

Shoot!

Projectiles and Space



Scouts BSA Nova Award Workbook

The requirements were issued in 2020 • This workbook was updated in July 2022.

Scout's Name: _____ Unit: _____

Counselor's Name: _____ Counselor's Phone No.: _____

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.
- B. Read (about three hours total) about projectiles, aviation, space, weather, astronomy, or aviation or space technology
- C. Do a combination of reading and watching (about three hours total).

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 or guardian's supervision.

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*.

What was watched or read?	Date	Start Time	Duration

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Then do the following:

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

1.	
2.	
3.	
4.	
5.	
6.	

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

1.	
2.	

2. Complete ONE merit badge from the following list. (Choose one that you have not already used toward another Nova award.)

- | | | |
|------------------------------------|---|--|
| <input type="checkbox"/> Archery | <input type="checkbox"/> Game Design | <input type="checkbox"/> Space Exploration |
| <input type="checkbox"/> Astronomy | <input type="checkbox"/> Rifle Shooting | <input type="checkbox"/> Sustainability |
| <input type="checkbox"/> Athletics | <input type="checkbox"/> Robotics | <input type="checkbox"/> Weather |
| <input type="checkbox"/> Aviation | <input type="checkbox"/> Shotgun Shooting | |

I completed the Merit Badge for: .

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3. Complete Option A.

- A. **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.

Helpful Links

Be sure you have your parent's or guardian's permission before using the Internet. Some of these websites require the use of Java runtime environments. If your computer does not support this program, you may not be able to visit those sites.

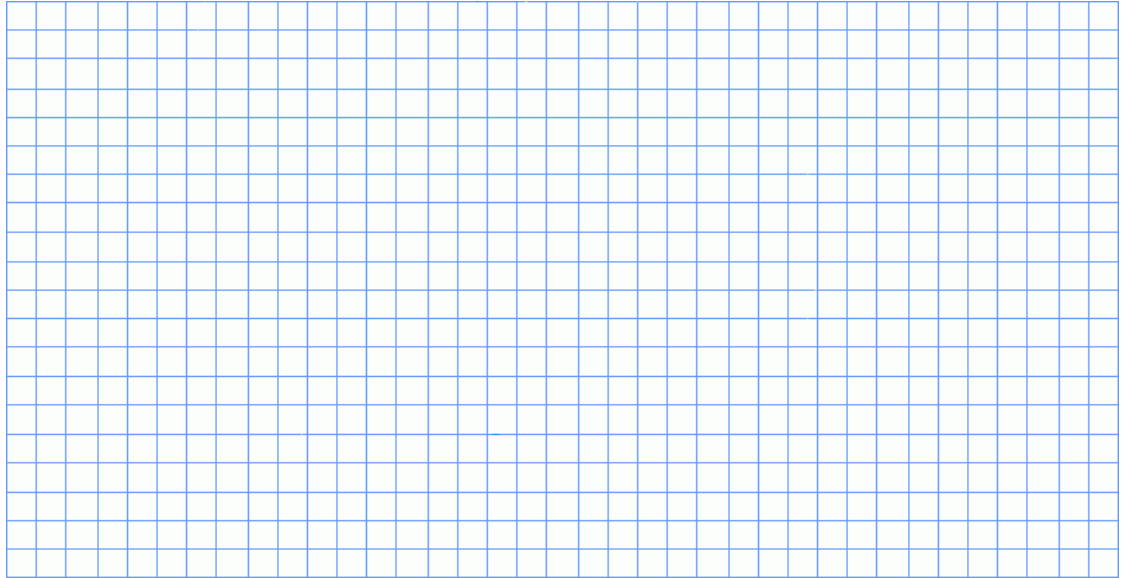
We will be using the Phet applet

https://phet.colorado.edu/sims/html/projectile-motion/latest/projectile-motion_en.html

1. Keep a record of the angle, time, and distance. If possible, measure the maximum height

Angle	Time	Distance/Range	Height (if determinable)

- 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,



- 3. Discuss with your counselor

a. What a projectile is

b. What projectile motion is

c. The factors affecting the path of a projectile

d. The difference between forward velocity and acceleration due to gravity.

4. Complete Option B.

- B. Discover the latitude and longitude coordinates of your current position.

Latitude: Longitude:

Then do the following:

- 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.)

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- 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.

The time of your viewing	
The weather conditions	
How long the satellite was visible	
Path of the satellite	

Then discuss your viewing with your counselor.

5. Complete Option C.

- 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?

Discuss your design, data, and experiments—both successes and failures—with your counselor.

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