



The **CRASH!** activities are broken into subject areas; each has the lab materials, computer software, visual aids, student worksheets, etc. for all the activities:

**Science:**

Examining Lamps for ON/OFF	Students determine whether each lamp was ON or OFF at the time of impact, based on materials properties of the lamp filament and Newton's Laws
Investigating a MV Homicide Case	Students question witnesses, collect physical evidence from the crash scene, and decide the best photographs to document the evidence
Was It Safe to Cross?	Students measure pedestrian walking speeds using time-distance analysis, and determine a traffic condition that is safe for crossing
Driver Perception-reaction Time	Measurements of perception-reaction time lead to a discussion of safe following distance, effects of impairment, etc.
Distractions Can Be Deadly !	Students apply the equations of motion to analyze distance traveled while distracted, the danger zone in front of a moving car, etc.
Skateboards and Cars Don't Mix	An example of perception-reaction time in a common situation, and the ability of a driver to avoid a sudden emergency
People Can't Fly	How energy and forces cause injuries to unbelted occupants; an analogy is developed between a car crash and falling from a height
Vehicle Kinematics	Newton's First and Third Laws applied to injuries in car crashes, and a discussion of the safety features of cars
Does Speeding Really Save Time ?	Analysis of common travel patterns and the difference in time at speeds above the posted safe speed

**Biology, Health Science:**

Using an Autopsy Report to Determine	Students make a drawing of the injuries reported in an
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Who Was Driving	autopsy report to determine who was driving; this activity reinforces anatomical terms by visualization
Alcohol and Driver Performance	Fundamentals of toxicology of alcohol, including absorption and elimination and the BAC v. time curve
Using the BACSim Software	Computer simulation of the effects of drinking on driver performance, and effect of alcohol impairment on reaction time
Using the Widmark Equation	Students determine the level of impairment for various drinking patterns, and the differing effects of alcohol on males and females
Observing Impairment in Driving Tests	Effects of impairment are observed in videotaped driver performance tests
“I only had two beers !” Under the Limit, But Seriously Impaired	Students research the ETOH content of various drinks Effects of low BAC's (under .08) on driving performance are investigated using an internet activity
The Intoxilyzer as Proof of Impairment	A police officer demonstrates the use of a breath test instrument, and the legal implications of the test
You Can't Afford a DWI ! The “cough medicine” defense	Students tabulate the various hidden costs of a DWI arrest Students apply the Widmark equation to calculate the impairment caused by drinking cough medicine
It's All in the Blood	Converting hospital blood test results to whole blood equivalency for forensic applications

### Physics :

Measuring Friction with a Police Drag Sled	Students measure road friction and apply it to stopping distance, speed estimates, etc
Projectile Motion in Accident Reconstruction	Examples of pedestrian collision, vaulting from the roadway, etc. that can be analyzed using projectile motion equations
Weighing a Car with a Bath Scale Reconstructing a Murder by Automobile	Application of torques to a hands-on problem Students apply physics to reconstruct speed, using an actual police accident report
Reconstructing a Motorcycle-Vehicle Collision	Applying energy conservation to determine vehicle speed
Linear Momentum in Accident Reconstruction Vehicle and Occupant Kinematics	Reconstruction of speed using linear momentum Newton's First and Third Laws applied to injuries in car crashes
How Do Crumple Zones Save Lives?	Newton's 2 <sup>nd</sup> Law applied to seat belt use and injury prevention

Newton's Laws in Court -Sargent v. Smith Newton's Laws in Court - Sullivan v. Mitton Determining Whether a Vehicle Ran a Stop Sign	Using an actual police report to reconstruct a crash Investigation of a collision in anticipation of a trial Students measure vehicle acceleration into an intersection to determine whether a driver is negligent
Newton Would Have Worn a Seat Belt	Application of Newton's Laws to seat belt use; students use actual video of crashes with live drivers to make force and acceleration calculations
Linear Momentum Takes the Witness Stand	Students look at the uncertainty of a momentum calculation in the context of proof at trial
Projectile Motion - Impact Speed in a Fatal Crash	Students find the speed of a motorcycle impact from the flight of the operator's body using projectile motion equations
<b>Math :</b>	
Parametric Equations and Tractor Trailer Speed	Algebraic manipulation of equations to produce a working equation for police investigators
Quadratic Equations in Accident Reconstruction	Solution of the quadratic equation applied to pedestrian motion, throw of debris in a collision, etc.
Was It Safe to Cross ?	Students measure pedestrian walking speeds, develop some statistics, analyze the data, and determine a traffic condition that is safe for crossing
Alcohol and Driver Performance	Application of the Widmark equation, and analysis of linear functions and relationships among the variables
Analyzing the BACSim Software	Computer simulation of impaired driving, and the algorithm for the software-analyzing a linear function
AFIS Fingerprint Mapping	Use of coordinate pairs to match fingerprints to a suspected operator
Trigonometry Solves a Murder	Trigonometry analysis establishes the theory of negligence in a motor vehicle homicide case
Quadratic Equations and Insurance Fraud	Students analyze vehicle damage and speed in a fraudulent insurance claim using a quadratic equation that relates vehicle damage to speed