

MY NOVA COUNSELORS:

MY SUPERNOVA
MENTORS:

SCIENCE
TECHNOLOGY
ENGINEERING
MATHEMATICS



CREW 110
VENTURER NOVA AND
SUPERNOVA WORKBOOK



110



NAME _____

PATROL _____

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 Venturers. Each award covers one component of STEM—Science, Technology, Engineering, or Mathematics.

Venturer 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.

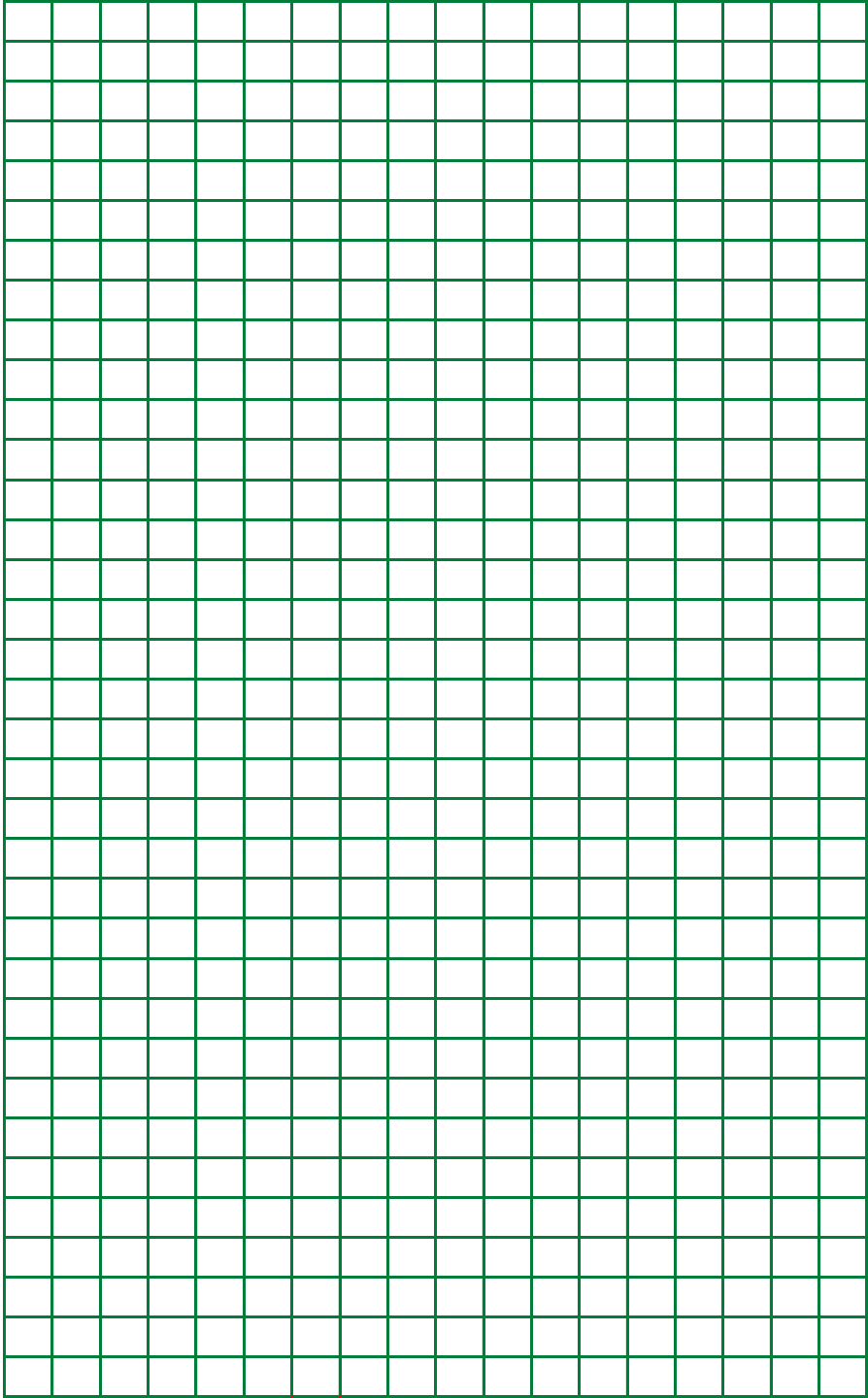
THE SUPERNOVA AWARDS

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 Venturers: Dr. Sally Ride Supernova Bronze Award, Wright Brothers Supernova Silver Award, Dr. Albert Einstein Supernova Gold Award

