



INVENTION JAMBOREE

Inventing Merit Badge Workbook



GREAT RIVERS COUNCIL
GreatRiversScouting.org

Scouts Name: _____

Unit: _____

Inventing means creating something new that helps solve a problem or makes life easier in some way. For the Inventing Merit Badge, inventing is about more than just coming up with a random idea—it involves careful thought, planning, and testing. An invention can be a new device, a tool, or even a new way of doing something. Inventing often starts with noticing a need or challenge and then coming up with a unique way to address it.

How to use this workbook in preparation for and during the Invention Jamboree

1. Every scout should be familiar with the workbook before the start of the Invention Jamboree.
2. This workbook provides many of the answers to the requirements for the Inventing Merit Badge, and space is provided for a scout to take notes while participating in the Invention Jamboree.
3. In order to complete the Merit Badge on the day of the Invention Jamboree there is one prerequisite: Requirement 3.c. (Highlighted in Red) needs to be completed before the event.
4. Requirements 1, 2, 3.a., 3.b., 3.d., 4, and 5 will be discussed during station rotations. Scouts should have read each requirement and have notes ready for the discussion.
5. Requirements 6 and 7 will be completed during the design and build rotations.
6. Requirement 8 is completed for anyone who attends and actively participates during the Invention Jamboree
7. Requirement 9 will be completed with the scout's Unit Leader at the conclusion of the Invention Jamboree.

1. In your own words, define inventing:

Notes for Class Discussion: _____

Inventors have played a big role in building the economy of the United States. By creating new products, tools, and technology, inventors have changed how people work, communicate, and live. For example, inventions like the light bulb, the telephone, and the automobile made life easier and created new industries and jobs. These inventions boosted the economy by making it possible to produce more goods and connect people across the country.

Scouts working on the Inventing Merit Badge learn that when an invention becomes popular, it can lead to new businesses and factories, which create jobs. This helps communities grow and gives people more opportunities to work and support their families. Inventions can also make work faster and easier, which helps companies produce goods more efficiently.

The Inventing Merit Badge teaches Scouts that inventors don't just help their own businesses; they can improve the economy for everyone. Today, inventions like smartphones and the internet continue to create jobs and connect people. By understanding the role of inventors, Scouts learn how creativity and problem-solving can shape the future and strengthen the country's economy. Take a look at 12 famous inventors who created life-changing inventions.

- **Electricity** – Electricity powers almost everything we use today, from lights to computers. It made homes, schools, and workplaces safer and more comfortable.
- **Telephone** – The telephone made it possible for people to talk to each other across long distances instantly. It helped families stay connected and made it easier to do business.
- **Automobile** – Cars changed how people traveled, allowing them to go farther and faster. This made it easier to get to work, school, and visit family and friends.

Scouts Name: _____

- **Airplane** – Airplanes made long-distance travel quicker and connected the world like never before. Air travel also helps deliver goods and aid to remote areas.
- **Internet** – The internet changed how people find information, communicate, and learn. It made it easier to share ideas and knowledge around the world.
- **Vaccines** – Vaccines help prevent diseases, saving millions of lives. They protect communities from illnesses like measles, polio, and the flu.
- **Refrigeration** – Refrigeration helps keep food fresh for longer, reducing food waste and making it safer to eat. It's especially helpful for safely storing perishable foods and medicines.
- **Printing Press** – The printing press allowed books and information to be shared widely. This made it easier for people to learn, read, and access knowledge.

1.a. Explain to your merit badge counselor the role of inventors and their inventions in the economic development of the United States.

Notes for Class Discussion: _____

1.b. List three inventions below and explain how they have helped humankind

Read and learn about a few Missouri inventors on the following pages.

Dr. George Washington Carver

George Washington Carver was an American agricultural scientist and inventor who promoted alternative crops to cotton and methods to prevent soil depletion. He was one of the most prominent black scientists of the early 20th century.



Born: July 12, 1864, Diamond, MO

Died: January 5, 1943 (age 78 years), Tuskegee, AL

Research Scientist Extraordinaire, Inventor, Man of Faith, Educator and Humanitarian

As a botany and agriculture teacher to the children of ex-slaves, Dr. George Washington Carver wanted to improve the lot of "the man farthest down," the poor, one-horse farmer at the mercy of the market and chained to land exhausted by cotton.

Unlike other agricultural researchers of his time, Dr. Carver saw the need to devise practical farming methods for this kind of farmer. He wanted to coax them away from cotton to such soil-enhancing, protein-rich crops as soybeans and peanuts and to teach them self-sufficiency and conservation.

Dr. Carver achieved this through an innovative series of free, simply-written brochures that included information on crops, cultivation techniques, and recipes for nutritious meals. He also urged the farmers to submit samples of their soil and water for analysis and taught them livestock care and food preservation techniques. In 1906, he designed the Jessup Wagon, a demonstration laboratory on wheels, which he believed to be his most significant contribution toward educating farmers.

