



Badge 3:

App Development

When you have a problem, wouldn't it be great to have a handy tool that could help you solve it? There's an app for that. Or there can be, because you can design it!

Data can help you solve problems, but it needs to be organized and understandable to be useful. Apps can do all of that: gather data, organize it, and present it in an understandable way.

Steps

1. Learn to code data objects
2. Create a data visualization
3. Design a data collection plan
4. Analyze your leadership data
5. Develop an app based on your data

Purpose

When you've earned this badge, you'll understand how to create data objects and how to develop apps that collect data that will help leaders change the world.

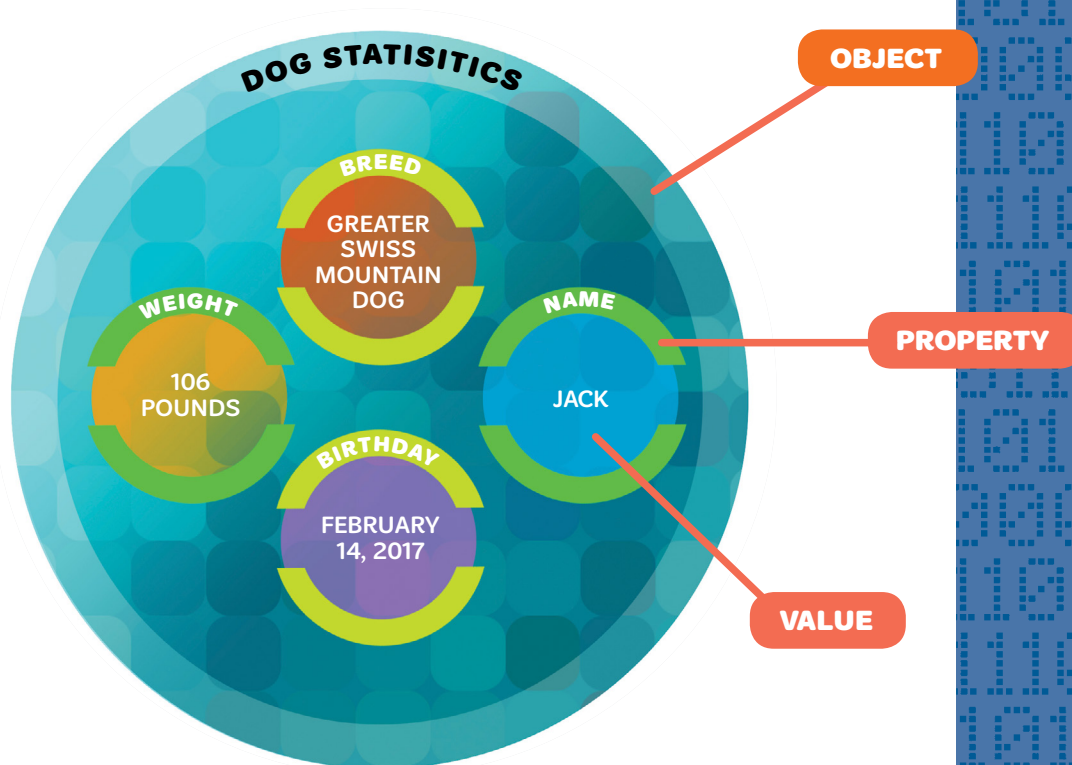
STEP

1 Learn to code data objects

To harness the power of data, first you have to organize it. Data are types of information gathered together for analysis. In coding, data can be organized into groups called **objects**. Inside an object, you have **properties**, like categories, and **values**, for specific things that would be in those categories.

For example, you could have an object organizing data about your dog. “Name” is a property and “Jack” is a value.

```
dog statistics = {  
  breed: "Greater Swiss Mountain Dog"  
  name: "Jack"  
  weight: "106 pounds"  
  birthday: "February 14, 2017"  
}
```



Objects let you group different kinds of data about a topic together. You label the data in objects like name, age, and address using properties. The data can be in any order. For example, if you had a digital map of coffee shops, each pin would have an object with data about each shop. Properties might include the shop's name, address, and hours of operation.

WORDS TO KNOW

App stands for application, used to refer to self-contained software that a user interacts with on different devices. Apps can be used for different purposes like organizing information (such as research notes or to-do lists), providing a service (such as searching for flight information or shopping online), or providing entertainment (such as playing a game or a video).

Big data very, very large datasets that contain huge quantities of information. People need incredible computational power to make sense of big data and make it useful.

