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Boy Scout Merit Badge Requirements

American Heritage

1. Read the Declaration of Independence. Pay close attention to the section that begins with "We hold these truths to be self-evident" and ends with "to provide new Guards for future security." Rewrite that section in your own words, making it as easy to understand as possible. Then share your writing with your merit badge counselor and discuss the importance of the Declaration of Independence.
2. Do TWO of the following:
 - a. Select two individuals from American history, one a political leader (a president, senator, etc.) and the other a private citizen (a writer, religious leader, etc.). Find out about each person's accomplishments and compare the contributions each has made to America's heritage.
 - b. With your counselor's approval, choose an organization that has promoted some type of positive change in American society. Find out why the organization believed this change was necessary and how it helped to accomplish the change. Discuss how this organization is related to events or situations from America's past.
 - c. With your counselor's approval, interview two veterans of the U.S. military. Find out what their experiences were like. Ask the veterans what they believe they accomplished.
 - d. With your counselor's approval, interview three people in your community of different ages and occupations. Ask these people what America means to them, what they think is special about this country, and what American traditions they feel are important to preserve.
3. Do the following:
 - a. Select a topic that is currently in the news. Describe to your counselor what is happening. Explain how today's events are related to or affected by the events and values of America's past.
 - b. For each of the following, describe its adoption, tell about any changes since its adoption, and explain how each one continues to influence Americans today: the flag, the Pledge of Allegiance, the seal, the motto, and the national anthem.
 - c. Research your family's history. Find out how various events and situations in American history affected your family. Share what you find with your counselor. Tell why your family came to America.
4. Do TWO of the following:
 - a. Explain what is meant by the National Register of Historic Places. Describe how a property becomes eligible for listing. Make a map of your local area, marking the points of historical interest. Tell about any National Register properties in your area. Share the map with your counselor, and describe the historical points you have indicated.

- b. Research an event of historical importance that took place in or near your area. If possible, visit the place. Tell your counselor about the event and how it affected local history. Describe how the area looked then and what it now looks like.
- c. Find out when, why, and how your town or neighborhood started, and what ethnic, national, or racial groups played a part. Find out how the area has changed over the past 50 years and try to explain why.
- d. Take an active part in a program about an event or person in American history. Report to your counselor about the program, the part you took, and the subject.
- e. Visit a historic trail or walk in your area. After your visit, share with your counselor what you have learned. Discuss the importance of this location and explain why you think it might qualify for National Register listing.

5. Do ONE of the following:

- a. Watch two motion pictures (with the approval and permission of your counselor and parent) that are set in some period of American history. Describe to your counselor how accurate each film is with regard to the historical events depicted and also with regard to the way the characters are portrayed.
- b. Read a biography (with your counselor's approval) of someone who has made a contribution to America's heritage. Tell some things you admire about this individual and some things you do not admire. Explain why you think this person has made a positive or a negative contribution to America's heritage.
- c. Listen to recordings of popular songs from various periods of American history. Share five of these songs with your counselor, and describe how each song reflects the way people felt about the period in which it was popular. If a recording is not available, have a copy of the lyrics available.

6. Discuss with your counselor the career opportunities in American heritage. Pick one that interests you and explain how to prepare for this career. Discuss what education and training are required for this career.

Auto Maintenance

NOTE: You will need access to a car or truck and its owner's manual to meet some of the requirements for this merit badge.

1. Discuss with your counselor the safety equipment, tools, and clothing used while checking or repairing a motor vehicle. Use this equipment, tools, and/or clothing (when needed or called for) in meeting the requirements for this merit badge.
2. **General Maintenance, Safety, and Registration** Do the following:
 - a. Review the maintenance chart in the owner's manual. Explain the requirements and time limits.
 - b. Demonstrate how to check the following:
 1. Brake Fluid
 2. Engine Oil
 3. Coolant
 4. Power steering fluid
 5. Windshield washer fluid
 6. Transmission fluid
 7. Battery fluid (if possible) and condition of the battery terminals
 - c. Locate the fuse boxes; determine the size of fuses. Demonstrate the proper replacement of burned-out fuses.
 - d. Demonstrate how to check the condition and tension of belts and hoses.
 - e. Check the lighting in the vehicle, including instrument, warning, and exterior bulbs.
 - f. Locate and check the air filter.
 - g. Explain the purpose, importance, and limitations of safety belts and passive restraints.
 - h. Find out the requirements for the state inspection in your state, including how often a vehicle needs to be inspected.
 - i. Explain the importance of registering a vehicle and find out the annual registration fee for renewing your family car's registration.
3. **Dashboard.** Do the following:
 - a. Explain the function of the fuel gauge, speedometer, tachometer, oil pressure, and engine temperature gauge. Point out each one on the instrument cluster.
 - b. Explain the symbols that light up on the dashboard and the difference between the yellow and red symbols. Explain each of the indicators on the dashboard, using the owner's manual, if necessary.
4. **Tires.** Do the following:
 - a. Explain the difference between tire manufacturer's and vehicle manufacturer's specifications and show where to find them.

- b. Demonstrate how to check pressure and properly inflate a tire. Check the spare tire and make sure it is ready for use.
 - c. Explain why wheel alignment is important to the life of a tire. Explain camber, caster, and toe-in adjustments on wheel alignment.
 - d. Explain the purpose of the lateral-wear bar indicator.
 - e. Explain how to dispose of old tires in accordance with local laws and regulations.
5. **Engine.** Do the following:
 - a. Explain how an internal combustion engine operates. Tell the differences between gasoline and diesel engines. Explain how a gasoline-electric hybrid vehicle is powered.
 - b. Explain the purpose of engine oil. Explain the API service code, the SAE number, and the viscosity rating.
 - c. Explain where to find the recommended oil type and the amount of oil to be used in the vehicle's engine.
6. **Cooling system.** Do the following:
 - a. Explain the need for coolant in the cooling system.
 - b. Explain how to flush and change the engine coolant in the vehicle, and how to properly dispose of the used coolant.
7. **Fuel system.** Do the following:
 - a. Explain how the air and fuel systems work together and why it is necessary to have an air filter and fuel filter.
 - b. Explain how a how a fuel injection system works and how an on-board computer works with the fuel injection system.
8. **Ignition and electrical systems.** Do the following:
 - a. Diagram and explain the parts of the electrical system.
 - b. Explain the cylinder engine sequence.
 - c. Explain the purpose of the spark gap.
 - d. Demonstrate how to change the spark plugs in any internal combustion engine (lawn mower, dirt bike, motorcycle).
 - e. Demonstrate how to safely connect jumper cables to your car battery.
9. **Drive Train.** Do the following:
 - a. Diagram the drive train and explain the different parts.
 - b. Explain the difference between automatic and standard transmissions.
 - c. Explain the types of automatic transmission fluid.
 - d. Explain the types of lubricants used in a standard transmission and in the differential.

e. Explain the difference between front-wheel, rear-wheel, and four-wheel drive.

10. Brake System. Do the following:

- a. Explain the brake system (including anti-lock systems) and how it operates.
- b. Explain the differences between disc and drum systems.
- c. Demonstrate how to check the condition of a vehicle's brake system. After checking make recommendations for repairs (if necessary).

11. Do two of the following:

- a. Determine the value of three different vehicles you are interested in purchasing. One must be new and one must be used; the third vehicle can be new or used. For each vehicle, find out the requirements and cost of automobile insurance to include basic liability and options for collision, comprehensive, towing, and rental car. Using the three vehicles you chose and with your merit badge counselor's assistance, complete the operation/maintenance chart provided in the merit badge pamphlet. Use this information to determine the operating cost per mile for each vehicle, and discuss what you learn with your counselor.
- b. Choose a car cleaner and wax product for a vehicle you want to clean. Explain clear-coat paint and the precautions necessary for care. Clean the vehicle, both inside and out, and wax the exterior. Use a vinyl and rubber protectant (on vinyl tops, rubber door seals, sidewalls, etc.) and explain the importance of the protectant.
- c. Locate the manufacturer's jack. Use the jack to demonstrate how to engage the jack correctly on the vehicle, then change a tire correctly.
- d. Perform an oil filter and oil change on a vehicle. Explain how to properly dispose of the used oil and filter.

12. Find out about three career opportunities in the automotive industry. Pick one and find out about the education, training, and experience required for this profession. Discuss this with your counselor, and explain why this profession might interest you.

Chemistry

1. Do EACH of the following activities:
 - a. Describe three examples of safety equipment used in a chemistry laboratory and the reason each one is used.
 - b. Describe what a material safety data sheet (MSDS) is and tell why it is used.
 - c. Obtain an MSDS for both a paint and an insecticide. Compare and discuss the toxicity, disposal, and safe-handling sections for these two common household products.
 - d. Discuss the safe storage of chemicals. How does the safe storage of chemicals apply to your home, your school, your community, and the environment?
2. Do EACH of the following activities:
 - a. Predict what would happen if you placed an iron nail in a copper sulfate solution. Then, put an iron nail in a copper sulfate solution. Describe your observations and make a conclusion based on your observations. Compare your prediction and original conclusion with what actually happened. Write the formula for the reaction that you described.
 - b. Describe how you would separate sand from water, table salt from water, oil from water, and gasoline from motor oil. Name the practical processes that require these kinds of separations.
 - c. Describe the difference between a chemical reaction and a physical change.
3. Construct a Cartesian diver. Describe its function in terms of how gases in general behave under different pressures and different temperatures. Describe how the behavior of gases affects a backpacker at high altitudes and a scuba diver underwater.
4. Do EACH of the following activities:
 - a. Cut a round onion into small chunks. Separate the onion chunks into three equal portions. Leave the first portion raw. Cook the second portion of onion chunks until the pieces are translucent. Cook the third portion until the onions are caramelized, or brown in color. Taste each type of onion. Describe the taste of raw onion versus partially cooked onion versus caramelized onion. Explain what happens to molecules in the onion during the cooking process.
 - b. Describe the chemical similarities and differences between toothpaste and an abrasive household cleanser. Explain how the end use or purpose of a product affects its chemical formulation.
 - c. In a clear container, mix a half-cup of water with a tablespoon of oil. Explain why the oil and water do not mix. Find a substance that will help the two combine, and add it to the mixture. Describe what happened, and explain how that substance worked to combine the oil and water.

5. List the four classical divisions of chemistry. Briefly describe each one, and tell how it applies to your everyday life.
6. Do EACH of the following activities:
- Name two government agencies that are responsible for tracking the use of chemicals for commercial or industrial use. Pick one agency and briefly describe its responsibilities to the public and the environment.
 - Define pollution. Explain the chemical effects of ozone, global warming, and acid rain. Pick a current environmental problem as an example. Briefly describe what people are doing to resolve this hazard and to increase understanding of the problem.
 - Using reasons from chemistry, describe the effect on the environment of ONE of the following:
 - The production of aluminum cans or plastic milk cartons
 - Sulfur from burning coal
 - Used motor oil
 - Newspaper
 - Briefly describe the purpose of phosphates in fertilizer and in laundry detergent. Explain how the use of phosphates in fertilizers affects the environment. Also, explain why phosphates have been removed from laundry detergents.
7. Do ONE of the following activities:
- Visit a laboratory and talk to a practicing chemist. Ask what the chemist does, and what training and education are needed to work as a chemist.
 - Using resources found at the library and in periodicals, books, and the Internet (with your parent's permission), learn about two different kinds of work done by chemists, chemical engineers, chemical technicians, or industrial chemists. For each of the four jobs, find out the education and training requirements.
 - Visit an industrial plant that makes chemical products or uses chemical processes and describe the processes used. What, if any, pollutants are produced and how they are handled.
 - Visit a county farm agency or similar governmental agency and learn how chemistry is used to meet the needs of agriculture in your county.

Chess

1. Discuss with your merit badge counselor the history of the game of chess. Explain why it is considered a game of planning and strategy.
2. Discuss with your merit badge counselor the following:
 - a. The benefits of playing chess, including developing critical thinking skills, concentration skills, and decision-making skills, and how these skills can help you other areas of your life.
 - b. Sportsmanship and chess etiquette.
3. Demonstrate to your counselor that you know each of the following. Then using Scouting Teaching EDGE, teach the following to a Scout who does not know how to play chess:
 - a. The name of each chess piece
 - b. How to set up a chess board
 - c. How each chess piece moves, including castling and en passant captures
4. Do the following:
 - a. Demonstrate scorekeeping using the algebraic system of chess notation.
 - b. Discuss the differences between the opening, the middle game, and the endgame.
 - c. Explain four opening principles.
 - d. Explain the four rules for castling.
 - e. On a chessboard, demonstrate a “scholar’s mate” and a “fool’s mate.”
 - f. Demonstrate on a chessboard four ways a chess game can end in a draw.
5. Do the following:
 - a. Explain four of the following elements of chess strategy: exploiting weaknesses, force, king safety, pawn structure, space, tempo, time.
 - b. Explain any five of these chess tactics: clearance sacrifice, decoy, discovered attack, double attack, fork, interposing, overloading, overprotecting, pin, remove the defender, skewer, zwischenzug.
 - c. Set up a chessboard with the white king on e1, the white rooks on a1 and h1, and the black king on e8. With White to move first, demonstrate how to force checkmate on the black king.
 - d. Set up and solve five direct-mate problems provided by your merit badge counselor.
6. Do ONE of the following:
 - a. Play at least three games of chess with other Scouts and/or your merit badge counselor. Replay the games from your score sheets and discuss with your counselor how you might have played each game differently.

- b. Play in a scholastic (youth) chess tournament and use your score sheets from that tournament to replay your games with your merit badge counselor. Discuss with your counselor how you might have played each game differently.
- c. Organize and run a chess tournament with at least four players, plus you. Have each competitor play at least two games.

Cinematography

1. Do the following:

- a. Explain and demonstrate the proper elements of a good motion picture. In your discussion, include visual storytelling, rhythm, the 180-degree axis rule, camera movement, framing and composition of camera shots, and lens selection.
- b. Discuss the Cinematographer's role in the movie-making process.

2. Do the following:

- a. In a three or four-paragraph treatment, tell the story you plan to film, making sure that the treatment conveys a visual picture.
- b. Prepare a storyboard for your motion picture (This can be done with rough sketches and stick figures).
- c. Demonstrate the following motion picture shooting techniques.
 1. Using a tripod
 2. Panning a camera
 3. Framing a shot
 4. Selecting an angle
 5. Selecting proper lighting
 6. Hand-held shooting
- d. Using motion picture techniques, plan ONE of the following programs. Start with a treatment, and complete the requirement by presenting this program to a pack or your troop, patrol or class.
 1. Film or videotape a court of honor and show it to an audience.
 2. Create a short feature of your own design using the techniques you learned.
 3. Shoot a vignette that could be used to train a new Scout in a Scouting skill.

3. Do ONE of the following:

- a. With your parent's permission and your counselor's approval, visit a film set or a television production studio and watch how production work is done.
- b. Explain to your counselor the elements of the zoom lens and three important parts.

4. Find out about three career opportunities in cinematography. Pick one and find out about the education, training, and experience required for this profession. Discuss this with your counselor. Explain why this profession might interest you.

Citizenship in the Community

1. Discuss with your counselor what citizenship in the community means and what it takes to be a good citizen in your community. Discuss the rights, duties, and obligations of citizenship, and explain how you can demonstrate good citizenship in your community, Scouting unit, place of worship or school.
2. Do the following:
 - a. On a map of your community, locate and point out the following:
 1. Chief government buildings such as your city hall, county courthouse, and public works/services facility
 2. Fire station, police station, and hospital nearest your home
 3. Historical or other interesting points
 - b. Chart the organization of your local or state government. Show the top offices and tell whether they are elected or appointed.
3. Do the following:
 - a. Attend a city or town council or school board meeting, or a municipal; county, or state court session.
 - b. Choose one of the issues discussed at the meeting where a difference of opinions was expressed, and explain to your counselor why you agree with one opinion more than you do another one.
4. Choose an issue that is important to the citizens of your community; then do the following:
 - a. Find out which branch of local government is responsible for this issue.
 - b. With your counselor's and a parent's approval, interview one person from the branch of government you identified in requirement 4a. Ask what is being done about this issue and how young people can help.
 - c. Share what you have learned with your counselor.
5. With the approval of your counselor and a parent, watch a movie that shows how the actions of one individual or group of individuals can have a positive effect on a community. Discuss with your counselor what you learned from the movie about what it means to be a valuable and concerned member of the community.
6. List some of the services (such as the library, recreation center, public transportation, and public safety) your community provides that are funded by taxpayers. Tell your counselor why these services are important to your community.

