Badge 1: Cybersecurity Basics

More and more, computers run everything from city power grids, banks, and traffic lights to hospitals, schools, homes, cars, and phones. All those computers store information and data. It's important to keep that information safe—that's what cybersecurity is all about.

Steps

1. **Find out how computers read information**
2. **Discover how networks work**
3. **Find out what protocols are and create one**
4. **Explore computer communication protocols**
5. **Find out what malware is**

Purpose

When I've earned this badge, I'll know the basics of cybersecurity and how computers communicate.

Noticing Networks

Networks are groups that are connected in some way. For example, a group of people who all go to the same school is a network. Television stations that show the same programs can belong to a network. A Girl Scout troop is a network—and you belong to the network of Girl Scouts around the country and around the world! In the same way, computer networks are groups of computers that are connected to the internet.

Getting Connected

You probably have heard someone say they're "going on the internet" or "doing an online search."

All of those computers can talk to each other because of wires or cables on the ocean floor. There are 300 undersea cables that are responsible for almost all of the data traffic on the internet.

These cables connect continents and help get messages, photos, and video from one place to another in milliseconds.

STEP

1 Find out how computers read information

Computers have their own coded language to process information. This language uses the two numbers 0 and 1 in specific patterns to "speak" and share directions. It is called binary code. Any code that uses two elements is called a binary code.

When you go online or play a video game, binary code spells out what the computer should do.

STEP

2 Discover how networks work

Computers—and devices such as laptops, tablets, and smartphones—that are linked together are part of a network. Like tracks that connect train stations, computer networks are connected by the internet. Information such as photographs, emails, text messages, and files can be sent along the computer networks to reach different computers.

Every day you connect with a network of people. For example, you connect with your parents, your brother or sister your classmates, your teachers, your neighbor, your friends, and many others.
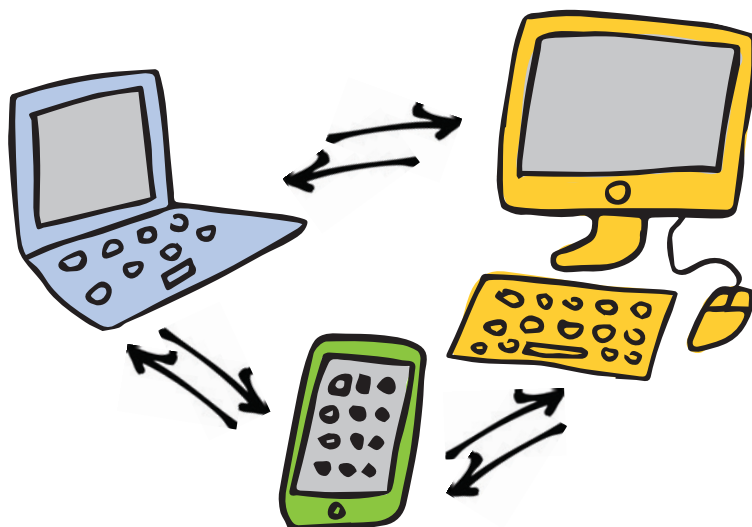
THREE SECRET CODES

One way of protecting a private message is to use a code. Here are three codes you can use with your friends. Give them a try—you'll learn how encryption works, which is an important way to keep information safe.

1. SECOND LETTER CODE

Read every second letter beginning with the first letter. When you finish, start with the second letter and skip every other letter.

WTEHLIISKOENCEOIDSEFSU!N

__ __ ____ _____ _____ ____ ___ __ ___!

2. PIGPEN CODE

This one looks hard, but all it takes is the right key.

First, draw two tic-tac-toe grids. Below that, draw two Xs.

Then put dots in each box of the second tic-tac-toe box and the second X. Add the letters of the alphabet as shown in the diagram.

Each letter is represented by the lines (or the pigpen) that surround it. Now you can read pigpen!

__ _____ ___ _____!

3. MORSE CODE

Before phones, people communicated over huge distances using codes. Morse Code is one of those codes. It started as a series of indentations on paper in the 1830s, but it soon became a sound code. A pattern of long dashes and short dots represents the different letters.

.... .- ...- . ..-. .- -. -.. . -.-. --- -.. .. -. --.

_____ __ ___ ___ _____ _____!

A •-	J •---	S •••
B -•••	K -•-	T -
C -•-•	L •-••	U ••-
D -••	M --	V ••••-
E •	N -•	W •--
F ••-•	O ---	X -••-
G --•	P •--•	Y -•--
H ••••	Q --•-	Z --••
I ••	R •-•	

Answers on page 9

WORDS TO KNOW

☑ **Anti-virus software:** Computer programs that scan your computer and keep it free of viruses.

