

# [Using mathematics to solve crime](https://assignbuster.com/using-mathematics-to-solve-crime/)

Typically, when peopleask me why I want to go into Law Enforcement, I shut down. It’s a simplequestion, really, but the answer isn’t so straightforward. But this essay isliving proof that I want to solve crimes; this is proof that I desire to becomea sleuth like Nancy Drew. Definitely. Of course, one would only assume that asimple statement like that would be the beginning of a fifth-grade story forLanguage Arts. But this is nothing of the kind, in fact, this is the work of acollege student conveying her aspirations in the form of an essay. The purposeof this essay it to draw a connection between math and sleuthing; I am going tofind a correlation between mathematics and criminal justice. According to aninterview (conducted by Pamme Boutselis) PoliceOfficer Tim McMillan—Bachelor of Arts in Mathematics— gives us a glimpse of whyhe does what he does and how math applies to it. Whenhe was almost 21 years old, a couple of his friends were murdered in a homeinvasion. He recalls that the suspect was caught and prosecuted, but all theculprit took was a DVD from the home. “ I had never experienced tragedy, and —being so young — it really, really bothered me. Very shortly after that, Ienrolled in the police academy and have been working as an officer ever since(McMillan, 2015).”  Many peopleend up in the police force in the aftermath of a tragedy similar to this one. I, on the other hand, cannot relate to any such scenario, but I do have apassion to make the world a better place; a vendetta, if you will. Now, theaverage person probably knows that the field of law enforcement deals heavilywith ballistics, forensic analysis, and chemistry. But, what the average persondoes not know is that not only does Law Enforcement deal with science, but mathas well. According to McMillan, “ one of the most successful data-drivensolutions I’ve seen in other agencies is the employment of data analysts whoexamine crime waves and deploy their assets to certain geographical locationsbased on what the crime stats are telling them. You’re almost trying to predictthe future by using mathematics and analyzing past events (2015).” He assertsthat mathematics has given way to a huge influx of data and information. “ We’rein the computer age, where we can extract data in seconds (2015).” Now, whenMcMillan started off in college, he was originally shooting for a degree inCriminal Justice (at this point, he had been on the police force for tenyears). He decided he didn’t think a degree in Criminal Justice would be worthit, considering he knew all he needed to know—academically—in that area. So, hechanged his major to a BA in Mathematics. “ Data analysis applied statistics andapplied mathematics are being used throughout the country and progressively inlaw enforcement agencies, and I wanted to be on the forefront (2015).” He givesus an example of how math applies to his job on the Police Force. He had anongoing occurrence of cars being stolen from gas stations—where the keys areleft dangling from the ignition and a perpetrator hops in a flees. So, they setup a hot seat: a bait car. The bait car was jimmied so that the perpetratorcould hop in the car and drive away, but the Police Force had a remote controlto shut the car down and lock the perpetrator from the inside. “ I was able todo the time analysis beforehand using applied mathematics — the same procedurethat’s in any other statistical research — to determine what times were thebest times to do this operation. We didn’t have to go out there randomly lastnight. We were able to have a plan as to what time statistically tipped thescales in our favor (McMillan, 2015).” During the time McMillan spent incollege, his eyes were opened as he saw all the ways math coincided with LawEnforcement, things like the scenario with the car. Who would think math reallydoes apply to Solving Crimes? (MathematicsApplied: Modern Applications of Math in Law Enforcement, 2015) Math is a hugebreak-through for the field of Criminal Justice; it proves theories and solvescrimes through the use of equations and step-by-step analytics.

Modern Applications of Math in Solving Crimes

In, The Numbers Behind NUMB3RS: Solving Crime with Mathematics — by Keith Devlin and Gary Lorden– the crime-acclimated television show, NUMB3RS, is dissected to prove how math is the secret weapon to solving enigmas. In the show, one of the protagonists is a mathematician, and much of the action revolves around him. Professor Charlie Eppes uses his crazy math services to help his older brother—FBI Agent Don Eppes— identify and prosecute criminals. Although the show is produced by Paramount Network Television and has received high ratings, many viewers deem the story line as implausible: math can’t solve crimes. However, as I already proved, you can. Law Enforcement Agencies and Police Forces use math in every instance they can.  The purpose of this book, as the authors describe, is to show society some of the math techniques that the Police Force, the FBI, and the CIA frequently use. “ Most of these methods have been mentioned during episodes of NUMB3RS” (Devlin and Lorden 2007). Among these methods are data mining. Tools used in data mining are: Link analysis —looking for associations and other forms of connection among, say, criminals or terrorists, Geometric clustering —a specific form of link analysis, Software agents —small, self-contained pieces of computer code that can monitor, retrieve, analyze, and act on information, Machine learning —algorithms that can extract profiles of criminals and graphical maps of crimes, and Neural networks —special kinds of computer programs that can predict the probability of crimes and terrorist attacks (Devlin and Lorden 2007).