Dr. Carver's practical and benevolent approach to science was based on a profound religious faith to which he attributed all his accomplishments. He always believed that faith and inquiry were not only compatible paths to knowledge, but that their interaction was essential if truth in all its manifold complexity was to be approximated.

Always modest about his success, he saw himself as a vehicle through which nature, God and the natural bounty of the land could be better understood and appreciated for the good of all people.

Dr. Carver took a holistic approach to knowledge, which embraced faith and inquiry in a unified quest for truth. Carver also believed that commitment to a Larger Reality is necessary if science and technology are to serve human needs rather than the egos of the powerful. His belief in service was a direct outgrowth and expression of his wedding of inquiry and commitment. One of his favorite sayings was:

"It is not the style of clothes one wears, neither the kind of automobile one drives, nor the amount of money one has in the bank, that counts. These mean nothing. It is simply service that measures success."

Dr. Edwin Hubble

Edwin Powell Hubble was an American astronomer. He played a crucial role in establishing the fields of extragalactic astronomy and observational cosmology. Hubble proved that many objects previously thought to be clouds of dust and gas and classified as "nebulae" were actually galaxies beyond the Milky Way.



Born: November 20, 1889, Marshfield, MO

Died: September 28, 1953 (age 63 years), San Marino, CA

The Makings of a Stellar Pioneer

Born on November 20, 1889 in Marshfield, Missouri, Hubble spent his youth honing athletic skills in basketball, football, baseball, track, and boxing, while mentally feeding his curiosity through science fiction novels. Hubble's innate fascination with the world around him foretold a lifetime of exploration. He entered the University of

Chicago in 1906 as an undergraduate, earning a bachelor's degree in mathematics and astronomy. He briefly deviated from his path of exploration, largely fueled by his father's expectations, to study law at Oxford University as a Rhodes Scholar. But his deep longing to pursue a career in the sciences outweighed his father's visions, and Hubble switched gears and obtained a Ph.D. in astronomy from the University of Chicago in 1914, setting his focus on the heavens.

Seeing the Cosmos Through a New Lens

Destined for the cosmos, Hubble's journey led him to Mount Wilson Observatory in California and the 100-inch Hooker Telescope, the world's largest at the time. Hubble used the 100-inch telescope to observe faint, fuzzy, cloud-like patches of light broadly labeled nebulae. His observations brought these fuzzy patches into focus, and in the process transformed the field of cosmology.

Up until the early 20th century, our perception of the cosmos fell within the bounds of the Milky Way. Although astronomers speculated about the existence of other galaxies in our universe, they had no observable evidence of them. It wasn't until Hubble pointed the Hooker Telescope at the constellation Andromeda that our perspective shifted.

Hubble studied what was then known as the Andromeda Nebula, an object that for centuries appeared as an elongated cloud of light. In 1923, he resolved individual stars in this "nebula."

Hubble's continued observations of Andromeda resulted in one of the most transformative discoveries in cosmology. He uncovered his first Cepheid variable star, a type of star used to measure distances in space by how it changes brightness. A Cepheid variable star's intrinsic brightness is directly related to its cycle from bright to dim and back to bright again. By charting the changes in these stars, Hubble discovered that Cepheid variable stars in Andromeda were much farther away than those in the Milky Way. This contrast in distance led Hubble to believe the Andromeda Nebula was a galaxy in its own right. Hubble used this technique to study other so called "nebulae" in the universe, and concluded that millions of galaxies existed beyond our own.

Hubble used his unique vantage point to compare galaxies with one another by studying their physical properties. Focusing on the visual appearances of galaxies, Hubble devised what is now the most influential system for classifying them: the Hubble Classification Scheme. This method of classifying galaxies arranges them in two main categories based on their shapes – elliptical or spiral – and is subdivided based on specific characteristics of each galaxy. Although simple in nature, this sequence helped lay the groundwork for understanding galactic evolution, and ultimately the formation of the universe.

By 1929, Hubble had completely reimagined our place in the universe; not only was it home to millions of other galaxies, but the universe itself was expanding as well. Contrary to the previously held view of a static universe, Hubble ultimately proved that galaxies are, in fact, moving away from us. By studying the light emitted from various galaxies, Hubble discovered that the light appeared displaced toward the red end of the spectrum. It became apparent that our universe was ceaselessly expanding outward, and all galaxies housed within it were moving away from one another. This phenomenon, known as redshift, reveals that the farther a galaxy is away from us, the redder its light will appear. Hubble also demonstrated that galaxies farther away from us are receding faster than those nearby – a fundamental observation now known as Hubble's Law. The idea of an expanding universe is a key underpinning of the Big Bang Theory. Hubble's observations provided the earliest insight into the origins of our universe.