For earning the Supernova award, Scouts receive a medal and certificate: each Crew determines how this medal is purchased.

All requirements may be found in the Nova awards guidebooks, available through local Scout shops and may be tracked in this workbook. 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 counselor and mentor.



NOVA SCIENCE - LAUNCH! (1)



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

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

____ A. Watch about three hours total of science-related shows or documentaries that involve projectiles, aviation, weather, astronomy, or space technology. Then do the following:

____ 1. Make a list of at least two questions or ideas from each show.

____ 2. Discuss two of the questions or ideas with your counselor.

Some examples include - but are not limited to—shows found on PBS ("NOVA"), Discovery Channel, Science Channel, National Geographic Channel, TED Talks (online videos), and the History Channel. The NASA website at www.nasa.gov has some short multimedia clips that involve projectiles, aviation, space, weather, astronomy, or aviation or space technology. You may choose to watch a live performance or movie at a planetarium or science museum instead of watching a media production. You may watch online productions with your counselor's approval and under your parent's supervision.

____ B. Read (about three hours total) about projectiles, aviation, space, weather, astronomy, or aviation or space technology. Then do the following:

____ 1. Make a list of at least two questions or ideas from each article.

____ 2. Discuss two of the questions or ideas with your counselor.

Examples of magazines include—but are not limited to—Odyssey, Popular Mechanics, Popular Science, Science Illustrated, Discover, Air & Space, Popular Astronomy, Astronomy, Science News, Sky & Telescope, Natural History, Robot, Servo, Nuts and Volts, and Scientific American.

____ C. Do a combination of reading and watching (about three hours total). Then do the following:

____ 1. Make a list of at least two questions or ideas from each article or show.

____ 2. Discuss two of the questions or ideas with your counselor.



NOVA SCIENCE - LAUNCH! (4)

____2. Make sure you apply the same force every time, perhaps by using a weight to launch the marshmallow. Discuss your design, data, and experiments—both successes and failures - with your counselor.

____ B. Design a pitching machine that will lob a softball into the strike zone. Answer the following questions, then discuss your design, data, and experiments - both successes and failures—with your counselor.

____1. At what angle and velocity will your machine need to eject the softball in order for the ball to travel through the strike zone from the pitcher's mound?

____2. How much force will you need to apply in order to power the ball to the plate?

____3. If you were to use a power supply for your machine, what power source would you choose and why?

____C. Design and build a marble run or roller coaster that includes an empty space where the marble has to jump from one part of the chute to the other. Do the following, then discuss your design, data, and experiments—both successes and failures—with your counselor.

____1. Keep track of your experimental data for every attempt. Include the vertical angle between the two parts of the chute and the horizontal distance between the two parts of the chute.

____2. Experiment with different starting heights for the marble. How do the starting heights affect the velocity of the marble? How does the starting height affect the jump distance?

____6. Discuss with your counselor how science affects your everyday life.

NOVA COUNSELOR:

DATE OF COMPLETION: _____

WRIGHT BROTHERS SUPERNOVA AWARD SECOND-LEVEL SUPERNOVA AWARD FOR VENTURERS (3)



Option 2: For those who earned the Dr. Bernard Harris Supernova Award as a registered Boy Scout (continued)

____7. Research a scientific, technical, engineering, or mathematical breakthrough or invention of the past 100 years that has affected our society in a meaningful way. Develop your hypothesis on how this invention might further affect our society during your lifetime. Present either a 30-minute oral report or a 1,500-word written report to your mentor.