7. Do the following:

- a. Choose a charitable organization outside of Scouting that interests you and brings people in your community together to work for the good of your community.
- b. Using a variety of resources (including newspapers, fliers and other literature, the Internet, volunteers, and employees of the organization), find out more about this organization.
- c. With your counselor's and your parent's approval, contact the organization and find out what young people can do to help. While working on this merit badge, volunteer at least eight hours of your time for the organization. After your volunteer experience is over, discuss what you have learned with your counselor.

8. Develop a public presentation (such as a video, slide show, speech, digital presentation, or photo exhibit) about important and unique aspects of your community. Include information about the history, cultures, and ethnic groups of your community; its best features and popular places where people gather; and the challenges it faces. Stage your presentation in front of your merit badge counselor or a group, such as your patrol or a class at school.

Citizenship in the Nation

1. Explain what citizenship in the nation means and what it takes to be a good citizen of this country. Discuss the rights, duties, and obligations of a responsible and active American citizen.
2. Do TWO of the following:
 - a. Visit a place that is listed as a National Historic Landmark or that is on the National Register of Historic Places. Tell your counselor what you learned about the landmark or site and what you found interesting about it.
 - b. Tour your state capitol building or the U.S. Capitol. Tell your counselor what you learned about the capitol, its function, and the history.
 - c. Tour a federal facility. Explain to your counselor what you saw there and what you learned about its function in the local community and how it serves this nation.
 - d. Choose a national monument that interests you. Using books, brochures, the Internet (with your parent's permission), and other resources, find out more about the monument. Tell your counselor what you learned, and explain why the monument is important to this country's citizens.
3. Watch the national evening news five days in a row OR read the front page of a major daily newspaper five days in a row. Discuss the national issues you learned about with your counselor. Choose one of the issues and explain how it affects you and your family.
4. Discuss each of the following documents with your counselor. Tell your counselor how you feel life in the United States might be different without each one.
 - a. Declaration of Independence
 - b. Preamble to the Constitution
 - c. The Constitution
 - d. Bill of Rights
 - e. Amendments to the Constitution
5. List the six functions of government as noted in the preamble to the Constitution. Discuss with your counselor how these functions affect your family and local community.
6. With your counselor's approval, choose a speech of national historical importance. Find out about the author, and tell your counselor about the person who gave the speech. Explain the importance of the speech at the time it was given, and tell how it applies to American citizens today. Choose a sentence or two from the speech that has significant meaning to you, and tell your counselor why.

7. Name the three branches of our federal government and explain to your counselor their functions. Explain how citizens are involved in each branch. For each branch of government, explain the importance of the system of checks and balances.
8. Name your two senators and the member of Congress from your congressional district. Write a letter about a national issue and send it to one of these elected officials, sharing your view with him or her. Show your letter and any response you receive to your counselor.

Citizenship in the World

1. Explain what citizenship in the world means to you and what you think it takes to be a good world citizen.
2. Explain how one becomes a citizen in the United States, and explain the rights, duties, and obligations of U.S. citizenship. Discuss the similarities and differences between the rights, duties, and obligations of U.S. citizens and the citizens of two other countries.
3. Do the following:
 - a. Pick a current world event. In relation to this current event, discuss with your counselor how a country's national interest and its relationship with other countries might affect areas such as its security, its economy, its values, and the health of its citizens.
 - b. Select a foreign country and discuss with your counselor how its geography, natural resources, and climate influence its economy and its global partnerships with other countries.
4. Do TWO of the following:
 - a. Explain international law and how it differs from national law. Explain the role of international law and how international law can be used as a tool for conflict resolution.
 - b. Using resources such as major daily newspapers, the Internet (with your parent's permission), and news magazines, observe a current issue that involves international trade, foreign exchange, balance of payments, tariffs, and free trade. Explain what you have learned. Include in your discussion an explanation of why countries must cooperate in order for world trade and global competition to thrive.
 - c. Select TWO of the following organizations and describe their role in the world.
 1. The United Nations
 2. The World Court
 3. World Organization of the Scout Movement
 4. The World Health Organization
 5. Amnesty International
 6. The International Committee of the Red Cross
 7. CARE
5. Do the following:
 - a. Discuss the differences between constitutional and nonconstitutional governments.
 - b. Name at least five different types of governments currently in power in the world.
 - c. Show on a world map countries that use each of these five different forms of government.

6. Do the following:

- a. Explain how a government is represented abroad and how the United States government is accredited to international organizations.
- b. Describe the roles of the following in the conduct of foreign relations.
 1. Ambassador
 2. Consul
 3. Bureau of International Information Programs
 4. Agency for International Development
 5. United States and Foreign Commercial Service
- c. Explain the purpose of a passport and visa for international travel.

7. Do TWO of the following and share with your counselor what you have learned:

- a. Visit the Web site (With your parent/guardian's permission) of the U.S. State Department. Learn more about an issue you find interesting that is discussed on this Web site.
- b. Visit the Web site (With your parent/guardian's permission) of an international news organization or foreign government, OR examine a foreign newspaper available at your local library, bookstore, or newsstand. Find a news story about a human right realized in the United States that is not recognized in another country.
- c. Visit with a student or Scout from another country and discuss the typical values, holidays, ethnic foods, and traditions practiced or enjoyed there.
- d. Attend a world Scout jamboree.
- e. Participate in or attend an international event in your area, such as an ethnic festival, concert, or play.

Coin Collecting

Plan on bringing your collection to Merit Badge College.

1. Understand how coins are made, and where the active U.S. Mint facilities are located.
2. Explain these collecting terms:
 - a. Obverse
 - b. Reverse
 - c. Reeding
 - d. Clad
 - e. Type set
 - f. Date set
3. Explain the grading terms Uncirculated, Extremely Fine, Very Fine, Fine, Very Good, Good, and Poor. Show five different grade examples of the same coin type. Explain the term proof and why it is not a grade. Tell what encapsulated coins are.
4. Know three different ways to store a collection, and describe the benefits, drawbacks, and expenses of each method. Pick one to use when completing requirements.
5. Do the following:
 - a. Demonstrate to your counselor that you know how to use two U.S. or world coin reference catalogs.
 - b. Read a numismatic magazine or newspaper and tell your counselor about what you learned.
6. Describe the 1999-2008 50 State Quarters Program. Collect and show your counselor five different quarters you have acquired from circulation.
7. Collect from circulation a set of currently circulating U.S. coins. Include one coin of each denomination (cent, nickel, dime, quarter, half-dollar, dollar). For each coin, locate the mint marks, if any, and the designer's initials, if any.
8. Do the following:
 - a. Identify the people depicted on the following denominations of current U.S. paper money: \$1, \$2, \$5, \$10, \$20, \$50, and \$100.
 - b. Explain "legal tender."
 - c. Describe the role the Federal Reserve System plays in the distribution of currency.
9. Do ONE of the following:
 - a. Collect and identify 50 foreign coins from at least 10 different countries.

- b. Collect and identify 20 bank notes from at least five different countries.
- c. Collect and identify 15 different tokens or medals.
- d. For each year since the year of your birth, collect a date set of a single type of coin.

10. Do ONE of the following:

- a. Tour a U.S. Mint facility, the Bureau of Engraving and Printing, or a Federal Reserve bank, and describe what you learned to your counselor.
- b. With your parent's permission, attend a coin show or coin club meeting, or view the Web site of the U.S. Mint or a coin dealer, and report what you learned.
- c. Give a talk about coin collecting to your troop or class at school.
- d. Do drawings of five Colonial-era U.S. coins.

Collections

1. Prepare a short written report or outline for your counselor, giving a detailed description of your collection,* including a short history. Be sure to include why you chose that particular type of collecting and what you enjoy and have learned from your collection.
2. Explain the growth and development of your collection.
3. Demonstrate your knowledge of preserving and displaying your collection.
 - a. Explain the precautions that you need to take to preserve your collection, including
 1. Handling
 2. Cleaning
 3. Storage
 - b. Explain how best to display your collection, keeping in mind preserving as discussed above.
 - c. Explain to your counselor the events available for a hobbyist of this collection, including shows, seminars, conventions, contests, and museum programs or exhibits.
4. Demonstrate your knowledge of collecting and investing. Discuss with your counselor:
 - a. How investing and speculation would apply to your collection
 - b. What you would look for in purchasing other collections similar to yours
 - c. What you would expect in return value in the event you decided to sell all or part of the collection.
5. Do the following:
 - a. Discuss with your counselor at least 10 terms commonly used in your collection and be prepared to discuss the definition of each.
 - b. Show your counselor any two groups from your collection. Explain how you organized your collection and why you chose that method. (Note: if your collection is too large to transport and your counselor is unable to view your collection directly, photographs should be available to share.)
 - c. Explain how your collection is valued by other collectors and display to your counselor any price guides that may be available.
 - d. Explain how your collection is graded for value, physical defects, size and age. Show the various classifications or ratings used in your collection.
 - e. List the national, state, or local association responsive to your collection.
 - f. Show the location of and explain to your counselor the identification number (if applicable), series, brand name (if any), and any special identification marks.
6. Discuss with your counselor the plans you have to continue with the collection in the future.
7. Discuss with your counselor why and how collecting has changed and how this applies to your collection.

8. Find out about career opportunities in collecting. 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.

* Stamp and coin collecting are excluded from eligibility for this merit badge.

Communications

1. Do ONE of the following:

- a. For one day, keep a log in which you describe your communication activities. Keep track of the time and different ways you spend communicating, such as talking person-to-person, listening to your teachers or the radio, watching television, reading books, and other print media, and communicating online. Discuss with your counselor what your log reveals about the importance of communication in your life. Think of ways to improve your communications skills.
- b. For three days, keep a journal of your listening experiences. Identify one example of each of the following, and discuss with your counselor when you have listened to:
 1. Obtain information
 2. A persuasive argument
 3. Appreciate or enjoy something
 4. Understand someone's feelings
- c. In a small-group setting, meet with other scouts or with friends. Have them share personal stories about significant events in their lives that affected them in some way. Take note of how each scout participates in the group discussion and how effective each one is in telling his story. Report what you have learned to your counselor about the differences you observed in effective communication.
- d. List as many ways as you can think of to communicate with others (face-to-face, by telephone, letter, e-mail, fax). For each type of communication discuss with your counselor an instance when that method might not be appropriate or effective.

2. Do ONE of the following:

- a. Think of a creative way to describe yourself, using, for example, a collage, short story or autobiography, drawing or series of photographs, or a song or skit. Using the aid you created, make a presentation to your counselor about yourself.
- b. Choose a concept, product, or service in which you have great confidence. Build a sales plan based on its good points. Try to persuade the counselor to agree with, use, or buy your concept, product or service. After your sales talk, discuss with your counselor how persuasive you were.

3. Write a five-minute speech. Give it at a meeting of a group.

4. Interview someone you know fairly well, like, or respect because of his or her position, talent, career or life experiences. Listen actively to learn as much as you can about the person. Then prepare and deliver to your counselor an introduction of the person as though this person were to be a guest speaker, and include reasons why the audience would want to hear this person speak. Show how you would call to invite this person to speak.

5. Attend a public meeting (city council, school board, debate) approved by your counselor where several points of view are given on a single issue. Practice active listening skills and take careful notes of each point of view. Present an objective report that includes all points of view that were expressed, and share this with your counselor.
6. With your counselor's approval, develop a plan to teach a skill or inform someone about something. Prepare teaching aids for your plan. Carry out your plan. With your counselor, determine whether the person has learned what you intended.
7. Do ONE of the following:
 - a. Write to the editor of a magazine or your local newspaper to express your opinion or share information on any subject you choose. Send your message by fax, email or regular mail.
 - b. Create a Web page for your scout troop, school, or other organization. Include at least one article and one photograph or illustration, and one link to some other web page that would be helpful to someone who visits the web page you have created. It is not necessary to post your web page to the internet, but if you decide to do so, you must first share it with your parents and counselor and get their permission.
 - c. Use desktop publishing to produce a newsletter, brochure, flier or other printed material for your scout troop, class at school, or other group. Include at least one article and one photograph or illustration.
8. Plan a troop court of honor or campfire program. Have the patrol leaders' council approve it, then write the script and prepare the program. Serve as master of ceremonies.
9. Learn about opportunities in the field of communication. Choose one career in which you are interested and discuss with your counselor the major responsibilities of that position and the qualifications, education, and preparation it requires.

Computers

1. Discuss with your counselor the tips for online safety.
2. Explain how the invention of the computer has affected society, science, and technology. In your explanation, give a short history of the computer.
3. Do the following:
 - a. Explain four different uses of computers.
 - b. Describe three ways you and your family could use a personal computer other than for games and recreation.
4. Explain to your counselor the following:
 - a. The major parts of a computer system
 - b. How the types of files used to store text, sound, pictures, and video are stored in a computer's memory
5. Do the following:
 - a. Explain what a program is and how it is developed.
 - b. Give three examples of programming languages, and describe their uses.
 - c. Name four software packages you or your family could use, and explain how you would use them.
 - d. Discuss ways you can help protect a computer from viruses and how to keep secure information that has been saved on a computer.
 - e. Describe how computers are linked to form the Internet and the World Wide Web.
6. Do **THREE** of the following:
 - a. Use a database manager to create a troop roster that includes the name, rank, patrol, and telephone number of each Scout. Show your counselor that you can sort the register by each of the following categories: rank, patrol, and alphabetically by name.
 - b. Use a spreadsheet program to develop a food budget for a patrol weekend campout.
 - c. Use a word processor to write a letter to the parents of your troop's Scouts inviting them to a court of honor. Use the program's mail merge feature to make a personalized copy of the letter for each family.
 - d. Use a computer graphics program to design and draw a campsite plan for your troop, OR design a flyer for an upcoming troop event.
 - e. Using a software package of your choice, develop a short presentation about a topic that has been approved by your counselor. For your presentation create at least 10 slides.

- f. Using an Internet search engine, 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 Web sites. Share what you found with your counselor, and explain how you used the search engine to find this information.
- g. Using a digital camera, take a picture of a troop activity. Transfer the picture file to a computer and use photographic software to make it small enough to send easily as an e-mail attachment. Then, using a computer connected to the Internet (with your parent's permission), send an e-mail to someone you know. In your message, include the photograph as an attachment. Verify that the person received your e-mail and was able to view the attachment.
- h. Describe two computer chip-based devices, and explain how they are "smarter" because of the chip and its program.

7. Do ONE of the following:

- a. Visit a business or an industrial plant that uses computers. Observe what tasks the computers accomplish, and be prepared to discuss what you have learned.
- b. Using a software package of your choice for computer aided design (CAD), create an engineering-style drawing of a simple object. Include the top, bottom, and at least one side view and the dimensions.
- c. Use a general purpose programming language to write a simple program application of your choice, subject to approval by your counselor.
- d. Design a Web page for your troop, patrol, school, or place of worship. You need not post the page to a Web site. However, if you decide to do so, you will first need to get your parent's permission and your counselor's approval, as well as permission from the host site.

8. For each of the following categories, discuss several related terms: input and output devices, storage media, memory, processors and coprocessors, modems or network cards, networks, World Wide Web and Internet, electronic mail, Wi-Fi.

9. Explain the following to your counselor:

- a. Why it is not permissible to accept a free copy of a copyrighted computer game or program from a friend
- b. The restrictions and limitations of downloading music from the Internet
- c. Why copyright laws exist

10. Pick two career opportunities in the computer field that interest you. Find out what education, training, and experience those positions require. Report what you learn to your counselor.