From one man's glimpse into the heavens to humanity's universal quest to understand the unknown, Edwin Hubble's contributions to cosmology have pushed humanity to the ultimate edge of the cosmic frontier. Today, the Hubble Space Telescope carries his name and enduring legacy with pride, as it searches for the questions we have yet to ask and the answers still waiting discovery.

Soaring high above Earth, removed from the planet's atmosphere, the Hubble Space Telescope now serves as our window to the universe, upholding Edwin Hubble's vision to explore as far as our curiosity will take us. Through his words, Edwin Hubble captures the essence of exploration that lives on through this technological marvel: "The search will continue. Not until the empirical resources are exhausted, need we pass on to the dreamy realms of speculation."

James L. Fergason

James Lee Fergason was an American inventor and business entrepreneur. A member of the National Inventors Hall of Fame, Fergason is best known for his work on an improved Liquid Crystal Display, or LCD. He held over one hundred U.S. patents at the time of his death.



Born: January 12, 1934, Wakenda, MO

Died: December 9, 2008 (age 74 years)

Fergason was born in Wakenda, Mo. and attended the University of Missouri. After graduating with a B.S. in physics in 1956, he joined the Westinghouse Research Laboratories in Pennsylvania, where he formed and led the first industrial research group in liquid crystal research. His pioneering work earned him the first patent on the practical use of cholesteric liquid crystals, which he filed in 1958 and received in December 1963. The patent was for a color-sensitive material that was used for mood rings and similar products in the 1970s.

Fergason joined the Liquid Crystal Institute at Kent State University in Kent, Ohio in the late 1960s. As Associate Director, he discovered the twisted nematic field effect of liquid crystals, which forms the scientific basis of modern LCDs. In 1970, Fergason started his own company, International Liquid Crystal Company (Ilixco), to further study and commercialize LCDs. His first customer was the Gruen Watch Co. of Switzerland, which used the technology to market the first liquid crystal display (LCD) watches using the technology. Most of the world's digital watches now use this kind of LCD display.

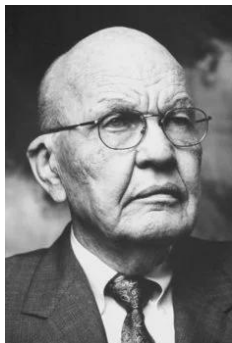
During the 1980s and 1990s, Fergason led self-funded research and technology incubation programs in which he and his teams focused on the challenges of liquid crystals and display technology. He founded Fergason Patent Properties LLC in 2001 to broadly license all of his intellectual property on a non-exclusive basis and to support licensees in integrating inventions into new and improved products that provide value to users.

Over the years, Fergason invented a number of other LCD applications such as surface mode LCDs, polymer dispersed liquid crystals (PDLC), head mounted displays (HMD), and eye protection technology.

Credited with more than 130 US and 500 foreign patents, Fergason was inducted into the National Inventors Hall of Fame in 1998. He was awarded OSA's David Richardson Medal in 2007 "for outstanding contributions to the understanding of the physics and optics of liquid crystals, and particularly for his pioneering contributions to liquid crystal display technology," and he was named an OSA Fellow in 2008. Fergason was the recipient of numerous other awards and honors, including the Ron Brown Technology Award from the U.S. Department of Commerce (1998), the Lemelson-MIT Prize (the "Oscar for Inventors") (2006) and the IEEE Jun-ichi Nishizawa Medal (2008). Through his professional organizations, he also mentored independent inventors. Serving on the U.S. Patent Office advisory board, he supported efforts to improve the quality of patents.

Jack St. Clair Kilby

Jack St. Clair Kilby was an American electrical engineer who took part, along with Robert Noyce of Fairchild Semiconductor, in the realization of the first integrated circuit while working at Texas Instruments in 1958. He was awarded the Nobel Prize in Physics on 10 December 2000.



Born: November 8, 1923, Jefferson City, MO

Died: June 20, 2005 (age 81 years), Dallas, TX

Jack Kilby was an American engineer and one of the inventors of the integrated circuit, a system of interconnected transistors on a single microchip. In 2000, Kilby was a co-recipient, with Herbert Kroemer and Zhores Alferov, of the Nobel Prize for Physics.

Kilby was the son of an electrical engineer and, like many inventors of his era, got his start in electronics with amateur radio. His interest began while he was in high school when the Kansas Power Company, had to rely on amateur radio operators for communications after an ice storm disrupted normal service. After serving as an electronics technician in the U.S. Army, Kilby enrolled in the electrical engineering program at the University of Illinois.

After graduation Kilby joined the Centralab Division of Globe Union, Inc., where he was placed in charge of designing and developing miniaturized electronic circuits. In 1952 Centralab sent Kilby to Bell Laboratories' headquarters, to learn about the transistor, which had been invented at Bell in 1947 and which Centralab had purchased a license to manufacture. Back at Centralab, Kilby began working on germanium-based transistors for use in hearing aids. He soon realized, however, that he needed the resources of a larger company to pursue the goal of miniaturizing circuits, and in 1958 he switched to another Bell licensee, Texas Instruments Incorporated.

