Lesson 3.1: Data Science

Objectives

In this lesson, students will:

- Be introduced to Data Science
- Learn about column and line charts and practice using them
- Be introduced to data analysis using tabular and chart data
- Practice making quantitative and predictive statements about data

Agenda

1. Data Science	5 mins
2. Visualizing Data for Analysis	10 mins
3. Student Activity: The *Happy Paws* Animal Shelter (Exercise 1)	20 mins
4. Student Activity: The *Happy Paws* Animal Shelter (Exercise 2)	15 mins

Preparation

- ❑ Projector for class discussions and demonstrations
- ❑ Print student activity worksheet, one per student team.

Resources & Links

- ❑ None

1. Data Science

In this lesson students are introduced to data science. They will visualize categorized data using charts and then analyze the data by answering observational questions about the data.

Engage students in an interactive class discussion and instruction:

Have you ever searched for something on Google, like a game, or a t-shirt you wanted and next thing you know the next time you open a website you see an ad for games or t-shirts like the one you searched for. That is a result of data science. Data is collected and analyzed to obtain information and insights from the data. As in this example, programs looked at data and determined that because you searched for a particular game, you might also like this other game.

Data Science is used in many fields and for many uses. One of them is to collect data on people's shopping habits. For example, stores collect data on how many cheerio cereal boxes they sell in a week and what other products shoppers buy during the same shopping trip. Then they use this data to make decisions on how much to order for the next month, where to place the product in the store or how to price items. For example if Cheerios are bought together with several expensive items, the store might think they can raise the price of Cheerios since they buy expensive stuff. I know, tricky !

2. Visualizing Data for Analysis

Engage students in an interactive class discussion.

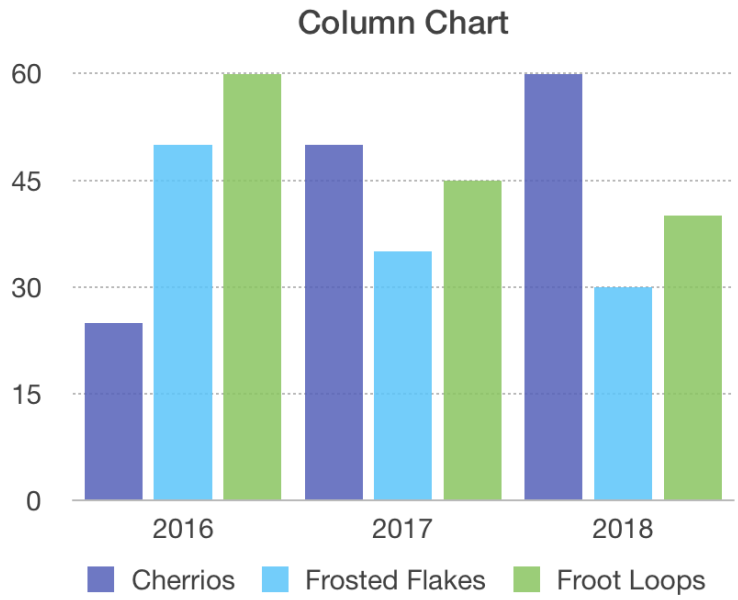
Categorizing and charting data can be a useful tool for drawing conclusions about data collected.

Let's take a look:

Comparison of Cereal Boxes Sold by Year

DESCRIPTION	2016	2017	2018
Cherrios	25	50	60
Frosted Flakes	50	35	30
Froot Loops	60	45	40

Here is a table of the number of cereal boxes sold over the course of 3 years categorized by cereal **brand**. This table is further visualized using a column chart. Column charts are good when you want to compare values.



Ask the following questions about the cereal data as a class exercise:

- ❏ What data is being compared ?
- ❏ What can we observe about the data in the year 2018?
- ❏ What can we observe and conclude about the sale of Froot Loops over the course of the 3 years. What about Cheerios?

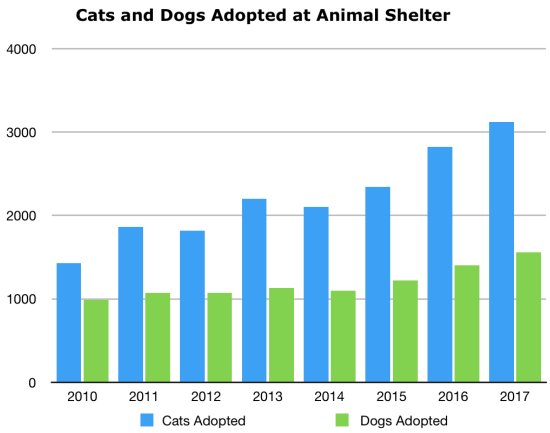
Explain answers by referring to the data in the chart.

