

BOY SCOUTS OF AMERICA  
MERIT BADGE SERIES

# DIGITAL TECHNOLOGY



*"Enhancing our youths' competitive edge through merit badges"*



BOY SCOUTS OF AMERICA®

# Note to the Counselor

The Digital Technology merit badge was designed to show the close relationship between humans and the technical world surrounding us. The fleur-de-lis in the center represents the Scout who, acting as the “brain” of a typical computing device, interfaces with the digital technology world through the means that those electronic devices can “understand”—electrons, bits of data, and specialized pathways for information. As we increasingly use digital technology in our everyday world, this relationship extends from the Scout to the digital devices.



Eventually, the machine becomes an extension of the Scout’s will, carrying out what the Scout directs it to do. The challenge for the Scout and for every user of digital technology is to understand this boundary and relationship, to not lose one’s own identity in the machine. We humans must remember that machines are simply an extension of—not a replacement for—the human mind.

The American Standard Code for Information Interchange, or ASCII, is used to transmit information between computers. To manage the alphabet, this binary system uses numbers 0 to 9 and special characters for 256 possible combinations with an eight-digit binary number. Those numbers would be 00000000, 00000001, 00000010, 00000011, 00000100, up to 11111111. In decimal it would be 0, 1, 2, 3, 4, and so on, up to 255. That’s 256 combinations, including zero.

Where does that number come from? Computers at the most fundamental level handle circuits that are like “on” and “off” switches. In the decimal system, we typically use 10 symbols—numerals 0 to 9—and every digit uses a factor of 10. The binary system uses only two symbols—0 and 1—and a factor of 2. In the digital technology industry, these conditions are typically referred to as a binary number system with 1 for “on” and

0 for “off.” In decimal, the number 12 would be written as  $12 = (1 \times 10) + (2 \times 1)$ . In binary, it would be written as  $1100 = (1 \times 8) + (1 \times 4) + (0 \times 2) + (0 \times 1)$ .

This chart includes a “translation” of zero through 9, the entire alphabet (capital and lowercase letters), and a few other characters. See “Understanding Data and Files” for more information on ASCII translation.

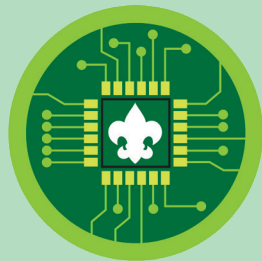
### ASCII Code - Character to Binary

0 0011 0000	I 0100 1001	b 0110 0010	v 0111 0110
1 0011 0001	J 0100 1010	c 0110 0011	w 0111 0111
2 0011 0010	K 0100 1011	d 0110 0100	x 0111 1000
3 0011 0011	L 0100 1100	e 0110 0101	y 0111 1001
4 0011 0100	M 0100 1101	f 0110 0110	z 0111 1010
5 0011 0101	N 0100 1110	g 0110 0111	
6 0011 0110	O 0100 1111	h 0110 1000	: 0011 1010
7 0011 0111	P 0101 0000	i 0110 1001	; 0011 1011
8 0011 1000	Q 0101 0001	j 0110 1010	? 0011 1111
9 0011 1001	R 0101 0010	k 0110 1011	- 0010 1110
	S 0101 0011	l 0110 1100	- 0010 1111
	T 0101 0100	m 0110 1101	! 0010 0001
A 0100 0001	U 0101 0101	n 0110 1110	- 0010 1100
B 0100 0010	V 0101 0110	o 0110 1111	- 0010 0010
C 0100 0011	W 0101 0111	p 0111 0000	( 0010 1000
D 0100 0100	X 0101 1000	q 0111 0001	) 0010 1001
E 0100 0101	Y 0101 1001	r 0111 0010	space 0010 0000
F 0100 0110	Z 0101 1010	s 0111 0011	
G 0100 0111		t 0111 0100	
H 0100 1000	a 0110 0001	u 0111 0101	

The original design for the Digital Technology merit badge contained a special ASCII encoding for “BSA.” However, due to constraints in the badge making process, this idea was abandoned. As a fun aside for Scouts, see if they can figure out the message. For the letters “B,” “S,” “A” in ASCII, here is the standard assignment:

B = 01000010      S = 01010011      A = 01000001

Starting from the tab in the top row to the far left, notice a trace that stops at a circle, which represents a zero. Going clockwise, the next trace twists and radiates outward. The next two end at circles. Then going down the right side of the yellow tabs, combinations of 1s and 0s are found. Eventually, if you go around the entire badge, you get the 1s and 0s to spell out “BSA” in ASCII format.



# Requirements

*Always check [www.scouting.org](http://www.scouting.org) for the latest requirements.*

1. Show your counselor your current, up-to-date Cyber Chip.
2. Do the following:
  - (a) Give a brief history of the changes in digital technology over time. Discuss with your counselor how digital technology in your lifetime compares with that of your parent's, grandparent's, or other adult's lifetime.
  - (b) Describe what kinds of computers or devices you imagine might be available when you are an adult.
3. Do the following:
  - (a) Explain to your counselor how text, sound, and pictures are digitized for storage.
  - (b) Describe the difference between lossy and lossless data compression, and give an example where each might be used.
  - (c) Describe two digital devices and how they are made more useful by their programming.
  - (d) Discuss the similarities and differences between computers, mobile devices, and gaming consoles.
  - (e) Explain what a computer network is and the difference between a local area network (LAN) versus a wide area network (WAN).
4. Do the following:
  - (a) Explain what a program or software application or "app" is and how a computer uses a CPU and memory to execute it.
  - (b) Name four software programs or mobile apps you or your family use, and explain how each one helps you.
  - (c) Describe what malware is, and explain how to protect your digital devices and the information stored on them.
5. Do the following:
  - (a) Describe at least two different ways data can be transferred through the internet.
  - (b) Using an internet search engine (with your parent's permission), find ideas about how to conduct a troop court of honor or campfire program. Print out a copy of the ideas from at least three different websites. Share what you found with your counselor, and explain how you used the search engine to find this information.