Career at Texas Instruments

Shortly after his arrival at Texas Instruments (TI), Kilby had his epoch-making "monolithic idea." Kilby realized that, instead of connecting separate components, an entire electronic assembly could be made as one unit from one semiconducting material by overlaying it with various impurities to replicate individual electronic components, such as resistors, capacitors, and transistors. Soon Kilby had a working postage-stamp-size prototype manufactured from germanium, and in February 1959 TI filed a patent application for this "miniaturized electronic circuit"—the world's first integrated circuit. Four months later, Robert Noyce of Fairchild Semiconductor Corporation filed a patent application for essentially the same device, but based on a different manufacturing procedure. Ten years later, long after their respective companies had cross-licensed technologies, the courts gave Kilby credit for the idea of the integrated circuit but gave Noyce the patent for his planar manufacturing process, a method for evaporating lines of conductive metal (the "wires") directly onto a silicon chip.

Although the original integrated circuit (IC) was Kilby's most important invention, it was only one of more than 50 patents that he was awarded. Many of those patents concerned improvements in IC design and manufacturing, including those for the first IC-powered experimental computer that TI built for the U.S. Air Force in 1961 and for the ICs that TI designed and delivered to the Air Force in 1962 for use in the Minuteman ballistic missile guidance system. In 1965 Kilby invented the semiconductor-based thermal printer. In 1967 he designed the first IC-based electronic calculator, the Pocketronic, gaining himself and TI the basic patent that lies at the heart of all pocket calculators. The Pocketronic required dozens of ICs, making it too complicated and expensive to manufacture for consumers, but by 1972 TI had reduced the number of necessary ICs to one. The introduction in that year of the TI Datamath pocket calculator marked the beginning of the IC's integration into the very fabric of everyday life. By 1976 the pocket calculator had made the slide rule a museum piece.

2.b. Read about three inventors. Select the one you find most interesting and tell your counselor what you learned.

Notes for Class Discussion: _____

Intellectual property refers to creations of the mind, like inventions, designs, brand names, and original art or writing. These are valuable ideas that people create and often want to protect so that others can't use them without permission.

In the United States, two main government agencies oversee the protection of intellectual property. The **U.S. Patent and Trademark Office (USPTO)** handles patents and trademarks, while the **U.S. Copyright Office** oversees copyrights. Each type of intellectual property is protected differently:

- **Patents** – Patents protect new inventions or processes. Once patented, only the inventor can make, use, or sell the invention for a certain number of years. This prevents others from copying it without permission.
- **Trademarks** – Trademarks protect brand names, logos, and symbols that identify a business or product. Trademarks prevent others from using similar names or logos, which could confuse customers.

- **Copyrights** – Copyrights protect original works of authorship, like books, music, movies, and artwork. Copyright gives the creator the exclusive right to reproduce, distribute, and display the work.

Protecting intellectual property is important because it encourages people to create new ideas and inventions. Without protection, anyone could copy these ideas, making it harder for inventors and creators to benefit from their own work. The Inventing Merit Badge teaches Scouts the value of IP protection, which helps inventors and creators earn recognition and sometimes money for their ideas. This protection also helps promote new inventions, art, and discoveries that benefit society.

3.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.

Notes for Class Discussion: _____

Understanding Patents and Their Types

As part of the Inventing Merit Badge, Scouts learn about patents, which are legal documents that protect new inventions. A patent gives the inventor exclusive rights to make, use, or sell their invention for a certain number of years. This means others can't copy or profit from it without permission.

A patent has several key components:

- **Title** – The title is the name of the invention.
- **Abstract** – This is a short summary that explains what the invention is and what it does.
- **Background** – This part explains why the invention was created and what problems it solves.
- **Description** – The description gives a detailed explanation of how the invention works and what it includes.
- **Claims** – Claims define the specific features or parts of the invention that are protected by the patent. This is one of the most important parts because it outlines exactly what others can't copy.

There are three main types of patents available:

1. **Utility Patents** – These protect new inventions or new ways of doing something. Most inventions, like machines, electronics, or processes, fall under this category. Utility patents last 20 years from the date they are filed.
2. **Design Patents** – Design patents protect the unique appearance or design of an item, rather than its function. For example, a new style for a phone case could be covered by a design patent. These patents last 15 years from the date they are granted.
3. **Plant Patents** – These are for new types of plants that are created or discovered and can be reproduced. Plant patents last 20 years from the date they are filed.

Through the Inventing Merit Badge, Scouts learn that patents protect different kinds of inventions and encourage people to keep creating and improving new ideas. Understanding patents helps Scouts see how inventors can secure their work and contribute to new technologies and products.

Scouts Name: _____

3.b. Explain the components of a patent and the different types of patents available.