Data any set of facts or statistics collected and analyzed or used for reference. Data can be in many forms and include information like information on location (such as GPS coordinates, street addresses, or zip codes), biographical information (such as birthdays or social network profiles), or even images (such as flags or photographs).

Data visualization a way data scientists, computer programmers, designers, and others communicate information clearly and efficiently. Data visualization uses statistical graphics, plots, information graphics, and other tools. Effective visualization helps users analyze and think about data. It makes complex data more accessible, understandable, and usable.

Empathy the ability to understand how someone feels.

Leading question a question that prompts a particular answer and will likely result in skewed answers. For example, “Since the lunch food is unhealthy, how likely are you to buy lunch outside of school?” is a leading question because it implies that you SHOULD buy your lunch outside of school because the food is unhealthy.

Object a way of storing lots of different types of data. In most programming languages, objects are represented with curly braces {}, with the content of the object between them. Objects are based on the idea of **properties** and **values**. When you code an object, each property-value pair is separated with a comma. Think of objects as being like a dictionary: a word to look up and there’s a definition of it. Properties are the word to look up, and values are the definition. For example:

```
dictionary = {  
  apple: "A tasty fruit.",  
  sun: "The ultimate power  
source of the solar system",  
  zebra: "A type of equid with  
black and white stripes"  
}
```

In this case, “apple” is a property, and “A tasty fruit” is the value.

Objects can also store other types of data. For example, this

could be an object that describes Juliette Gordon Low:

```
juliette = {  
  name: "Juliette Gordon Low",  
  birthday: "October 31",  
  born: 1860,  
  died: 1927,  
  fact: "founder of GSUSA"  
}
```

Pitch a business presentation seeking support from people to invest in or buy a new product. It can be an email, a letter, or even a conversation. Sometimes the presentation is called a “sales pitch,” where the goal is to get a user to buy a product.

Prototype a first version of a product which is built to be tested so that changes can be made before production.

User-centered design when programmers involve their users at multiple stages of the product design process. By incorporating the users’ needs, concerns, and feedback into their design, programmers can create a better product that solves their users’ problem and takes into account what’s most important to them.

User interface the visual elements of a program through which a user controls or communicates with the application. Often abbreviated UI.

STEP 2 Create a data visualization

Computers are much better at analyzing big sets of data than people are. That's where data visualization is useful. **Data visualization** is a visual or graphic representation of data that makes it easier to understand and use.

Apps often collect data, like the number of steps you've taken in a day—and then present it to the user in a useful way. The app developers have lots of different visualization styles to choose from, so they need to pick the one best suited to displaying their data in the most understandable way. Sometimes a specialized chart will work best. Other times, a map or timeline might work better. It all depends on the kind of data the app developers are trying to share with the user.

For example, streamgraphs show changes in different categories of data over time, when there are lots of categories starting and stopping at different times. One of the most famous streamgraphs was used in a New York Times article about how much money different movies made over a 20-year period.

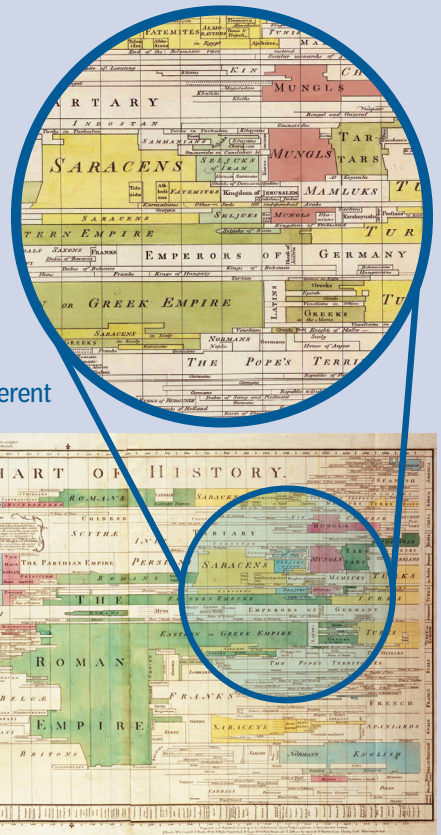
Seeing Is Understanding

People's eyes are drawn to colors and patterns, so data visualization provides a visual interpretation of data that's easier to understand than raw data in the form of a spreadsheet or list.

Charts, graphs, and tables are familiar kinds of data visualizations, but there are many variations that can display complex kinds of data. For example, a bubble chart contains three dimensions or types of data. The first two types of data are represented using x and y locations, but the third is represented by a circle, or bubble, that varies in size. You can even convey a fourth kind of data by using different colors for your bubbles.