____8. Submit an application to the district or council Nova or advancement committee for approval.

DR. ALBERT EINSTEIN SUPERNOVA AWARD THIRD-LEVEL SUPERNOVA AWARD FOR VENTURERS



____1. Earn either the Thomas Edison Supernova Award while a registered Boy Scout or the Wright Brothers Supernova Award while a registered Venturer.

____2. Complete FOUR additional Supernova activity topics, one in each of the four different STEM areas. (Note: The intent is that upon completion of the Dr. Albert Einstein Supernova Award the Venturer will have completed two Supernova activity topics in each of the four STEM areas for a total of eight.)

____3. Create and propose a new Nova awards topic for any program (Cub Scout, Webelos, Boy Scouts, or Venturing) comparable to the existing Nova awards topics at that program level. Prepare a written outline for this proposed Nova awards topic and submit it to your mentor.

____4. With guidance from your mentor, select an area of current STEM-related concern and develop a research project or experiment related to that area. This research project or experiment should be challenging and should require a significant investment of time and effort on your part. (A guideline would be approximately 100 hours.) If your mentor is not a specialist in the area of your project or experiment, he or she will solicit assistance from a specialist who to serve as a STEM consultant. Execute the project or experiment. Prepare a complete and well-documented written report AND an oral presentation. Present both to your mentor and your local council Nova committee.

____5. Submit an application to the national Nova committee for approval.



WRIGHT BROTHERS SUPERNOVA AWARD SECOND-LEVEL SUPERNOVA AWARD FOR VENTURERS (2)

Option 2: For those who earned the Dr. Bernard Harris Supernova Award as a registered Boy Scout

- _____ 1. Earn the Dr. Bernard Harris Supernova Award while a registered Boy Scout.
- _____ 2. Complete ONE additional Venturer Nova award for a total of four. (Note: This may be done at any time after becoming a Venturer.) The Venturer Nova award completed should be different from the Boy Scout Nova awards previously completed.
- _____ 3. Using the guidelines found in the "Venturing STEM Explorations" chapter, complete FOUR of the topics listed above. The four topics must be different from those completed while working on the Dr. Bernard Harris Supernova Award, for a total of eight different topics. (Note: These awards may be earned at any time after becoming a Venturer.) Additional merit badges earned while a Boy Scout may not be used in lieu of the STEM explorations required for this award.
- _____ 4. Complete TWO additional Supernova activity topics, one each in the two STEM areas not completed for the Harris Supernova Award. (Note: The intent is that upon completion of the Wright Brothers Supernova Award, the Venturer will have completed one Supernova activity topic in each of the four STEM areas.)
- _____ 5. Participate in a local, state, or national science fair or mathematics competition OR any other equally challenging STEM-oriented competition or workshop approved by your mentor. An example of this would be an X-Prize type competition. (Note: The intent is that, upon completion of the Wright Brothers Supernova Award, the Venturer will have participated in two such events.)
- _____ 6. Working with your mentor, organize and present a Nova award or other STEM-related program to a Cub Scout den or pack meeting. Be sure to receive permission from the appropriate unit leader. If a Cub Scout den or pack is not available, your presentation may be given to another youth group. (Note: The intent is that upon completion of the Wright Brothers Supernova award the Venturer will have completed two such presentations.)

NOVA TECHNOLOGY - POWER UP (1)



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 about three hours total of technology-related shows or documentaries that involves transportation or transportation technology. Then do the following:
 - _____ 1. Make a list of at least two questions or ideas from each show.
 - _____ 2. Discuss two of the questions or ideas with your counselor.

Some examples include—but are not limited to—shows found on PBS ("NOVA"), Discovery Channel, Science Channel, National Geographic Channel, TED Talks (online videos), and the History Channel. You may choose to watch a live performance or movie at a planetarium or science museum instead of watching a media production. You may watch online productions with your counselor's approval and under your parent's supervision.