Cooking

1. Do the following:
 - a. Review with your counselor the injuries that might arise from cooking, including burns and scalds, and the proper treatment.
 - b. Describe how meat, fish, chicken, eggs, dairy products, and fresh vegetables should be stored, transported, and properly prepared for cooking.
 - c. Describe the following food-related illnesses and tell what you can do to help prevent each from happening:
 1. Salmonella enteritis
 2. Staphylococcal enteritis
 3. E. coli (Escherichia coli) enteritis
 4. Botulism
 5. Trichinosis
 6. Hepatitis

2. Do the following:
 - a. Illustrate for your counselor the food pyramid that fits you. Label the following food groups in the pyramid and how much of each you should eat each day:
 1. Grains
 2. Vegetables
 3. Fruits
 4. Milk, yogurt, cheese
 5. Meats, poultry, fish, beans, eggs, nuts
 6. Oils (fats) and sugars
 - b. Explain why you should limit your intake of oils and sugars.
 - c. Explain the number of servings recommended per day from each group.
 - d. Give your counselor examples from each food group.
 - e. Describe for your counselor the measurements of servings for each food group.
 - f. Describe to your counselor food preparation techniques that result in more healthful and nutritious meals.

3. Plan a menu for two straight days (six meals) of camping. Include the following:
 - a. A camp dinner with soup; meat, fish, poultry, or an appropriate substitute; two fresh vegetables; drink; and dessert. All are to be properly prepared. When preparing your menu, follow the nutritional guidelines set by the food pyramid.
 - b. A one-pot dinner. Use foods other than canned.
 - c. Using the menu planned for requirement 3, make a food list showing cost and amount needed to feed three or more boys.
 - d. List the utensils needed to cook and serve these meals.

4. Using the menu planned for requirement 3, do the following and discuss the process with your merit badge counselor:
 - a. Prepare and serve for yourself and two others, the two dinners, one lunch, and one breakfast. Time your cooking so that each course will be ready to serve at the proper time.*
 - b. For meals prepared in requirement 4a for which a fire is needed, use a lightweight stove or build a low-impact fire. Include support for your cooking utensils from rocks, logs, or like material. The same fireplace may be used for more than one meal. Use a backpacking stove to cook at least one meal. (Where local regulations do not allow you to do this, the counselor may change the requirement to meet the law.)
 - c. For each meal prepared in requirement 4a, use safe food-handling practices. Dispose of garbage, cans, foil, paper, and other rubbish by packing them out and depositing them in a proper container. After each meal, clean up the site thoroughly.
5. Plan a menu for one day (three meals) or for four meals over a two-day period of trail hiking or backpacking. Include the following:
 - a. A breakfast, lunch, and dinner for a trail or backpacking trip where light weight is important. You should be able to store all foods used for several days without refrigeration. When preparing your menu, follow the nutritional guidelines set by the food pyramid.*
 - b. Using the menu planned for requirement 5, make a food list showing cost and amount needed to feed three or more boys.
 - c. List the utensils needed to cook and serve these meals.
 - d. Figure the weight of the foods in requirement 5a.
6. Using the menu planned for requirement 5, do the following:
 - a. Prepare and serve for yourself and two others, the trail breakfast and dinner. Time your cooking so that each course will be ready to serve at the proper time.
 - b. Use an approved trail stove (with proper supervision) or charcoal to prepare your meals.
 - c. For each meal prepared in requirement 6a, use safe food-handling practices. Dispose of garbage, cans, foil, paper, and other rubbish by packing them out and depositing them in a proper container. After each meal, clean up the site thoroughly.
7. Plan a menu for three full days of meals (breakfast, lunch, and dinner) to be cooked at home.
 - a. When preparing your menu, follow the nutritional guidelines set by the food pyramid. All meals are to be cooked or properly prepared.
 - b. Using the menu planned for requirement 7, make a food list showing cost and amount needed to feed yourself and at least one adult (parent, family member, guardian, or other responsible adult).
 - c. Tell what utensils were needed to cook and serve these meals.

d. Prepare and serve a breakfast, lunch, and dinner from the menu you planned for requirement 7. Time your cooking to have each course ready to serve at the proper time. Have an adult verify the preparation of the meal to your counselor.

8. Find out about three career opportunities in cooking. 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.

* The meals for requirements 4a and 5a may be prepared for different trips. They need not be prepared consecutively. Scouts working on this badge at summer camp should plan around food they can get at the camp commissary.

Crime Prevention

1. Discuss the role and value of laws in society with regard to crime and crime prevention. Include in your discussion the definitions of "crime" and "crime prevention."
2. Prepare a notebook of newspaper and other clippings that addresses crime and crime prevention efforts in your community.
3. Discuss the following with your counselor:
 - a. The role of citizens, including youth, in crime prevention
 - b. Gangs and their impact on the community
 - c. When and how to report a crime
4. After doing EACH of the following, discuss with your counselor what you have learned.
 - a. Inspect your neighborhood for opportunities that may lead to crime. Learn how to do a crime prevention survey.
 - b. Using the checklist in this (the merit badge) pamphlet, conduct a security survey of your home and discuss the results with your family.
5. Teach your family or patrol members how to protect themselves from crime at home, at school, in your community, and while traveling.
6. Help raise awareness about one school safety issue facing students by doing ONE of the following:
 - a. Create a poster for display on a school bulletin board.
 - b. With permission from school officials, create a page long public service announcement that could be read over the public address system at school or posted on the school's Web site.
 - c. Make a presentation to a group such as a Cub Scout den that addresses the issue.
7. Do ONE of the following:
 - a. Assist in the planning and organization of a crime prevention program in your community such as Neighborhood Watch, Community Watch, or Crime Stoppers. Explain how this program can benefit your neighborhood.
 - b. With your parent's and counselor's approval, visit a jail or detention facility or a criminal court hearing. Discuss your experience with your counselor.
8. Discuss the following with your counselor:
 - a. How drug abuse awareness programs, such as "Drugs: A Deadly Game," help prevent crime.

- b. Why alcohol, tobacco, and marijuana are sometimes called "gateway drugs" and how "gateway drugs" can lead to the use of other drugs .
- c. Three resources in your city where a person with a drug problem or drug-related problem can go for help.
- d. How the illegal sale and use of drugs lead to other crimes
- e. How to recognize child abuse.
- f. The three R's of Youth Protection.

9. Discuss the following with your counselor:

- a. The role of a sheriff's or police department in crime prevention.
- b. The purpose and operation of agencies in your community that help law enforcement personnel prevent crime, and how those agencies function during emergency situations.
- c. Explain the role private security plays in crime prevention.
- d. Choose a career in the crime prevention or security industry that interests you. Describe the level of education required and responsibilities of a person in that position. Tell why this position interests you.

Electricity

1. Demonstrate that you know how to respond to electrical emergencies by doing the following:
 - a. Show how to rescue a person touching a live wire in the home.
 - b. Show how to render first aid to a person who is unconscious from electrical shock.
 - c. Show how to treat an electrical burn.
 - d. Explain what to do in an electrical storm.
 - e. Explain what to do in the event of an electrical fire.
2. Complete an electrical home safety inspection of your home, using the checklist found in this pamphlet or one approved by your counselor. Discuss what you find with your counselor.
3. Make a simple electromagnet and use it to show magnetic attraction and repulsion.
4. Explain the difference between direct current and alternating current.
5. Make a simple drawing to show how a battery and an electric bell work.
6. Explain why a fuse blows or a circuit breaker trips. Tell how to find a blown fuse or tripped circuit breaker in your home. Show how to safely reset the circuit breaker.
7. Explain what overloading an electric circuit means. Tell what you have done to make sure your home circuits are not overloaded.
8. On a floor plan of a room in your home, make a wiring diagram of the lights, switches, and outlets. Show which fuse or circuit breaker protects each one.
9. Do the following:
 - a. Read an electric meter and, using your family's electric bill, determine the energy cost from the meter readings.
 - b. Discuss with your counselor five ways in which your family can conserve energy.
10. Explain the following electrical terms: volt, ampere, watt, ohm, resistance, potential difference, rectifier, rheostat, conductor, ground, circuit, and short circuit.
11. Do any TWO of the following:
 - a. Connect a buzzer, bell, or light with a battery. Have a key or switch in the line.
 - b. Make and run a simple electric motor (not from a kit).
 - c. Build a simple rheostat. Show that it works.
 - d. Build a single-pole, double-throw switch. Show that it works.
 - e. Hook a model electric train layout to a house circuit. Tell how it works.

Emergency Preparedness

1. Earn the **First Aid Merit Badge**.
2. Do the following:
 - a. Discuss with your counselor the aspects of emergency preparedness:
 1. Prepare for emergency situations
 2. Respond to emergency situations
 3. Recover from emergency situations
 4. Mitigate and prevent emergency situations

Include in your discussion the kinds of questions that are important to ask yourself as you consider each of these.

b. Make a chart that demonstrates your understanding of each of the aspects of emergency preparedness in requirement 2a (prepare, respond, recover, mitigate) with regard to 10 of the situations listed below. **You must use situations 1, 2, 3, 4, and 5*** below in boldface but you may choose any other five listed here for a total of 10 situations. Discuss this chart with your counselor.

- 1. Home kitchen fire***
- 2. Home basement/storage room/garage fire***
- 3. Explosion in the home***
- 4. Automobile accident***
- 5. Food-borne disease (food poisoning)***
6. Fire or explosion in a public place
7. Vehicle stalled in the desert
8. Vehicle trapped in a blizzard
9. Flash flooding in town or the country
10. Mountain/backcountry accident
11. Boating accident
12. Gas leak in a home or a building
13. Tornado or hurricane
14. Major flood
15. Nuclear power plant emergency
16. Avalanche (snow slide or rockslide)
17. Violence in a public place

c. Meet with and teach your family how to get or build a kit, make a plan, and be informed for the situations on the chart you created for requirement 2b. Complete a family plan. Then meet with your counselor and report on your family meeting, discuss their responses, and share your family plan.

3. Show how you could safely save a person from the following:

- a. Touching a live household electric wire.
 - b. A room filled with carbon monoxide
 - c. Clothes on fire.
 - d. Drowning using non-swimming rescues (including accidents on ice).
4. Show three ways of attracting and communicating with rescue planes/aircraft.
 5. With another person, show a good way to transport an injured person out of a remote and/or rugged area, conserving the energy of rescuers while ensuring the well-being and protection of the injured person.
 6. Do the following:
 - a. Tell the things a group of Scouts should be prepared to do, the training they need, and the safety precautions they should take for the following emergency services:
 1. Crowd and traffic control
 2. Messenger service and communication.
 3. Collection and distribution services.
 4. Group feeding, shelter, and sanitation.
 - b. Identify the government or community agencies that normally handle and prepare for the emergency services listed under 6a, and explain to your counselor how a group of Scouts could volunteer to help in the event of these types of emergencies.
 - c. Find out who is your community's emergency management director and learn what this person does to prepare, respond to, recover from, and mitigate and prevent emergency situations in your community. Discuss this information with your counselor and apply what you discover to the chart you created for requirement 2b.
 7. Take part in an emergency service project, either a real one or a practice drill, with a Scouting unit or a community agency.
 8. Do the following:
 - a. Prepare a written plan for mobilizing your troop when needed to do emergency service. If there is already a plan, explain it. Tell your part in making it work.
 - b. Take part in at least one troop mobilization. Before the exercise, describe your part to your counselor. Afterward, conduct an "after-action" lesson, discussing what you learned during the exercise that required changes or adjustments to the plan.
 - c. Prepare a personal emergency service pack for a mobilization call. Prepare a family kit (suitcase or waterproof box) for use by your family in case an emergency evacuation is needed. Explain the needs and uses of the contents.
 9. Do ONE of the following:
 - a. Using a safety checklist approved by your counselor, inspect your home for potential hazards. Explain the hazards you find and how they can be corrected.

b. Review or develop a plan of escape for your family in case of fire in your home.

c. Develop an accident prevention program for five family activities outside the home (such as taking a picnic or seeing a movie) that includes an analysis of possible hazards, a proposed plan to correct those hazards, and the reasons for the corrections you propose.

Environmental Science

1. Make a timeline of the history of environmental science in America. Identify the contribution made by the Boy Scouts of America to environmental science. Include dates, names of people or organizations, and important events.
2. Define the following terms: population, community, ecosystem, biosphere, symbiosis, niche, habitat, conservation, threatened species, endangered species, extinction, pollution prevention, brownfield, ozone, watershed, airshed, nonpoint source, hybrid vehicle, fuel cell.
3. Do ONE activity in EACH of the following categories (using the activities in this {the merit badge} pamphlet as the basis for planning and carrying out your projects):
 - a. Ecology
 1. Conduct an experiment to find out how living things respond to changes in their environments. Discuss your observations with your counselor.
 2. Conduct an experiment illustrating the greenhouse effect. Keep a journal of your data and observations. Discuss your conclusions with your counselor.
 3. Discuss what an ecosystem is. Tell how it is maintained in nature and how it survives.
 - b. Air Pollution
 1. Perform an experiment to test for particulates that contribute to air pollution. Discuss your findings with your counselor.
 2. Record the trips taken, mileage, and fuel consumption of a family car for seven days, and calculate how many miles per gallon the car gets. Determine whether any trips could have been combined ("chained") rather than taken out and back. Using the idea of trip chaining, determine how many miles and gallons of gas could have been saved in those seven days.
 3. Explain what acid rain is. In your explanation, tell how it affects plants and the environment and the steps society can take to help reduce its effects.
 - c. Water Pollution
 1. Conduct an experiment to show how living things react to thermal pollution. Discuss your observations with your counselor.
 2. Conduct an experiment to identify the methods that could be used to mediate (reduce) the effects of an oil spill on waterfowl. Discuss your results with your counselor.
 3. Describe the impact of a waterborne pollutant on an aquatic community. Write a 100-word report on how that pollutant affected aquatic life, what the effect was, and whether the effect is linked to bio magnification.

d. Land Pollution

1. Conduct an experiment to illustrate soil erosion by water. Take photographs or make a drawing of the soil before and after your experiment, and make a poster showing your results. Present your poster to your patrol or troop.
2. Perform an experiment to determine the effect of an oil spill on land. Discuss your conclusions with your counselor.
3. Photograph an area affected by erosion. Share your photographs with your counselor and discuss why the area has eroded and what might be done to help alleviate the erosion.

e. Endangered Species

1. Do research on one endangered species found in your state. Find out what its natural habitat is, why it is endangered, what is being done to preserve it, and how many individual organisms are left in the wild. Prepare a 100-word report about the organism, including a drawing. Present your report to your patrol or troop.
2. Do research on one species that was endangered or threatened but which has now recovered. Find out how the organism recovered, and what its new status is. Write a 100-word report on the species and discuss it with your counselor.
3. With your parent's and counselor's approval, work with a natural resource professional to identify two projects that have been approved to improve the habitat for a threatened or endangered species in your area. Visit the site of one of these projects and report on what you saw.

f. Pollution Prevention, Resource Recovery, and Conservation

1. Look around your home and determine 10 ways your family can help reduce pollution. Practice at least two of these methods for seven days and discuss with your counselor what you have learned.
 2. Determine 10 ways to conserve resources or use resources more efficiently in your home, at school, or at camp. Practice at least two of these methods for seven days and discuss with your counselor what you have learned.
 3. Perform an experiment on packaging materials to find out which ones are biodegradable. Discuss your conclusions with your counselor.
4. Choose two outdoor study areas that are very different from one another (e.g., hilltop vs. bottom of a hill; field vs. forest; swamp vs. dry land). For BOTH study areas, do ONE of the following:
- a. Mark off a plot of 4 square yards in each study area, and count the number of species found there. Estimate how much space is occupied by each plant species and the type and number of nonplant species you find. Write a report that adequately discusses the biodiversity and population density of these study areas. Discuss your report with your counselor.

- b. Make at least three visits to each of the two study areas (for a total of six visits), staying for at least 20 minutes each time, to observe the living and nonliving parts of the ecosystem. Space each visit far enough apart that there are readily apparent differences in the observations. Keep a journal that includes the differences you observe. Then, write a short report that adequately addresses your observations, including how the differences of the study areas might relate to the differences noted, and discuss this with your counselor.
5. Using the construction project provided or a plan you create on your own, identify the items that would need to be included in an environmental impact statement for the project planned.
 6. Find out about three career opportunities in environmental science. 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.

