Portrayal of Mathematicians in Fictional Works

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Abstract: In his article "Portrayal of Mathematicians in Fictional Works," Daniel Dotson explores how people with mathematical abilities -- including mathematicians, mathematics teachers, math-ematically-inclined youths, cryptographers, and more -- are portrayed in novels, films, television programs, and a play. A summary table of the characters gives a short description of each of them, the title of the work in which they appeared, and the format of the work. Characters were analyzed to see if they possessed any of ten personality traits: obsessive, having major mental health problems, withdrawn, brave, timid, socially inept, arrogant, uses math to escape reality, out of touch, and stubborn. Dobson describes in his paper each personality trait, lists the characters with that trait, and several characters are described with further details as to how that character manifested that personality trait during the course of the work in which they appeared. Male and female characters are compared to determine if one gender received a better portrayal (i.e., fewer negative personality traits) than another. In addition, characters possessing several personality traits are described in detail as well as the few characters not possessing any of the traits.

Daniel DOTSON

Portrayal of Mathematicians in Fictional Works

What image comes to mind when one thinks of a mathematician? Some may think of mathematicians as being male, obsessive about their work, withdrawn, and more. The television series *Numb3rs* has brought a mathematician into millions of homes weekly. How are this mathematician and others portrayed in fiction? What is a mathematician anyway? For the purpose of this survey of characters, it is anyone mathematically inclined. This includes college/university professors and K-12 teachers, people with degrees in mathematics working in various fields, students studying mathematics, autistic and mentally incapacitated people with outstanding mathematical abilities, teenagers and adults with promising mathematical ability but no mathematics degree, and more. For lack of a better term, all of these people will be labeled as mathematicians. Searching in English-language materials, eighty-five mathematicians in a variety of fictional media were examined, including characters in 41 novels, 2 television series, 22 films, and a recorded play. The characters' actions and stated facts about them were examined to determine if they possessed one or more of a number of personality traits: obsessive, having major mental problems, withdrawn, brave, timid, socially inept, using math to escape reality, out of touch, arrogant, and stubborn. The focus of the work at hand in which the mathematicians are featured is not necessarily on mathematics and include such topics as photographing an eclipse, escaping a deadly cube, murders and criminal activity, love, teaching, aliens, and time travel. The character had to have enough of a presence in the work in order to gather information on the personality traits. In some instances, a mathematician may only appear briefly, which does not give a good sense of the personality. While most of the mathematicians portrayed are purely fictional, eleven characters are based upon people who actually existed: Ada Byron King, Alan Turing, Archimedes, Evariste Galois, Faufi Kovalevskaya (daughter or Sofya), Hypatia, Jaime Escalante, John Nash, Sophie Germain, Pierre de Fermat, and Sofya Kovalevskaya. Overall, the mathematicians were examined to determine how they were portrayed in fictional works: Did they possess a lot of negative personality traits? Also, did one gender get a better portrayal than another?

Library catalogs (academic, public, consortia, and WorldCat) proved to be valuable tools in finding works featuring mathematicians as characters/protagonists. In addition, booksellers such as Amazon and Barnes and Noble proved to be useful sources. The Internet Movie Database <http://www.imdb.com> proved to be a valuable resource for films and television programs. A great site to find out summaries and other information about books, stories, films, and other fictional works with mathematical themes is Alex Kasman's *Mathematical Fiction* website <http://math.cofc.edu/faculty/kasman/MATHFICT/>: this website was valuable for finding items that were missed in the other resources. The table below provides a short description of the 85 characters examined and lists their work and the format of the work in which they were featured.

Table 1: List of Fictional Characters/Protagonists, Titles of Works, Type of Genre, and Brief Description of Plot

Character	Title of Work	Genre	Description of Plot
Ada Byron King	Conceiving Ada	film	Shown as promiscuous and standing up for herself (especially to Charles Babbage). Felt nobody knew her because she was never what she should have been.
Adolph Drukker	*The Bishop Murder Case*	novel	An adult hunchback who gets along with kids, but clearly has emotional problems and does not always interact well with adults. Known to have had arguments and even tantrums in interacting with other adults.
Agnes Urquhart	*Isaac and His Devils*	novel	Teacher, mentor, and later lover to Isaac Hooker. She takes care of him after his mental breakdown but turns down his marriage proposal. She promises to wait for

