

MERIT BADGE SERIES



INVENTING



BOY SCOUTS OF AMERICA®

STEM-Based

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INVENTING



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The Inventing merit badge and pamphlet were made possible in part by the Lemelson-MIT Program.

"Enhancing our youths' competitive edge through merit badges"



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Note to the Counselor

While the scope of inventing projects is far too wide to cover here, there are some general guidelines and concerns that a merit badge counselor should keep in mind. Be mindful of managing risk and using good judgment when undertaking any invention project. Remember, an injury that doesn't happen needs no treatment; an emergency that doesn't occur requires no response.

See the *Composite Materials*, *Home Repairs*, *Woodwork*, *Emergency Preparedness*, and *First Aid* merit badge pamphlets for more information about safety, first aid, and managing risk.

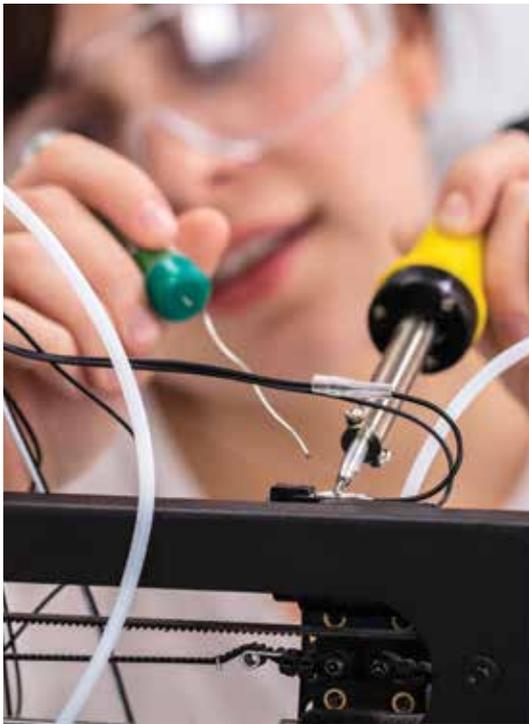
Safety is the top priority, so Scouts who are working on their inventions should follow safety precautions whenever using tools, equipment, and other materials. In a workshop setting, use the buddy system. Be sure Scouts know they should always work under the supervision of a responsible adult who is knowledgeable about the tools, equipment, and materials they plan to use.

Working on inventions can take place in home workshops, in school shops, or even in community shops. When working outside of the home, be sure to familiarize Scouts with the safety requirements of the shop. Some shops require a basic safety class or will have minimum age requirements to use equipment like a lathe or milling machine.

Here are some basic rules to follow:

- Use the proper personal protective equipment, including body, hand, ear (such as protective foam ear plugs), and eye-face protection (such as safety glasses with side shields), closed-toe shoes, and foot coverings.
- Use protective clothing whenever necessary to prevent exposure to hands, eyes, and face, and to keep hazardous materials from contaminating street clothes.

- Be trained on any equipment you plan to use *before* you get started.
- If fine particles in the air are anticipated—even in a well-ventilated area—be sure to have the proper respiratory equipment on hand for protection from dust, exhaust, and fumes.
- Never tolerate horseplay when using tools.
- Stay an arm’s length away from others using tools or equipment.
- Know where the “off” switch is before turning on a power tool.
- Clean up the area every time work is finished and return all tools to their proper location.
- Have a first-aid kit and fire extinguisher on hand.
- *Ask questions; never assume or guess!*



Wear close-fitting clothing. Loose or baggy clothing can easily get caught in machinery.

Requirements

Always check www.scouting.org for the latest requirements.

1. In your own words, define *inventing*. Then do the following:
 - a. Explain to your merit badge counselor the role of inventors and their inventions in the economic development of the United States.
 - b. List three inventions and state how they have helped humankind.
2. Do ONE of the following:
 - a. Identify and interview with a buddy (and with your parent's permission and merit badge counselor's approval) an individual in your community who has invented a useful item. Report what you learned to your counselor.
 - b. Read about three inventors. Select the one you find most interesting and tell your counselor what you learned.
3. Do EACH of the following:
 - a. Define the term *intellectual property*. Explain which government agencies oversee the protection of intellectual property, the types of intellectual property that can be protected, how such property is protected, and why protection is necessary.
 - b. Explain the components of a patent and the different types of patents available.
 - c. Examine your Scouting gear and find a patent number on a camping item you have used. With your parent's permission, use the internet to find out more about that patent. Compare the finished item with the claims and drawings in the patent. Report what you learned to your counselor.
 - d. Explain to your counselor the term *patent infringement*.
4. Discuss with your counselor the types of inventions that are appropriate to share with others, and explain why. Tell your counselor about one unpatented invention and its impact on society.