3. Student Activity: The *Happy Paws* Animal Shelter (Exercise 1)

Explain to students that in this next activity they will work in teams. They have been given the job of managing the "Happy Paws" animal shelter. This is their first year on the job and they have to make some important management decisions. They are given some data that was collected over the last 8 years. Their boss wants to see if the team can make some sound decisions.

Distribute the activity worksheet and tell students to work on exercise 1 only.

Solution to Student Activity: Exercise 1



1. Are you going to buy more cat food or dog food in 2018? **A: Cat food because year after year more cats are being adopted.**

2. You have 2 spare rooms to house pets in 2018. Will you use it for cats or dogs? **A: For Cats**

3. What is the trend of cats and dogs being adopted year after year? **A: Each year more cats and dogs are being adopted. Adoptions are increasing for both.**

4. What other conclusions can you draw from the data?

- Cat adoptions are increasing faster. (Dog adoptions are increasing slower)
- Almost twice as many cats are being adopted
- Cats are a more popular pet
- Dog adoptions increased the most in the last 3 years

4. Student Activity: The *Happy Paws* Animal Shelter (Exercise 2)

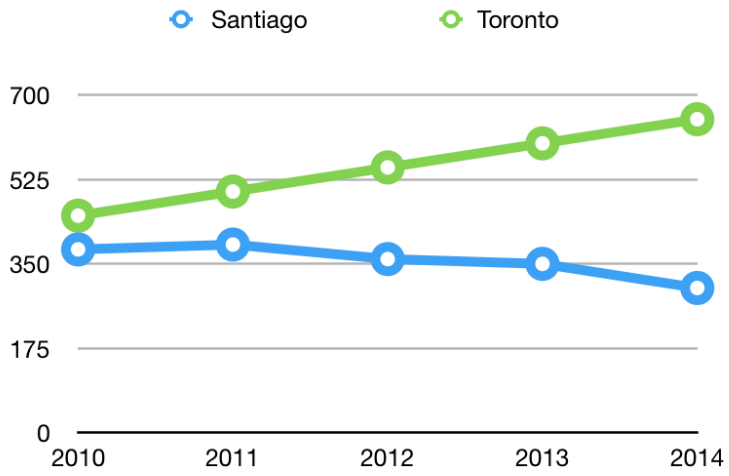
Explain to students that they will create other visual representations of shelter data from the "Happy Paws" animal shelter. They will conduct some additional analysis of total pets adopted and number of volunteers that help out at the shelter every day.

For this analysis, we will use a different type of chart. Let's take a look.

A line chart is good when we have continuous data over a period of time and we want to look at trends or patterns. If you have more than 1 data set, it is also useful to see relationships.

Ask students what a data set is. Answer: A data set is a collection of data, usually related.

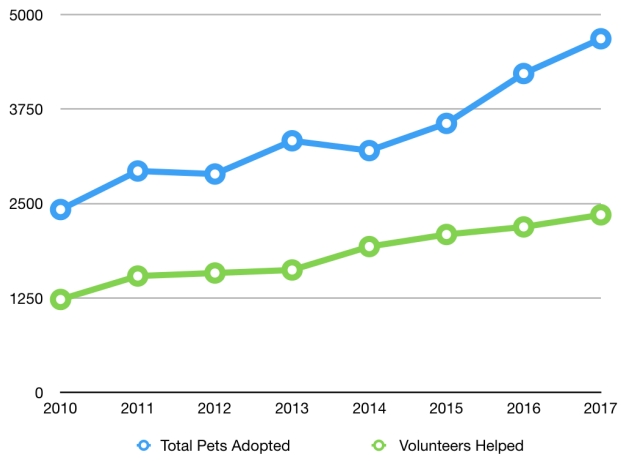
Let's take a look at a line chart of rainfall in 2 cities over 5 years (chart in exhibit B).



We can see that the rainfall for Santiago has decreased, whereas in Toronto it has increased. We can also predict that in 2015 and 2016, based on the trend, it will rain less in Santiago than in previous years and more in Toronto. The rainfall relationship between the two cities is inverse (opposite).

Students work with the same team and use the same worksheet, but work on exercise 2 now.