			him to return to her.
Alan Turing	*Breaking the Code*	film	A nervous youth and middle-aged stutterer who helps break the German enigma code. His homosexuality gets him into trouble with the government and he eventually commits suicide.
Alex Ligon	*Dark as Day*	novel	Living in Europa, he works on a formula that predicts future human population, which is eventually zero. An alien signal's discovery leads him to add alien life to the formula, resulting in a human-filled future. Unable to refuse his powerful family's demands.
Andrea Aspinall	*The Company of Strangers*	novel	Alias Anne Ashworth (later Anne Ashworth Ameida). Her math skills are put to use as a British spy in World War II Portugal, but confides too easily in others (including complete strangers). Secrets in her life date back to her mother's past, resulting in major developments for her decades after her spy career.
Archimedes	*The Sand Reckoner*	novel	Forced to return home from Alexandria. Wonderful inventor, but only when in desperate monetary need. His slave often keeps him from going totally broke. Falls in love with the king's sister, but he informs her that she will be second to math.
Aron Aronov	*Revenge: Wrongs Redressed*	novel	Refused his degree when Jews lose rights in his country. Begins an underground paper and works with others to attack the government and eventually kill certain officials.
Arthur Seldom	*Oxford Murders*	novel	Seemingly helping a murder investigation, he is in reality covering up for his murderer daughter by leaving fake clues in the form of a series.
Arthur Weatherburn	*The Three-body Problem: A Cambridge Mystery*	novel	A stuttering Cambridge mathematician accused of murdering three mathematicians. He becomes friends with and is eventually cleared by the help of his neighbor Vanessa Duncan, who he proposes to.
Athene Tilson	*Out of the Sun*	novel	Her mind has reached new levels, able to do things few others can do. Using her abilities, she has caused one of her students to go insane and has murdered other people.
Benedikt August Anton Cecil August Count Waller von Wallerstein (Benedikt Waller)	*Sad Strains of a Gay Waltz*	novel	A lonely German count and professor whose only close relationship is his sister, but occasionally dates men. Advertises to adopt a child and gets a Russian woman and her son. Becomes obsessed with the child and marries and tries to abandon the mother. The child only gets close after the father returns.
Bob Howard	*The Atrocity Archives*	novel	Does occult work for the British government (which includes summoning demons), work that dates back to World War II. Gets involved in dangerous missions.
Cady Heron	*Mean Girls*	film	Attending a regular school for the first time, she at first

			works at the behest of her new friends to bring down The Plastics clique a peg, but becomes a member and as bad as they are before realizing who she really is. Fakes being bad at math (at which she is quite adept) to get help from a boy in her class.
Caspar "Chazz" Lundquist	*Shiloh Project*	novel	Finds the Kovalevskaya formula that is the secret to time travel and uses it to search for his love, Schaharazade (believing her to have existed). He is not good at time travel and gets two others involved in dangerous past events. Eventually marries Faufi Kovalevskaya.
Catherine Liewelyn	*Proof*	film	Robert Liewelyn's daughter who has emotional problems and took care of ailing father before his death. Learned math from him and her proof's origin is disputed by her sister and new love interest Hal Dobbs.
Charles Morrison	*The Three-body Problem: A Cambridge Mystery*	novel	A mathematician who is impressed with Vanessa Duncan, teacher of his young niece, and helps her in her mission to absolve her neighbor of murder charges. Gives his niece a large sum of money without question, which she uses to travel to Europe.
Charlie Epps	*Numb3rs*	TV series	Helps his FBI-agent brother with investigations. Very intelligent, but seems oblivious to his advisee's interest in him. Escapes to math when under emotional stress.
Chris Barton	*7 Steps to Midnight*	novel	Working on a solution for turbulence interference with lasers in the atmosphere. Ends up in a conspiracy (which in reality is a plot to refresh his working abilities), wondering whether or not his life is real.
Cynthia May	*Two Moons*	novel	Receives a job as a number cruncher in President Hayes's Washington DC. Uses her brain for work, her boldness to win an astronomer's heart, and her femininity to get him equipment from a womanizing senator.
Daniel Keane	*Fermat's Last Tango*	play	Proved Fermat's Last Theorem, but then a hole is discovered. Neglects family (to wife's frustration) for his proof and is visited by several famous mathematicians, including Fermat. A statement by his wife triggers the solution.
Daniel Pratt	*Moebius*	film	Called to help investigate a missing subway train, he finds that a math professor is key to its disappearance and the train is eventually found with the professor operating it at the speed of thought.
David Sumner	*Straw Dogs*	film	Cannot confront others (such as the men working on his home) and escapes to his chalkboard to avoid others. Eventually snaps and violently defends an accused criminal in his home from a vigilante mob.
David Venning	*Out of the Sun*	novel	In a coma for most of the book, he is obsessed with finding a way to see if the human mind can reach new levels. Has stabbed others in the back in his pursuit.
Dmitri Arkanov	*The Wild Numbers*	novel	An emeritus professor and former Soviet Russia psych ward inmate. He misses an obvious error in a colleague's proof and underestimates a student's problematic behavior.