- _____ B. Read (about three hours total) about transportation or transportation technology. Then do the following:
 - _____ 1. Make a list of at least two questions or ideas from each article.
 - _____ 2. Discuss two of the questions or ideas with your counselor.

Examples of magazines include—but are not limited to—Odyssey, Popular Mechanics, Popular Science, Science Illustrated, Discover, Air & Space, Popular Astronomy, Astronomy, Science News, Sky & Telescope, Natural History, Robot, Servo, Nuts and Volts, and Scientific American.

- _____ C. Do a combination of reading and watching (about three hours total). Then do the following:
 - _____ 1. Make a list of at least two questions or ideas from each article or show.
 - _____ 2. Discuss two of the questions or ideas with your counselor.



NOVA TECHNOLOGY - POWER UP (2)

___2. Choose ONE STEM field of interest from the following list. Complete ALL the requirements for a Venturing STEM exploration in that field. Venturing exploration topics. (If you have already completed a Venturing STEM exploration in one of these fields, please choose a different field for this award.) Automotive Maintenance, Aviation, Canoeing, Cycling, Drafting, Electricity, Energy, Farm Mechanics, Motorboating, Nuclear Science, Railroad, Small-Boat Sailing, Space Exploration, Truck Transportation.

___3. Do ALL of the following.

___A. Using the requirements from the above list of STEM explorations:

___1. Tell your counselor the energy source(s) used in these STEM explorations.

___2. Discuss the pros and cons of each energy source with your counselor.

___B. Make a list of sources of energy that may be possible to use in transportation.

___C. With your counselor:

___1. Discuss alternative sources of energy.

___2. Discuss the pros and cons of using alternative energy sources.

___4. Design and build a working model vehicle (not from a kit).

___A. Make drawings and specifications of your model vehicle before you begin to build.

___B. Include one of the following energy sources to power your vehicle (do not use gasoline or other combustible fuel source): solar power, wind power, or battery power.

___C. Test your model. Then answer the following questions:

___1. How well did it perform?

___2. Did it move as well as you thought it would?

___3. Did you encounter problems? How can these problems be corrected?

___D. Discuss with your counselor:

___1. Any difficulties you encountered in designing and building your model

___2. Why you chose a particular energy source

WRIGHT BROTHERS SUPERNOVA AWARD SECOND-LEVEL SUPERNOVA AWARD FOR VENTURERS



Option 1: For those who earned the Dr. Sally Ride Supernova Award as a registered Venturer

___1. Earn the Dr. Sally Ride Supernova Award while a registered Venturer.

___2. Complete ONE additional Venturer Nova award for a total of four. (Note: This may be done at any time after becoming a Venturer.)

___3. Using the guidelines found in the "Venturing STEM Explorations" chapter, complete FOUR of the topics listed above. The four topics must be different from those completed while working on the Dr. Sally Ride Supernova Award, for a total of eight different topics. (Note: These awards may be earned at any time after becoming a Venturer.)

___4. Complete TWO additional Supernova activity topics, one each in the two STEM areas not completed for the Dr. Sally Ride Supernova Award. (Note: The intent is that upon completion of the Wright Brothers Supernova Award, the Venturer will have completed one Supernova activity topic in each of the four STEM areas.)

___5. Participate in a local, state, or national science fair or mathematics competition OR any other equally challenging STEM-oriented competition or workshop approved by your mentor. An example of this would be an X-Prize type competition. (Note: The intent is that upon completion of the Wright Brothers Supernova Award, the Venturer will have participated in two such events.)

___6. Working with your mentor, organize and present a Nova awards or other STEM-related program at a Cub Scout den or pack meeting. Be sure to receive permission from the appropriate unit leader. If a Cub Scout den or pack is not available, your presentation may be given to another group. (Note: The intent is that upon completion of the Wright Brothers Supernova Award, the Venturer will have completed two such presentations.)