Modern Applications of Math in Crime SceneInvestigations

One of the reasons why we havelearned math (practically our whole lives), but especially in college, is to develop keen thinking and problem-solving skills.  Now, as a policeofficer or an investigator in law enforcement, problems will find you like food finds its way to a grocery store. Now, are all those problems going to involve mathematics? No, but because you (hopefully) payed attention in math from gradesk-12, your brain developed keen awareness, which is what police officers usedaily. So, for the problems that do, indeed, involve math, geometry may helpyou as a police officer. For example, lets’ say there was a car accident, andyou’re the deputy in charge of the scene. You need to be able to determine where car a was coming from when it car b. Also, say you get a call thatsomeone was shot, and you arrive at the scene and find everything in disarray. It would be useful to determine where the victim was standing when he/or shewas shot/or stabbed—this is called ballistics in the case that someone was shot(Geometry for Police Officers, 1997).

There are many sectors in ‘ solvingcrimes’, however, a big sector comes from the crime scene . A great example applying math to a crime scene isthrough the analysis of blood spatter. Blood accountsfor 8% of your total body weight, 5 to 6 liters of blood for males, 4 to 5liters for females. A 40% blood volume loss(internally and/or externally) is required to produce irreversible shock(death). Blood loss of 1. 5 liters (internallyor externally) is needed to cause the loss of consciousness. The three categories of bloodstains are Passive, Projected, and Transfer.

Blood spatter evidence inAmerican legal cases did not occur until 1955, when Dr. Paul Kirk submitted hisfindings in well renown case. The field saw a modernization break-through inthe work of innovative forensic scientist Herbert MacDonell. MacDonell trainedlaw-enforcement personnel in blood spatter analysis and developed courses tocontinue to train analysts. In 1983, he and other attendees of the firstAdvanced Bloodstain Institute founded the International Association ofBloodstain Pattern Analysts (IABPA). Prior to the 1970s, blood analysis used asystem of categories based on the velocity of blood drops at impact: Low-velocityimpact spatters (LVIS) that resulted from dripping and were assisted by gravityalone, Medium-velocityimpact spatters (MVIS), which were slower than those produced by a gunshot butfaster than gravity drips and High-velocity impact spatters (HVIS), produced by gunshots or fast-movingmachinery. After the 1970s, these definitions changed. Instead of“ impact” referring to the speed of the droplets, it came to refer tothe speed of the weapon or object that sent them flying. These newinterpretations gave way too many unknown factors. Also, they lead investigatorsto make assumptions based on outside information — for example, to assume thatdroplets were HVIS because the case involved a suspected shooting. To deterthis, analysts today use more specific terms. LVIS, for example, might becalled “ gravitational drops” or “ drips”.  Investigators use calipers to measure the blooddrop (length and width). Then, by using the Law of Sine, they find the angle ofimpact of the blood drop, and later calculate the height of the source of bloodusing the law of tangents. Furthermore, hairs are often discovered at crimescenes, however, only using math can determine whether it is a human or ananimal hair. You can do so by calculating the ratio of the diameter of themedulla (middle, pigmented section of the hair) to the diameter of the entirehair. An animal hair parades a ratio of ≤. 5, while a human hair parades aration of ≥. 5.

Criminal Justice needsMath

The New Mathways Project, acollaboration of The Charles A. Dana Center at The University of Texas atAustin and the Texas Association of Community Colleges, writes a compellingarticle about high-demand fields recruiting students with college degrees inC. J. in the state of Texas. In Texas, 2012, 3, 365 students had a degree in C. J. Now, with that in mind, there are many mathematicians out there who aresuggesting colleges should “ offer multiple mathematics pathways with relevantand challenging math content aligned to specific programs of study” (Cullinaneand Tow). The Academy of Criminal Justice Sciences states that the “ primary objectivesof all criminal justice programs include the development of critical thinking; communication, technology and computing skills; quantitative reasoning; ethicaldecision-making; and an understanding of diversity” (ACJS, 2005, p. 10). ACJSendorses statistics as a must for students in line to receive a C. J. degree(ACJS, 2005, p. 9). According to the Mathematical Association of America, “ studentsin social science majors require a strong foundation in mathematical literacy—particularlyin the area of statistics in order to succeed in a data-driven career field”(Johnson and Grant, 2011, p. 34). The Texas Higher Education recommends 3-hourcredit of a math class (THECB, n. d., table). Criminal Justice needs to keep usingmath like cookies need chocolate chips. There are other ingredients to put incookies, but chocolate chip cookies were the original cookie and thereforecannot be replaced. Math cannot be replaced, it is original. You can use othermethods to find solutions, but at the end of the day, math is the only thingthat works.

Conclusion

More and more studentsreceiving higher education and aiming to achieve a C. J. Degree are also gettingMath Degrees as well. Why is that? Math is applicable to Criminal Justice inthe same way butter is lathered on bread. As in the crime scene examples, onlymath could be used to distinguish between an animal hair and a human hair; thatcould determine if someone was at the crime scene or not—a human hair samplecould lead investigators to a potential suspect, otherwise unknown. Talk abouttying up loose ends, I think math could do that, too.

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