

A Description of the CRASH! Activities:

The *CRASH!* activities are broken into subject areas; the Universal Crash! Toolbox has the lab materials, computer softwares, DVD's, worksheets, etc. for the activities:

Physical Science:

Examining Lamps for ON/OFF	Students determine whether each lamp was ON or OFF at the time of impact, based on material's properties and Newton's Laws . Ten forensic photographs of lamps from real crashes are provided.
Investigating a MV Homicide Case	Students question witnesses, collect physical evidence from the crash scene, make measurements of tire mark evidence, and specify photographs to document the evidence
Was It Safe to Cross?	Students measure pedestrian walking speeds, and use statistics to determine a traffic condition that is safe for crossing.
Driver Perception-reaction Time	Measurements of perception-reaction time are the basis for an analysis of safe following distance, effects of impairment, etc. Students make measurements using "chronoscopes" that are based on the Galileo free-fall equation
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	Study of perception-reaction time in a common situation, and the ability of a driver to avoid a sudden emergency when a skateboarder enters the roadway
People Can't Fly	How energy and forces cause injuries to unbelted occupants. Analysis includes potential and kinetic energies.
Vehicle Kinematics	How Newton's First and Third Laws applied to injuries in car crashes.
Does Speeding Really Save Time ?	Analysis of common travel patterns and the difference in time at speeds above the posted safe speed to show how little time is saved by speeding .

Biology:

Using an Autopsy Report to Determine Who Was Driving

Students make a drawing of the injuries reported in an autopsy report to determine who was driving. By visualizing the injury locations the students are learning the meaning of **anatomical terms** like lateral, medial, etc. rather than just memorizing them.

Alcohol and Driver Performance

Fundamentals of the **toxicology** of alcohol, including absorption and elimination and the BAC (Blood Alcohol Concentration) v. time curve. Shows students how long it takes to clear ETOH from the blood.

Using the BACSim Software

Computer simulation of the effects of drinking on driver performance includes an interactive **perception-reaction time** test that can simulate reacting while impaired

Calculating with the Widmark Equation

Students determine the level of **impairment** for various drinking patterns, and the differing effects of alcohol on males and females, and how the BAC level is affected by body weight

Observing Impairment in Driving Tests

Effects of **impairment** are observed in videotaped driver performance tests; students are asked to observe and identify the impaired behaviors at various drinking levels.

"I only had two beers !"

Students research the **ETOH content** of various drinks to determine how many drinks it would take to reach the .02 BAC level of legally impaired for teen drivers

Under the Limit, But Seriously Impaired

Effects of low BAC's (under .08) on driving performance and the reality of how little alcohol it takes to cause **impairment**.

The Intoxilyzer as Proof of Impairment

Police officer demonstrates the use of a **breath test** instrument, and the legal implications of the test, showing that a small breath sample can reveal BAC levels accurately.

You Can't Afford a DWI !

Students tabulate the various hidden **costs of a DWI arrest** to understand how costly it can be to drink and drive.

The "cough medicine" defense

Students apply the **Widmark equation** to calculate the impairment caused by drinking cough medicine to dispel the myth that you can easily get impaired by taking cough syrup that contains ETOH.

It's All in the Blood

Converting hospital blood test results to whole blood equivalents for forensic applications; this activity demonstrates which **components of the blood** absorb ETOH

Physics :

Measuring Friction with a Police Drag Sled	Students measure road friction and apply it to determine 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	Application of torques to a hands-on problem in which the weight of a car is measured with a scale using a lever
Reconstructing a Murder by Automobile	Students apply general physics equations and concepts to reconstruct speed, using an actual police accident report in which a drug deal gone wrong results in a motor vehicle fatality
Reconstructing a Motorcycle-Vehicle Collision	Applying conservation of energy to determine vehicle speed in an actual motorcycle-car collision case to prove that the operator was criminally negligent (this activity can also be used to have a mock trial in which the laws of physics are challenged by the defense" expert
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 2nd Law applied to seat belt use and injury prevention
Newton's Laws in Court -Sargent v. Smith	Using an actual police report to reconstruct a crash using Newton's Laws
Newton's Laws in Court - Sullivan v. Mitton	Investigation of a collision in anticipation of a trial; Newton's Laws are used to solve a mystery involving the direction of travel of a vehicle entering an intersection prior to a crash.
Determining Whether a Vehicle Ran a Stop Sign	Students measure vehicle acceleration into an intersection to determine whether a driver is negligent for not stopping for a stop sign.
Newton Would Have Worn a Seat Belt	Application of Newton's 2nd Law to seat belt use, showing why a properly used seat belt can greatly reduce the risk of injury in a crash
Linear Momentum Takes the Witness Stand	Students look at the uncertainty of a momentum calculation by showing how sensitive the calculations are to uncertainties in the field data.
Projectile Motion - Impact Speed in a Fatal Crash	Students find the speed of a motorcycle at impact from the projectile motion of the operator's body

Math :

Parametric Equations and Tractor Trailer Speed	Algebraic manipulation of equations to produce a working equation for police investigators in a tractor-trailer crash. (algebra)
Quadratic Equations in Accident Reconstruction	Quadratic equation applied to analyze a pedestrian motion, throw of debris in a collision, etc. (quadratic equation)
Was It Safe to Cross ?	Students measure pedestrian walking speeds, and use statistics to determine a traffic condition that is safe for crossing (statistics)
Alcohol and Driver Performance	Application of a linear equation to determine driver BAC at the time of a crash based on subsequent blood tests (slope and intercept of a linear function)
Analyzing the BACSim Software	Computer simulation of impaired driving, and the analysis to determine the algorithm used in the software (linear functions)
AFIS Fingerprint Mapping	Use of coordinate pairs to match fingerprints to a suspected operator; the AFIS system of computerized fingerprint matching replaced the long, tedious process of visually inspecting fingerprint cards to find a match to a defendant.
Calculations Solve a Murder	Math analysis of a vehicle trajectory develops the theory of negligence in a motor vehicle homicide case; students use trigonometry to make field measurements needed for the calculations
Quadratic Equations and Insurance Fraud	Students analyze vehicle damage and speed in a fraudulent insurance claim to show whether the claim for a personal injury and property damage was legitimate. (quadratic equation)