Family Life

1. Prepare an outline on what a family is and discuss this with your merit badge counselor. Tell why families are important to individuals and to society. Discuss how the actions of one member can affect other members.
2. List several reasons why you are important to your family and discuss this with your parents or guardians and with your merit badge counselor.
3. Prepare a list of your regular home duties or chores (at least five) and do them for 90 days. Keep a record of how often you do each of them.
4. With the approval of your parents or guardians and your merit badge counselor, decide on and carry out a project that you would do around the home that would benefit your family. Submit a report to your merit badge counselor outlining how the project benefited your family.
5. Plan and carry out a project that involves the participation of your family. After completing the project, discuss the following with your merit badge counselor:
 - a. The objective or goal of the project
 - b. How individual members of your family participated
 - c. The results of the project
6. Do the following:
 - a. Discuss with your merit badge counselor how to plan and carry out a family meeting.
 - b. After this discussion, plan and carry out a family meeting to include the following subjects:
 1. Avoiding substance abuse, including tobacco, alcohol, and drugs, all of which negatively affect your health and well-being
 2. Understanding the growing-up process and how the body changes, and making responsible decisions dealing with sex
 3. Personal and family finances
 4. A crisis situation within your family
 5. The effect of technology on your familyDiscussion of each of these subjects will very likely carry over to more than one family meeting.
7. Discuss the following with your counselor:
8.
 - a. Your understanding of what makes an effective father and why, and your thoughts on the father's role in the family
 - b. Your understanding of the responsibilities of a parent.

Fingerprinting

1. Give a short history of fingerprinting. Tell the difference between civil and criminal identification.
2. Explain the difference between the automated fingerprint identification systems (AFIS) now used by some law enforcement agencies and the biometric fingerprint systems used to control access to places like buildings, airports, and computer rooms.
3. Do the following:
 - a. Name the surfaces of the body where friction or papillary ridges are found.
 - b. Name the two basic principles supporting the science of fingerprints and give a brief explanation of each principle.
 - c. Explain what it takes to positively identify a person using fingerprints.
4. Take a clear set of prints using ONE of the following methods:
 - a. Make both rolled and plain impressions. Make these on an 8-by-8-inch fingerprint identification card available from your local police department or counselor.
 - b. Using clear adhesive tape, a pencil, and plain paper, record your own fingerprints or those of another person.
5. Show your merit badge counselor you can identify the three basic types of fingerprint patterns and their subcategories. Using your own hand, identify the types of patterns you see.

Fire Safety

1. Do the following:
 - a. Demonstrate the technique of stop, drop, roll, and cool. Explain how burn injuries can be prevented.
 - b. List the most frequent causes of burn injuries.
2. Explain the chemistry and physics of fire. Name the parts of the fire tetrahedron. Explain why vapors are important to the burning process. Name the products of combustion. Give an example of how fire grows and what happens.
3. Name the most frequent causes of fire in the home and give examples of ways it can be prevented.
4. Do the following:
 - a. Explain the role of human behavior in the arson problem in this country
 - b. List the actions that cause seasonal fires and explain how these fires can be prevented.
5. List common circumstances that cause holiday-related fires and explain how these fires can be prevented.
6. Conduct a home safety survey with the help of an adult. Then do the following:
 - a. Draw a home fire-escape plan, create a home fire-drill schedule, and conduct a home fire drill.
 - b. Test a smoke alarm and demonstrate regular maintenance of a smoke alarm.
 - c. Explain what to do when you smell gas and when you smell smoke.
 - d. Explain how you would report a fire alarm.
 - e. Explain what fire safety equipment can be found in public buildings.
 - f. Explain who should use fire extinguishers and when these devices can be used.
 - g. Explain how to extinguish a grease pan fire.
 - h. Explain what fire safety precautions you should take when you are in a public building.
7. Do the following:
 - a. Demonstrate lighting a match safely.
 - b. Demonstrate the safe way to start a charcoal fire.
 - c. Demonstrate the safe way to melt wax.
8. Explain the difference between combustible and noncombustible liquids and between combustible and noncombustible fabrics.

9. Do the following:

- a. Demonstrate the safe way to fuel a lawnmower.
- b. Demonstrate the safety factors, such as proper ventilation, for auxiliary heating devices and the proper way to fuel those devices.

10. Do the following:

- a. Explain the cost of outdoor and wildland fires and how to prevent them.
- b. Demonstrate setting up and putting out a cooking fire.
- c. Demonstrate using a camp stove and lantern.
- d. Explain how to set up a campsite safe from fire.

11. Visit a fire station. Identify the types of fire trucks. Find out about the fire prevention activities in your community.

12. Choose a fire safety-related career that interests you and describe the level of education required and responsibilities of a person in that position. Tell why this position interests you.

First Aid

1. Satisfy your counselor that you have current knowledge of all first aid requirements for Tenderfoot Rank, Second Class Rank, and First Class Rank.
2. Prepare a First Aid kit for your home. Display and discuss its contents with your counselor.

Genealogy

1. Explain to your counselor what the words genealogy, ancestor, and descendant mean.
2. Do ONE of the following:
 - a. Do a time line for yourself or for a relative. Then write a short biography based on that time line.
 - b. Keep a journal for 6 weeks. You must write in it at least once a week.
3. With your parent's help, choose a relative or a family acquaintance you can interview in person, by telephone, or by e-mail or letter. Record the information you collect so you do not forget it.
4. Do the following:
 - a. Name three types of genealogical resources and explain how these resources can help you chart your family tree.
 - b. Obtain at least one genealogical document that supports an event that is or can be recorded on your pedigree chart or family group record. The document could be found at home or at a government office, religious organization, archive, or library.
 - c. Tell how you would evaluate the genealogical information you found for requirement 4b.
5. Contact ONE of the following individuals or institutions. Ask what genealogical services, records, or activities this individual or institution provides, and report the results:
 - a. A genealogical or lineage society
 - b. A professional genealogist (someone who gets paid for doing genealogical research)
 - c. A surname organization, such as your family's organization
 - d. A genealogical education facility or institution.
 - e. A genealogical record repository of any type (courthouse, genealogical library, state or national archive, state library, etc.)
6. Begin your family tree by listing yourself and include at least two additional generations. You may complete this requirement by using the chart provided in the Genealogy merit badge pamphlet or the genealogy software program of your choice.
7. Complete a family group record form, listing yourself and your brothers and sisters as the children. On another family group record form, show one of your parents and his or her brothers and sisters as the children. This requirement may be completed using the chart provided or the genealogy software program of your choice.

8. Do the following:
 - a. Explain the effect computers and the Internet are having on the world of genealogy.
 - b. Explain how photography (including microfilming) has influenced genealogy.
9. Discuss what you have learned about your family and your family members through your genealogical research

Geocaching

1. Do the following:
 - a. Explain to your counselor the most likely hazards you may encounter while participating in geocaching activities and what you should do to anticipate, help prevent, mitigate, and respond to these hazards.
 - b. Discuss first aid and prevention for the types of injuries or illnesses that could occur while participating in geocaching activities, including cuts, scrapes, snakebite, insect stings, tick bites, exposure to poisonous plants, heat and cold reactions (sunburn, heatstroke, heat exhaustion, hypothermia), and dehydration.
 - c. Discuss how to properly plan an activity that uses GPS, including using the buddy system, sharing your plan with others, and considering the weather, route, and proper attire.

2. Discuss the following with your counselor:
 - a. Why you should never bury a cache.
 - b. How to use proper geocaching etiquette when hiding or seeking a cache, and how to properly hide, post, maintain, and dismantle a geocache.
 - c. The principles of Leave No Trace as they apply to geocaching.

3. Explain the following terms used in geocaching: waypoint, log, cache, accuracy, difficulty and terrain ratings, attributes, trackable. Choose five additional terms to explain to your counselor.

4. Explain how the Global Positioning System (GPS) works. Then, using Scouting's Teaching EDGE, demonstrate the use of a GPS unit to your counselor. Include marking and editing a waypoint, changing field functions, and changing the coordinate system in the unit.

5. Do the following:
 - a. Show you know how to use a map and compass and explain why this is important for geocaching.
 - b. Explain the similarities and differences between GPS navigation and standard map reading skills and describe the benefits of each.
 - c. Explain the UTM (Universal Transverse Mercator) system and how it differs from the latitude/longitude system used for public geocaches.
 - d. Show how to plot a UTM waypoint on a map. Compare the accuracy to that found with a GPS unit.

6. Describe the four steps to finding your first cache to your counselor. Then mark and edit a waypoint.

7. With your parent's permission*, go to www.Geocaching.com. Type in your zip code to locate public geocaches in your area. Share the posted information about three of those geocaches with your counselor. Then, pick one of the three and find the cache.

- To fulfill this requirement, you will need to set up a free user account with www.Geocaching.com. Ask your parent for permission and help before you do so.

8. Do ONE of the following:

- a. If a Cache to Eagle® series exists in your council, visit at least three of the 12 locations in the series. Describe the projects that each cache you visit highlights, and explain how the Cache to Eagle® program helps share our Scouting service with the public.
- b. Create a Scouting-related Travel Bug® that promotes one of the values of Scouting. "Release" your Travel Bug into a public geocache and, with your parent's permission, monitor its progress at www.geocaching.com for 30 days. Keep a log, and share this with your counselor at the end of the 30-day period.
- c. Set up and hide a public geocache, following the guidelines in the *Geocaching* merit badge pamphlet. Before doing so, share with your counselor a six-month maintenance plan for the geocache where you are personally responsible for the first three months. After setting up the geocache, with your parent's permission, follow the logs online for 30 days and share them with your counselor.
- d. Explain what Cache In Trash Out (CITO) means, and describe how you have practiced CITO at public geocaches or at a CITO event. Then, either create CITO containers to leave at public caches, or host a CITO event for your unit or for the public.

9. Plan a geohunt for a youth group such as your troop or a neighboring pack, at school, or your place of worship. Choose a theme, set up a course with at least four waypoints, teach the players how to use a GPS unit, and play the game. Tell your counselor about your experience, and share the materials you used and developed for this event.

Geology

1. Define geology. Discuss how geologists learn about rock formations. In geology, explain why the study of the present is important to understanding the past.
2. Pick three resources that can be extracted or mined from Earth for commercial use. Discuss with your counselor how each product is discovered and processed.
3. Review a geologic map of your area or an area selected by your counselor, and discuss the different rock types and estimated ages of rocks represented. Determine whether the rocks are horizontal, folded, or faulted, and explain how you arrived at your conclusion.
4. Do ONE of the following:
 - a. With your parent's and counselor's approval, visit with a geologist, land use planner, or civil engineer. Discuss this professional's work and the tools required in this line of work. Learn about a project that this person is now working on, and ask to see reports and maps created for this project. Discuss with your counselor what you have learned.
 - b. Find out about three career opportunities available in geology. Pick one and find out the education, training, and experience required for the profession. Discuss this with your counselor, and explain why this profession might interest you.
5. Complete ONE of the options listed below A, B, C, or D.
 - a. Surface and Sedimentary Processes Option
 1. Conduct an experiment approved by your counselor that demonstrates how sediments settle from suspension in water. Explain to your counselor what the exercise shows and why it is important.
 2. Using topographical maps provided by your counselor, plot the stream gradients (different elevations divided by distance) for four different stream types (straight, meandering, dendritic, trellis). Explain which ones flow fastest and why, and which ones will carry larger grains of sediment and why.
 3. On a stream diagram, show areas where you will find the following features: cut bank, fill bank, point bar, medial channel bars, lake delta. Describe the relative sediment grain size found in each feature.
 4. Conduct an experiment approved by your counselor that shows how some sedimentary material carried by water may be too small for you to see without a magnifier.
 5. Visit a nearby stream. Find clues that show the direction of water flow, even if the water is missing. Record your observations in a notebook, and sketch those clues you observe. Discuss your observations with your counselor.
 - b. Energy Resources Option
 1. List the top five Earth resources used to generate electricity in the United States.

2. Discuss source rock, trap, and reservoir rock - the three components necessary for the occurrence of oil and gas underground.
3. Explain how each of the following items is used in subsurface exploration to locate oil or gas: reflection seismic, electric well logs, stratigraphic correlation, offshore platform, geologic map, subsurface structure map, subsurface isopach map, and core samples and cutting samples.
4. Using at least 20 data points provided by your counselor, create a subsurface structure map and use it to explain how subsurface geology maps are used to find oil, gas, or coal resources.
5. Do ONE of the following activities:
 - a. Make a display or presentation showing how oil and gas or coal is found, extracted, and processed. You may use maps, books, articles from periodicals, and research found on the Internet (with your parent's permission). Share the display with your counselor or a small group (such as your class at school) in a five minute presentation.
 - b. With your parent's and counselor's permission and assistance, arrange for a visit to an operating drilling rig. While there, talk with a geologist and ask to see what the geologist does onsite. Ask to see cutting samples taken at the site.

c. Mineral Resources Option

1. Define rock. Discuss the three classes of rocks including their origin and characteristics.
2. Define mineral. Discuss the origin of minerals and their chemical composition and identification properties, including hardness, specific gravity, color, streak, cleavage, luster, and crystal form.
3. Do ONE of the following:
 - a. Collect 10 different rocks or minerals. Record in a notebook where you obtained (found, bought, traded) each one. Label each specimen, identify its class and origin, determine its chemical composition, and list its physical properties. Share your collection with your counselor.
 - b. With your counselor's assistance, identify 15 different rocks and minerals. List the name of each specimen, tell whether it is a rock or mineral, and give the name of its class (if it is a rock) or list its identifying physical properties (if it is a mineral).
4. List three of the most common road building materials used in your area. Explain how each material is produced and how each is used in road building.
5. Do ONE of the following activities:
 - a. With your parent's and counselor's approval, visit an active mining site, quarry, or sand and gravel pit. Tell your counselor what you learned about

the resources extracted from this location and how these resources are used by society.

b. With your counselor, choose two examples of rocks and two examples of minerals. Discuss the mining of these materials and describe how each is used by society.

c. With your parent's and counselor's approval, visit the office of a civil engineer and learn how geology is used in construction. Discuss what you learned with your counselor.

d. Earth History Option

1. Create a chart showing suggested geological eras and periods. Determine which period the rocks in your region might have been formed.

2. Explain to your counselor the processes of burial and fossilization, and discuss the concept of extinction.

3. Explain to your counselor how fossils provide information about ancient life, environment, climate, and geography. Discuss the following terms and explain how animals from each habitat obtain food: benthonic, pelagic, littoral, lacustrine, open marine, brackish, fluvial, eolian, protected reef.

4. Collect 10 different fossil plants or animals OR (with your counselor's assistance) identify 15 different fossil plants or animals. Record in a notebook where you obtained (found, bought, traded) each one. Classify each specimen to the best of your ability, and explain how each one might have survived and obtained food. Tell what else you can learn from these fossils.

6. Do ONE of the following:

a. Visit a science museum or the geology department of a local university that has fossils on display. With your parent's and counselor's approval, before you go, make an appointment with a curator or guide who can show you how the fossils are preserved and prepared for display.

b. Visit a structure in your area that was built using fossiliferous rocks. Determine what kind of rock was used and tell your counselor the kinds of fossil evidence you found there.

c. Visit a rock outcrop that contains fossils. Determine what kind of rock contains the fossils, and tell your counselor the kinds of fossil evidence you found at the outcrop.

d. Prepare a display or presentation on your state fossil. Include an image of the fossil, the age of the fossil, and its classification. You may use maps, books, articles from periodicals, and research found on the Internet (with your parent's permission). Share the display with your counselor or a small group (such as your class at school). If your state does not have a state fossil, you may select a state fossil from a neighboring state.