Notes for Class Discussion: _____

Investigating Patents on Your Scouting Gear

For the Inventing Merit Badge, Scouts are encouraged to explore the patents behind their camping gear. Many items used in Scouting have patents that protect unique features, designs, or functions. By looking up a patent number on a piece of gear, Scouts can learn more about how and why it was made. Here's a list of common gear with patents that Scouts might investigate:

- **Backpacks** – Patents often cover features like frame design, ventilation systems, or strap adjustments to improve comfort and support.
- **Tents** – Tent patents may protect features like waterproofing, pole structure, quick setup methods, or new fabric technology.
- **Sleeping Bags** – Some sleeping bags are patented for special insulation methods, zippers, or designs that retain heat more efficiently.
- **Flashlights and Headlamps** – Patents for lighting devices might cover the way they focus or adjust light, battery life improvements, or waterproofing.
- **Stoves and Cooking Equipment** – Patents on camping stoves and cookware might protect efficient heating systems, wind protection features, or compact designs.
- **Water Filters and Purifiers** – Water filters often have patents for unique filtering materials, methods, or systems that make water safe to drink in the wilderness.
- **Multi-tools or Pocket Knives** – These patents might protect a tool's folding design, locking mechanism, or arrangement of different functions.
- **Portable Camping Chairs** – Patents may cover folding methods, durable lightweight materials, or special comfort features.

To complete this requirement, Scouts can choose one of these items, find its patent number, and research it online with a parent or guardian's permission. By looking at the claims and drawings in the patent, they can compare the original design to the actual gear. This activity helps Scouts understand how inventions are protected and encourages them to appreciate the thought and work that goes into improving everyday camping items.

Prerequisite: **3.c. Examine your Scouting gear and find a patent number on a camping item you have used. With your parent or guardian'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.**

Notes for Class Discussion: _____

Scouts Name: _____

What is Patent Infringement?

As Scouts work on the Inventing Merit Badge, they learn about **patent infringement**, which is when someone uses, makes, sells, or imports an invention without the patent owner's permission. When an inventor receives a patent, they have exclusive rights to their invention for a set time, usually 20 years for utility patents. This means they get to decide how their invention is used or who can produce it.

If someone copies or uses the patented invention without permission, it is considered patent infringement, which is against the law. Patent infringement can harm inventors and companies because they lose potential earnings or control over their own ideas. This can make it less rewarding to invent and improve products if others can just copy the work without permission.

The Inventing Merit Badge helps Scouts understand that patent protection encourages inventors to create new products by giving them the chance to benefit from their ideas. If others could freely copy inventions, it would be harder for inventors to profit or be recognized for their original work. Learning about patent infringement teaches Scouts the importance of respecting others' intellectual property and encourages them to create original ideas of their own.

3.d. Explain to your counselor the term patent infringement.

Notes for Class Discussion: _____

Everyday Inventions That Were Shared Freely and Changed the World

For the Inventing Merit Badge, Scouts explore how some inventions are freely shared with everyone to make life better. These inventions have no patent or copyright, allowing people everywhere to use and improve upon them. Here are some examples of inventions that have had a big impact on society:

- **The Wheel** – The wheel transformed transportation, agriculture, and industry, making it easier to move people, goods, and machinery.
- **Nails** – Simple metal nails revolutionized construction, making it easier and faster to build sturdy structures.
- **The Lever** – This basic tool helped lift heavy objects, making tasks in construction and labor easier and safer.
- **The Pulley** – Pulleys allowed people to lift heavy loads with less effort, enabling the construction of large buildings and machinery.
- **Concrete** – Used in building structures, roads, and dams, concrete has been essential in creating strong, durable buildings and infrastructure.
- **Bricks** – Bricks have been used for centuries as a basic building material, making housing and other structures sturdy and fire-resistant.
- **The Compass** – By helping travelers and explorers navigate accurately, the compass made long-distance travel and trade possible.
- **The Umbrella** – Umbrellas provided simple weather protection, helping people stay dry in rain and shade from the sun.
- **Eyeglasses** – Simple lenses for vision correction have helped millions of people see clearly, improving quality of life and productivity.
- **Soap** – Soap has improved hygiene and health by reducing the spread of disease and encouraging cleanliness.
- **The Anvil** – The anvil made metalworking easier and was crucial in developing tools, weapons, and machinery.

Scouts Name: _____

- **The Fishing Hook** – An essential tool for catching food, the fishing hook has supported communities by making fishing more effective.

Each of these inventions is widely shared and has been used and adapted in many ways over time. Through the Inventing Merit Badge, Scouts learn how these inventions have shaped history and made life easier for people everywhere. These freely shared ideas encourage future inventors to think about how they, too, can create positive change.

4. Discuss with your counselor the types of inventions that are appropriate to share with others, and explain why. Tell your counselor about one nonpatented or noncopyrighted invention and its impact on society.