Dr. Malcolm	*Jurassic Park*	film	A Chaotician who believes the female-only dinosaurs in Jurassic Park will find a way to reproduce and resist their keepers. Unfortunately, he is correct and must struggle to survive and escape.
Elisha Pomeranz	*Touvh the Water Touch the Wind*	novel	When the Nazis invade, he hides, gets captured, and eventually makes it to Israel. He in turn becomes a watch-maker and shepherd. His article submission gets questioned. His wife eventually reappears on the scene.
Elliott Wakefield	*Case of Lies*	novel	His MIT friends introduce him to counting cards, leading to his gambling career. So obsessed with prime numbers, he fights a robber over his notebook. Eventually helps solve a murder at the robbery scene after the woman he loves (unrequitedly) gets killed.
Eric Wynn	*Cube Zero*	film	A technician in a cube filled with deadly traps, he enters it to rescue someone he believes innocent of her accused crime. His mathematics enables him to predict outcomes (which he often visualizes), such as chess moves.
Esbeth Waters	*Black Like Blood*	novel	A retired math teacher turned police dispatcher in her 70s, she helps solve a murder, helps out a young couple, and gets held hostage as a result of her sleuthing.
Eunice Doom	*The Shadow Guests*	novel	An Oxford professor who takes in her young cousin Cosmo. Believes in a family curse, poltergeists, and other paranormal things, seemingly unscientific for a mathematician.
Evariste Galois	*The French Mathematician*	novel	Galois's aimless life is steadied by math. He also gets involved in revolutionary happenings in Paris, especially after his father's death. Unable to accept a woman's rejection, he dies in a duel over her honor.
Faufi Kovalevskaya	*Shiloh Project*	novel	Learns the secret to time travel from her mother, Sofya Kovalevskaya. Eventually finds and marries Caspar Lundquist after helping him and the other travelers get back to the future.
Frances Montrose	*Leaning Towards Infinity*	novel	Learned from her distant mother's math books and notes. Feels inferior to mother in looks and mind. Attends a conference to present mother's ideas, but mother's ex-lover claims them as his own. She flees and travels randomly, but returns to present them later in the parking lot with the few remaining attendees.
Giacopo Tigor	*The Snowflake Constant*	novel	After his theories are rejected at a conference in his birth town, he goes on a journey taking on various jobs (from stage hand to teacher). Eventually, he searches Mt Ararat for Noah's Ark, where is later found frozen.
Gordon Henderson	*Echoes from the Past*	novel	He has an eventful year, gets two inheritances, helps capture a diamond smuggler, gets appointed department chair, gets held at gunpoint, gets married, and has twins.
Greg Hale	*Digital Fortress*	novel	Hacks into Trevor Strathmore's email and discovers he is up to something suspicious. Attempts to escape using Susan Fletcher as a hostage. Later killed and framed by Strathmore for murdering a colleague and leaving a fake

			suicide note.
Gregory Larkin	*Mirror Has Two Faces*	film	A math professor who wants a platonic relationship and discovers someone willing to enter a loveless marriage. Learns to be more interactive in teaching in class from her. She eventually wants more, but it takes him longer to realize the same.
Hamid Tabriz	*Nanotime*	novel	A genius mathematician and terrorist who begins a world war after making people into bombs and controlling them via an implant.
Harold "Hal" Dobbs	*Proof*	film	Math student, rock band member, and love interest of Catherine Liewelyn. At first believes her proof to be her father's, but eventually compares handwriting differences.
Hypathia	*Remembering Hypatia*	novel	A strong-willed woman who teaches in the library and has few friends, but is loved by many (including one student infatuated with her). Close to city's ruler (some believing him to be her one love) and is killed in a religious fervor, accused of being a witch.
Iphigenia Julia Esker	*Heart, You Bully, You Punk*	novel	A private school teacher who agrees to tutor a house-bound student and eventually begins a relationship with the student's father (whose actress wife is rarely in the picture). She quits before being dismissed for the relationship, which she ends.
Irena Bozinska	*American Heaven*	novel	Leaves her lover and fellow mathematician, mother, and cat behind in Poland and comes to Chicago where she is caregiver to a retired jazz musician. A return to Poland with the musician and a fellow apartment dweller (and rumored gangster) is only a short trip.
Isaac Swift	*The Wild Numbers*	novel	Obsessed with mathematics from an early age. His proof about wild numbers has a fatal flaw that he did not catch. Accused by Leonard Vale of stealing the proof and gets bitten by him.
Jack Potter	*A Signal Shattered*	novel	Partially responsible for the Earth's destruction, he attempts to save humanity's remnants via outdoing the alien whose technology resulted in the destruction. Travels to the Moon, Earth, and other planets.
Jaime Escalante	*Stand and Deliver*	film	Enables a group of supposedly unteachable kids to pass the AP Calculus test. Neglects family and health for his students, who he stands by when they are accused of cheating.
Jayne Smyers	*The Fractal Murders*	novel	Discovers that 3 of 5 people she wanted to critique her article are dead. Hires a private investigator (who she develops feelings for) and puts herself at risk to find out what is happening.
Jeremy Bremen	*The Hollow Man*	novel	Has telepathic abilities and only forms a close relationship with his wife, another telepath. He goes on a journey to escape the pain of his wife's dying, but meets danger on the journey.
John Nash	*A Beautiful*	film	Schizophrenic, his mind creates a best friend (and later

