BOY SCOUT NOVA AWARD - SHOOT! (SCIENCE)

Additional checkoff sheets and helps are available from ScouterMom.com.

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.										
1A. Watch about three hours total of science-related shows or documentaries that involve projectiles, aviation, weather, astronomy, or space technology. Then do the following:										
1A-1. Make a list of at least five questions or ideas from the show(s) you watched.										
1A-2. Discuss two of the questions or ideas with your counselor.										
1B. Read (about three hours total) about projectiles, aviation, space, weather, astronomy, or aviation or space technology. Then do the following:										
1B-1. Make a list of at least two questions or ideas from each article.										
1B-2. Discuss two of the questions or ideas with your counselor.										
1C. Do a combination of reading and watching (about three hours total). Then do the following:										
1C-1. Make a list of at least two questions or ideas from each article or show.										
1C-2. Discuss two of the questions or ideas with your counselor.										
2. Complete ONE merit badge from the following list. (Choose one that you have not already used toward another Nova award.) After completion, discuss with your counselor how the merit badge you earned uses science.										
2A. Archery										
2B. Astronomy										
2C. Athletics										
2D. Aviation										
2E. Game Design										
2F. Rifle Shooting										
2G. Robotics										
2H. Shotgun Shooting										
2I. Space Exploration										
2J. Sustainability										
2K. Weather										
3. Choose A or B and complete ALL the requirements.										
3A. Simulations. Find and use a projectile simulation applet on the Internet (with your parent’s or guardian’s permission). Then design and complete a hands-on experiment to demonstrate projectile motion.										

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3A-1. Keep a record of the angle, time, and distance.										
3A-2. Graph the results of your experiment. (Note: Using a high-speed camera or video camera may make the graphing easier, as will doing many repetitions using variable heights from which the projectile can be launched.)										
3A-3. Discuss with your counselor:										
3A-3a. What a projectile is										
3A-3b. What projectile motion is										
3A-3c. The factors affecting the path of a projectile										
3A-3d. The difference between forward velocity and acceleration due to gravity										
3B. Discover. Explain to your counselor the difference between escape velocity (not the game), orbital velocity, and terminal velocity. Then answer TWO of the following questions. (With your parent's or guardian's permission, you may explore websites to find this information.)										
3B-1. Why are satellites usually launched toward the east, and what is a launch window?										
3B-2. What is the average terminal velocity of a skydiver? (What is the fastest you would go if you were to jump out of an airplane?)										
3B-3. How fast does a bullet, baseball, airplane, or rocket have to travel in order to escape Earth's gravitational field? (What is Earth's escape velocity?)										
4. Choose A or B and complete ALL the requirements.										
4A. Visit an observatory or a flight, aviation, or space museum.										
4A-1. During your visit, talk to a docent or person in charge about a science topic related to the site.										
4A-2. Discuss your visit with your counselor.										
4B. Discover the latitude and longitude coordinates of your current position. Then do the following:										
4B-1. Find out what time a satellite will pass over your area. (A good resource to find the times for satellite passes is the Heavens Above website at www.heavens-above.com.)										
4B-2. Watch the satellite using binoculars. Record the time of your viewing, the weather conditions, how long the satellite was visible, and the path of the satellite. Then discuss your viewing with your counselor.										
5. Choose A or B or C and complete ALL the requirements.										
5A. Design and build a catapult that will launch a marshmallow a distance of 4 feet. Then do the following:										
5A-1. Keep track of your experimental data for every attempt. Include the angle of launch and the distance projected.										

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5A-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.										
5B. 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										
5B-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?										
5B-2. How much force will you need to apply in order to power the ball to the plate?										
5B-3. If you were to use a power supply for your machine, what power source would you choose and why?										
5C. 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.										
5C-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.										
5C-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.										
Completed										
Presented										