Notes for Class Discussion: _____

Improving Your Camping Gear: Choosing an Item to Redesign

For the Inventing Merit Badge, Scouts can practice thinking like inventors by picking a camping item they've used and suggesting ways to make it better. Many items used on camping trips have room for improvement, and Scouts can learn to look for ways to make gear more efficient, comfortable, or user-friendly. Here are some common items Scouts might consider improving:

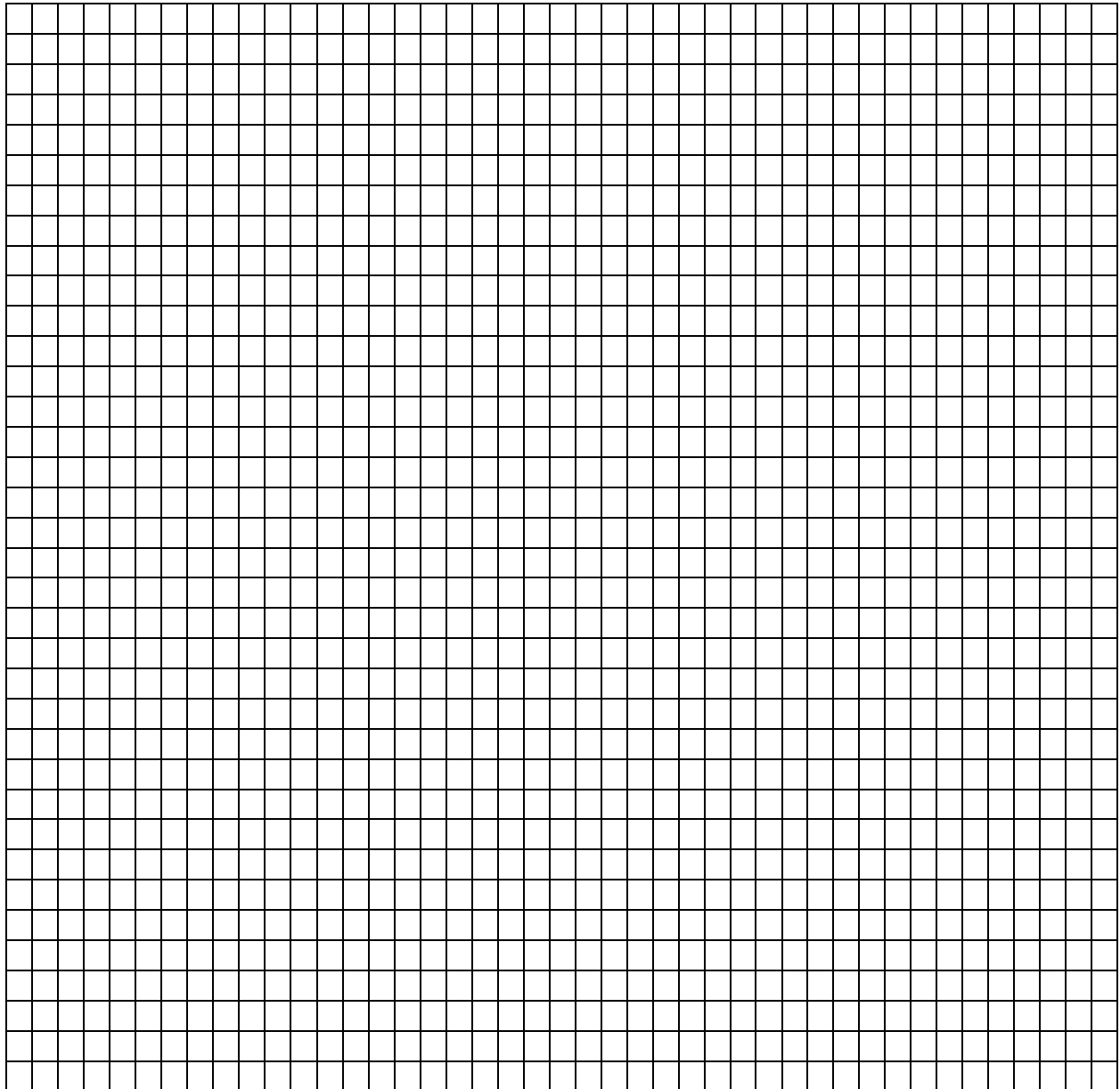
- **Backpack** – Could the straps or padding be more comfortable? Are there better ways to organize pockets or reduce weight?
- **Tent** – Is the setup process simple and quick? Could the tent's waterproofing or ventilation be improved?
- **Sleeping Bag** – Does the sleeping bag provide enough warmth? Could it be lighter, more compact, or easier to zip?
- **Camping Stove** – Is it easy to use and efficient with fuel? Can it handle wind well, and is it stable on rough ground?
- **Headlamp or Flashlight** – Is the brightness adjustable? Is the battery life long enough, and could the design be more comfortable or waterproof?
- **Water Bottle or Filter** – Does it keep water cool, filter efficiently, or fit well in a backpack pocket? Could it be made easier to clean?
- **Camp Chair** – Is it light and easy to carry? Could it be more comfortable or fold up more compactly?
- **Cookware** – Is it lightweight and easy to clean? Could it be better for cooking in wind or over a campfire?