	Mind		his niece) and a government job with agents. He eventually marries and has a child, but his mental problems continue to plague him and even puts his family in danger.
John Wosileski	*An Almost Perfect Moment*	novel	A high school teacher who becomes infatuated with a student in his class and whom he unknowingly gets pregnant. He dates a biology teacher and after ignoring her for a year, is rejected when he proposes to her.
Juanita Hernandez	*Leaning Towards Infinity*	novel	Placed in a convent after her father's death, she learns math from the nuns but her mother refuses further education. Cheats on her husband and prefers her son to her daughter (Frances Montrose). Ends up in a nursing home with some mental problems and attacks daughter.
Kazan	*The Cube*	film	Appears to be autistic and is able to do complex calculations which are a key to escaping the deadly cube in which he and others are trapped. Seems to be timid and afraid.
Leaven	*The Cube*	film	Math student who tries to figure out the code on the exit doors in the deadly cube in which she is trapped. However, there is more to her than she lets on.
Leonard Vale	*The Wild Numbers*	novel	Goes insane as a high school math teacher. He returns to college and persists in annoying professors in and out of class and eventually bites Isaac Swift after he believes he stole a proof.
Lindsay Weir	*Freaks and Geeks*	TV series	Former mathlete who now hangs out with the freaks in her high school. Stands up for her friends when needed. Rejoins the mathletes for a short time, but demands to be first string and leaves after one match.
Lucas Hutchman	*Ground Zero Man*	novel	Risks losing his family and their money in order to make a device that makes nuclear weapons inactive. In his desire to complete his invention, he gets into many difficult situations. His actions lead to deaths, his wife's paralysis, and redesign of nuclear weapons.
Luke Williams	*Murder Is Easy*	film	States he does not work well with people. A woman on a train tells him the murderer in her town is the least likely suspect before she gets killed. However, he uses a computer to predict the most likely killer, getting the woman he is falling for as a result. The murderer is indeed the least likely suspect.
Martin Smith	*Codename Icarus*	film	Accused of being rude and a cheater, he is actually a genius and is invited to a prestigious school after chatting with someone via a computer. He investigates the strange happenings at the school and uncovers a dark secret.
Max Cohen	*Pi*	film	Determined to find a mathematical explanation for everything. Others seem to want his information and he is plagued by migraines, Wall Street, and religious figures as he nears insanity.
Melanie Pres-	*The Givenchy*	novel	A shopaholic high-fashion aficionado, Her cryptography