Maps can also show more than geography. When you combine them with other data, they can show information about population, economic development, voting trends, epidemics, and more.

Calendars, clocks, and timelines help users see their data in the context of time. In 1786, a man named Joseph Priestley created "A New Chart of History" that showed a timeline of events in history across 106 locations. The user could see if important historical events around the world had happened at the same time or in the same place. Priestley used color, size, and location on his timeline to present multiple types of data. Today, app developers design digital timelines and other data visualizations to help users see how several types of data are related.



How Can I Help?

Charities and non-governmental organizations work to make positive change in our world, but they need help to accomplish their goals. Many apps are available now to support the work of charities.

■ **My Life as a Refugee** was created by the United Nations Refugee Agency, UNHCR, to build awareness about the challenges refugees face as they try to reach safety and establish lives in new places.

■ **VolunteerMatch** lets people find volunteer opportunities by location.

■ **CharityMiles** allows users to earn money for their favorite charity by tracking how much they run, walk, or bike.

■ **Budge** lets users set up a challenge with friends and family, where the loser has to pay a donation to a charity. It's a fun way to motivate people toward a goal and support a charity.

■ **DonorReminder** helps blood donors keep track of their donations and reminds them when it's time to make another donation. Every 2 seconds, someone in the US needs a blood donation, so this app saves lives!

STEP 3 Design a data collection plan

How does an app designer choose which data to collect? She starts by asking potential users what kind of data they want! Then, she makes a plan to collect the data so she can organize, analyze, and present it in a useful way.

One way to collect data is to interview people. Another way would be to have people log information. It's important to organize the data as it's collected so it's easier to analyze.

Often data gets **quantified** to make it easier to analyze. That means, for example, that answers to a survey question may get turned into numbers. You might ask, "on a scale of one to five, with one being the most important and five being the least, how would you rate these leadership skills?"

The kind of data you decide to look for will shape the way you gather it.



STEP 4 Analyze leadership data

Now that you have data, what are you going to do with it?

You need to organize it and then analyze it!

For example, you might:

- Look for patterns and trends, or a lack of them, to help you understand the big picture.
- Look for unusual or uncommon answers that could point out important exceptions to bigger patterns.
- Think about whether you have enough information to draw conclusions.

If you're making an app for one person, then her interview answers are the only ones you need. But if you're making an app to be used by lots of people, then you need to interview and gather feedback from a lot of potential users to get an idea of what the app should do.



Using Data To Solve Problems

Everybody needs help sometimes. Collecting and analyzing data can give decision-makers the information they need to make smart choices. Big data, or super large sets of data that need very strong computers to analyze them, can provide insights that make a big difference!

For example:

- United Parcel Service (UPS) uses sensor data from its delivery trucks to know when to replace parts or do maintenance, preventing costly breakdowns.
- In Rio de Janeiro, government officials use weather data to predict when dangerous landslides might happen and coordinate emergency responses.
- Cities like Memphis, Ft. Lauderdale, and Detroit use data to predict where and when crimes might happen.
- Researchers are using genetic data collected by 23andMe from more than 1 million people to look for genetic links to diseases like depression.

Computers make problem solving with data possible because they can organize, analyze, and find patterns in data much more quickly than people can.

STEP 5 Develop an app based on your data

You've got the data, now run with it!

Once app developers know what their users want, they can use that information to plan what the app will do and look like. Their plan might include:

- The name and focus of the app
- The kinds of data it will collect and how the data will be collected
- How the app will use data visualization
- Any other features the app might have like communication tools, ways to take notes or manage tasks, or search functions.

App developers might make a **paper prototype** which maps out the different features, screens, and data visualizations on paper. It's especially helpful to draw the **user interface**, or visual parts the user uses to control the app, like the menus, icons, buttons, links, and the landing page. Prototyping their app and interface lets the designers see how the app will work for the user, before they spend time coding.

Once the program is coded, the developers will test the app, ask for feedback, and improve its design. Once the app is ready to go, the developers need to market it to potential investors or users. They'll create a marketing campaign with pitches for different audiences and demonstrate how their app works.



Now that I've earned this badge, I can give service by:

- Researching and making a presentation about how government leaders could make better use of data to guide policy decisions and solve problems.
- Creating and sharing data visualizations to raise awareness about issues that are important in my community.
- Hosting a panel discussion of app development professionals to talk about their experiences and what they see as the future of app development.

I'm inspired to: