MERIT BADGE SERIES
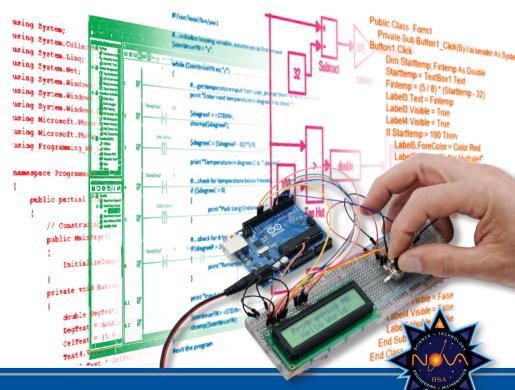
PROGRAMMING

BOY SCOUTS OF AMERICA®

STEM-Based

PROGRAMMING

"Enhancing our youths' competitive edge through merit badges"

BOY SCOUTS OF AMERICA®

Note to the Counselor

Thank you for offering your talents as a merit badge counselor. Scouting's merit badge program succeeds because of the dedication and generosity of people like you.

This merit badge is intended to introduce Scouts to programming, to help them understand how programming affects them in their everyday lives, and to help them realize that programming is something any Scout can do and even possibly pursue as a career.

To that end, the requirements are designed simply to expose the Scout to several kinds of programming in different industries—not to turn the Scout into a "programmer." Please help guide the Scout to make project choices that are fun and relatively simple.

Supporting this merit badge is an online resource, www.scoutlife.org/programming, where the Scout will find many examples, video tutorials, and development tools provided at minimal or no cost. This resource is presented with the young Scout in mind and serves as the starting point for accomplishing the "meat" of the merit badge requirements (specifically requirements 5a–5d).

> Before spending a lot of time and effort on the requirements, the Scout should meet with you to be sure the requirements are being met to your satisfaction.

For the purposes of this badge, we expect a program to take an input, make decisions based on that input, and then provide an output based on those decisions. Scouts should write the instructions in the languages and development environments of their choice. While "programming" a home thermostat or a DVR is *not* an acceptable project, creating a macro in a spreadsheet program *could* qualify as a project if you think it is appropriate. Please guide the Scout accordingly.

Also note that the requirements do not restrict the code from being run natively on an actual 'machine.' Running the program on a simulated machine or in a virtual world is fine. For example, most cell phone development environments provide cell phone simulators with which the code can be tested.

Thank you again for your service. Now, let's get some Scouts excited about programming!

Requirements

1. **Safety.** Do the following:

   a. Show your counselor your current, up-to-date Cyber Chip.

   b. Discuss first aid and prevention for the types of injuries that could occur during programming activities, including repetitive stress injuries and eyestrain.

2. **History.** Do the following:

   a. Give a brief history of programming, including at least three milestones related to the advancement or development of programming.

   b. Discuss with your counselor the history of programming and the evolution of programming languages.

3. **General knowledge.** Do the following:

   a. Create a list of five popular programming languages in use today and describe which industry or industries they are primarily used in and why.

   b. Describe three different programmed devices you rely on every day.

4. **Intellectual property.** Do the following:

   a. Explain the four types of intellectual property used to protect computer programs.

   b. Describe the difference between licensing and owning software.

   c. Describe the differences between freeware, open source, and commercial software, and why it is important to respect the terms of use of each.

5. **Projects.** Do the following:

   a. With your counselor's approval, choose a sample program. Modify the code or add a function or subroutine to it. Debug and demonstrate the modified program to your counselor.

The Programming merit badge website, www.scoutlife. org/programming, has a number of sample programs that you could use for requirement 5a. However, you have the option of finding a program on your own. It's a good idea to seek your merit badge counselor's guidance.

    b.   With your counselor's approval, choose a second programming language and development environment, different from those used for requirement 5a and in a different industry from 5a. Then write, debug, and demonstrate a functioning program to your counselor, using that language and environment.

    c.   With your counselor's approval, choose a third programming language and development environment, different from those used for requirements 5a and 5b and in a different industry from 5a or 5b. Then write, debug, and demonstrate a functioning program to your counselor, using that language and environment.

    d.   Explain how the programs you wrote for requirements 5a, 5b, and 5c process inputs, how they make decisions based on those inputs, and how they provide outputs based on the decision making.

6. Careers. Find out about three career opportunities that require knowledge in programming. Pick one and find out the education, training, and experience required. Discuss this with your counselor and explain why this career might be of interest to you.

Programming Resources

Scouting Literature

Animation, Communication, Digital Technology, Electronics, Game Design, and *Robotics* merit badge pamphlets

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

Books

Foxall, James. *Sams Teach Yourself Visual Basic 2015 in 24 Hours.* Sams Publishing, 2015.

Henney, Kevlin. 97 *Things Every Programmer Should Know: Collective Wisdom From the Experts.* O'Reilly Media, 2010.

Horstmann, Cay S. *C++ for Everyone,* 2nd ed. Wiley, 2010.

Newsome, Bryan. *Beginning Visual Basic 2015*. Wrox, 2015.

Sharp, John. *Microsoft Visual C#,* 9th ed. Microsoft Press, 2018.

Watson, Karli, Jacob Vibe Hammer, Jon Reid, Morgan Skinner, et al. *Beginning Visual C# 2012 Programming.* Wrox, 2012.

Organizations and Websites

Android
Tutorials for Android app building
developer.android.com/guide

Code.org
Free tutorials and introductions
to programming
code.org

HowToStartProgramming.com
Beginner information about programming
for Visual Basic and PHP
www.howtostartprogramming.com

> The best place to start your programming journey is with the companion website for this merit badge, scoutlife.org/programming. There you will find many examples and free resources appropriate for Scouts. You will be up and running quickly and be able to find what you need to fulfill the Programming merit badge requirements.

InterConnecting Automation Inc.
Free access to Scouts (send them a note);
learn about PLCs (programmable
logic controllers)
www.interconnectingautomation.com

Learn C++
Free tutorials and other resources on
how to program in C++
www.learncpp.com

Learnpython.org
Interactive Python tutorial
www.learnpython.org

Oracle Corporation
Java tutorials
docs.oracle.com/javase/tutorial

**Robotics Academy of
Summer Learning**
From the Carnegie Mellon Robotics
Academy, animation, robotics, web
design, game design, and more
www.cs2n.org

Scratch
Good, free examples of programs
scratch.mit.edu

U.S. Copyright Office
www.copyright.gov

U.S. Patent and Trademark Office
www.uspto.gov

W3schools.com
Tutorials for all web design
programming tools
www.W3schools.com