To pick an item, Scouts should think back on their camping experiences and choose something they found challenging to use or wished worked better. They should ask themselves questions like, "Was it comfortable?" or "Was it easy to set up?" Focusing on one problem area will make it easier to think of solutions and improvements.

Once a Scout picks an item, they can brainstorm ways to improve it, then sketch a new design showing their ideas. They could discuss these ideas with their counselor, showing the sketch and explaining how the new design would work. This exercise helps Scouts develop problem-solving skills and encourages them to think like inventors.

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.

Notes for Class Discussion: _____



Scouts Name: _____

Designing an Invention: Steps to Solve a Problem for Your Community

For the Inventing Merit Badge, Scouts learn the steps to create an invention that could help their family, troop, or community. This process helps Scouts practice problem-solving, design, and communication skills. Here's a guide to the steps for coming up with an invention idea and sharing it:

Identify a Problem

Start by thinking of issues you see in your daily life or in your community. This could be something that would make camping easier for your troop, help organize a community event, or solve a common problem at home. It could even be something helpful for a special-interest group or club. Write down several ideas in your notebook, then choose one that stands out to you.

Talk to Potential Users

Once you have a problem in mind, talk to people who might use your invention. Ask them about their needs, what they would want in a solution, and any problems they face with current products. Write down their responses in your notebook, and look for common themes or ideas that could guide your invention.

Describe Your Invention Idea

Based on what you learned, write a clear statement in your notebook describing your invention. Explain what it is, how it would work, and how it would solve the problem you've identified. Include any special features you want to add to make it user-friendly or efficient. Also, make a sketch of your idea to show how it will look and function.

Build a Simple Model

To help others understand your idea, create a basic model using materials you have on hand, like cardboard, clay, or paper. This doesn't need to be a working version; it's just to show the design and how it might look or be used. Think about the parts your invention needs and how they fit together. List any specific materials that would be needed to build a working prototype, such as metal, wood, or electronics.

Share Your Idea and Get Feedback

Present your model and idea to your merit badge counselor and potential users. Explain how your invention would work and show them the model and sketch. Record their feedback in your notebook—what they liked, any improvements they suggest, or new ideas they have. This feedback can help you refine your invention and make it more useful.

Refine Your Invention

Review the feedback and make any changes to your invention design based on what you learned. This step teaches Scouts to be flexible and open to improving their ideas, which is an important skill for inventors.

This process helps Scouts develop creative thinking and learn how to turn ideas into real solutions. Working through each step for the Inventing Merit Badge is a great way to build skills that can help you tackle real-world problems.

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.

6.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.

6.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

6.c. Share the idea and the model with your counselor and potential users of your invention. Record their feedback in your notebook.

NOTES for Requirement 6

Scouts Name: _____

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.

Building and Testing Your Invention: Steps to Make a Prototype

Gather Materials

Scouts Name: _____

materials that fit your invention's purpose, durability needs, and budget. For a prototype, you can use affordable materials, but they should still allow you to test the invention properly.

Assemble Your Prototype

Build your prototype carefully, following your design. You may need to make small adjustments as you go along, especially if certain parts don't fit or function exactly as planned. Take notes about any changes you make to the original design so you can review these later.

Test Your Prototype

Try out your invention to see how well it works. Use it as you would expect real users to, and test it under different conditions to see if it performs consistently. Pay attention to the following aspects:

- **Function** – Does it work the way you intended?
- **Usefulness** – Does it solve the problem for your family, troop, or community?
- **Durability** – Does it hold up after repeated use?
- **Safety** – Is it safe for users, with no sharp edges or hazards?

Evaluate Key Aspects: After testing, evaluate your invention based on several important factors:

1.
 - **Cost** – Was the prototype affordable to build? Would the final version be cost-effective?
 - **Usefulness** – Does it solve the intended problem well? Could it be improved?
 - **Marketability** – Would people want to buy it? Is it something that has value to others?
 - **Appearance** – Does it look appealing and easy to use?
 - **Function** – Are there any parts that need adjustments to work better?

Compare to Your Original Vision

Think about how your prototype compares to your original idea. Did the invention turn out as you expected? Sometimes the final prototype may look or work a bit differently than planned. Write down any differences between your vision and the final prototype, and describe any improvements or surprises along the way.

Get Feedback from Your Counselor

Present your prototype to your counselor, explain its purpose, and describe how it works. Share what you learned from testing and any challenges you faced. Your counselor's feedback is a valuable part of the Inventing Merit Badge process, helping you see how your invention might be improved further.