Indian Lore

1. Give the history of one American Indian tribe, group or nation that lives or has lived near you. Visit it, if possible. Tell about traditional dwellings, way of life, tribal government, religious beliefs, family and clan relationships, language, clothing styles, arts and crafts, food preparation, means of getting around, games, customs in warfare, where members of the group now live, and how they live.
2. Do TWO of the following. Focus on a specific group or tribe.
 - a. Make an item of clothing worn by members of the tribe.
 - b. Make and decorate three items used by the tribe, as approved by your counselor.
 - c. Make an authentic model of a dwelling used by any Indian tribe, group, or nation.
 - d. Visit a museum to see Indian artifacts. Discuss them with your counselor. Identify at least 10 artifacts by tribe or nation, their shape, size, and use.
3. Do ONE of the following:
 - a. Learn three games played by a group or tribe. Teach and lead one game with a Scout group.
 - b. Learn and show how a tribe traditionally cooked or prepared food. Make three food items.
 - c. Give a demonstration showing how a specific Indian group traditionally hunted, fished, or trapped.
4. Do ONE of the following:
 - a. Write or briefly describe how life would have been different for the European settlers if there had been no native Americans to meet them when they came to this continent.
 - b. Sing two songs in an Indian language. Explain their meaning.
 - c. Learn in an Indian language at least 25 common terms and their meanings.
 - d. Show 25 signs in Indian sign language. Include those that will help you ask for water, for food, and where the path or road leads.
 - e. Learn in English (or the language you commonly speak at home or in the troop) an Indian story of at least 250 words, or any number of shorter ones adding up to 300 words. Tell the story or stories at a Scout meeting or campfire.
 - f. Write or tell about eight things adopted by others from American Indians.
 - g. Learn 25 Indian place names. Tell their origins and meanings.
 - h. Name five well-known American Indian leaders, either from the past or people of today. Give their tribes or nations. Describe what they did or do now that makes them notable.
 - i. Learn about the Iroquois Confederacy, including how and why it was formed. Tell about its governing system. Describe some of the similarities and differences between the governments of the United States and of the Six Nations (the Haudenosaunee or Iroquois Confederacy).

Insect Study

1. Tell how insects are different from all other animals. Show how insects are different from centipedes and spiders.
2. Point out and name the main parts of an insect.
3. Describe the characteristics that distinguish the principal families and orders of insects.
4. Do the following:
 - a. Observe 20 different live species of insects in their habitat. In your observations, include at least four orders of insects.
 - b. Make a scrapbook of the 20 insects you observe in 4a. Include photographs, sketches, illustrations, and articles. Label each insect with its common and scientific names, where possible. Share your scrapbook with your merit badge counselor.
5. Do the following:
 - a. From your scrapbook collection, identify three species of insects helpful to humans and five species of insects harmful to humans.
 - b. Describe some general methods of insect control.
6. Compare the life histories of a butterfly and a grasshopper. Tell how they are different.
7. Raise an insect through the complete metamorphosis from its larval stage to its adult stage (e.g. raise a butterfly or moth from a caterpillar). *
8. Observe an ant colony or a beehive. Tell that you saw.
9. Tell the things that make social insects different from solitary insects.
10. Tell how insects fit in the food chains of other insects, fish, birds, and mammals.
11. Find out about three career opportunities in insect study. Pick one and find out about the education, training, and experience required for this profession. Discuss this with your counselor, and explain why this profession might interest you.

* Some insects are endangered species and are protected by federal or state law. Every species is found only in its own special type of habitat. Be sure to check natural resources authorities in advance to be sure that you will not be collecting any species that is known to be protected or endangered, or in any habitat where collecting is prohibited. In most cases, all specimens should be returned at the location of capture after the requirement is met. Check with your merit badge counselor for those instances where the return of these specimens would not be appropriate.

Law

1. Define "law." Tell some of its sources. Describe functions it serves.
2. Discuss TWO of the following:
 - a. The Justinian Code, The Code of Hammurabi, and the Magna Carta.
 - b. The development of the jury system.
 - c. Two famous trials in history.
3. Tell what civil law is; tell what criminal law is. Tell the main differences between them. Give examples of each.
4. Ask five people (not more than one from your immediate family) about the role of law enforcement officers in our society. Discuss their answers with them. Go to a law enforcement officer in your neighborhood and ask about his or her responsibilities and duties. Report your findings.
5. Tell about several laws that were passed to protect the consumer and the seller. Tell about several organizations that provide help to consumers and sellers.
6. Do ONE of the following:
 - a. Attend a session of a civil or criminal court. Write 250 words or more on what you saw.
 - b. Plan and conduct a mock trial with your troop or school class. After the trial is over, discuss it with the group.
7. Arrange a visit with a lawyer who works for a business, bank, title company, or government agency. Find out his or her duties and responsibilities. Report what you learned.
8. Explain the requirements for becoming a lawyer in your state. Describe how judges are selected in your state.
9. Make a list of 15 jobs which deal with some aspect of law or legal processes. Tell which you prefer. Why?
10. Tell where people can go to obtain the help of a lawyer if they are unable to pay for one. Tell what you can do if you can afford a lawyer but do not know of any in your area.
11. Discuss with your counselor the importance of TWO of the following areas of law that have recently emerged and are still developing:
 - a. Environmental law
 - b. Computers and the Internet

- c. Copyright and the Internet
- d. Space travel and satellites orbiting the earth

Medicine

1. Discuss with your counselor the influence that EIGHT of the following people or events had on the history of medicine:
 - a. Hippocrates
 - b. William Harvey
 - c. Antoine van Leeuwenhoek
 - d. Edward Jenner
 - e. Florence Nightingale
 - f. Louis Pasteur
 - g. Gregor Mendel
 - h. Joseph Lister
 - i. Robert Koch
 - j. Daniel Hale Williams
 - k. Marie and Pierre Curie
 - l. Walter Reed
 - m. Karl Landsteiner
 - n. Alexander Fleming
 - o. Charles Richard Drew
 - p. Helen Raussig
 - q. James Watson and Francis Crick
 - r. Jonas Salk
2. Explain the Hippocratic Oath to your counselor, and compare to the original version to a more modern one. Discuss to whom those subscribing to the original version of the oath owe the greatest allegiance.
3. Discuss the health-care provider-patient relationship with your counselor, and the importance of such a relationship in the delivery of quality care to the patient. Describe the role of confidentiality in this relationship.
4. Do the following:
 - A Describe the roles the following people play in the delivery of health care in your state. (Note: Not all may exist in your state.)
 1. Allopathic physician
 2. Chiropractor
 3. Emergency medical technician
 4. Licensed practical/vocational nurse
 5. Medical assistant
 6. Medical laboratory technologist
 7. Nurse-midwife
 8. Nurse practitioner
 9. Occupational therapist
 10. Optometrist

11. Osteopathic physician
12. Pharmacist
13. Physical therapist
14. Physician's assistant
15. Podiatrist
16. Psychologist
17. Radiologic technologist
18. Registered nurse
19. Respiratory therapist

b. Describe the educational and licensing requirements for five of those in 4a --other than 4a(1)- - practicing health care in your state.

5. a. Tell what is meant by the term "primary care" with regard to a medical specialty. Briefly describe the types of work done by physicians in the following "core" specialties:

1. Internal medicine*
2. Family practice*
3. Obstetrics/gynecology*
4. Pediatrics*
5. Psychiatry
6. Surgery

b. Describe the additional educational requirements for these specialties.

6. a. Briefly describe the types of work performed by physicians in FIVE of the following specialties or subspecialties:

1. Allergy/immunology
2. Anesthesiology
3. Cardiology
4. Colon and rectal surgery
5. Dermatology
6. Emergency Medicine
7. Endocrinology
8. Gastroenterology
9. Geriatric medicine
10. Hematology/oncology
11. Infectious disease
12. Nephrology
13. Neuro surgery
14. Neurology
15. Nuclear medicine
16. Ophthalmology
17. Orthopedic surgery
18. Otolaryngology/head and neck surgery
19. Pathology

20. Physical medicine and rehabilitation
21. Plastic, reconstructive, and maxillofacial surgery.
22. Preventive medicine
23. Radiology
24. Rheumatology
25. Thoracic/cardiothoracic surgery
26. Urology
27. Vascular surgery

b. Describe the additional educational requirements for the five specialties or subspecialties you chose in 6a.

7. a. Visit a physician's office, ** preferably one who delivers "primary care." (This may be that of your counselor.) Discuss the components of a medical history and physical examination (an official BSA health form may be used to guide this discussion), and become familiar with the instruments used.

b. Describe the characteristics of a good diagnostic test to screen for disease (e.g. routine blood pressure measurement). Explain briefly why diagnostic tests are not perfect.

c. Show how to take a blood pressure reading and a pulse reading.

8. Do the following:

a. Discuss the roles medical societies, the insurance industry, and the government play in influencing the practice of medicine in the United States.

b. Briefly tell how your state monitors the quality of health care within its borders, and how it provides care to those who do not have health insurance.

9. Compare and discuss with your counselor the health care delivery systems in the United States, Sweden, and China.

10. 1 Serve as a volunteer at a health-related event or facility in your community (e.g. blood drive, "health fair", blood pressure screening, etc.) approved by your counselor.

* "Primary care" specialties

** If this cannot be arranged, demonstrate to your counselor that you understand the components of a medical history and physical, and discuss the instruments involved.

Music

1. Please bring your instrument (if possible) and a book which has songs you are learning. Sing or play a simple song or hymn chosen by your counselor using good technique, phrasing, tone, rhythm, and dynamics. Read all the signs and terms of the score.
2. Name the five general groups of musical instruments. Create an illustration that shows how tones are generated and how instruments produce sound.
3. Do TWO of the following:
 - a. Attend a live performance, or listen to three hours of recordings from any two of the following musical styles: blues, jazz, classical, country, bluegrass, ethnic, gospel, musical theater, opera. Describe the sound of the music and the instruments used. Identify the composers or songwriters, the performers, and the titles of the pieces you heard. If it was a live performance, describe the setting and the reaction of the audience. Discuss your thoughts about the music.
 - b. Interview your parents and grandparents about music. Find out what the most popular music was when they were your age. Find out what their favorite music is now, and listen to three of their favorite tunes with them. How do their favorites sound to you? Had you ever heard any of them? Play three of your favorite songs for them, and explain to them why you like these songs. Ask them what they think of your favorite music.
 - c. Serve for six months as a member of a school band, choir, or other local musical group; or perform as a soloist in public six times.
 - d. List five people who are important in the history of American music and explain to your counselor why they continue to be influential. Include at least one composer, one performer, one innovator, and one person born more than 100 years ago.
4. Do ONE of the following:
 - a. Teach three songs to a group of people. Lead them in singing the songs, using proper hand motions.
 - b. Compose and write the score for a piece of music of 12 measures or more.
 - c. Make a traditional instrument and learn to play it.
 - d. Catalog your own or your family's collection of 12 or more compact discs, tapes or records. Show how to handle and store them.

Nature

1. Name three ways in which plants are important to animals. Name a plant that is important to animals that is protected in your state or region, and explain why it is at risk.
2. Name three ways in which animals are important to plants. Name an animal that is protected in your state or region, and explain why it is at risk.
3. Explain the term "food chain." Give an example of a four-step land food chain and a four-step water food chain.
4. Do all the requirements in FIVE of the following fields:
 - a. Birds
 1. In the field, identify eight species of birds.
 2. Make and set out a birdhouse OR a feeding station OR a birdbath. List what birds used it during a period of one month.
 - b. Mammals
 1. In the field, identify three species of wild animals.
 2. Make plaster casts of the tracks of a wild animal.
 - c. Reptiles and Amphibians
 1. Show that you can recognize the poisonous snakes in your area.
 2. In the field, identify three species of reptiles or amphibians.
 3. Recognize one species of toad or frog by voice; OR identify one reptile or amphibian by eggs, den, burrow or other signs.
 - d. Insects and Spiders
 1. Collect, mount, and label 10 species of insects or spiders.
 2. Hatch an insect from the pupa or cocoon; OR hatch adults from nymphs; OR keep larvae until they form pupae or cocoons; OR keep a colony of ants or bees through one season.
 - e. Fish
 1. Catch and identify two species of fish.
 2. Collect four kinds of animal food eaten by fish in the wild.
 - f. Mollusks and Crustaceans
 1. Identify five species of mollusks and crustaceans.
 2. Collect, mount, and label six shells.

g. Plants

1. In the field, identify 15 species of wild plants.
2. Collect and label seeds of six plants; OR the leaves of 12 plants.

h. Soils and Rocks

1. Collect and identify soils found in different layers of a soil profile.
2. Collect and identify five different types of rocks from your area.

Notes

- In most cases all specimens should be returned to the wild at the location of original capture after the requirements have been met. Check with your merit badge counselor for those instances where the return of these specimens would not be appropriate.
- Under the Endangered Species Act of 1973, some plants and animals are or may be protected by federal law. The same ones and/or others may be protected by state law. Be sure that you do not collect protected species.
- Your state may require that you purchase and carry a license to collect certain species. Check with the wildlife and fish and game official in your state regarding species regulations before you begin to collect.

Nuclear Science

1. Do the following:
 - a. Tell what radiation is.
 - b. Describe the hazards of radiation to humans, the environment, and wildlife. Explain the difference between radiation exposure and contamination. In your explanation, discuss the nature and magnitude of radiation risks to humans from nuclear power, medical radiation, and background radiation including radon. Explain the ALARA principle and measures required by law to minimize these risks.
 - c. Describe the radiation hazard symbol and explain where it should be used. Tell why and how people must use radiation or radioactive materials carefully.

2. Do the following:
 - a. Tell the meaning of the following: atom, nucleus, proton, neutron, electron, quark, isotope; alpha particle, beta particle, gamma ray, X-ray; ionization, radioactivity, and radioisotope.
 - b. Choose an element from the periodic table. Construct 3-D models for the atoms of three isotopes of this element, showing neutrons, protons, and electrons. Use the three models to explain the difference between atomic number and mass number and the difference between the quark structure of a neutron and a proton.

3. Do ONE of the following; then discuss modern particle physics with your counselor:
 - a. Visit an accelerator (research lab) or university where people study the properties of the nucleus or nucleons.
 - b. Name three particle accelerators and describe several experiments that each accelerator performs.

4. Do TWO of the following; then discuss with your counselor the different kinds of radiation and how they can be used:
 - a. Build an electroscope. Show how it works. Place a radiation source inside and explain the effect it causes.
 - b. Make a cloud chamber. Show how it can be used to see the tracks caused by radiation. Explain what is happening.
 - c. Obtain a sample of irradiated and non-irradiated foods. Prepare the two foods and compare their taste and texture. Store the leftovers in separate containers and under the same conditions. For a period of 14 days, observe their rate of decomposition or spoilage, and describe the differences you see on days 5, 10, and 14.
 - d. Visit a place where radioisotopes are being used. Using a drawing, explain how and why they are used.

5. Do ONE of the following; then discuss with your counselor the principles of radiation safety:
 - a. Using a radiation survey meter and a radioactive source, show how the counts per minute change as the source gets closer to or farther from the radiation detector. Place three different materials between the source and the detector, then explain any differences in the measurements per minute. Explain how time, distance, and shielding can reduce an individual's radiation dose.
 - b. Describe how radon is detected in homes. Discuss the steps taken for the long-term and short-term test methods, tell how to interpret the results, and explain when each type of test should be used. Explain the health concern related to radon gas and tell what steps can be taken to reduce radon in buildings.
 - c. Visit a place where X-rays are used. Draw a floor plan of this room. Show where the unit, the unit operator, and the patient would be when the X-ray unit is operated. Explain the precautions taken and the importance of those precautions.
6. Do ONE of the following; then discuss with your counselor how nuclear energy is used to produce electricity:
 - a. Make a drawing showing how nuclear fission happens, labeling all details. Draw another picture showing how a chain reaction could be started and how it could be stopped. Explain what is meant by a "critical mass."
 - b. Build a model of a nuclear reactor. Show the fuel, control rods, shielding, moderator, and cooling material. Explain how a reactor could be used to change nuclear energy into electrical energy or make things radioactive.
 - c. Find out how many nuclear power plants exist in the United States. Locate the one nearest your home. Find out what percentage of electricity in the United States is generated by nuclear power plants, by coal, and by gas.
7. Give an example of each of the following in relation to how energy from an atom can be used: nuclear medicine, environmental applications, industrial applications, space exploration, and radiation therapy. For each example, explain the application and its significance to nuclear science.
8. Find out about three career opportunities in nuclear science that interest you. Pick one and find out the education, training, and experience required for this profession and discuss this with your counselor. Tell why this profession interests you.

Oceanography

1. Name four branches of oceanography. Describe at least five reasons why it is important for people to learn about the oceans.
2. Define salinity, temperature, and density, and describe how these important properties of seawater are measured by the physical oceanographer. Discuss the circulation and currents of the ocean. Describe the effects of the oceans on weather and climate.
3. Describe the characteristics of ocean waves. Point out the differences among the storm surge, tsunami, tidal wave, and tidal bore. Explain the difference between sea, swell, and surf. Explain how breakers are formed.
4. Draw a cross-section of underwater topography. Show what is meant by:
 - a. Continental shelf
 - b. Continental slope, and
 - c. Abyssal plain

Name and put on your drawing the following: seamount, guyot, rift valley, canyon, trench, and oceanic ridge. Compare the depths in the oceans with the heights of mountains on land.

