the point in the graph below.
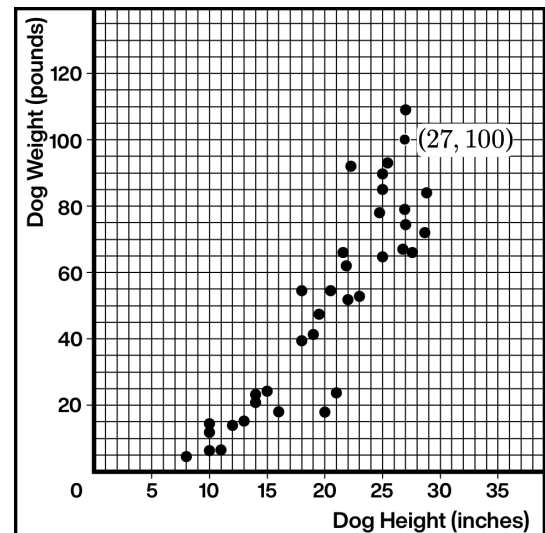
1.3 Each point on the scatter plot represents one dog. Since the x-axis represents the height of a dog in inches, we can find the number of points that have an x-value of 25 to help us determine how many dogs are about 25 inches tall. There are 5 points that have an x-value of roughly 25, so there are 5 dogs that are about 25 inches tall.

1.4 Since the y-axis represents the weight of a dog in pounds, we can find the heaviest dog by finding the y-value of the highest point on the scatter plot, which is about 110. This means that the heaviest dog in the set is about 110 pounds.

2.1 Since the y-axis represents fuel efficiency in miles per gallons, we can find the points on the graph that describe cars with a fuel efficiency greater than 22 miles per gallon by finding the number of points that have a y-value greater than 22. There are nine points with a y-value greater than 22, so there are nine cars with a fuel efficiency that is greater than 22 miles per gallon.

2.2 There is a negative association between weight and fuel efficiency because as the weight of the car increases, the fuel efficiency decreases.

2.3   Using the line of fit, we can predict that a 1.5-ton car will have a fuel efficiency of about 25.5 miles per gallon.

2.4 $(2, 30)$ is one example of an outlier. It is far from the rest of the data and has far greater fuel efficiency than the line of fit predicts for a car that weighs 2 tons.
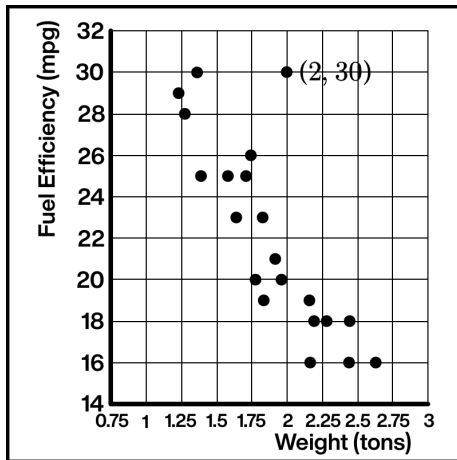
3.1 $\dfrac{47}{63}$ is approximately 0.75, so the percentage of 18- to 29-years-olds who use a cell phone as an alarm clock is about 75%.

	Uses Cell Phone as Alarm	Does Not Use Cell Phone as Alarm	Total
18 **to** 29 **Years Old**	75%	25%	100%
30 **to** 49 **Years Old**	76%	24%	100%
$50 +$ **Years Old**	44%	56%	100%

3.2   There is not an association between cell phone alarm use and age for 18- to 29-year-olds and 30- to 49-year-olds because the relative frequencies are very similar (75% vs. 76% and 25% vs. 24%).

3.3   Using a cell phone as an alarm is associated with being in the younger age brackets. About 75% of 18- to 29-year olds use their cell phone as an alarm, but only 44% of people 50 years or older do.