___7. Research a scientific, technical, engineering, or mathematical breakthrough or invention of the past 100 years that has affected our society in a meaningful way. Develop your hypothesis on how this invention might further affect our society during your lifetime. Present either a 30-minute oral report or a 1,500-word written report to your mentor.

___9. Submit an application to the district or council Nova or advancement committee for approval.



DR. SALLY RIDE SUPERNOVA AWARD

FIRST-LEVEL SUPERNOVA AWARD FOR VENTURERS

NOVA TECHNOLOGY - POWER UP (1)



____ 7. Working with your mentor, organize and present a Nova award or other STEM-related program at a Cub Scout den or pack meeting. Be sure to receive permission from the appropriate unit leader, and plan accordingly. If a Cub Scout den or pack is not available, your presentation may be given to another youth group.

____ 8. Review the scientific method (you may know this as the scientific process) and note how scientists establish hypotheses, theories, and laws. Compare how the establishment of "facts" or "rules" using the scientific method differs from the establishment of "facts" or "rules" in other environments, such as legal, cultural, religious, military, mathematical, or social environments. Then do each of the following:

____ A. Choose a current subject with at least two competing theories on the subject and learn as much as possible about each theory. Analyze the competing theories, decide which one is most convincing to you, and explain why to your mentor.

____ B. Make a presentation to your mentor that describes the controversy, the competing theories, and your conclusions about how the scientific method can or cannot contribute to the resolution of the controversy.

____ 9. [Submit an application](#) to the district or council Nova or advancement committee for approval.

____ 3. Whether your model met your specifications

____ 4. How you would modify your design to make it better

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

NOVA COUNSELOR:

DATE OF COMPLETION: _____

SUPERNOVA MENTOR:

SUPERNOVA ACTIVITY TOPIC #1:

SUPERNOVA ACTIVITY TOPIC #2:

DATE OF COMPLETION: _____



NOVA ENGINEERING - HANG ON! (1)

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

- ____ 1. Choose A or B or C and complete ALL the requirements.
- ____ A. Watch about three hours total of engineering-related shows or documentaries that involve motion or motion-inspired technology. Then do the following:
- ____ 1. Make a list of at least five questions or ideas from the show(s) you watched.
 - ____ 2. Discuss two of the questions or ideas with your counselor.

Some examples include—but are not limited to—shows found on PBS ("NOVA"), Discovery Channel, Science Channel, National Geographic Channel, TED Talks (online videos), and the History Channel. You may choose to watch a live performance or movie at a planetarium or science museum instead of watching a media production. You may watch online productions with your counselor's approval and under your parent's supervision. One example is the NOVA Lever an Obelisk page on ancient Egypt and the use of levers, available at www.pbs.org/wgbh/nova/egypt/raising/lever.html

Examples of magazines include—but are not limited to—Odyssey, Popular Mechanics, Popular Science, Science Illustrated, Discover, Air & Space, Popular Astronomy, Astronomy, Science News, Sky & Telescope, Natural History, Robot, Servo, Nuts and Volts, and Scientific American.

- ____ B. Read (about three hours total) about motion or motion-inspired technology. Then do the following:
- ____ 1. Make a list of at least two questions or ideas from each article.
 - ____ 2. Discuss two of the questions or ideas with your counselor.
- ____ C. Do a combination of reading and watching (about three hours total). Then do the following:
- ____ 1. Make a list of at least two questions or ideas from each article or show.
 - ____ 2. Discuss two of the questions or ideas with your counselor.