Solution to Student Activity: Exercise 2.



1. What is the relationship between pets adopted and volunteers that helped?

The more pets were adopted, the more volunteers helped.

Both pet adoptions and volunteers that helped increased over time.

2. Why do you think there is a relationship?

If you have more pets being adopted, you need more volunteers to help. (there is a logical inference here that more adoptions require more volunteers, not the other way around).

3. Do you think you'll need more volunteers in 2018? Why or why not?

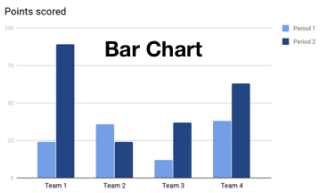
The trend of the number of adoptions is increasing year after year. This leads us to conclude and predict that in the following year, 2018, the trend might continue and more volunteers will be needed.

Student Activity: The *Happy Paws* Animal Shelter

Exercise 1

What to do:

- ❏ Use a bar chart to represent the Cats Adopted data. You can use the grid provided for your graph. For the bar you can just draw a thick line.



- ❏ Add the Dogs Adopted data to the same chart.
- ❏ In reference to the chart, answer the following questions. Support your answer by referring to the data.

  Be prepared to share your findings with the class.

1. Are you going to buy more cat food or dog food in 2018?_____

   Why?_____

   _____

2. You have 2 spare rooms to house pets in 2018. Will you use it for cats or dogs?

   _____

   _____

3. What is the trend of cats and dogs being adopted year after year?

   _____

4. What other conclusions can you draw or observations can you make from the data?

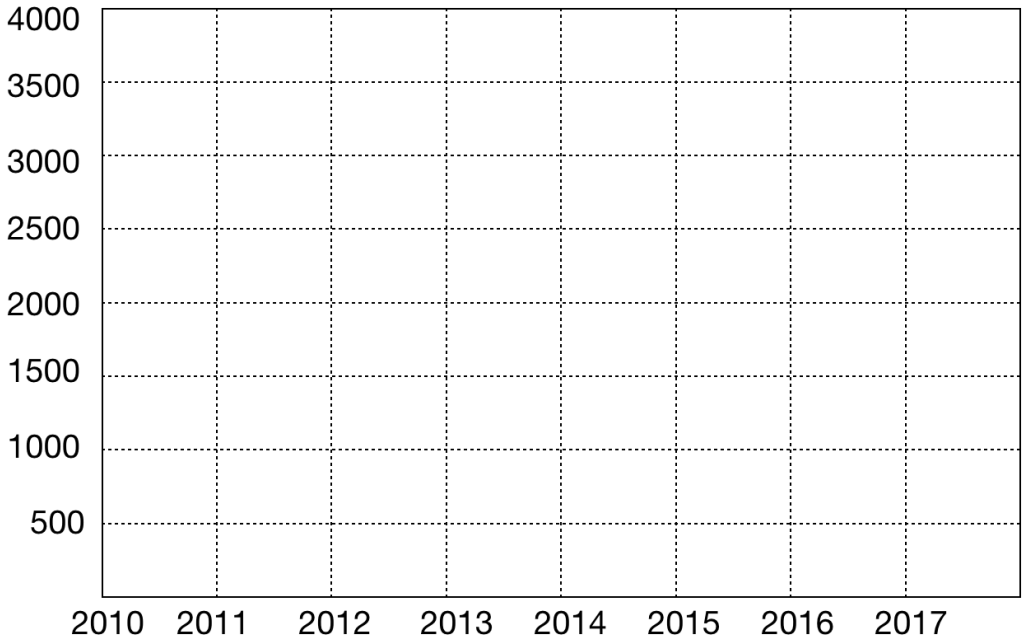
   _____

   _____

Animal Shelter Data

Year	Cats Adopted	Dogs Adopted	Total Pets Adopted	Volunteers Helped
2010	1430	990	2420	1230
2011	1860	1070	2930	1540
2012	1820	1070	2890	1580
2013	2200	1130	3330	1620
2014	2100	1100	3200	1930
2015	2340	1220	3560	2090
2016	2820	1400	4220	2190
2017	3120	1560	4680	2350

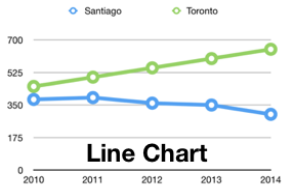
Cats and Dogs Adopted



Exercise 2

What to do:

- ❏ Use a line chart to represent the total number of pets adopted. You can use the grid provided for your graph.