cott	*Code*		skills come in handy when an online game she used to play results in deaths. At first scared, she then becomes thrilled and falls for the man who is helping her.
Melvin Schwartz	*Shiloh Project*	novel	Enjoys teaching and is falsely accused of molesting a girl by Schmuyle Goldenberg. Goes on a dangerous journey throughout time and falls in love with Ruth Foster.
Mona Gray	*An Invisible Sign of My Own*	novel	Barely an adult herself, she is asked to teach math at the elementary school. Odd behaviors abound in the town. She eats soap and brings an axe to class with shocking consequences.
Mrs Paley	*The Cube 2: Hypercube*	film	Suffers from some form of dementia, some of her former work is still available to her memory. She recognizes that the group is in a hypercube and that time is a factor in escaping its deadly traps.
Narrator (Square)	*Flatland*	novel	A square that tells us about his two-dimensional home and a visit to the land of three dimensions. His story eventually leads to his imprisonment for telling stories about his visit.
Patricia Moriarty *alias* Miss Donleavy	*The Beekeeper's Apprentice*	novel	An Oxford tutor who seeks to get revenge for her father (Professor Moriarty) on Sherlock Holmes and Mary Russell via a kidnapping and bombs. She poses as Mary Russell's tutor for some time and even hints at her background by giving Russell an example of some of Professor Moriarty's work.
Paul Rivers	*21 Grams*	film	Becomes obsessed with the widow of the man he received his heart from and tries to help kill the man who killed her husband and kids in a car accident. Gets her pregnant, but shoots himself instead of getting revenge.
Petros Papachristos	*Uncle Petros and Goldbach's Conjecture*	novel	A secretive and asocial man, his life's work is with Goldbach's Conjecture. His family seems to consider him a bit of a black sheep. Bitter at others' success, he claims before dying he has the proof, but sounds insane.
Petros Papachristos's nephew	*Uncle Petros and Goldbach's Conjecture*	novel	Mathematician, but not what his uncle would consider to be one. Obsessed to learn more of his uncle, but has little luck.
Pierre de Fermat	*Fermat's Last Tango*	play	Seems to enjoy teasing and taunting Daniel Keane and says he would rather be known for his missing proof.
Robert Liewelyn	*Proof*	film	Considered to be a brilliant mathematician, but had some mental problems. His daughter helped take care of him in his declining years and seems to share similar mental problems. Visits his daughter after his death (or her mind makes him up).
Ronald Lisbon	*The Virgin Suicides*	film	A teacher whose daughters are sheltered. After convincing his wife to let the daughters go on a group date, one's late return leads to their virtual imprisonment and suicide. He is not known for being an outgoing person.
Ruth Foster	*Shiloh Project*	novel	Time travels with and eventually falls in love with Melvin Schwartz. At one point, wanted to stay in the past rather

			than make further risks in returning to the present. Gets into dangerous situations, sometimes going where women are forbidden.
Schmuyle Goldenberg	*Shiloh Project*	novel	Being turned down for tenure, he tries to cajole Melvin Schwartz into leaving so he can have the slot and then tries to frame him for molesting a girl. After the accusation is revealed to be a setup, he is asked to leave.
Selena Cott	*Shooting the Sun*	novel	Former tomboy and prize winner in math and astronomy. Traveling to the American west in the early 1800s to take a Daguerreotype of an eclipse. She faces many challenges, ranging from general danger in the west to the attitude of some of her arrogant and sexist colleagues.
Shlomi Bardayan	*Bonjour Monsieur Shlomi*	film	A teenager who shows wonderful math abilities (family considers him retarded) and keeps his family together. His grandfather leaves him money for taking care of him and he uses it to leave for a better school with a neighboring woman.
Sigurd Arnesson	*The Bishop Murder Case*	novel	Framed for murder by his adopted father, who has become jealous of him. Seems casual about several murders in his home and neighborhood, which at first makes him seem suspicious.
Simon Lynch	*Mercury Rising*	film	Autistic child who cracks a complex code that leads to his parents being killed and his being protected by an FBI agent. Fearful and untrusting of others, but eventually trusts the agent.
Sofya Kovalevskaya	*Beyond the Limit: The Dream of Sofya Kovalevskaya*	novel	Marries a man so she can leave Russia to study mathematics in Germany. Puts her studies before husband's. Determined to study math despite any hindrances. Begins to miss husband after their separation.
Sophie Germain	*Sophie's Diary*	novel	As a young lady, she records events around her in her diary, including the French Revolution, her desire to learn math, her mother's attempts to stop her from learning such an unfeminine topic, and her views on equality in education.
Susan Fletcher	*Digital Fortress*	novel	A cryptographer who trusts her boss Trevor Strathmore too much, which nearly costs her and her fiancé their lives. It takes irrefutable evidence to convince her of his terrible actions, but she first readily accepts that others at her agency are behind what is happening.
Tom Jericho	*Enigma*	film	Returning to World War II Bletchley Park (where work is being done on code breaking) after having mental problems, he finds his girlfriend missing and is determined, with her roommate's help, to find out what happened.
Trevor Swarthmore	*Digital Fortress*	novel	Is willing to commit murder and take risks in order to crack Digital Fortress, which ends up being a trap. In love with coworker Susan Fletcher and tries to have her fiancé killed. Believes what he is doing is in the best interests of the country.