DR. SALLY RIDE SUPERNOVA AWARD FIRST-LEVEL SUPERNOVA AWARD FOR VENTURERS



- ____ D. Do ONE of the following:
- ____ i. Show that you have taken part in a scholarly activity (in school or in Scouting) that required teamwork, and discuss with your mentor what you learned about how a team of people can work together effectively, fairly, and efficiently.
 - ____ ii. Find three resources (online, in a library, personal interview, etc.) of expert advice on successful teamwork strategies and discuss with your mentor what you learned about how a team of people can work together effectively, fairly, and efficiently.
- ____ E. Do ONE of the following:
- ____ i. Write an argument of approximately 500 words that defends or opposes the principle that, "Students should be obligated to report instances of cheating by others." Discuss this with your mentor.
 - ____ ii. With your crews, another crew, school class, or another peer group, conduct an ethical controversy discussion that addresses the question, "Should students be obligated to report instances of cheating by others?"
- ____ 3. Using the guidelines found in the "Venturing STEM Explorations" chapter, complete STEM explorations for four of the topics listed above. (Note: These may be completed at any time after becoming a Venturer.)
- ____ 4. Complete TWO Supernova activity topics, one each in two different STEM areas.
- ____ 5. Participate in a local, state, or national science fair or mathematics competition OR in any equally challenging STEM-oriented competition or workshop approved by your mentor. An example of this would be an X-Prize type competition.
- ____ 6. Do ONE of the following:
- ____ A. Spend at least one day "shadowing" a local scientist or engineer. After your visit, discuss with your mentor your experience and what you learned about STEM careers.
 - ____ B. Learn about a career that is heavily involved with STEM. Make a presentation to your mentor about what you learned.



DR. SALLY RIDE SUPERNOVA AWARD

FIRST-LEVEL SUPERNOVA AWARD FOR VENTURERS

____ 1. Complete THREE of the Venturer Nova Awards. (Note: These may be done at any time after becoming a Venturer.)

____ 2. Complete the Venturing Scholarship exploration. (The following requirement was inadvertently left out of the guidebook.)

____ A. Do ONE of the following:

____ i. Show that you have had an average grade of B or higher (80 percent or higher) for one term or semester.

____ ii. Show that for one term or semester you have improved your school grades over the previous period.

____ B. Do TWO of the following:

____ i. Discuss with your mentor the following situation: Suppose you are writing a research paper and you find a resource in which the author's words are so perfectly aligned with your perspectives and understanding that you cannot imagine a better way to put it in your paper than to use the author's own words. How can you handle such a situation while still maintaining scholarly integrity?

____ ii. Discuss with your mentor the following situation: Suppose you are writing a research paper and you find resources with conflicting "facts" and/or conflicting conclusions. What are some viable strategies for resolving these conflicts and deciding which resources are trustworthy?

____ iii. Discuss with your mentor the following situation: Suppose you are writing a research paper and have acquired dozens of resources. How would you keep track of the resources, summarize the salient parts of each resource, and synthesize the collection of resources into a coherent research paper?

____ C. Get a note from an instructor* of yours that states that during the past term you have demonstrated satisfactory abilities or progress in independently completing scholarly endeavors and proactively seeking help when needed.

**If you are home-schooled, you may obtain a note from a counterpart such as your parent. If you are near the end of your current term, you may ask a current instructor. Otherwise, you should ask an instructor from the immediate past term.*

NOVA ENGINEERING - HANG ON! (2)



____ 2. Choose ONE STEM field of interest from the following list. Complete ALL the requirements for a Venturing STEM exploration in that field. [Venturing exploration topics](#). (If you have already completed a Venturing STEM exploration in one of these fields, please choose a different field for this award.) Archery, Aviation, Composite Materials, Drafting, Electronics, Engineering, Inventing, Model Design and Building, Railroading, Rifle Shooting, Robotics, Shotgun Shooting.

Composites can be found just about everywhere: in airplanes and sports cars, golf clubs and guitars, boats and baseball bats, bathtubs and circuit boards, and even bridges. Composites make bicycles and skis lighter, kayaks and fishing poles stronger, houses warmer, and helmets tougher." Choose one of these items for your discussion to answer requirement 3c.