5. List the main salts, gases, and nutrients in sea water. Describe some important properties of water. Tell how the animals and plants of the ocean affect the chemical composition of seawater. Explain how differences in evaporation and precipitation affect the salt content of the oceans.
6. Describe some of the biologically important properties of seawater. Define benthos, nekton, and plankton. Name some of the plants and animals that make up each of these groups. Describe the place and importance of phytoplankton in the oceanic food chain.
7. Do ONE of the following:
 - a. Make a plankton net*. Tow the net by a dock, wade with it, hold it in a current, or tow it from a rowboat. Do this for about 20 minutes. Save the sample. Examine it under a microscope or high-power glass. Identify the three most common types of plankton in the sample.
 - b. Make a series of models (clay or plaster and wood) of a volcanic island. Show the growth of an atoll from a fringing reef through a barrier reef. Describe the Darwinian theory of coral reef formation.
 - c. Measure the water temperature at the surface, midwater, and bottom of a body of water four times daily for five consecutive days. You may measure depth with a rock tied to a line. Make a Secchi disk to measure turbidity (how much suspended sedimentation is in

the water). Measure the air temperature. Note the cloud cover and roughness of the water. Show your findings (air and water temperature, turbidity) on a graph. Tell how the water temperature changes with air temperature.

d. Make a model showing the inshore sediment movement by littoral currents, tidal movement, and wave action. Include such formations as high and low waterlines, low tide terrace, berm, and coastal cliffs. Show how the offshore bars are built up and torn down.

e. Make a wave generator. Show reflection and refraction of waves. Show how groins, jetties, and breakwaters affect these patterns.

f. Track and monitor satellite images available on the Internet for a specific location for three weeks. Describe what you have learned to your counselor.

8. Do ONE of the following:

a. Write a 500-word report on a book about oceanography approved by your counselor.

b. Visit one of the following:

1. Oceanographic research ship

2. Oceanographic institute.

Write a 500-word report about your visit.

c. Explain to your troop in a five minute prepared speech "Why Oceanography Is Important" or describe "Career Opportunities in Oceanography." (Before making your speech, show your speech outline to your counselor for approval.)

9. Describe four methods that marine scientists use to investigate the ocean, underlying geology, and organisms living in the water.

* May be done in lakes or streams.

Personal Fitness

If meeting any of the requirements for this merit badge is against the Scout's religious convictions, the requirement does not have to be done if the Scout's parents and the proper religious adviser's state in writing that to do so would be against religious convictions. The Scout's parents must also accept full responsibility for anything that might happen because of this exemption.

1. Do the following:
 - a. Before completing requirements 2 through 9, have your health-care practitioner give you a physical examination, using the Scout medical examination form. Describe the examination. Tell what questions the doctor asked about your health. Tell what health or medical recommendations the doctor made and report what you have done in response to the recommendations. Explain the following:
 1. Why physical exams are important
 2. Why preventative habits (such as exercising regularly) are important in maintaining good health, and how the use of tobacco products, alcohol, and other harmful substances can negatively affect our personal fitness.
 3. Diseases that can be prevented and how.
 4. The seven warning signs of cancer.
 5. The youth risk factors that affect cardiovascular fitness in adulthood.
 - b. Have a dental examination. Get a statement saying that your teeth have been checked and cared for. Tell how to care for your teeth.
2. Explain to your merit badge counselor verbally or in writing what personal fitness means to you, including:
 - a. Components of personal fitness
 - b. Reasons for being fit in all components.
 - c. What it means to be mentally healthy
 - d. What it means to be physically healthy and fit.
 - e. What it means to be socially healthy. Discuss your activity in the areas of healthy social fitness.
 - f. What you can do to prevent social, emotional, or mental problems.
3. With your counselor answer and discuss the following questions:
 - a. Are you free from all curable diseases? Are you living in such a way that your risk of preventable diseases is minimized?
 - b. Are you immunized and vaccinated according to the advice of your health-care provider?
 - c. Do you understand the meaning of a nutritious diet and know why it is important for you? Does your diet include foods from all food groups?

- d. Are your body weight and composition what you would like them to be, and do you know how to modify them safely through exercise, diet, and behavior modification?
 - e. Do you carry out daily activities without noticeable effort? Do you have extra energy for other activities?
 - f. Are you free from habits relating to poor nutrition and the use of alcohol, tobacco, drugs, and other practices that could be harmful to your health?
 - g. Do you participate in a regular exercise program or recreational activities?
 - h. Do you sleep well at night and wake up feeling refreshed and energized for the new day?
 - i. Are you actively involved in the religious organization of your choice, and do you participate in its youth activities?
 - j. Do you spend quality time with your family and friends in social and recreational activities?
 - k. Do you support family activities and efforts to maintain a good home life?
4. Explain the following about physical fitness:
- a. The components of physical fitness
 - b. Your weakest and strongest component of physical fitness
 - c. The need to have a balance in all four components of physical fitness.
 - d. How the components of personal fitness relate to the Scout Law and Scout Oath.
5. Explain the following about nutrition:
- a. The importance of good nutrition
 - b. What good nutrition means to you
 - c. How good nutrition is related to the other components of personal fitness
 - d. The three components of a sound weight (fat) control program.
6. Before doing requirements 7 and 8, complete the aerobic fitness, flexibility, muscular strength, and body composition tests as described in the *Personal Fitness* merit badge pamphlet. Record your results and identify those areas where you feel you need to improve.

AEROBIC FITNESS TEST

Record your performance on one of the following tests:

- a. Run/walk as far as you can in nine minutes.
- b. Run/walk one mile as fast as you can.

FLEXIBILITY TEST

Using a sit-and-reach box constructed according to specifications in the *Personal Fitness* merit badge pamphlet, make four repetitions and record the fourth reach. This last reach must be held steady for 15 seconds to qualify. (Remember to keep your knees down.)

STRENGTH TESTS

Record your performance on all three tests.

- a. **Sit-ups.** Record the number of sit-ups done correctly in 60 seconds. The sit-ups must be done in the form explained and illustrated in the *Personal Fitness* merit badge pamphlet.
- b. **Pull-ups.** Record the total number of pull-ups completed correctly in 60 seconds. Be consistent with the procedures presented in the *Personal Fitness* merit badge pamphlet.
- c. **Push-ups.** Record the total number of push-ups completed correctly in 60 seconds. Be consistent with the procedures presented in the *Personal Fitness* merit badge pamphlet.

BODY COMPOSITION TEST

Have your parent, counselor, or other adult take and record the following measurements:

- a. Circumference of the right upper arm, midway between the shoulder and the elbow, with the arm hanging naturally and not flexed.
 - b. Shoulders, with arms hanging by placing the tape two inches below the top of the shoulders around the arms, chest, and back after breath expiration.
 - c. Chest, by placing the tape under the arms and around the chest and back at the nipple line after breath expiration.
 - d. Abdomen circumference at the navel level (relaxed).
 - e. Circumference of the right thigh, midway between the hip and knee, and not flexed.
- If possible, have the same person take the measurements whenever you are ready to be remeasured to chart your progress.
- 7. Outline a comprehensive 12-week physical fitness program using the results of your fitness tests. Be sure your program incorporates the endurance, intensity, and warm-up guidelines discussed in the *Personal Fitness* merit badge pamphlet. Before beginning your exercises, have the program approved by your counselor and parents.
 - 8. Complete the physical fitness program you outlined in requirement 7. Keep a log of your fitness program activity (how long you exercised; how far you ran, swam, or biked; how many exercise repetitions you completed; your exercise heart rate; etc.). Repeat the aerobic fitness, muscular strength, and flexibility tests every two weeks and record your results. After the 12th week, repeat all four tests, record your results, and show improvement in each one. Compare and analyze your preprogram and post program body composition measurements. Discuss the meaning and benefit of your experience, and describe your long-term plans regarding your personal fitness.
 - 9. Find out about three career opportunities in personal fitness. Pick one and find out the education, training, and experience required for these professions. Discuss what you learned with your counselor, and explain why this profession might interest you.

Personal Management

1. Do the following:

- a. Choose an item that your family might want to purchase that is considered a major expense.
- b. Write a plan that tells how your family would save money for the purchase identified in requirement 1a.
 1. Discuss the plan with your merit badge counselor
 2. Discuss the plan with your family
 3. Discuss how other family needs must be considered in this plan.
- c. Develop a written shopping strategy for the purchase identified in requirement 1a.
 1. Determine the quality of the item or service (using consumer publications or rating systems).
 2. Comparison shop for the item. Find out where you can buy the item for the best price. (Provide prices from at least two different price sources.) Call around; study ads. Look for a sale or discount coupon. Consider alternatives. Can you buy the item used? Should you wait for a sale?

2. Do the following:

- a. Prepare a budget reflecting your expected income (allowance, gifts, wages), expenses, and savings. Track your actual income, expenses, and savings for 13 consecutive weeks. (You may use the forms provided in this pamphlet, devise your own, or use a computer generated version.) When complete, present the results to your merit badge counselor.
- b. Compare expected income with expected expenses.
 1. If expenses exceed income, determine steps to balance your budget.
 2. If income exceeds expenses, state how you would use the excess money (new goal, savings).

3. Discuss with your merit badge counselor FIVE of the following concepts:

- a. The emotions you feel when you receive money.
- b. Your understanding of how the amount of money you have with you affects your spending habits.
- c. Your thoughts when you buy something new and your thoughts about the same item three months later. Explain the concept of buyer's remorse.
- d. How hunger affects you when shopping for food items (snacks, groceries).
- e. Your experience of an item you have purchased after seeing or hearing advertisements for it. Did the item work as well as advertised?
- f. Your understanding of what happens when you put money into a savings account.
- g. Charitable giving. Explain its purpose and your thoughts about it.
- h. What you can do to better manage your money.

4. Explain the following to your merit badge counselor:
 - a. The differences between saving and investing, including reasons for using one over the other.
 - b. The concepts of return on investment and risk.
 - c. The concepts of simple interest and compound interest and how these affected the results of your investment exercise.

5. Select five publicly traded stocks from the business section of the newspaper. Explain to your merit badge counselor the importance of the following information for each stock:
 - a. Current price
 - b. How much the price changed from the previous day
 - c. The 52-week high and the 52-week low prices

6. Pretend you have \$1,000 to save, invest, and help prepare yourself for the future. Explain to your merit badge counselor the advantages or disadvantages of saving or investing in each of the following:
 - a. Common stocks
 - b. Mutual funds
 - c. Life insurance
 - d. A certificate of deposit (CD)
 - e. A savings account or U.S. savings bond

7. Explain to your merit badge counselor the following:
 - a. What a loan is, what interest is, and how the annual percentage rate (APR) measures the true cost of a loan.
 - b. The different ways to borrow money.
 - c. The differences between a charge card, debit card, and credit card. What are the costs and pitfalls of using these financial tools? Explain why it is unwise to make only the minimum payment on your credit card.
 - d. Credit reports and how personal responsibility can affect your credit report.
 - e. Ways to reduce or eliminate debt.

8. Demonstrate to your merit badge counselor your understanding of time management by doing the following:
 - a. Write a "to do" list of tasks or activities, such as homework assignments, chores, and personal projects, that must be done in the coming week. List these in order of importance to you.
 - b. Make a seven-day calendar or schedule. Put in your set activities, such as school classes, sports practices or games, jobs or chores, and/or Scout or church or club meetings, then plan when you will do all the tasks from your "to do" list between your set activities.

- c. Follow the one-week schedule you planned. Keep a daily diary or journal during each of the seven days of this week's activities, writing down when you completed each of the tasks on your "to do" list compared to when you scheduled them.
- d. Review your "to do" list, one-week schedule, and diary/journal to understand when your schedule worked and when it did not work. With your merit badge counselor, discuss and understand what you learned from this requirement and what you might do differently the next time.

9. Prepare a written project plan demonstrating the steps below, including the desired outcome. This is a project on paper, not a real-life project. Examples could include planning a camping trip, developing a community service project or a school or religious event, or creating an annual patrol plan with additional activities not already included in the troop annual plan. Discuss your completed project plan with your merit badge counselor.

- a. Define the project. What is your goal?
- b. Develop a timeline for your project that shows the steps you must take from beginning to completion.
- c. Describe your project.
- d. Develop a list of resources. Identify how these resources will help you achieve your goal.
- e. If necessary, develop a budget for your project.

10. Do the following:

- a. Choose a career you might want to enter after high school or college graduation.
- b. Research the limitations of your anticipated career and discuss with your merit badge counselor what you have learned about qualifications such as education, skills, and experience.

Photography

1. Explain how the following elements and terms affect the quality of a picture:
 - a. Light-natural light/ambient, flash
 - b. Exposure-aperture (f-stops), shutter speed, depth of field
 - c. Composition-rule of thirds, leading lines, framing, depth
 - d. Angle of view
 - e. Stopping action
2. Explain the basic parts and operation of a film camera or digital camera. Explain how an exposure is made when you take a picture.
3. Discuss with your counselor the differences between a film camera and a digital camera. List at least five advantages and five disadvantages of using a digital camera versus using a film camera.
4. Do ONE of the following:
 - a. Produce a picture story using the photojournalistic technique of documenting an event. Share your plan with your counselor and get your counselor's input and approval before you proceed. Then, using either a film camera or a digital camera, produce your approved picture story. Process your images and select eight to 12 images that best tell your story. Arrange your images in order, then mount the prints on a poster board. If you are using digital images, you may create a slide show on your computer or produce printouts for your poster board. Share your picture story with your counselor.
 - b. Choose a topic that interests you to photograph for an exhibit or display. Get your counselor's approval, then photograph (digital or film) your topic. Process your images. Choose 20 of your favorite images and mount them on poster board. Share your display with your counselor. If you are using digital images, you may create a slide show on your computer or produce printouts for your poster board.
5. Discuss with your counselor the career opportunities in photography. Pick one that interests you and explain how to prepare for such a career. Discuss with your counselor the education and training such a career would require.

Public Speaking

1. Give a three- to five-minute introduction of yourself to an audience such as your troop, class at school, or some other group.
2. Prepare a three- to five-minute talk on a topic of your choice that incorporates body language and visual aids.
3. Give an impromptu talk of at least two minutes, either as part of a group discussion or before your counselor. Use a subject selected by your counselor that is interesting to you but that is not known to you in advance and for which you do not have time to prepare.
4. Select a topic of interest to your audience. Collect and organize information about this topic and prepare an outline. Write an eight- to 10-minute speech, practice it, then deliver it in the conversational way.
5. Show you know parliamentary procedure by leading a discussion or meeting according to accepted rules of order; or by answering questions on the rules of order.

Radio

1. Explain what radio is. Then discuss the following:
 - a. The differences between broadcast radio and hobby radio.
 - b. The differences between broadcasting and two-way communications.
 - c. Radio call signs and how they are used in broadcast radio and amateur radio
 - d. The phonetic alphabet and how it is used to communicate clearly.
2. Do the following:
 - a. Sketch a diagram showing how radio waves travel locally and around the world. Explain how the broadcast radio stations, WWV and WWVH can be used to help determine what you will hear when you listen to a shortwave radio.
 - b. Explain the difference between a DX and a local station. Discuss what the Federal Communication Commission (FCC) does and how it is different from the International Telecommunication Union.
3. Do the following:
 - a. Draw a chart of the electromagnetic spectrum covering 100 kilohertz (kHz) to 1000 megahertz (MHz).
 - b. Label the MF, HF, VHF, UHF, and microwave portions of the spectrum on your diagram.
 - c. Locate on your chart at least eight radio services such as AM and FM commercial broadcast, citizens band (CB), television, amateur radio (at least four amateur radio bands), and public service (police and fire).
4. Explain how radio waves carry information. Include in your explanation: transceiver, transmitter, receiver, amplifier, and antenna.
5. Do the following:
 - a. Explain the differences between a block diagram and a schematic diagram.
 - b. Draw a block diagram for a radio station that includes a transceiver, amplifier, microphone, antenna, and feed line.
 - c. Explain the differences between an open circuit a closed circuit, and a short circuit.
 - d. Draw eight schematic symbols. Explain what three of the represented parts do. Find three electrical components to match to three of these symbols.
6. Explain the safety precautions for working with radio gear, including the concept of grounding for direct current circuits, power outlets, and antenna systems.
7. Visit a radio installation (an amateur radio station, broadcast station, or public communications center, for example) approved in advance by your counselor. Discuss

what types of equipment you saw in use, how it was used, what types of licenses are required to operate and maintain the equipment, and the purpose of the station.

