

HOW TO USE THIS PAMPHLET

The secret to successfully earning a merit badge is to use both the pamphlet and the suggestions of your counselor.

Your counselor can be as important to you as a coach is to an athlete. Use all of the resources your counselor can make available to you. This may be the best chance you will have to learn about this particular subject. Make it count.

If you or your counselor feels that any information in this pamphlet is incorrect, please let us know. Please state your source of information.

Merit badge pamphlets are reprinted annually and requirements are updated regularly. Your suggestions for improvement are welcome.

For comments along with a brief statement about yourself to National Merit Badge Commission, contact the National Merit Badge Commission, 2209 • Boy Scouts of America • 1325 Walnut Hill Lane • P.O. Box 152079 • Irving, TX 75015-2079 • merit_badge@Scouting.org.

WHO PAYS FOR THIS PAMPHLET?

This merit badge pamphlet is one in a series of more than 100 covering all kinds of hobby and career subjects. It is made available for you to buy as a service of the national and local councils, Boy Scouts of America. The costs of the development, writing, and editing of the merit badge pamphlets are paid for by the Boy Scouts of America in order to bring you the best book at a reasonable price.

BOY SCOUTS OF AMERICA
MERIT BADGE SERIES

METALWORK



"Enhancing our youths' competitive edge through merit badges"



BOY SCOUTS OF AMERICA

Note to the Counselor

The Metalwork merit badge offers Boy Scouts a fun way to learn about metalworking disciplines. The four options in this pamphlet were selected because they can be offered at any Boy Scout summer camp that schedules five two-hour sessions for this merit badge.

There is no need to make all four metalworking options available during a Scout's summer camp experience. If finding a counselor for each of the options proves to be too difficult, or if providing all of the tools and materials is too costly, select one option and do it well.

The projects in this pamphlet are offered as guidelines only. If you have favorite projects that can be readily completed by Scouts, feel free to use them. You are encouraged to help enter each Scout's experience by drawing upon your professional knowledge and experience, but remember that a merit badge counselor may neither add nor delete requirements, nor simplify or make requirements more difficult than stated.

Scouts working on this merit badge require direct adult supervision. A sheet metal burr can cause a cut, molten pewter and orange-hot steel can cause severe burns, and the sulfuric acid silversmiths use to pickle their silver can be dangerous to anyone if used improperly. Work in groups no larger than two to three Scouts per merit badge counselor.

Some of the tools described in this pamphlet are those collected by professional metalworkers throughout their years of experience. Many metalworking professionals continue to practice their trade with a minimal use of power tools. To earn this merit badge, Scouts need learn to use only a few basic tools that they should be able to borrow from a more experienced metalworker. If a Scout develops greater interest in the craft and desires to further the hobby outside the requirements of the Metalwork merit badge, he can begin to collect his own set of tools.

Requirements

1. Read the safety rules for metalwork. Discuss how to be safe while working with metal. Discuss with your counselor the additional safety rules that apply to the metalwork option you choose for requirement 5.
2. Define the terms native metal, malleable, metallurgy, alloy, nonferrous, and ferrous. Then do the following:
 - a. Name two nonferrous alloys used by pre-Iron Age metalworkers. Name the metals that are combined to form these alloys.
 - b. Name three ferrous alloys used by modern metalworkers.
 - c. Describe how to work-harden a metal.
 - d. Describe how to anneal a nonferrous and a ferrous metal.
3. Do the following:
 - a. Work-harden a piece of 26- or 28-gauge sheet brass or sheet copper. Put a 45-degree bend in the metal, then heavilypeen the area along the bend line to work-harden it. Note the amount of effort that is required to overcome the yield point in this unworked piece of metal.
 - b. Soften the work-hardened piece from requirement 3a by annealing it, and then try to remove the 45-degree bend. Note the amount of effort that is required to overcome the yield point.
 - c. Make a temper color index from a flat piece of steel. Using hand tools, make and temper a center punch of medium-carbon or high-carbon steel.

4. Find out about three career opportunities in metalworking. 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.
5. After completing the first four requirements, complete at least ONE of the options listed below.

a. Option 1—Sheet Metal Mechanic/Tinsmith

- 1) Name and describe the use of the basic sheet metalworking tools.
- 2) Create a sketch of two objects to make from sheet metal. Include each component's dimensions on your sketch, which need not be to scale.
- 3) Make two objects out of 24- or 26-gauge sheet metal. Use patterns either provided by your counselor or made by you and approved by your counselor. Construct these objects using a metal that is appropriate to the object's ultimate purpose, and using cutting, bending, edging, and either soldering or brazing.
 - a) One object also must include at least one riveted component.
 - b) If you do not make your objects from zinc-plated sheet steel or tin-plated sheet steel, preserve your work from oxidation.



b. Option 2—Silversmith

- 1) Name and describe the use of a silversmith's basic tools.
- 2) Create a sketch of two objects to make from sheet silver. Include each component's dimensions on your sketch, which need not be to scale.
- 3) Make two objects out of 18- or 20-gauge sheet copper. Use patterns either provided by your counselor or made by you and approved by your counselor. Both objects must include a soldered joint. If you have prior silversmithing experience, you may substitute sterling silver, nickel silver, or lead-free pewter.
 - a) At least one object must include a sawed component you have made yourself.
 - b) At least one object must include a sunken part you have made yourself.
 - c) Clean and polish your objects.



c. Option 3—Funder

- 1) Name and describe the use of the basic parts of a two-piece mold. Name at least three different types of molds.
- 2) Create a sketch of two objects to cast in metal. Include each component's dimensions on your sketch, which need not be to scale.
- 3) Make two molds, one using a pattern provided by your counselor and another one you have made yourself that has been approved by your counselor. Position the pouring gate and vents yourself. *Do not use copyrighted materials as patterns.*
 - a) Using lead-free pewter, make a casting using a mold provided by your counselor.
 - b) Using lead-free pewter, make a casting using the mold that you have made.