Unnamed Argintinian Ph.D. Student	*Oxford Murders*	novel	Unnamed student from Argentina who works to solve his landlady's killer with the assistance of Arthur Seldom (or so he believes). Meanwhile, he comforts her granddaugter and dates fellow tennis enthusiast.
Walter Josiah Tudor Hollis	*Shooting the Sun*	novel	His eclipse calculations agree with Charles Babbage's machine. He sees himself as superior to Selena Cott since she is not formally education and a woman.
Will Hunting	*Good Will Hunting*	film	Young janitor who solves difficult problems left for the students, but does not care about math. Has friends, but does not let anybody get close to most of them. He eventually moves away to finally pursue his life.

The personality traits are subjectively assigned to the characters based upon their actions and statements about and by them. The personality traits are not meant to be an official psychological assessment and are based solely upon their fitting into the concept of that trait. Obsessive (31 out of 85 or 36.5%): This trait could refer to the characters being obsessed about just about anything, although in several cases it is about their mathematics work. The characters who exhibited obsessive traits were Archimedes, Jaime Escalante, Aron Aronov, John Nash, Benedikt Waller, John Wosileski, Cady Heron, Lucas Hutchman, Caspar "Chazz" Lundquist, Max Cohen, Charlie Epps, Patricia Moriarty, Daniel Keane, Paul Rivers, Daniel Pratt, Petros Papachristos, David Venning, Petros Papachristos's nephew, Elisha Pomeranz, Robert Liewelyn, Elliott Wakefield, Simon Lynch, Evariste Galois, Sofya Kovalevskaya, Greg Hale, Sophie Germain, Hamid Tabriz, Tom Jericho, Isaac Swift, Trevor Strathmore, and Jack Potter. Some of the obsessive behavior of the characters revolves around their work. For example, Lucas Hutchman is so obsessed with making a device to disable nuclear weapons that he depletes his family's bank account, alienates his wife, and his actions eventually lead to her getting paralyzed. Jaime Escalante's obsession with getting his students to pass the AP Calculus test leads to major health problems. Some of the characters are obsessed with other people: Romantic obsessions include John Wosileski (with a female student in his high school math class, whom he unknowingly gets pregnant), Caspar Lundquist (with Schaharazade, time traveling to find her), Trevor Strathmore (with colleague Susan Fletcher, going so far as to send a hitman after her fiancé), and Paul Rivers (with the widow of the man who provided his new heart). Benedikt Waller is obsessed with a child he wants to be his, going so far as to try to abandon the child's mother and force her to marry him (despite the fact she is still married to the child's father). Petros Papachristos's nephew is obsessed with his uncle's past. Revenge is another obsession. Patricia Moriarty is determined to avenge her father and do away with Sherlock Holmes and his new protégé. Cady Heron is determined to bring down the cliquish Plastics a peg at her new high school, but becomes one of them before realizing it.

Has Major Mental Health Problems (19 out of 85, or 22.4%). The Characters who have major mental problems are Athene Tilson, Jeremy Bremen, Benedikt Waller, John Nash, Catherine Liewelyn, Juanita Hernandez, David Sumner, Leonard Vale, Dmitri Arkanov, Max Cohen, Elliott Wakefield, Patricia Moriarty, Giacopo Tigor, Robert Liewelyn, Greg Hale, Tom Jericho, Hamid Tabriz, Trevor Strathmore, and Iphegenia Julia Esker. It is important to note that three characters were mentally impaired: Mrs Paley (suffering from some form of dementia), Kazan (who appears to be autistic), and Simon Lynch (who is autistic). However, these impairments were not categorized as mental health problems. While some of the mathematicians are actually stated as possessing major mental problems, others are labeled as having them due to their behavior. One thing to note is that sanity is usually judged relative to others in the same society (what is insane to us might not be insane in another society). The character Mona Gray, for example, at first seems to have mental problems. For example, in the book she eats soap, brings an axe into her elementary classroom (with later disastrous consequences), tells another teacher he is fired for his strange teaching methods (with no authority to fire him), and other strange behaviors. However, nearly everyone else in the book exhibits odd behavior. A former teacher of hers wears wax numbers around his neck to indicate his mood and later in the book went on vacation and left his