8. Find out about three career opportunities in radio. 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.
9. Do ONE of the following: (a OR b OR c)

a. AMATEUR RADIO

1. Tell why the FCC has an amateur radio service. Describe some of the activities that amateur radio operators can do on the air, once they have earned an amateur radio license.
2. Using proper call signs, Q signals, and abbreviations, carry on a 10 minute real or simulated radio contact using voice, Morse Code, or digital mode. (Licensed amateur radio operators may substitute five QSL cards as evidence of contacts with amateur radio operators from at least three different call districts.) Properly log the real or simulated ham radio contact and record the signal report.
3. Explain at least five Q signals or amateur radio terms you hear while listening.
4. Explain some of the differences between the Technician, General, and Extra Class license requirements and privileges. Explain who administers amateur radio exams.
5. Explain how you would make an emergency call on voice or Morse code.
6. Explain the differences between handheld transceivers and home "base" transceivers. Explain the uses of mobile amateur radio transceivers and amateur radio repeaters.

b. BROADCAST RADIO

1. Prepare a program schedule for radio station "KBSA" of exactly one-half hour, including music, news, commercials, and proper station identification. Record your program on audiotape or in a digital audio format using proper techniques.
2. Listen to and properly log 15 broadcast stations Determine the program format and target audience for five of these stations.
3. Explain at least eight terms used in commercial broadcasting, such as segue, cut, fade, continuity, remote, Emergency Alert System, network, cue, dead air, PSA, and playlist..

c. SHORTWAVE LISTENING

1. Listen across several shortwave bands for four one-hour periods - at least one period during daylight hours and at least one period at night. Log the stations properly and locate them geographically on a globe.
2. For several major foreign stations (BBC in Great Britain or HCJB in Ecuador, for example), list several frequency bands used by each.

3. Compare your daytime and nighttime logs ; note the frequencies on which your selected stations were loudest during each session. Explain the differences in the signal strength from one period to the next.

Reading

1. Do EACH of the following:
 - a. Learn how to search your library's card catalog or computerized catalog by author, title, and subject.
 - b. With the assistance of your merit badge counselor or a librarian, select six books of four different types (such as poetry, drama/plays, fiction, nonfiction, biographies, etc.). Ask your librarian or counselor about award-winning books that are recommended for readers your age and include at least one of those titles.
 - c. Find the books in the library catalog. With your counselor's or a librarian's assistance, locate the books on the shelves.
 - d. Read each book. Keep a log of your reading that includes the title of the book, the pages or chapters read, the date you completed them, and your thoughts about what you have read so far. Discuss your reading with your counselor. Using your log as a reference, explain why you chose each book and tell whether you enjoyed it and what it meant to you.
2. Read about the world around you from any two sources: books, magazines, newspapers, the Internet (with your parent's permission), field manuals, etc. Topics may include sports, environmental problems, politics, social issues, current events, nature, religion, etc. Discuss what you have learned with your counselor.
3. Do ONE of the following:
 - a. From a catalog of your choice, fill out an order form for merchandise as if you intended to place an order. Share the completed form with your counselor and discuss it.
 - b. With your parent's permission, locate at least five Web sites that are helpful for your scouting or other activities. Write the Internet addresses of these sites in your log. Talk with your counselor or a librarian about safety rules for using the Internet.
4. With your counselor's and parent's permission, choose ONE of the following activities and devote at least four hours of service to that activity. Discuss your participation with your counselor.
 - a. Read to a sick, blind, or homebound person in a hospital or in an extended-care facility.
 - b. Perform volunteer work at your school library or a public library.
 - c. Read stories to younger children, in a group or individually.

Robotics

Safety. Do each of the following:

- a. Explain to your counselor the most likely hazards you may encounter while working with robots and what you should do to anticipate, mitigate and prevent, and respond to these hazards. Describe the appropriate safety gear and clothing that should be used when working with robotics.
- b. Discuss first aid and prevention for the types of injuries that could occur while participating in robotics activities and competitions, including cuts, eye injuries, and burns (chemical or heat).

2. **Robotics industry.** Discuss the following with your counselor:

- a. The kinds of things robots can do and how robots are best used today.
- b. The similarities and differences between remote-control vehicles, telerobots, and autonomous robots.
- c. Three different methods robots can use to move themselves other than wheels or tracks. Describe when it would be appropriate to use each method.

3. **General knowledge.** Discuss with your counselor three of the five major fields of robotics (human-robot interface, mobility, manipulation, programming, sensors) and their importance to robotics development. Discuss either the three fields as they relate to a single robot system OR talk about each field in general. Find pictures or at least one video to aid in your discussion.

4. **Design, build, program, test.** Do each of the following:

- a. With your counselor's approval, choose a task for the robot or robotic subsystem that you plan to build. Include sensor feedback and programming in the task. Document this information in your robot engineering notebook.
- b. Design your robot. The robot design should use sensors and programming and have at least 2 degrees of freedom. Document the design in your robot engineering notebook using drawings and a written description.
- c. Build a robot or robotic subsystem of your original design to accomplish the task you chose for requirement 4a.
- d. Discuss with your counselor the programming options available for your robot. Then do either option 1 OR option 2.
 - (1) Option 1. Program your robot to perform the task you chose for your robot in 4a. Include a sample of your program's source code in your robot engineering notebook.
 - (2) Option 2. Prepare a flowchart of the desired steps to program your robot for accomplishing the task in 4a. Include procedures that show activities based on sensor inputs. Place this in your robot engineering notebook.
- e. Test your robot and record the results in your robot engineering notebook. Include suggestions on how you could improve your robot, as well as pictures or sketches of your finished robot.

5. Demonstrate. Do the following:

- a. Demonstrate for your counselor the robot you built in requirement 4.
- b. Share your robot engineering notebook with your counselor. Talk about how well your robot accomplished the task, the improvements you would make in your next design, and what you learned about the design process.

6. Competitions. Do ONE of the following.

- a. Attend a robotics competition and report to your counselor what you saw and learned about the competition and how teams are organized and managed.
- b. Learn about three youth robotics competitions. Tell your counselor about these, including the type of competition, time commitment, age of the participants, and how many teams are involved.

7. Careers. Name three career opportunities in robotics. 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.

Safety

1. Explain what safety is and what it means to be safe. Then prepare a notebook to include:
 - a. Newspaper and other stories, facts, and statistics showing common types and causes of injuries in the home and in the workplace, and how these injuries could be prevented.
 - b. Newspaper and other stories, facts, and statistics showing common kinds of crimes and ways to avoid being a crime victim..
 - c. Facts you have obtained concerning the frequency of accidents and of crimes in your local area.
 - d. A paragraph or more, written by you, explaining how a serious fire, accident, or crime could change your family life.
 - e. A list of safe practices and safety devices currently used by your family, such as safety practices used while driving or working and safety devices that prevent injuries or help in an emergency.

2. Do the following:
 - a. Using a safety checklist approved by your counselor, make an inspection of your home. Explain the hazards found and how these can be corrected.
 - b. Review or develop your family's plan of escape in case of fire in your home. As you develop the escape plan with family members, share with them facts about the common causes of fire in the home, such as smoking, cooking, electrical appliances, and candles.

3. Do the following:
 - a. Discuss with your counselor how you contribute to the safety of yourself, your family, and your community.
 - b. Show your family members how to protect themselves and your home from accidents, fire, burglary, robbery, and assault.
 - c. Discuss with your counselor the tips for online safety. Explain the steps individuals can take to help prevent identity theft.
 - d. Discuss with your counselor the three R's of Youth Protection and how to recognize child abuse.

4. Show your family the exits you would use from different public buildings (such as a theater, municipal building, library, supermarket, shopping center, or your place of worship) in the event of an emergency. Teach your family what to do in the event that they need to take shelter in or evacuate a public place.

5. Make an accident prevention plan for five family activities outside the home (at your place of worship, at a theater, on a picnic, at the beach, and while traveling, for example). Each plan should include an analysis of possible hazards, proposed action to correct hazards, and reasons for the correction you propose in each plan.

6. Plan and complete a safety project approved by your counselor for your home, school, place of worship, place of employment, or community. Include in your plan an explanation of the U.S. Department of Homeland Security's Advisory System and appropriate actions to take for each threat level.

7. Learn about three career opportunities in the field of safety. Pick one career and find out the education, training, and experience required for this profession. Discuss this choice with your counselor, and explain why this profession might interest you.

Scholarship

1. Do ONE of the following:
 - a. Show that you have had an average grade of B or higher (80 percent or higher) for one term or semester.
 - b. Show that for one term or semester you have improved your school grades over the previous period.
2. Do TWO of the following:
 - a. Make a list of educational places located where you live (other than schools). Visit one, and report on how you used the place for self-education.
 - b. With your counselor's and your parent's approval, interview two professionals (other than teachers or other professionals at your school) with established careers. Find out where they were educated, what training they received, and how their education and training have helped prepare them for the career they have chosen. Find out how they continue to educate themselves. Discuss what you find out with your counselor.
 - c. Using a daily planner, show your counselor how you keep track of assignments and activities, and discuss how you manage your time.
 - d. Discuss the advantages and disadvantages of the different methods of research available to you for school assignments, such as the library, books and periodicals, and the Internet.
3. Get a note from the principal* of your school (or another school official named by the principal) that states that during the past year your behavior, leadership, and service have been satisfactory.
4. Do ONE of the following:
 - a. Show that you have taken part in an extracurricular school activity, and discuss with your counselor the benefits of participation and what you learned about the importance of teamwork.
 - b. Discuss your participation in a school project during the past semester where you were a part of a team. Tell about the positive contributions you made to the team and the project.
5. Do ONE of the following:
 - a. Write a report of 250 to 300 words about how the education you receive in school will be of value to you in the future and how you will continue to educate yourself in the future.
 - b. Write a report of 250 to 300 words about two careers that interest you and how specific classes and good scholarship in general will help you achieve your career goals.

* If you are home-schooled or your school environment does not include a principal, you may obtain a note from a counterpart such as your parent. Come prepared to discuss/share/show written proof of work.

Scouting Heritage

1. Discuss with your counselor the life and times of Lord Baden-Powell of Gilwell. Explain why he felt a program like Scouting would be good for the young men of his day. Include in your discussion how Scouting was introduced in the United States, and the origins of Boy Scouting and Cub Scouting under Baden-Powell.

2. Do the following:

a. Give a short biographical sketch of any TWO of the following, and tell of their roles in how Scouting developed and grew in the United States prior to 1940.

- Daniel Carter Beard
- William D. Boyce
- Waite Phillips
- Ernest Thompson Seton
- James E. West

b. Discuss the significance to Scouting of any TWO of the following:

- Brownsea Island
- The First World Scout Jamboree
- Boy Scout Handbook
- Boys' Life Magazine

3. Discuss with your counselor how Scouting's programs have developed over time and been adapted to fit different age groups and interests (Cub Scouting, Boy Scouting, Exploring, Venturing).

4. Do ONE of the following:

a. Attend either a BSA national jamboree, OR world Scout jamboree, OR a national BSA high-adventure base. While there, keep a journal documenting your day-to-day experiences. Upon your return, report to your counselor what you did, saw, and learned. You may include photos, brochures, and other documents in your report.

b. Write or visit the National Scouting Museum in Irving, Texas.* Obtain information about this facility. Give a short report on what you think the role of this museum is in the Scouting program.

- If you visit the BSA's national traveling tour, Adventure Base 100, in 2010, you may use this experience to fulfill requirement 4b. Visit www.adventurebase100.org (with your parent's permission) for the schedule and for more information.

5. Learn about the history of your unit or Scouting in your area. Interview at least two people (one from the past and one from the present) associated with your troop. These individuals could be adult unit leaders, Scouts, troop committee members, or representatives of your troop's chartered organization. Find out when your unit was originally chartered. Create a report of your findings on the history of your troop, and present it to your patrol or troop or at a court of honor,

and then add it to the troop's library. This presentation could be in the form of an oral/written report, an exhibit, a scrapbook, or a computer presentation such as a slide show.

6. Make a collection of some of your personal patches and other Scouting memorabilia. With their permission, you may include items borrowed from family members or friends who have been in Scouting in the past, or you may include photographs of these items. Show this collection to your counselor, and share what you have learned about items in the collection. (There is no requirement regarding how large or small this collection must be.)

7. Reproduce the equipment for an old-time Scouting game such as those played at Brownsea Island. You may find one on your own (with your counselor's approval), or pick one from the Scouting Heritage merit badge pamphlet. Teach and play the game with other Scouts.

8. Interview at least three people (different from those you interviewed for requirement 5) over the age of 50 who were Scouts. Find out about their Scouting experiences. Ask about the impact that Scouting has had on their lives. Share what you learned with your counselor.

Search and Rescue

1. Do the following:
 - a. Explain to your counselor the hazards you are most likely to encounter while participating in search and rescue (SAR) activities, and what you should do to anticipate, help prevent, mitigate, and respond to these hazards.
 - b. Discuss first aid and prevention for the types of injuries or illnesses that could occur while participating in SAR activities, including: snakebites, dehydration, shock, environmental emergencies such as hypothermia or heatstroke, blisters, and ankle and knee sprains.
2. Demonstrate knowledge to stay found and prevent yourself from becoming the subject of a SAR mission.
 - a. How does the buddy system help in staying found and safe?
 - b. How can knowledge of the area and its seasonal weather changes affect your plans?
 - c. Explain how the Ten Essentials are similar to a “ready pack.”
3. Discuss the following with your counselor:
 - a. The difference between search and rescue
 - b. The difference between PLS (place last seen) and LKP (last known point)
 - c. The meaning of these terms:
 1. AFRCC (Air Force Rescue Coordination Center)
 2. IAP (Incident Action Plan)
 3. ICS (Incident Command System)
 4. Evaluating search urgency
 5. Establishing confinement
 6. Scent item
 7. Area air scent dog
 8. Briefing and debriefing
4. Find out who in your area has authority for search and rescue and what their responsibilities are. Discuss this with your counselor, and explain the official duties of a search and rescue team.
5. Complete the training for ICS-100, Introduction to Incident Command System. Print out the certificate of completion and show it to your counselor. Discuss with your counselor how the ICS compares with Scouting’s patrol method.
6. Identify four types of search and rescue teams and discuss their use or role with your counselor. Then do the following:

- a. Interview a member of one of the teams you have identified above, and learn how this team contributes to a search and rescue operation. Discuss what you learned with your counselor.
 - b. Describe the process and safety methods of working around at least two of the specialized SAR teams you identified above.
 - c. Explain the differences between wilderness, urban, and water SARs.
7. Discuss the Universal Transverse Mercator (UTM) system, latitude, and longitude. Then do the following:
 - a. Using a 1:24,000 scale USGS topographic map, show that you can identify a location of your choice using UTM coordinates.
 - b. Using a 1:24,000 scale map, ask your counselor to give you a UTM coordinate on the map, then identify that location.
 - c. Show that you can identify your current location using the UTM coordinates on a Global Positioning System (GPS) unit and verify it on a 1:24,000 scale map.
 - d. Determine a hypothetical place last seen, and point out an area on your map that could be used for containment using natural or human-made boundaries.
8. Choose a hypothetical scenario, either one presented in this merit badge pamphlet or one created by your counselor. Then do the following:
 - a. Complete an incident objectives form for this scenario.
 - b. Complete an Incident Action Plan (IAP) to address this scenario.
 - c. Discuss with your counselor the behavior of a lost person and how that would impact your incident action plan (for example, the differences between searching for a young child versus a teen).
 - d. After completing 8a–8c, discuss the hypothetical scenario with your counselor.
9. Discuss with your counselor the terms hasty team and hasty search. Then do the following:
 - a. Plan and carry out a practice hasty search—either urban or wilderness—for your patrol or troop. Include the following elements in the search: clue awareness, evidence preservation, tracking the subject, and locating the subject using attraction or trail sweep.
 - b. When it's over, hold a team debriefing to discuss the hasty search. Discuss problems encountered, successful and unsuccessful tactics, and ideas for improvement.
10. Find out about three career or volunteer opportunities in search and rescue. Pick one and find out the education, training, and experience required for this professional or volunteer position. Discuss this with your counselor, and explain why this position might interest you.