- (c) Use a web browser to connect to an HTTPS (secure) website (with your parent's permission). Explain to your counselor how to tell whether the site's security certificate can be trusted, and what it means to use this kind of connection.
6. Do THREE of the following. For each project you complete, copy the files to a backup device and share the finished projects with your counselor.
- (a) Using a spreadsheet or database program, develop a food budget for a patrol weekend campout OR create a troop roster that includes the name, rank, patrol, and telephone number of each Scout. Show your counselor that you can sort the roster by each of the following categories: rank, patrol, and alphabetically by name.
- (b) Using a word processor, write a draft letter to the parents of your troop's Scouts, inviting them to a troop event.
- (c) Using a graphics program, design and draw a campsite plan for your troop OR create a flier for an upcoming troop event, incorporating text and some type of visual such as a photograph or an illustration.
- (d) Using a presentation software program, develop a report about a topic approved by your counselor. For your presentation, create at least five slides, with each one incorporating text and some type of visual such as a photograph or an illustration.
- (e) Using a digital device, take a picture of a troop activity. Send or transfer this image to a device where it can be shared with your counselor.
- (f) Make a digital recording of your voice, transfer the file to a different device, and have your counselor play back the recording.
- (g) Create a blog and use it as an online journal of your Scouting activities, including group discussions and meetings, campouts, and other events. Include at least five entries and two photographs or illustrations.
- Share your blog with your counselor. You need not post the blog to the internet; however, if you choose to go live with your blog, you must first share it with your parents AND counselor AND get their approval.
- (h) Create a webpage for your troop, patrol, school, or place of worship. Include at least three articles and two photographs or illustrations. Include at least one link to a website of interest to your audience. You need not post the page to the internet; however, if you decide to do so, you must first share the webpage with your parents AND counselor AND get their approval.

7. Do the following:
  - (a) Explain to your counselor each of these protections and why they exist: copyright, patents, trademarks, trade secrets.
  - (b) Explain when it is permissible to accept a free copy of a program from a friend.
  - (c) Discuss with your counselor an article or (with your parent or guardian's permission) a report on the internet about a recent legal case involving an intellectual property dispute.
8. Do TWO of the following:
  - (a) Describe why it is important to properly dispose of digital technology. List at least three dangerous chemicals that could be used to create digital devices or used inside a digital device.
  - (b) Explain to your counselor what is required to become a certified recycler of digital technology hardware or devices.
  - (c) Do an internet search for an organization that collects discarded digital technology hardware or devices for repurposing or recycling. Find out what happens to that waste. Share with your counselor what you found.
  - (d) Visit a recycling center that disposes of digital technology hardware or devices. Find out what happens to that waste. Share what you learned with your counselor.
  - (e) Find a battery recycling center near you and find out what it does to recycle batteries. Share what you have learned with your counselor about the proper methods for recycling batteries.
9. Do ONE of the following:
  - (a) Investigate three career opportunities that involve digital technology. Pick one and find out the education, training, and experience required for this profession. Discuss this with your counselor, and explain why this profession might interest you.
  - (b) Visit a business or an industrial facility that uses digital technology. Describe four ways digital technology is being used there. Share what you learned with your counselor.

# Digital Technology Resources

## Scouting Literature

*Drafting, Electricity, Electronics, Engineering, Game Design, Graphic Arts, Inventing, Photography, Programming, and Robotics* merit badge pamphlets

With your parent's permission, visit the Boy Scouts of America's official retail website, [www.scoutshop.org](http://www.scoutshop.org), for a complete listing of all merit badge pamphlets and other helpful Scouting materials and supplies.

## Organizations and Websites

### American Society for Engineering Education

[www.asee.org](http://www.asee.org)  
[www.engineeringk12.org](http://www.engineeringk12.org)

### Computer and Information Technology Occupations

*Occupational Outlook Handbook:*  
[www.bls.gov/ooh/computer-and-information-technology/home.htm](http://www.bls.gov/ooh/computer-and-information-technology/home.htm)

### The Computer History Museum

[www.computerhistory.org](http://www.computerhistory.org)

### Entertainment Software Association

[www.theesa.com](http://www.theesa.com)

### Environmental Protection Agency

[www.epa.gov](http://www.epa.gov)

### IEEE (Institute of Electrical and Electronics Engineers)

[www.ieee.org](http://www.ieee.org)

### IEEE Computer Society

[www.computer.org](http://www.computer.org)

### International Game Developers Association

[www.igda.org](http://www.igda.org)

### International Intellectual Property Alliance

[www.iipa.org](http://www.iipa.org)

### Library of Congress

[www.loc.gov](http://www.loc.gov)

### Recording Industry Association of America

[www.riaa.com](http://www.riaa.com)

### U.S. Patent and Trademark Office

[www.uspto.gov](http://www.uspto.gov)

### World Wide Web Consortium

[www.w3.org](http://www.w3.org)

For more information and resources about digital technology, go to [scoutlife.org/digitaltechnology](http://scoutlife.org/digitaltechnology).

## E-Waste Resources

### Call2Recycle

[www.call2recycle.org](http://www.call2recycle.org)

### Earth911

[earth911.com](http://earth911.com)

### Terracycle

[www.terracycle.com/en-US](http://www.terracycle.com/en-US)