470213-300

# The Science Behind Ballistics and Firearms Lab Activity

Aligned With All Published National Standards

ward's science

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# overview

**In this lab, students will learn background information on different types of firearms, and how a ballistics expert might use that knowledge to assist in crime scene investigations. Students will then use a Vernier caliper, trajectory rods and ballistic blocks to assess the bullets that are provided in this kit. Students will obtain metric data, analyze bullet caliber, and use tools to analyze a "bullet hole". These exercises will help students learn how to analyze damage to a bullet and connect it to a specific caliber firearm.**

## materials included:

- 1 set of four embedded .45 caliber bullets
- 1 set of four embedded .45 caliber shell casings
- 1 bullet model
- 1 set/8 safety bullets
- 1 set/7 various caliber safety bullets
- 1 set of 4 ballistic blocks
- 4 trajectory rods
- 4 protractors
- 1 laser pointer
- 8 Vernier calipers
- 8 magnifying glasses
- 1 roll string
- 1 set, product literature (Student and Teacher Guides)

## materials not provided:

- Dissection microscope (optional)

## number of uses:

This lab activity is designed for eight groups of students.

Visit wardsci.com for replacement materials.

# framework for K-12 science education © 2012

* The Dimension I practices listed below are called out as **bold** words throughout the activity.

**DIMENSION 1** Science and Engineering Practices

| | | | |
|---|---|---|---|
| X | Asking questions (for science) and defining problems (for engineering) | X | Use mathematics and computational thinking |
| X | Developing and using models | X | Constructing explanations (for science) and designing solutions (for engineering) |
| X | Planning and carrying out investigations | X | Engaging in argument from evidence |
| X | Analyzing and interpreting data | X | Obtaining, evaluating, and communicating information |

**DIMENSION 2** Cross Cutting Concepts

| | | | |
|---|---|---|---|
| X | Patterns | | Energy and matter: Flows, cycles, and conservation |
| X | Cause and effect: Mechanism and explanation | | Structure and function |
| X | Scale, proportion, and quantity | | Stability and change |
| X | Systems and system models | | |

**DIMENSION 3** Core Concepts

| Discipline | Core Idea Focus |
|---|---|
| Physical Science | PS1: Matter and Its Interactions |
| | PS2: Motion and Stability: Forces and Interactions |
| | PS3: Energy |

x Indicates standards covered in activity

# next generation science standards © 2013

| Middle School Standards Covered | High School Standards Covered |
|---|---|
| MS.PS1-4: Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. | HS.PS2-1: Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration. |
| MS.PS2-1: Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects. | HS.PS2-3: Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision. |
| MS.PS2-2: Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object. | |
| MS.PS2-4: Construct and present arguments using evidence to support the claims that gravitational interactions are attractive and depend on the masses of interacting objects. | |
| MS.PS3-1: Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object. | |
| MS.PS3-5: Construct, use, and present arguments to support the claim that when the motion energy of an object changes, energy is transferred to or from the object. | |




*(continued on next page)*

# standards/learning objectives

## national science education standards © 1996

| Content Standards (K-12) | | | |
|---|---|---|---|
| | Systems, order, and organization | | Evolution and equilibrium |
| X | Evidence, models, and explanation | X | Form and Function |
| X | Constancy, change, and measurement | | |

| Physical Science Standards Middle School | | Physical Science Standards High School | |
|---|---|---|---|
| X | Motions and Forces | X | Motions and Forces |
| X | Transfer of Energy | X | Interactions of Energy and Matter |

**x** Indicates standards covered in activity

## benchmarks for science literacy (AAAS, © 1993)

| | |
|---|---|
| 1. The Nature of Science | 1B: Scientific Inquiry |
| 2. The Nature of Mathematics | 2B: Mathematics, Science, and Technology |
| | 2C: Mathematical Inquiry |
| 4. The Physical Setting | 4E: Energy Transformations |
| | 4F: Motion |
| | 4G: Forces of Nature |
| 11.Common Themes | 11A. Systems |
| | 11B. Models |

## activity objectives:

- Conduct comparisons of known and unknown bullets, using a large manipulative.
- Compare bullets and shell casings in question to spent bullets and shell casings from three different firearms to determine which firearm fired the bullet.
- Determine the outer diameter of the bullet head portion of a dummy round in millimeters (metric units), then convert millimeters to inches and express caliber in English units of measurement.
- Measure the trajectory of a projectile that entered a Lucite block mounted to a desktop and/or attached to a wall.

## time requirement:

- Part I - 20 Minutes
- Part II - 30 Minutes
- Part III - 15 Minutes
- Part IV - 30 Minutes
- Part V - 30 Minutes

## lab specific safety:

- A laser pointer is used in this activity. NEVER point the laser beam directly at a person or at an angle where it could be reflected into a person's eyes.

## general safety:

- Consider establishing a safety contract that students and their parents must read and sign. This is a good way to identify students with allergies (e.g., latex) so that you (and they) will be reminded of specific lab materials that may pose risks to individuals.
- Students should know where all emergency equipment (safety shower, eyewash station, fire extinguisher, fire blanket, first aid kit etc.) is located.
- Require students to remove all dangling jewelry and tie back long hair before they begin.
- Remind students to read all instructions before starting the lab activities, and to ask questions about safety and safe laboratory procedures.

## at the end of the lab:

- Remind students to wash their hands thoroughly with soap and water before leaving the laboratory.


**teacher notes**

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