____ 3. Do ALL of the following:

____ A. Make a list or drawing of the six simple machines.

____ B. Be able to tell your counselor the name of each machine and how each machine works.

Helpful Link

"Six Simple Machines": ConstructionKnowledge.net - Website: http://www.constructionknowledge.net/general_technical_knowledge/general_tech_basic_six_simple_machines.php

____ C. Discuss the following with your counselor:

____ 1. The simple machines that were involved with the motion in your chosen STEM exploration (Hint: Look at the moving parts of an engine to find simple machines.)

____ 2. The energy source causing the motion for the subject of your STEM exploration

____ 3. What you learned about motion from doing the STEM exploration

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

____ A. Visit an amusement park. Then discuss the following with your counselor:

____ 1. The simple machines present in at least two of the rides

____ 2. The forces involved in the motion of any two rides



NOVA ENGINEERING - HANG ON! (1)

____ B. Visit a playground. Then discuss the following with your counselor:

____ 1. The simple machines present in the playground equipment

____ 2. The forces involved in the motion of any two playground fixtures

____ 5. Do the following:

____ A. On your own, design one of the following and include a drawing or sketch: an amusement park ride OR a playground fixture OR a method of transportation.

____ B. Discuss with your counselor:

____ 1. The simple machines present in your design

____ 2. The energy source powering the motion of your creation

____ 6. Discuss with your counselor how engineering affects your everyday life.

NOVA COUNSELOR:

DATE OF COMPLETION: _____

NOVA MATHEMATICS- NUMBERS DON'T LIE (3)



____ 4. Do ALL of the following.

____ A. Investigate your calculator and explore the different functions.

____ B. Discuss the functions, abilities, and limitations of your calculator with your counselor. Talk about how these affect what you can and cannot do with a calculator. (See your counselor for some ideas to consider.)

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

NOVA COUNSELOR:

DATE OF COMPLETION: _____



NOVA MATHEMATICS- NUMBERS DON'T LIE (4)

___ D. Attend a football game or watch one on TV. (This is a fun activity to do with a parent or friend!) Keep track of the efforts of your favorite team during the game. (Make sure you write down your data and calculations.) Calculate your team's statistics using the following as examples:

- ___ 1. Kicks/punts
 - ___ a. Kickoff—Kick return yards
 - ___ b. Punt—Number, yards
 - ___ c. Field goals—Attempted, percent completed, yards
 - ___ d. Extra point—Attempted, percent completed
- ___ 2. Offense
 - ___ a. Number of first downs
 - ___ b. Forward passes—Attempted, percent completed, total length of passes, longest pass, number and length of passes caught by each receiver, yardage gained by each receiver after catching a pass
 - ___ c. Running plays—Number, yards gained or lost for each run, longest run from scrimmage line, total yards gained or lost, and number of touchdowns
- ___ 3. Defense—Number of quarterback sacks, interceptions turnovers, and safeties

Share your calculations with your counselor, and discuss your conclusions about your team's strengths and weaknesses.

___ E. How starry are your nights? Participate in a star count to find out. This may be done alone but is more fun with a group. Afterward, share your results with your counselor.

- ___ 1. Visit NASA's Student Observation Network website (with your parent's or guardian's permission) at www.nasa.gov/audience/foreducators/son/energy/starcount/ for instructions on performing a star count.
- ___ 2. Do a star count on five clear nights at the same time each night.
- ___ 3. Report your results on NASA's Student Observation Network website (with your parent's or guardian's permission) and see how your data compares to others.



NOVA MATHEMATICS- NUMBERS DON'T LIE (1)

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

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

___ A. Watch about three hours total math-related shows or documentaries that involve scientific models and modeling, physics, sports equipment design, bridge building, or cryptography. Then do the following:

- ___ 1. Make a list of at least five questions or ideas from the show(s) you watched.
- ___ 2. Discuss two of the questions or ideas with your counselor

Some examples include—but are not limited to—shows found on PBS ("NOVA"), Discovery Channel, Science Channel, National Geographic Channel, TED Talks (online videos), and the History Channel. You may choose to watch a live performance or movie at a planetarium or science museum instead of watching a media production. You may watch online productions with your counselor's approval and under your parent's supervision.

___ B. Research (about three hours total) several websites (with your parent's or guardian's permission) that discuss and explain cryptography or the discoveries of people who worked extensively with cryptography. Then do the following:

- ___ 1. List and record the URLs of the websites you visited and the major topics covered on the websites you visited. (You may use the copy and paste function—eliminate the words—if you include your sources.)
- ___ 2. Discuss with your counselor how cryptography is used in the military and in everyday life and how a cryptographer uses mathematics.

Helpful Link

"The Mathematics of Cryptology": University of Massachusetts Website: <http://www.math.umass.edu/~gunnells/talks/crypt.pdf>



NOVA MATHEMATICS- NUMBERS DON'T LIE (2)

____C. Read at least three articles (about three hours total) about physics, math, modeling, or cryptography. You may wish to read about how technology and engineering are changing sports equipment, how and why triangles are used in construction, bridge building, engineering, climate and/or weather models, how banks keep information secure, or about the stock market. Then do the following:

- ____1. Make a list of at least two questions or ideas from each article.
- ____2. Discuss two of the questions or ideas with your counselor.

Examples of magazines include—but are not limited to—Odyssey, Popular Mechanics, Popular Science, Science Illustrated, Discover, Air & Space, Popular Astronomy, Astronomy, Science News, Sky & Telescope, Natural History, Robot, Servo, Nuts and Volts, and Scientific American.

____D. Do a combination of reading, watching, or researching (about three hours total). Then do the following:

- ____1. Make a list of at least two questions or ideas from each article, website, or show.
- ____2. Discuss two of the questions or questions with your counselor.

____2. Choose ONE STEM field of interest from the following list. Complete ALL the requirements for a Venturing STEM exploration in that field. Venturing exploration topics. (If you have already completed a Venturing STEM exploration in one of these fields, please choose a different field for this award.) After completion, discuss with your counselor how the Venturing STEM exploration you completed uses mathematics. American Business, Chess, Computers, Drafting, Entrepreneurship, Orienteering, Personal Management, Radio, Surveying, Weather.

____3. Choose TWO from A or B or C or D or E and complete ALL the requirements. (Write down your data and calculations to support your explanation to your counselor. You may use a spreadsheet. Do not use someone else's data or calculations.)

____A. Calculate your horsepower when you run up a flight of stairs.



NOVA MATHEMATICS- NUMBERS DON'T LIE (3)

Helpful Links

"How to Calculate Your Horsepower": [wikiHow](http://www.wikihow.com/Calculate-Your-Horsepower)

Website: <http://www.wikihow.com/Calculate-Your-Horsepower>

"Lab Power": [Haplosciences.net](http://onlinephys.com/labpower1.html)

Website: <http://onlinephys.com/labpower1.html>

____1. How does your horsepower compare to the power of a horse?

____2. How does your horsepower compare to the horsepower of your favorite car?

Share your calculations with your counselor, and discuss what you learned about horsepower.

____B. Attend at least two track, cross-country, or swim meets.

____1. For each meet, time at least three racers. (Time the same racers at each meet.)

____2. Calculate the average speed of the racers you timed. (Make sure you write down your data and calculations.)

____3 Compare the average speeds of your racers to each other, to the official time, and to their times at the two meets you attended.

Share your calculations with your counselor, and discuss your conclusions about the racers' strengths and weaknesses.

____C. Attend a soccer, baseball, softball, or basketball game. Choose two players and keep track of their efforts during the game. (Make sure you write down your data and calculations.) Calculate their statistics using the following as examples:

____1. Soccer—Goals, assists, corner kicks, keeper saves, fouls, offsides

____2. Baseball or softball—Batting average, runs batted in, fielding statistics, pitching statistics

____3 Basketball—Points, baskets attempted, rebounds, steals, turnovers, and blocked shots

Share your calculations with your counselor, and discuss your conclusions about the players' strengths and weaknesses.