hardware store wide-open for a week with nobody working in it. A student brought in a preserved severed arm as an example of something that looks like the number one. Hence, Mona Gray is as normal as others around her. John Nash clearly has mental problems. Throughout the course of the film, his mind invents a roommate and best friend (and later a niece for this friend), a secret government job and agents to give him orders, and he also exhibits other odd behaviors. Some characters exhibiting mental problems commit murder and violent crimes. Athene Tilson, at first apparently a normal older professor, is actually a murderer and possesses strange powers. David Sumner begins the film as a mathematician who seemingly cannot confront people and escapes reality by doing mathematics. He eventually snaps when a mob of locals tries to invade his house to capture a crime suspect and he begins violently attacking anyone who tries to enter. Leonard Vale had a past of mental problems, going insane as a high school teacher. He later returns to college, where he bites a professor. Patricia Moriarty plants bombs and kidnaps a young girl in a plot to get even with her father's former nemesis, Sherlock Holmes, and his new protégé. Perhaps the most dangerous character is Hamid Tabriz, who plants chips into people to control them and make them into bombs. His actions eventually lead to the outbreak of a world war.

Withdrawn (25 out of 85, or 29.4%). Characters who are withdrawn tend to be loners or want to be left alone. They let few people get close to them. They try to isolate themselves from society. The withdrawn characters are Agnes Urquhart, Isaac Swift, Alan Turing, Jeremy Bremen, Archimedes, John Nash, Benedikt Waller, John Wosileski, Catherine Liewelyn, Kazan, Charlie Epps, Martin Smith, Daniel Keane, Max Cohen, David Sumner, Petros Papachristos, Elisha Pomeranz, Robert Liewelyn, Elliott Wakefield, Ronald Lisbon, Evariste Galois, Shlomi Bardayan, Frances Montrose, Will Hunting, and Gregory Larkin. Isaac Swift, who possesses telepathic abilities, withdraws himself from society due to the fact that he knows what others are thinking. The only person who he has made a bond with is his similarly gifted wife, who is dying in the hospital. Gregory Larkin does not interact much with others and makes a marriage of convenience with a woman he is able to actually get along with. Will Hunting, although having a group of friends, never lets anyone get to know him and pushes people away. Shlomi Bardayan is really the center of his family. He takes care of his grandfather, cooks for his family, but nobody seems to know the real him.

Brave (34 out of 85, or 40.0%). Are the characters willing to take risks, do things that might risk their safety, willing to fight for something? The characters who are brave are Andrea Aspinall, Hypatia, Aron Aronov, Jack Potter, Bob Howard, Jaime Escalante, Caspar "Chazz" Lundquist, Jayne Smyers, Chris Barton, Leaven, Cynthia May, Martin Smith, Daniel Pratt, Melanie Prescott, David Sumner, Melvin Schwartz, Dr. Malcolm, Mona Gray, Elisha Pomeranz, Narrator (Square), Eric Wynn, Patricia Moriarty, Esbeth Walters, Ruth Foster, Evariste Galois, Selena Cott, Faufi Kovalevskaya, Sofya Kovalevskaya, Giacopo Tigor, Sophie Germain, Gordon Henderson, Susan Fletcher, Hamid Tabriz, and the Unnamed Argentinian PhD student. This personality trait is the most common of all the traits recorded for the characters. It is important to note that many of these characters are thrust into situations where they are forced to be brave so that they can survive. Many of the works involved situations where the characters had to travel to dangerous or unfamiliar areas, help solve murders, or brave dangerous situations where they live or work. Further categories within Brave include Traveling to the unknown and this was a common theme. Such instances were Andrea Aspinall (who moved to Portugal as a British spy during World War II), Jack Potter (who traveled to various places in the galaxy), Selena Cott (who traveled the American west in the early 1800ss to photograph an eclipse), and Dr. Malcolm (who visits the dinosaur-filled Jurassic Park). Ruth Foster, Melvin Schwartz, Faufi Kovalevskaya, and Chazz Lundquist all time travel to the past, never sure of what will happen. Some characters get involved in investigations: Esbeth Walters, Melanie Prescott, and Jayne Smyers get involved in murder investigations. Daniel Pratt investigates the disappearance of a populated subway train, eventually managing to get onto the train after learning the mathematics behind its journey. Chris Barton is in a conspiracy in which he seems to be the center and investigates what is happening. Teenager Martin Smith gets invited to attend a prestigious school, then begins to investigate the strange activities that seem to be happening there. Finally, some characters are brave as they constantly

face death. Leaven and Eric Wynn travel though a cube that is filled with deadly traps, hoping to make it out alive.