☑ **Cipher:** A method of changing a message so as to conceal its meaning. For example, when you use special numbers, letters, and symbols in a code to send a secret message, you are using a cipher. When you figure out a code, you decipher it.

☑ **Code:** A system of symbols, such as letters or numbers, which are used to create a secret message. Code is also the language computers use. When you write code on a computer, you give it commands to tell it what to do.

☑ **Download:** Copying a file, such as a photo, video, app, or game, from one computer to another, usually over the internet.

☑ **Hacker:** Usually means a person who secretly gets access to a computer system to get information or cause damage. However, when it comes to hackers, there are good actors and bad actors (see page 14 to learn more).

☑ **Network:** A system of computers and other devices (such as printers) that are connected to each other.

☑ **Password:** A secret word or phrase usually made up of a string of characters—letters, numbers, and symbols—that allows you to get access to a computer or system.

☑ **Private information:** Facts about you that you don't want everyone to know. For example, your home address or the name of your school is private information. You don't want to share that with strangers.

☑ **Protocol:** A system of rules that explains the correct steps to follow.

☑ **Spam:** Unwanted emails—short for "Sending Particularly Annoying Messages."

☑ **Username:** A name, word, or characters you type so you can use a computer, cell phone, tablet, or website. Usernames are also called user IDs.

3 Find out what protocols are and how to create one

Protocols are important in everyday life. A protocol is a set of rules that says exactly how something should be done. We use protocols all the time.

For example, when a school bus stops and turns on its flashing red lights, drivers also stop. That helps keep children safe as they get off the bus. Before an airplane takes off, the pilot uses a checklist—a set of protocols—to make sure the equipment and instruments work properly.

When computers share data, they follow a set of rules or protocols that make it easier and safer to share information.

4 Explore computer communication protocols

If you want to communicate or speak with a friend, you might tap her on the shoulder, call her name, or wave to get her attention. Once she sees you and is ready, then you can talk. You make a connection first.

For a computer to pass along any information it must make a connection between the host and the server. In order to do this, the computer follows a three-step protocol called a handshake.

★ **STEP 1** A request is sent out.

★ **STEP 2** The request is received and understood.

★ **STEP 3** The request and the acceptance of the request is then acknowledged by the sender. Now messages can be sent.

Handshake History

In ancient Greece, warriors would grasp each other's elbows to greet one another. It was a sign of peace. They did it to show they weren't holding any hidden weapons.

Even today, people often shake hands when they meet. It's a gesture of friendliness. It's also a communication protocol, just like a computer's handshake.

5 Find out what malware is

Combine the words "malicious" (meaning "harmful") and "software" and you get the word "malware." Malware is software that can attack computers, tablets, phones, and other digital devices and cause harm.

Computer viruses are one type of malware. Viruses can make their way into your computer or device when you download email attachments or content from someone else's flash drive. When you click on online ads or download programs from the internet, you also risk getting a virus. For this step, find out the ways that malware can enter your computer.

Malicious Malware

Take a look at the chart that shows the different kinds of malware and what they do.

They can be as nasty as they sound. Here are six common types of malware to avoid:
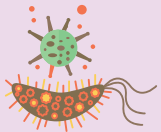
Viruses
A computer virus is a small program that sneaks into your computer on an email or a download. Then it copies itself and causes problems the same way that a cold virus does in your body. A virus might just slow down your device—or it might make you lose all your applications and documents!

Worms
Worms are programs designed to get into your computer, copy themselves, and quickly harm your device. A worm can infect your email account and then send a copy of itself to all of your email contacts!

Trojan horse
A Trojan horse seems to be a program that can be helpful. But when you download it, it attacks your device. The name comes from an old Greek story. The Greeks were battling the Trojans. They made a huge wooden horse, pushed it up to the city gates, and hid inside. The people of Troy thought it was a gift. They opened the gates and pulled it in. They had no idea there were soldiers inside waiting to attack.

Spyware
Spyware is sneaky software that installs itself onto devices. Once it's in your computer, it starts to steal passwords, email addresses, and other important information.

Adware
Adware uses clever advertisements to trick you into giving away your private information.

Ransomware
This software takes over a computer and kidnaps data. The attacker won't allow the user to access any information until a ransom is paid. Even then, they sometimes won't give you your data back.

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

- Creating a video about the most interesting thing I learned and sending it to my family members around the country.

- Talking to my parents about installing anti-virus software on our family computers.

- Putting together a workshop to help senior citizens protect their digital devices from malware.

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I'm inspired to: