STEM / Nova Awards for Webelos Scouts

The following information is available online at: http://www.scouting.org/stem.aspx

STEM—Science, Technology, Engineering and Mathematics

STEM is part of an initiative the Boy Scouts of America has taken on to encourage the natural curiosity of youth members and their sense of wonder about these fields through existing programs. From archery to welding, Scouts can't help but enjoy the wide range of STEM-related activities. To support this initiative, the BSA developed the Nova Awards program so that youth members have fun and receive recognition for their efforts.

Why STEM?

We live in a time of great opportunity. The spirit of innovation can help us overcome challenges and ensure a prosperous and secure future. To seize this opportunity, we must position ourselves at the cutting edge of scientific discovery and technological innovation.

Yet our country is falling behind in science, technology, engineering and mathematics. This is why many professionals and educators in science, technology, engineering, and mathematics believe the United States should do more now than ever to encourage students to enter STEM-related fields. These experts say our young people need strong STEM skills to compete in the world market. We must work together to cultivate the next generation of critical thinkers and innovators.

Ten-year employment projections by the U.S. Department of Labor show that of the 20 fastest-growing occupations projected for 2014, 15 of them require significant mathematics or science preparation.

STEM is the future

Fostering a strong STEM education is our best opportunity to boost the spirit of innovation. It's what we need to help ensure this country continues on a prosperous and secure journey. STEM literacy is also critical because it has a profound and growing impact on our day-to-day lives. Nature, space exploration, and any STEM-related interest reveals to us the beauty and power of the world we inhabit.

Requirements

All requirements may be found in the Nova Awards guidebooks available through local Scout shops—one for Cub Scouts, one for Boy Scouts, and one for Venturers. The requirements can be completed with a parent or an adult leader as the counselor (for the Nova awards) or mentor (for the Supernova awards). Each guidebook includes a section for the STEM Nova counselor and mentor.

While there are many Cub Scout adventures that support the science and math parts of STEM, learning about STEM doesn't just mean carrying out science investigations or solving math problems. Engineering is also important for a full appreciation of STEM, with its opportunities for applied problem solving and technology. In STEM-related Cub Scout adventures, boys can create items from wood, calculate ingredients for a new recipe, or even build Rube Goldberg–like machines, marble roller coasters, and robotic hands. At the end of this plan, you will find a few suggested adventures with STEM elements.

Encouraging boys to investigate these adventures outdoors and indoors, and to ask a lot of questions, helps to build their confidence. Instead of "Why" questions, they will start to ask the "What" questions in STEM learning: Not "Why does that airplane need to fly so high?" but "What are the forces needed to keep the plane in the sky?"

What Are the Nova Awards?

The Boy Scouts of America's NOVA Awards program incorporates learning with cool activities and exposure to science, technology, engineering and mathematics for Cub Scouts, Boy Scouts, and Venturers. The hope is that the requirements and activities for earning these awards stimulates interest in STEM-related fields and shows how science, technology, engineering and mathematics apply to everyday living and the world around them. Counselors and mentors help bring this engaging, contemporary, and fun program to life for youth members.

The Nova Awards

There are four Nova awards for Cub Scouts, Webelos Scouts, Boy Scouts, and Venturers. Each award covers one component of STEM—science, technology, engineering, or mathematics.

- Science Everywhere, Down and Dirty, Nova WILD!, Out of This World, Tech Talk, Swing!, and 1-2-3 Go!
- Boy Scout Nova awards: Shoot!, Let it Grow! Start Your Engines, Whoosh!, and Designed to Crunch
- Venturer Scout Nova awards: Launch!, Power Up, Hang On!, and Numbers Don't Lie

For their first Nova award, Scouts earn the distinctive Nova award patch. After that, a Scout can earn three more Nova awards, each one recognized with a separate pi (π) pin-on device that attaches to the patch. The patch and the three devices represent each of the four STEM topics—science, technology, engineering, and mathematics.

Nova Modules

Webelos Scouts work on the same modules as Tigers, Wolves and Bears, but earn a different Supernova award.

- **Science Everywhere - Science**
- **Down and Dirty - Science**
- **Nova WILD! - Science**
- **Out of This World - Science**
- **Tech Talk - Technology**
- **Swing! - Engineering**
- **1-2-3 Go! - Math**

Science Everywhere

This module is designed to help you explore how science affects your life each day.

1. Choose A or B or C and complete ALL the requirements.
    A. Watch an episode or episodes (about one hour total) of a show about anything related to science. Then do the following:
        1. Make a list of at least two questions or ideas from what you watched.
        2. Discuss two of the questions or ideas with your counselor.
    B. Read (about one hour total) about anything related to science. Then do the following:
        1. Make a list of at least two questions or ideas from what you read.
        2. Discuss two of the questions or ideas with your counselor.
    C. Do a combination of reading and watching (about one hour total) about anything related to science. Then do the following:
        1. Make a list of at least two questions or ideas from what you read and watched.
        2. Discuss two of the questions or ideas with your counselor.
2. Complete ONE adventure from the following list. (Choose one that you have not already earned.) Discuss with your counselor what kind of science, technology, engineering, or math was used in the adventure.
    - **Camper**
    - **Earth Rocks!**
    - **Maestro!**
3. Act like a scientist! Explore EACH of the following:
    A. With your counselor, choose a question you would like to investigate.
    Here are some examples only (you may get other ideas from your adventure activities):
        1. Why do rockets have fins? Is there any connection between the feathers on arrows and fins on rockets?
        2. Why do some cars have spoilers? How do spoilers work?
        3. If there is a creek or stream in your neighborhood, where does it go? Does your stream flow to the Atlantic or the Pacific ocean?
        4. Is the creek or stream in your neighborhood or park polluted?
        5. What other activity can you think of that involves some kind of scientific questions or investigation?
    B. With your counselor, use the scientific method/process to investigate your question. Keep records of your question, the information you found, how you investigated, and what you found out about your question.
    C. Discuss your investigation and findings with your counselor.

4. Visit a place where science is being done, used, or explained, such as one of the following: zoo, aquarium, water treatment plant, observatory, science museum, weather station, fish hatchery, or any other location where science is being done, used, or explained.
    A. During your visit, talk to someone in charge about science.
    B. Discuss with your counselor the science done, used, or explained at the place you visited.
5. Discuss with your counselor how science affects your everyday life.

Down and Dirty

This module is designed to help you explore how earth science affects your life each day.

1. Choose A or B or C and complete ALL the requirements:
    A. Watch an episode or episodes (about one hour total) of a show about Earth, the weather, geology, volcanoes, or oceanography. Then do the following:
        1. Make a list of at least two questions or ideas from what you watched.
        2. Discuss two of the questions or ideas with your counselor.
    B. Read (about one hour total) about Earth, the weather, geology, volcanoes, or oceanography. Then do the following:
        1. Make a list of at least two questions or ideas from what you read.
        2. Discuss two of the questions or ideas with your counselor.
    C. Do a combination of reading and watching (about one hour total) about Earth, the weather, geology, volcanoes, or oceanography. Then do the following:
        1. Make a list of at least two questions or ideas from what you read and watched.
        2. Discuss two of the questions or ideas with your counselor.
2. Complete ONE adventure from the following list. (Choose one that you have not already earned.) Discuss with your counselor what kind of science, technology, engineering, or math was used in the adventure.
    - **Adventures in Science**
    - **Earth Rocks!**
3. Investigate: Choose A or B or C or D and complete ALL the requirements:
    A. Volcanoes erupt
        1. How are volcanoes formed?
        2. What is the difference between lava and magma?
        3. How does a volcano both build and destroy land?
        4. Build or draw a volcano model. If you build a working model, make sure you follow all safety precautions including wearing protective glasses for your volcano's eruption. If you draw a volcano, be sure to draw a cross section and explain the characteristics of different types of volcanoes.

5. Share your model and what you have learned with your counselor.

B. Rock on

1. What minerals are common in your state? Make a collection of three to five common minerals and explain how they are used.
2. Are these minerals found in sedimentary, igneous, or metamorphic rocks?
3. Explain or demonstrate the difference in formation of the three major types of rocks. Which types of rocks are common in your area?
4. Share your collection and what you have learned with your counselor.

C. Weather changes our world

1. Make three weather instruments out of materials around your home. (Examples include a rain gauge, weather vane, barometer, anemometer, and weather journal.) Use these and another method that is readily available (i.e., thermometer, eyes, older person's joints, etc.) for a total of four methods to monitor and predict the weather for one week. Keep a log of your findings. Which instrument provided the most accurate information?
2. Keep a weather journal for a week. Include your predictions and the predictions of a local meteorologist. Do your predictions match those of the local meteorologist? Do your predictions match the weather that occurred? How can the predictions become more accurate?
3. Discuss your work with your counselor.

D. Animal habitats: Choose TWO of the following animal habitats and complete the activity and questions. At least one habitat should be close to your home (within 50 miles). Visit at least one of the habitats. Once you have completed the activity and questions, discuss the habitats and the activities with your counselor:

1. Prairie
   Draw or model a food web with at least five consumers and two producers that live in the prairie habitat. What is the difference between consumers and producers? Predators and prey? What would happen if one of the animals in the food web disappeared?
2. Temperate forest
   Research the two main categories of trees in the temperate forest (coniferous and deciduous). Why are their leaves different? How are their seeds different? Put a twig from a coniferous tree (cone-bearing tree with needles) in a cup of water and tightly fasten a clear plastic bag around the needles. Put a twig from a deciduous tree (leafy tree that loses its leaves in the fall) in a cup of water and tightly fasten a clear plastic bag around the leaves. Observe what happens and draw pictures of your observations. Think of an explanation for what occurred and discuss your explanation with your counselor.
3. Aquatic ecosystem
   With a parent's permission and guidance, visit an aquatic habitat near your home. Examples include a stream, river, lake, pond, ocean, and wetland (a marsh or swamp). Draw or photograph the area. What are the most common types of plants growing there? What animals did you see? Did you see, hear, or

smell any evidence of other animals? (Your evidence might include things like bird calls, splashes of fish or frogs jumping, tracks, feathers, or bones.) How do aquatic ecosystems affect your life? How have humans affected the ecosystem? (Look for signs of humans such as trash and bridges or walkways.) How do you think humans have affected the ecosystem in ways you cannot see? (Think about fertilizer and pesticides washing off your lawn and flowing into a stream. How would this affect creatures that live in the water?) What can you do to improve the quality of the ecosystem?

4. Temperate or subtropical rain forest
   Describe the three main levels of the rain forest (canopy, understory, and forest floor). Make a drawing or model showing examples of animals and plants that live at each level. Choose an animal or plant from each level and explain how it is adapted to its particular place in the rain forest.

5. Desert
   Choose a desert animal or plant. Make a model of it, draw it, or describe it. Explain how it is particularly well adapted to survive in a place where there is very little water. How would the desert be different if this plant or animal were not there?

6. Polar ice
   Research an animal that can be found in the polar ice habitat. Draw or make a model of the animal and name three characteristics that make it well adapted for life in the very cold and snowy environment.

7. Tide pools
   Explain how a tide pool is formed and describe several animals that are found in tide pools. Make a model or draw a diagram of a tide pool at a high intertidal zone and a low intertidal zone. Include animals found in tide pools and explain how they adapt to their constantly changing environment.

4. Visit. Choose A or B and complete ALL the requirements.

   A. Visit a place where earth science is being done, used, explained, or investigated, such as one of the following: cave, quarry or mine, geology museum or the gem or geology section of a museum, gem and mineral show, university geology department, TV or radio station meteorology department, weather station, volcano or volcano research station, or any other location where earth science is being done, used, explained, or investigated.

      1. During your visit, talk to someone in charge about how people at the site use or investigate a particular area of science. How could this investigation make the world better?

      2. Discuss with your counselor the science being done, used, explained, or investigated at the place you visited.

   B. Explore a career associated with earth science. Find out what subjects you would need to study as you get older. What kind of education would you need in the future to help explore Earth? What types of people other than geologists explore Earth? Discuss with your counselor what is needed to have a career in earth science.

Nova WILD!

This module is designed to help you learn about wildlife and the natural world around you.

1. Choose A or B or C and complete ALL the requirements:
    A. Watch an episode or episodes (about one hour total) of a show about wildlife, endangered species, invasive species, food chains, biodiversity, ecosystems, or wildlife habitats. Then do the following:
        1. Make a list of at least two questions or ideas from what you watched.
        2. Discuss two of the questions or ideas with your counselor.
    B. Read (about one hour total) about wildlife, endangered species, invasive species, food chains, biodiversity, ecosystems, or wildlife habitats. Then do the following:
        1. Make a list of at least two questions or ideas from what you read.
        2. Discuss two of the questions or ideas with your counselor.
    C. Do a combination of reading and watching (about one hour total) about wildlife, endangered species, invasive species, food chains, biodiversity, ecosystems, or wildlife habitats. Then do the following:
        1. Make a list of at least two questions or ideas from what you read and watched.
        2. Discuss two of the questions or ideas with your counselor.
2. Complete ONE adventure from the following list. (Choose one that you have not already earned.) Discuss with your counselor what kind of science, technology, engineering, or math was used in the adventure.
    - **Into the Wild**
    - **Into the Woods**
3. Explore.
    A. What is wildlife? Wildlife refers to animals that are not normally domesticated (raised by humans).
    B. Explain the relationships among producer, prey, predator, and food chain. (You may draw and label a food chain to help you answer this question.)
    C. Draw (or find) pictures of your favorite native plant, native reptile or fish, native bird, and native mammal that live in an ecosystem near you. Why do you like these? How do they fit into the ecosystem?
    D. Discuss what you have learned with your counselor.
4. Act like a naturalist. Choose TWO from A or B or C or D or E or F, and complete ALL the requirements for those options.
    A. Investigate the endangered species in your state.
        1. Make a list, drawing, or photo collection of three to five animals and plants that are endangered.

2. Design a display (a poster, PowerPoint presentation, or other type of display) to show at least 10 of the threatened, endangered, or extinct species in your state. (You may use your drawings or photo collection in your display.)
3. Discuss with your counselor the differences between threatened, endangered, and extinct species. Discuss how threatened animals or plants could become endangered or extinct. How might the loss of these animals or plants affect the ecosystem and food chain? What can be done to preserve these species?

B. Investigate invasive species

1. Make a list, drawing, or photo collection of at least five mammals, plants, fish, birds, insects, or any other organisms that are invasive in your state or region of the country.
2. Design a presentation (a poster, PowerPoint presentation, or other display) including at least one of the invasive species from your list. Explain where they came from, how they got to your area, what damage they are causing, and what is being done to get rid of them. Share your presentation with your counselor and your family or your den.
3. Discuss with your counselor what an invasive species is, how invasive animals or plants cause problems for native species, and how these invasive species could affect an ecosystem and food chain.

C. Visit an ecosystem near where you live.

1. Investigate the types of animals and plants that live in that ecosystem.
2. Draw a food web of the animals and plants that live in this ecosystem. Mark the herbivores, omnivores, and carnivores. Include at least one decomposer or scavenger.
3. Discuss with your counselor (using your food web drawing) how the animals or plants in the food web fit into a food chain. Which animals are predators and which can be prey? How does each plant and animal obtain its energy? Describe the energy source for all the plants and animals.

D. Investigate one wild mammal, bird, fish, or reptile that lives near you.

1. Create a diorama representing the habitat of this creature. Include representations of everything it needs to survive; its home, nest, or den; and possible threats. You may use a variety of different materials within your diorama (usually constructed in a shoebox or similar container).
2. Explain to your counselor what your animal must have in its habitat in order to survive.

E. Investigate your wild neighbors.

1. Make a bird feeder and set it up in a place where you may observe visitors. The feeder could be complex or as simple as a pinecone covered with peanut butter and rolled in birdseed and then tied with a string to an appropriate location, like a tree branch.
2. Fill the feeder with birdseed. (Make sure that your feeder does not remain empty once you have started feeding birds.)

3. Provide a source of water.
4. Watch and record the visitors to your feeder for two or three weeks. (It may take a while for visitors to discover your food source.)
5. Identify your visitors using a field guide, and keep a list of what visits your feeder. (Visitors are not always birds! Sometimes deer, rabbits, chipmunks, squirrels, and raccoons visit bird feeders—or the area under the feeder! The kinds of nonbird visitors will depend on where you live. You may want to investigate how to collect the tracks of any nighttime visitors.)
6. Discuss with your counselor what you learned about your wild neighbors.

F. Earn the Cub Scout Outdoor Ethics Awareness Award OR the Cub Scout World Conservation Award (if you have not already earned them for another Nova award).

5. Visit a place where you can observe wildlife. Examples include parks (national, state, and local), zoos, wetlands, nature preserves, and national forests.
    A. During or after your visit, talk to someone about:
        1. The native species, invasive species, and endangered or threatened species that live there. If you visit a zoo, talk to someone about the ecosystems for different zoo animals and whether any of the zoo animals are invasive in different areas of the world. (For example, pythons are often found in zoos, but they are an invasive species in Florida.)
        2. The subjects studied in school that enable him or her to work with wildlife. Examples of experts to talk to include forest ranger, wildlife biologist, botanist, park ranger, naturalist, game warden, zookeeper, docent, or another adult whose career involves wildlife.
    B. Discuss with your counselor what you learned during your visit.
6. Discuss with your counselor:
    A. Why wildlife is important
    B. Why biodiversity is important
    C. The problems with invasive species and habitat destruction

Out of This World

This module is designed to help you discover the wonders of space exploration.

1. Choose A or B or C and complete ALL the requirements.
    A. Watch an episode or episodes (about one hour total) of a show about the planets, space, space exploration, NASA, or astronomy. Then do the following:
        1. Make a list of at least two questions or ideas from what you watched.
        2. Discuss two of the questions or ideas with your counselor.
    B. Read (about one hour total) about the planets, space, space exploration, NASA, or astronomy. Then do the following:

1. Make a list of at least two questions or ideas from what you read.
2. Discuss two of the questions or ideas with your counselor.

C. Do a combination of reading and watching (about one hour total) about the planets, space, space exploration, NASA, or astronomy. Then do the following:

1. Make a list of at least two questions or ideas from what you read and watched.
2. Discuss two of the questions or ideas with your counselor.

2. Complete ONE adventure from the following list. (Choose one that you have not already earned.) Discuss with your counselor what kind of science, technology, engineering, or math was used in the adventure.

- **Adventures in Science**
- **Engineering**
- **Game Design**

3. Choose TWO from A or B or C or D or E or F and complete ALL the requirements for the options you choose.

A. Have a star party with your den, pack, or family. (Make sure you wear proper clothing for the nighttime temperature.)

1. Choose a clear night to investigate the stars. A fun time to watch stars is during a meteor shower. You may check http://earthsky.org/astronomy-essentials with your parent's or guardian's permission to find good times to watch meteors.
2. Find five different constellations and draw them. With your parent's or guardian's permission, you may use a free smartphone application such as Google Sky Map for Android phones or Night Sky for iPhones to help identify stars and constellations.
3. Share your drawings with your counselor. Discuss whether you would always be able to see those constellations in the same place.

B. Explain how "revolution," or "orbit," compares with "rotation" when talking about planets and the solar system. Show these by walking and spinning around your counselor. Do the following:

1. Choose three planets to investigate (you may include the dwarf planet Pluto). Compare these planets to Earth. Find out how long the planet takes to go around the sun (the planet's year) and how long the planet takes to spin on its axis (the planet's day). Include at least TWO of these: distance from the sun, diameter, atmosphere, temperature, number of moons.
2. Discuss what you have learned with your counselor.

C. Using materials you have on hand (plastic building blocks, food containers, recycled materials, etc.), design a model Mars rover that would be useful to explore the rocky planet's surface. Share your model with your counselor and explain the following:

1. The data the rover would collect
2. How the rover would work

3. How the rover would transmit data
4. Why rovers are needed for space exploration

D. Design on paper an inhabited base located on Mars or the moon. Consider the following: the energy source, how the base will be constructed, the life-support system, food, entertainment, the purpose and function, and other things you think would be important. Then do the following:

1. Draw or build a model of your base using recycled materials.
2. Discuss with your counselor what people would need to survive on Mars or the moon.

E. Become an asteroid mapper. Obtain your parent's or guardian's permission and map an asteroid as part of the Jet Propulsion Laboratory and the California Institute of Technology's Dawn project: http://dawn.jpl.nasa.gov/DawnCommunity/asteroid_mappers.asp . Then discuss with your counselor your mapping activities, why mapping asteroids is important, and what you learned about space and asteroids.

F. Eclipses

1. Investigate and make models or diagrams of solar and lunar eclipses. (Example: You may wish to use balls of different sizes and a flashlight to represent the sun.)
2. Using your model or diagram, discuss eclipses with your counselor, and explain the difference between a solar eclipse and a lunar eclipse.

4. Visit or explore. Choose A or B and complete ALL the requirements.

A. Visit a place where space science is being done, used, explained, or investigated, such as one of the following: observatory, planetarium, air and space museum, star lab, astronomy club, NASA, or any other location where space science is being done, used, explained, or investigated.

1. During your visit, talk to someone in charge about how people at the location use or investigate space science. Find out how this investigation could make the world a better place.
2. Discuss with your counselor the science being done, used, explained, or investigated at the place you visited.

B. Explore a career associated with space exploration. Find out what subjects you would need to study as you get older. Find out whether you must be an astronaut to explore space, and what other opportunities exist for people interested in space exploration.

5. Tell your counselor what you have learned about space exploration while working on this award.

Tech Talk

This module is designed to help you explore how technology affects your life each day.

1. Choose A or B or C and complete ALL the requirements.

A. Watch an episode or episodes (about one hour total) of a show about anything related to technology. Then do the following:

1. Make a list of at least two questions or ideas from what you watched.
2. Discuss two of the questions or ideas with your counselor.

B. Read (about one hour total) about anything related to technology. Then do the following:
1. Make a list of at least two questions or ideas from what you read.
2. Discuss two of the questions or ideas with your counselor.

C. Do a combination of reading and watching (about one hour total) about anything related to technology. Then do the following:
1. Make a list of at least two questions or ideas from what you read and watched.
2. Discuss two of the questions or ideas with your counselor.

2. Complete ONE adventure from the following list. (Choose one that you have not already earned.) Discuss with your counselor what kind of science, technology, engineering, or math was used in the adventure.
- **Build It**
- **Fix It**
- **Movie Making**

3. Explore EACH of the following:
A. Look up a definition of the word technology and discuss the meaning with your counselor.
B. Find out how technology is used in EACH of the following fields:
1. Communication
2. Business
3. Construction
4. Sports
5. Entertainment

C. Discuss your findings with your counselor.

4. Visit a place where technology is being designed, used, or explained, such as one of the following: an amusement park, a police or fire station, a radio or television station, a newspaper office, a factory or store, or any other location where technology is being designed, used, or explained.
A. During your visit, talk to someone in charge about the following:
1. The technologies used where you are visiting
2. Why the organization is using these technologies

B. Discuss with your counselor the technology that is designed, used, or explained at the place you visited.

5. Discuss with your counselor how technology affects your everyday life.

Swing!

This module is designed to help you explore how engineering and simple machines called levers affect your life each day.

1. Choose A or B or C and complete ALL the requirements.
    A. Watch an episode or episodes (about one hour total) of a show about anything related to motion or machines. Then do the following:
        1. Make a list of at least two questions or ideas from what you watched.
        2. Discuss two of the questions or ideas with your counselor.
    B. Read (about one hour total) about anything related to motion or machines. Then do the following:
        1. Make a list of at least two questions or ideas from what you read.
        2. Discuss two of the questions or ideas with your counselor.
    C. Do a combination of reading and watching (about one hour total) about anything related to motion or machines. Then do the following:
        1. Make a list of at least two questions or ideas from what you read and watched.
        2. Discuss two of the questions or ideas with your counselor.
2. Complete ONE adventure from the following list. (Choose one that you have not already earned.) Discuss with your counselor what kind of science, technology, engineering, or math was used in the adventure.
    - **Adventures in Science**
    - **Engineer**
    - **Sportsman**
3. Explore EACH of the following.
    A. Levers
        1. Make a list or drawing of the three types of levers. (A lever is one kind of simple machine.)
        2. Show:
            1. How each lever works
            2. How the lever in your design will move something
            3. The class of each lever
            4. Why we use levers
    B. On your own, design, including a drawing, sketch, or model, ONE of the following:
        1. A playground fixture that uses a lever
        2. A game or sport that uses a lever
        3. An invention that uses a lever
           Be sure to show how the lever in your design will move something.

C. Discuss your findings with your counselor.

4. Do the following:
    A. Visit a place that uses levers, such as a playground, carpentry shop, construction site, restaurant kitchen, or any other location that uses levers.
    B. Discuss with your counselor the equipment or tools that use levers in the place you visited.
    C.
5. Discuss with your counselor how engineering and simple machines affect your everyday life.

1-2-3 Go!

This module is designed to help you explore how math affects your life each day.

Math and physics are used in almost every kind of invention, including cars, airplanes, and telescopes. Math also includes cryptography, the use of secret codes.