Soil and Water Conservation

1. Do the following:
 - a. Tell what soil is. Tell how it is formed.
 - b. Describe three kinds of soil. Tell how they are different.
 - c. Name the three main plant nutrients in fertile soil. Tell how they can be put back when used up.

2. Do the following:
 - a. Define soil erosion.
 - b. Tell why soil conservation is important. Tell how it affects you.
 - c. Name three kinds of soil erosion. Describe each.
 - d. Take pictures of or draw two kinds of soil erosion.

3. Do the following:
 - a. Tell what is meant by "conservation practices".
 - b. Describe the effect of three kinds of erosion-control practices.
 - c. Take pictures of or draw three kinds of erosion-control practices.

4. Do the following:
 - a. Explain what a watershed is.
 - b. Outline the smallest watershed that you can find on a contour map.
 - c. Outline, as far as the map will allow, the next larger watershed which also has the smaller one in it.
 - d. Explain what a river basin is. Tell why all people living in a river basin should be concerned about land and water use in the basin.

5. Do the following:
 - a. Make a drawing to show the hydrologic cycle.
 - b. Demonstrate at least two of the following actions of water in relation to the soil: percolation, capillary action, precipitation, evaporation, transpiration.
 - c. Explain how removal of vegetation will affect the way water runs off a watershed.
 - d. Tell how uses of forest, range, and farmland affect usable water supply.
 - e. Explain how industrial use affects water supply.

6. Do the following:
 - a. Tell what is meant by water pollution.
 - b. Describe common sources of water pollution and explain the effects of each.
 - c. Tell what is meant by "primary water treatment," "secondary waste treatment," and "biochemical oxygen demand."

d. Make a drawing showing the principles of complete waste treatment.

7. Do TWO of the following:

a. Make a trip to two of the following places. Write a report of more than 500 words about the soil and water and energy conservation practices you saw.

1. An agricultural experiment.
2. A managed forest or a woodlot, range, or pasture.
3. A wildlife refuge or a fish or game management area.
4. A conservation-managed farm or ranch.
5. A managed watershed.
6. A waste-treatment plant.
7. A public drinking water treatment plant.
8. An industry water-use installation.
9. A desalinization plant.

b. Plant 100 trees, bushes and/or vines for a good purpose.

c. Seed an area of at least one-fifth acre for some worthwhile conservation purposes, using suitable grasses or legumes alone or in a mixture.

d. Study a soil survey report. Describe the things in it. Using tracing paper and pen, trace over any of the soil maps, and outline an area with three or more different kinds of soil. List each kind of soil by full name and map symbol.

e. Make a list of places in your neighborhood, camps, school ground, or park having erosion, sedimentation, or pollution problems. Describe how these could be corrected through individual or group action.

f. Carry out any other soil and water conservation project approved by your merit badge counselor.

Space Exploration

1. Tell the purpose of space exploration and include the following:
 - a. Historical reasons
 - b. Immediate goals in terms of specific knowledge
 - c. Benefits related to Earth resources, technology, and new products.
2. Design a collector's card, with a picture on the front and information on the back, about your favorite space pioneer. Share your card and discuss four other space pioneers with your counselor.
3. Build, launch, and recover a model rocket.* Make a second launch to accomplish a specific objective. (Rocket must be built to meet the safety code of the National Association of Rocketry. See the "Model Rocketry" chapter of the *Space Exploration* merit badge pamphlet.) Identify and explain the following rocket parts:
 - a. Body tube
 - b. Engine mount
 - c. Fins
 - d. Igniter
 - e. Launch lug
 - f. Nose cone
 - g. Payload
 - h. Recovery system
 - i. Rocket engine
4. Discuss and demonstrate each of the following:
 - a. The law of action-reaction.
 - b. How rocket engines work
 - c. How satellites stay in orbit
 - d. How satellite pictures of Earth and pictures of other planets are made and transmitted.
5. Do TWO of the following:
 - a. Discuss with your counselor an unmanned space exploration mission and an early manned mission. Tell about each mission's major discoveries, its importance, and what we learned from it about the planets, moons, or regions of space explored.
 - b. Using magazine photographs, news clippings, and electronic articles (such as from the Internet), make a scrapbook about a current planetary mission.
 - c. Design an unmanned mission to another planet or moon that will return samples of its surface to Earth. Name the planet or moon your spacecraft will visit. Show

how your design will cope with the conditions of the planet's or moon's environment.

6. Describe the purpose and operation of ONE of the following:
 - a. Space shuttle
 - b. International Space Station

7. Design an inhabited base located on the Moon or Mars. Make drawings or a model of your base. In your design, consider and plan for the following:
 - a. Source of energy
 - b. How it will be constructed
 - c. Life-support system
 - d. Purpose and function

8. Discuss with your counselor two possible careers in space exploration that interest you. Find out the qualifications, education, and preparation required and discuss the major responsibilities of those positions.

* If local laws prohibit the launching of model rockets, do the following activity: Make a model of a NASA rocket. Explain the functions of the parts. Give the history of the rocket.

Sports

1. Show that you know first aid for and how to prevent injuries or illnesses that could occur while playing sports, including sprains, strains, contusions, abrasions, fractures, blisters, muscle cramps, dehydration, heat and cold reactions. injured teeth, nausea, and suspected injuries to the head, neck, and back.
2. Explain the importance of the following:
 - a. The physical exam
 - b. Maintaining good health habits, especially during training
 - c. Maintaining a healthy diet
3. Discuss the following:
 - a. The importance of warming up and cooling down
 - b. The importance of weight training
 - c. What an amateur athlete is and the differences between an amateur and a professional athlete
 - d. The attributes (qualities) of a good sport, the importance of sportsmanship, and the traits of a good team leader and player who exhibits Scout spirit on and off the playing field
4. Take part for one season (or four months) as a competitive individual or as a member of an organized team in TWO of the following sports: baseball, basketball, bowling, cross-country, field hockey, football, ice hockey, lacrosse, soccer, softball, table tennis, tennis, volleyball, water polo. Your counselor may approve in advance other recognized sports, but not any sport that is restricted and not authorized by the Boy Scouts of America. Then with your chosen sports do the following:
 - a. Give the rules and etiquette for the two sports you picked.
 - b. List the equipment needed for the two sports you chose. Describe the protective equipment and appropriate clothing (if any) and explain why it is needed.
 - c. Draw diagrams of the playing areas for your two sports.
5. With guidance from your counselor, establish a personal training program suited to the activities you chose for requirement 4. Then do the following:
 - a. Organize a chart to track your training, practice, and development in these sports for one season (or four months).
 - b. Demonstrate proper technique for your two chosen sports.
 - c. At the end of the season, share your completed chart with your counselor and discuss how your participation in the sports you chose has affected you mentally and physically.

Theater

1. See or read three full-length plays or scripts. These can be from the stage, movies, television, or video. Write a review of each. Comment on the story, acting, and staging.
2. Write a one-act play that will take at least eight minutes to perform. The play must have a main character, conflict, and a climax.
3. Do THREE of the following:
 - a. Act a major part in a full-length play; or act a part in three one-act plays.
 - b. Direct a play. Cast, rehearse, and stage it. The play must be at least 10 minutes long.
 - c. Design the set for a play or a production of a circus. Make a model of it.
 - d. Design the costumes for five characters in one play set in a time before 1900.
 - e. Show skill in stage makeup. Make up yourself or a friend as an old man, a clown, an extraterrestrial, or a monster as directed.
 - f. Help with the building of scenery for one full-length play or two one-act plays.
 - g. Design the lighting for a play; or, under guidance, handle the lighting for a play.
4. Mime or pantomime any ONE of the following chosen by your counselor.
 - a. You have come into a large room. It is full of pictures, furniture, other things of interest.
 - b. As you are getting on a bus, your books fall into a puddle. By the time you pick them up, the bus has driven off.
 - c. You have failed a school test. You are talking with your teacher who does not buy your story.
 - d. You are at a camp with a new Scout. You try to help him pass a cooking test. He learns very slowly.
 - e. You are at a banquet. The meat is good. You don't like the vegetable. The dessert is ice cream.
 - f. You are a circus performer such as a juggler, high-wire artist, or lion tamer doing a routine.
5. Explain the following: proscenium arch, central or arena staging, spotlight, floodlight, flies, center stage, stage right, stage left, stage brace, stage crew, cyclorama, portal, sound board.
6. Do two short entertainment features that you could present either alone or with others for a troop meeting or campfire.

Traffic Safety

1. Do the following:

- a. Describe the top 10 mistakes new drivers frequently make. Name the two items you are required by law to carry with you whenever you operate a motor vehicle.
- b. Describe how alcohol and other drugs affect the human body and why a person should never drink and drive, or drive while under the influence of any mind-altering substances, including prescription drugs, cold medications, and illicit drugs. For the state where you live, find out what is the legal blood alcohol concentration and the consequences for driving while intoxicated or driving under the influence. Find out what the open-container law is in your state.
- c. Describe at least four factors to be considered in the design of a road or highway. Explain how roadside hazards and road conditions contribute to the occurrence and seriousness of traffic crashes.
- d. Explain why a driver who is fatigued or distracted should not operate a motor vehicle. List five common distractions, explain how driver distractions contribute to traffic accidents, and tell how drivers can minimize distractions. Describe how volunteer drivers can plan to be alert when transporting Scouting participants.

2. Do the following:

- a. Demonstrate how to properly wear a lap or shoulder belt. Explain why it is important for drivers and passengers to wear safety belts at all times.
- b. List five safety features found in motor vehicles besides occupant restraint systems. Describe each safety feature, how each works, and how each contributes to safety.

3. Do the following:

- a. Using your family car or another vehicle, demonstrate that all lights and lighting systems in the vehicle are working. Describe the function and explain why each type of light is important to safe driving.
- b. Using your family car or another vehicle, demonstrate how to check tire pressure and identify the correct tire pressure for the vehicle. Explain why proper tire pressure is important to safe driving.
- c. Demonstrate a method to check for adequate tire tread. Explain why proper tire tread is important to safe driving.
- d. Demonstrate with a smear-and-clear test if the windshield wiper blades will clear the windshield completely or need to be replaced. Describe instances in good and bad weather when windshield washers are important to safe driving.

4. Do the following:

- a. In a location away from traffic hazards, measure with a tape measure - not in a car - and mark off with stakes the distance that a car will travel during the time needed for decision and reaction, and the braking distances necessary to stop a car traveling 30, 50,

and 70 miles per hour on dry, level pavement. Discuss how environmental factors such as bad weather and road conditions will affect the distance.

b. Demonstrate the difference in nighttime visibility between a properly lit bicycle and rider (or a pedestrian) wearing reflective material and a bicycle and rider with no lights (or a pedestrian) dressed in dark clothing, without reflective material.

c. Explain how color and shape are used to help road users recognize and understand the information presented on traffic and roadway signs. Explain the purpose of different types of signs, signals, and pavement markings.

d. Describe at least three examples of traffic laws that apply to drivers of motor vehicles and that bicyclists must also obey.

5. Do ONE of the following:

a. Interview a traffic law enforcement officer in your community to identify what three traffic safety problems the officer is most concerned about. Discuss with your merit badge counselor possible ways to solve one of those problems.

b. Using the Internet (with your parent's permission), visit five Web sites that cover safe driving for teenagers. As a group, discuss what you learn with your counselor and at least three other teenagers.

c. Initiate and organize an activity or event to demonstrate the importance of traffic safety.

d. Accompanied by an adult and a buddy, pick a safe place to observe traffic at a controlled intersection (traffic signal or stop sign) on three separate days and at three different times of the day, for 30 minutes on each visit. At this intersection, survey (1) such violations as running a red light or stop sign; or (2) seat belt usage. Count the number of violations or number of drivers not wearing a seat belt. Record in general terms if the driver was young or old, male or female. Keep track of the total number of vehicles observed so that you can determine the percentage of compliance vs. violations.

Discuss the findings with your merit badge counselor.

Veterinary Medicine

1. Discuss with your counselor the roles a veterinarian plays in the following:
 - a. Companion or small animal medicine, and equine medicine
 - b. Food animal or large animal medicine
 - c. Exotic animal medicine
 - d. Marine animal medicine (mammal and fish)
 - e. Poultry medicine
 - f. Wildlife medicine and aquaculture medicine
2. Discuss with your counselor the roles a veterinarian plays in the following:
 - a. Public health medicine and zoonotic disease surveillance and control
 - b. The military
 - c. Food safety and inspection
 - d. Laboratory animal medicine and research
 - e. Teaching and government
3. Describe the training required to become a veterinarian. Where is the veterinary medical college nearest you? Describe the prerequisites for applying to veterinary school.
4. Tell your counselor what a registered veterinary technician (R.V.T.) or animal health technician (A.H.T.) is. Describe the training required to become an R.V.T. or A.H.T. Where is the school or facility for R.V.T. or A.H.T training nearest you? Describe the role an R.V.T. or A.H.T. would play in assisting a veterinarian working in three of the practice types listed in requirement 1.
5. Discuss with your merit badge counselor the role a veterinarian plays in the human-animal bond.
6. Do ONE of the following:
 - a. Visit a veterinary clinic, hospital, or veterinary referral teaching hospital that does work in one of the practices listed in requirement 1. Spend as much time as you can observing the veterinarians and their staff. Write a report on what you observed and learned at the facility. Share your report with your counselor.
 - b. Spend as much time as possible with a veterinarian who works in one of the fields listed in requirement 2. Learn what special training beyond veterinary medical school may have been required for that position. Learn about any special or unusual activities required of this position. Write a report on what you have learned about this field of veterinary medicine. Include in your report how this field serves the needs of the general public. Share your report with your counselor.

Weather

1. Define meteorology. Explain what weather is and what climate is. Discuss how the weather affects farmers, sailors, aviators, and the outdoor construction industry. Tell why weather forecasts are important to each of these groups.
2. Name five dangerous weather-related conditions. Give the safety rules for each when outdoors and explain the difference between a severe weather watch and a warning. Discuss the safety rules with your family.
3. Explain the difference between high and low pressure systems in the atmosphere. Tell which is related to good and to poor weather. Draw cross sections of a cold front and a warm front, showing the location and movements of the cold and warm air, the frontal slope, the location and types of clouds associated with each type of front, and the location of precipitation.
4. Tell what causes wind, why it rains, and how lightning and hail are formed.
5. Identify and describe clouds in the low, middle, and upper levels of the atmosphere. Relate these to specific types of weather.
6. Draw a diagram of the water cycle and label its major processes. Explain the water cycle to your counselor.
7. Define acid rain. Identify which human activities pollute the atmosphere and the effects such pollution can have on people.
8. Do ONE of the following:
 - a. Make one of the following instruments: wind vane, anemometer, rain gauge, hygrometer. Keep a daily weather log for one week using information from this instrument as well as from other sources such as local radio and television stations, NOAA Weather Radio, and Internet sources (with your parent's permission). Record the following information at the same time every day: wind direction and speed, temperature, precipitation, and types of clouds. Be sure to make a note of any morning dew or frost. In the log, also list the weather forecasts from radio or television at the same time each day and show how the weather really turned out.
 - b. Visit a National Weather Service office or talk with a local radio or television weathercaster, private meteorologist, local agricultural extension service officer, or university meteorology instructor. Find out what type of weather is most dangerous or damaging to your community. Determine how severe weather and flood warnings reach the homes in your community.
9. Do ONE of the following:

- a. Give a talk of at least five minutes to a group (such as your unit or a Cub Scout pack) explaining the outdoor safety rules in the event of lightning, flash floods, and tornadoes. Before your talk, share your outline with your counselor for approval.
 - b. Read several articles about acid rain and give a prepared talk of at least five minutes to a group (such as your unit or a Cub Scout pack) about the articles. Before your talk, share your outline with your counselor for approval.
10. Find out about a weather-related career opportunity that interests you. Discuss with and explain to your counselor what training and education are required for such a position, and the responsibilities required of such a position.