Building a prototype for the Inventing Merit Badge helps Scouts develop skills in design, evaluation, and problem-solving. It teaches that inventing is a hands-on process that requires testing and adjusting, bringing an idea closer to becoming a useful, real-world product.

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.

NOTES for Requirement 7

Exploring Inventions: Joining a Club or Visiting a Museum

By attending the Invention Jamboree, actively participating, and staying engaged at each station Scouts receive the experience of being part of an invention club or team. Scouts can continue to learn from inventors and hands-on projects by either joining a club that builds useful items or visiting a museum dedicated to an invention. Here's a guide to help Scouts further their experiences from the Invention Jamboree.

Option 1: Participate with a Club or Team

Joining a club like a robotics team, science club, or engineering club gives Scouts a chance to build, test, and improve new ideas with others. Working with a team teaches problem-solving, teamwork, and engineering skills. Through the club, Scouts often work on projects like building robots, designing useful gadgets, or creating devices for competitions.

After participating with the club, Scouts share what they learned with their counselor. They can talk about the project they worked on, what their role was, and any challenges the team faced. They might also discuss how the club project inspired new ideas or changed their perspective on inventing.

Option 2: Visit a Museum or Exhibit Dedicated to an Inventor

Visiting a museum or exhibit focused on an inventor or invention is another way for Scouts to learn about the inventing process. Museums often have displays on famous inventors like Thomas Edison or Nikola Tesla, or they might show collections of inventions that changed daily life. Some technology or science museums have interactive exhibits where visitors can see how inventions work or even try out simple engineering activities.

After the visit, Scouts create a presentation about their experience to share with their troop or patrol. This presentation can include:

- A description of the inventor or invention they learned about
- Photos or drawings of the inventions they saw
- Interesting facts about how the invention was developed or its impact
- What inspired them about the visit and how it connects to their Inventing Merit Badge work

By completing one of these options, Scouts gain a deeper understanding of inventing and learn valuable skills or insights. Both choices help Scouts see how inventions come to life, and how creativity and hard work can turn ideas into useful tools for society.

8.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.

Preparing to Be an Inventor: Skills, Education, and Career Paths

For the Inventing Merit Badge, Scouts learn about the skills and training needed to become an inventor. Inventors need a mix of skills, from technical knowledge to creativity, and they often have training in areas like science, engineering, or business. Here's an overview of the skills and careers that can support an inventive path.

Skills and Training for Inventors

Inventors usually need a wide range of skills to develop, test, and share their ideas. Key skills include:

- **Creativity and Problem-Solving** – Finding new solutions to everyday problems.
- **Technical Knowledge** – Understanding math, science, and engineering concepts.
- **Communication** – Explaining ideas clearly to others, both verbally and in writing.
- **Persistence** – Working through failures and improving ideas until they work.
- **Teamwork** – Working with others, especially when ideas are complex.

Inventors often pursue education and training in fields like engineering, science, technology, or business to gain the knowledge they need to make their ideas a reality. Many inventors gain experience by working in industries like manufacturing, product design, or software development.

Preparing to Be Creative and Inventive

To become more inventive, Scouts can practice skills that help them solve problems creatively at home, in school, or in their community. Here are some ways to prepare:

- **Try New Hobbies** – Activities like building models, coding, or crafting can improve hands-on skills and encourage creativity.
- **Stay Curious** – Ask questions about how things work and explore different solutions to everyday problems.
- **Practice Brainstorming** – Write down ideas, no matter how simple or wild they seem, to get comfortable thinking creatively.
- **Learn from Challenges** – Use mistakes or setbacks as a chance to improve, which builds perseverance.

Career Fields That Use Inventor Skills

Many career paths involve inventing and creating new solutions. Here are three fields where invention skills are valuable:

- **Engineering** – Engineers design, test, and improve products and systems in areas like civil, mechanical, and electrical engineering.
- **Product Design** – Product designers create new items for consumer use, such as electronics, tools, and home goods.
- **Research and Development (R&D)** – R&D professionals work in industries like pharmaceuticals, manufacturing, or technology, developing and testing new products.

Careers for Inventive Scouts to Consider

Here are some careers that require creativity, problem-solving, and technical skills:

- **Mechanical Engineer** – Designs and tests machines and devices, like engines, tools, and factory equipment.
- **Electrical Engineer** – Develops electrical systems and devices, such as power systems or electronic gadgets.

- These careers each offer opportunities to invent, improve, and create new solutions, helping Scouts understand the many ways they can apply invention skills in the real world.

NOTES for Requirement 9

[illegible]

Invention Jamboree Rotation:

- Each Path will consist of 4 Stations: Let's Invent, I-LAB, Design, and Build.
- Scouts will rotate through each station where they will do hands on learning while discussing the Merit Badge Requirements.

Inventing Merit Badge 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 or guardian'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 or guardian'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 nonpatented or noncopyrighted 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.

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.