1. Choose A or B or C and complete ALL the requirements.
    A. Watch an episode or episodes (about one hour total) of a show that involves math or physics. Then do the following:
        1. Make a list of at least two questions or ideas from what you watched.
        2. Discuss two of the questions or ideas with your counselor.
    B. Read (about one hour total) about anything that involves math or physics. Then do the following:
        1. Make a list of at least two questions or ideas from what you read.
        2. Discuss two of the questions or ideas with your counselor.
    C. Do a combination of reading and watching (about one hour total) about anything that involves math or physics. Then do the following:
        1. Make a list of at least two questions or ideas from what you read and watched.
        2. Discuss two of the questions or ideas with your counselor.
2. Complete ONE adventure from the following list. (Choose one that you have not already earned.) Discuss with your counselor what kind of science, technology, engineering, or math was used in the adventure.
    - **Game Design**
3. Explore TWO options from A or B or C and complete ALL the requirements for those options. Keep your work to share with your counselor. The necessary information to make your calculations can be found in a book or on the Internet. (See the Helpful Links box for ideas.) You may work with your counselor on these calculations.
    A. Choose TWO of the following places and calculate how much you would weigh there.
        1. On the sun or the moon
        2. On Jupiter or Pluto

3. On a planet that you choose

B. Choose ONE of the following and calculate its height:

1. A tree
2. Your house
3. A building of your choice

C. Calculate the volume of air in your bedroom. Make sure your measurements have the same units—all feet or all inches—and show your work.

Volume = Length × Width × Height

4. Secret Codes

A. Look up, then discuss with your counselor each of the following:

1. Cryptography
2. At least three ways secret codes or ciphers are made
3. How secret codes and ciphers relate to mathematics

B. Design a secret code or cipher. Then do the following:

1. Write a message in your code or cipher.
2. Share your code or cipher with your counselor.

5. Discuss with your counselor how math affects your everyday life.

The Supernova Awards

Use the Advancement Report, No.34403, as documentation for the Supernova Award. Submit the *Supernova Award Application* as instructed in the requirements.

The Supernova awards have more rigorous requirements than the Nova awards. The requirements and activities were designed to motivate youth and recognize more in-depth, advanced achievement in STEM-related activities.

For earning the Supernova award, Scouts receive a medal and certificate.

Webelos Scout Supernova Award

To earn the Webelos Scout Supernova award, you must be a Webelos Scout who is active with a den. With your parent's and unit leader's help, you must select a council-approved mentor who is a registered Scouter. You may NOT choose your parent or your unit leader (unless the mentor is working with more than one youth).

If you earned the Cub Scout Supernova award, you must repeat similar requirements while you are a Webelos Scout.

Although it is not a requirement, it is recommended that you earn at least two of the seven Nova awards for Cub Scouts before earning the Dr. Charles H. Townes Supernova Award.

Dr. Charles H. Townes Supernova Award for Webelos Scouts

Requirements

1. Complete the following Webelos adventures: **Adventures in Science**, **Engineer**, and **Scouting Adventure**.
2. Complete three of the following adventures: **Build It**, **Building a Better World**, **Castaway**, **First Responder**, **Into the Wild**, and **Into the Woods**.
3. Find interesting facts about Dr. Charles H. Townes using resources in your school or local library or on the Internet (with your parent's or guardian's permission and guidance). Then discuss what you learned with your mentor, including answers to the following questions: What very important award did Dr. Townes earn? What was Dr. Townes' most famous invention?
4. Find out about five other famous scientists, technology innovators, engineers, or mathematicians approved by your mentor. Discuss what you learned with your mentor.
5. Speak with your teacher(s) at school (or your parents if you are home-schooled) OR one of your Cub Scout leaders about your interest in earning the Webelos Scout Supernova award. Ask them

why they think math and science are important in your education. Discuss what you learn with your mentor.

6. Participate in a science project or experiment in your classroom or school. Discuss this activity with your mentor.
7. Do ONE of the following:
    A. Visit with someone who works in a STEM-related career. Discuss what you learned with your mentor.
    B. Learn about a career that depends on knowledge about science, technology, engineering, or mathematics. Discuss what you learned with your mentor.
8. Under the direct supervision of your mentor, do an experiment that shows how the scientific method (or scientific process) is used. Prepare a short report on the results of your experiment for your mentor.
9. Participate in a Nova- or other STEM-related activity in your Webelos Scout den or pack meeting that is conducted by a Boy Scout or Venturer who is working on his or her Supernova award. If this is not possible, participate in another Nova- or STEM-related activity in your den or pack meeting.
10. Submit an application for the Webelos Scout Supernova award to the district STEM or advancement committee for approval.