- ❏ Add another line to represent the number of volunteers that helped each year.

- ❏ In reference to the chart, answer the following questions. Support your answer referring to the data. Be prepared to share your findings with the class.

1. What is the relationship between pets adopted and volunteers that helped?

   _____

2. Why do you think there is a relationship? _____

   _____

3. Do you think you'll need more volunteers in 2018? Why or why not?

   _____

Pets Adopted and Volunteers Helped

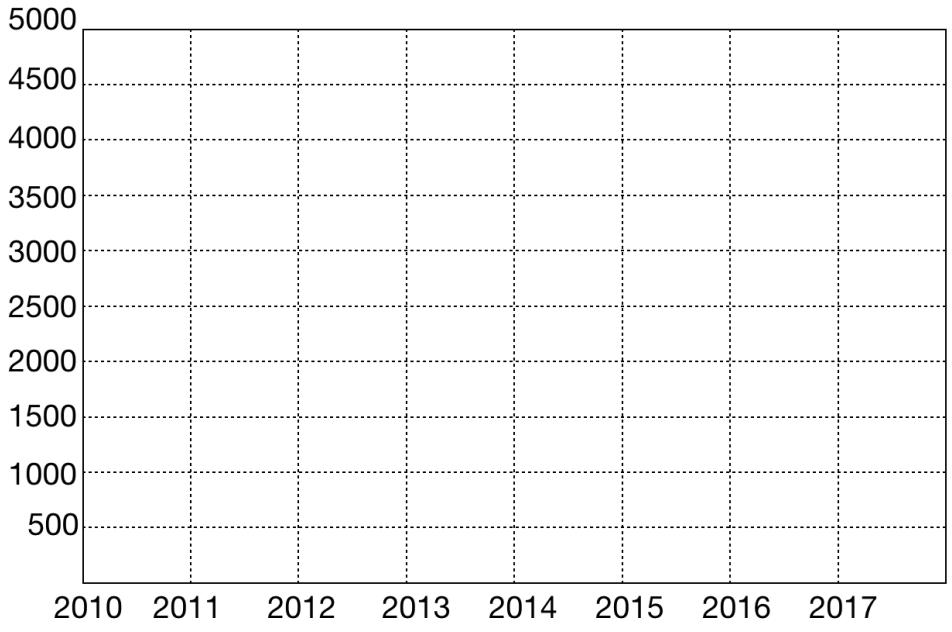


Exhibit A

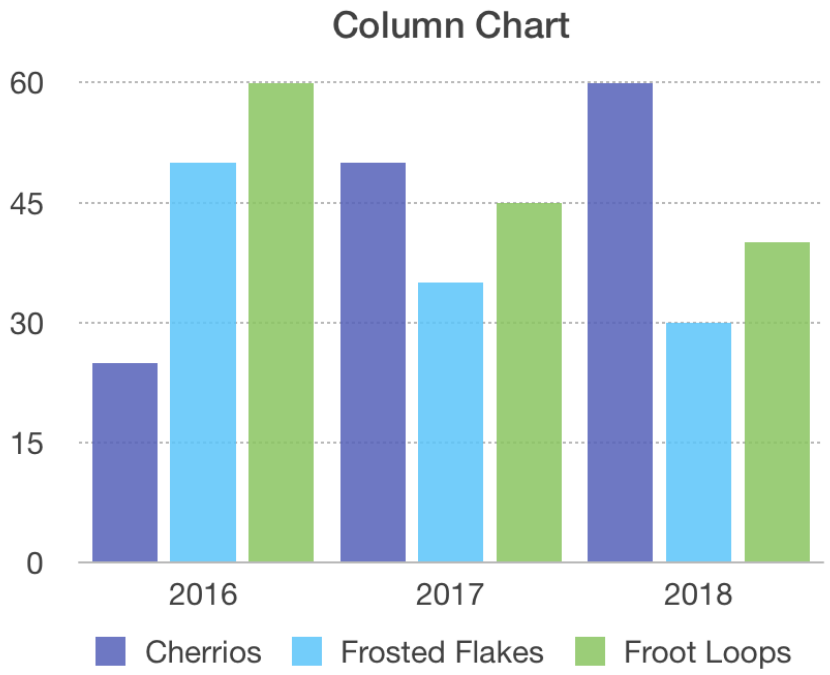


Exhibit B