5. Choose a commercially available product that you have used on an overnight camping trip with your troop. Make recommendations for improving the product, and make a sketch that shows your recommendations. Discuss your recommendations with your counselor.
6. Think of an item you would like to invent that would solve a problem for your family, troop, chartered organization, community, or a special-interest group. Then do EACH of the following, while keeping a notebook to record your progress.
 - a. Talk to potential users of your invention and determine their needs. Then, based on what you have learned, write a statement describing the invention and how it would help solve a problem. This statement should include a detailed sketch of the invention.
 - b. Create a model of the invention using clay, cardboard, or any other readily available material. List the materials necessary to build a working prototype of the invention.
 - c. Share the idea and the model with your counselor and potential users of your invention. Record their feedback in your notebook.
7. Build a working prototype of the item you invented for requirement 6*. Test and evaluate the invention. Among the aspects to consider in your evaluation are cost, usefulness, marketability, appearance, and function. Describe how your original vision and expectations for your invention are similar or dissimilar to the prototype you built. Have your counselor evaluate and critique your prototype.

*Before you begin building the prototype, you must have your counselor's approval, based on the design and building plans you have already shared.
8. Do ONE of the following:
 - a. Participate with a club or team (robotics team, science club, or engineering club) that builds a useful item. Share your experience with your counselor.
 - b. Visit a museum or exhibit dedicated to an inventor or invention, and create a presentation of your visit to share with a group such as your troop or patrol.
9. Discuss with your counselor the diverse skills, education, training, and experience it takes to be an inventor. Discuss how you can prepare yourself to be creative and inventive to solve problems at home, in school, and in your community. Discuss three career fields that might utilize the skills of an inventor.

Inventing Resources

Scouting Literature

American Business, American Labor, Architecture and Landscape Architecture, Composite Materials, Digital Technology, Drafting, Electronics, Engineering, Entrepreneurship, Game Design, Home Repairs, Metalwork, Model Design and Building, Programming, Robotics, Textiles, and *Woodwork* 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

- Anderson, Maxine. *Amazing Leonardo da Vinci Inventions You Can Build Yourself*. Nomad Press, 2006.
- Boy Scouts of America. *Boy Scouts Handbook, The First Edition, 1911*, reprint. Dover Publications, 2005.
- Brown, David E. *Inventing Modern America: From the Microwave to the Mouse*. MIT Press, 2002.
- Brown, Travis. *Popular Patents America's First Inventions From the Airplane to the Zipper*. The Scarecrow Press, 2000.

- Carson, Mary Kay. *The Wright Brothers for Kids*. Chicago Review Press, 2003.
- Griffith, Saul, Nick Dragotta, and Joost Bonsen. *Howtoons: The Possibilities are Endless*. HarperCollins Publishers, 2007.
- Macaulay, David, and Neil Ardley. *The New Way Things Work*. Houghton Mifflin Company, 1998.
- Robinson, James. *Inventions*. Kingfisher, 2006.
- Sobel, Dava, and William J. H. Andrewes. *The Illustrated Longitude*. Walker and Company, 1998.
- Woodford, Chris, James Flint, Ben Morgan, Clint Witchalls, and Luke Collins. *Cool Stuff and How It Works*. DK Publishing Inc., 2005.

Periodicals

Make

makezine.com

Inventors Digest

www.inventorsdigest.com

Organizations and Websites

CreativeFuture

www.creativefuture.org

Design Squad

pbskids.org/designsquad

FreePatentsOnline

www.freepatentsonline.com

Howtoons

www.howtoons.com

This do-it-yourself comic website with tools of mass construction includes fun projects.

**Lemelson-MIT Program
Massachusetts Institute
of Technology**

lemelson.mit.edu/

The program recognizes outstanding inventors, encourages sustainable new solutions to real-world problems, and enables and inspires young people to pursue creative lives and careers through invention. The program is funded by the Lemelson Foundation and administered by the Massachusetts Institute of Technology.

OpenCourseWare

ocw.mit.edu/index.htm

A special section, “Highlights for High School,” features materials useful for students and their teachers.

SolidWorks®

www.solidworks.com

Free trial software is available.

U.S. Patent and Trademark Office

www.uspto.gov

Acknowledgments

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