Timid (15 out of 85, or 17.6%). The characters in this category tend to be shy, not very interactive, non-confrontational, etc. The timid characters are Alan Turing, Gregory Larkin, Alex Ligon, Irena Bozinska, Arthur Weatherburn, John Wosileski, Benedikt Waller, Kazan, David Sumner, Max Cohen, Elliott Wakefield, Mrs Paley, Frances Montrose, Ronald Lisbon, and Simon Lynch. Some of the characters' timidity is related to their mental impairments. Mrs. Paley, Kazan, and Simon Lynch all have mental disabilities that likely increase their timidity. David Sumner is a notable character who spends most of the film as a timid man who will not confront people who wrong him. Finally, he snaps and goes on a violent rampage against the vigilante mob that is trying to capture a suspected criminal in his home.

Socially Inept (24 out of 85, or 28.2%). The characters in this category tend not to be able to interact well with others. This characteristic is not always tied to other ones, since some characters who are socially inept are not always timid or withdrawn. While being withdrawn and socially inept may seem to be similar, several characters do have people they regularly interact with, but their ability to interact socially is not always good. The socially inept characters are Adolph Drukker, Jeremy Bremen, Alan Turing, John Nash, Alex Ligon, John Wosileski, Benedikt Waller, Kazan, Cady Heron, Leonard Vale, Catherine Liewelyn, Luke Williams, Charlie Epps, Martin Smith, David Sumner, Max Cohen, Elliott Wakefield, Petros Papachristos, Evariste Galois, Ronald Lisbon, Frances Montrose, Sigurd Arnesson, Gregory Larkin, and Sophie Germain. Luke Williams honestly states that he does not work well with people. Unlike other characters, he is upfront about his inability to interact socially with others. Perhaps one of the more extreme examples of an inability to interact socially is Leonard Vale. After having a mental breakdown as a high school teacher, he goes back to college and proceeds to interrupt professors constantly in classes, monopolize their time in their offices, and even bites one professor in a fit of rage. Adolph Drukker's inability to interact socially is only true for interacting with adults. He seemingly gets along well with children. However, his interactions with adults have known at times to result in fits of anger and even tantrums. His overprotective mother (who blames herself for his physical disability) does not help his social abilities. Some characters are only partially socially inept. For example, Charlie Epps seems to be socially impaired when it comes to matters of the heart. He does not seem to realize (although everyone else does) that his thesis advisee is interested in him romantically.

Uses Math to Escape Reality (13 out of 85, or 15.3%). When problems occur, the character tends to retreat to mathematics to escape the real world. The characters who use mathematics to escape reality are Archimedes, Isaac Swift, Benedikt Waller, John Nash, Daniel Keane, Juanita Hernandez, David Sumner, Max Cohen, Charlie Epps, Sofya Kovalevskaya, Elliott Wakefield, Sophie Germain, and Evariste Galois. Many of these characters tend to retreat to their math to escape reality. Charlie Epps is found at a chalkboard working on math whenever upset. According to his father, he spent a good deal of time at the board when his mother was dying. Daniel Keane's wife voices her displeasure at his spending too much time focused on his mathematics. Sophie Germain and Evariste Galois both escape family and revolutionary problems in France by absorbing themselves into their mathematics studies.

Out of Touch (19 out of 85, or 22.4%). Some characters are in their own world, unaware of the events and people around them or seem to do things that are totally inappropriate for their situation. The out-of-touch characters are Andrea Aspinall, Elliott Wakefield, Archimedes, Gregory Larkin, Benedikt Waller, John Nash, Caspar "Chazz" Lundquist, Lucas Hutchman, Catherine Liewelyn, Max Cohen, Charles Morrison, Petros Papachristos, Daniel Keane, Robert Liewelyn, David Sumner, Ronald Lisbon, Dmitri Arkanov, Susan Fletcher, and Elisha Pomeranz. Andrea Aspinall, sent as a British spy to World War II Portugal, makes critical mistakes by not seeming to realize that a spy should place little trust in people. She at times shares information with people she barely knows. Susan Fletcher puts too much trust in her boss, Trevor Strathmore. When many signs are pointing to the fact that something seriously wrong is going on, she continues to trust him until she receives irrefutable evidence that he had sent a hitman after her fiancé. Charles Morrison, who seems to be a normally rational man, gives his ten-year-old niece a large sum of money with

no questions as to why she is asking for it. She takes the money to follow her teacher to mainland Europe, a risky trip for a young child.

Arrogant (10 out of 85, or 11.8%). Some characters at times act as if they are better than others. The arrogant characters are Athene Tilson, Lindsay Weir, David Venning, Pierre de Fermat, Hamid Tabriz, Schmuyle Goldenberg, Jack Potter, Trevor Strathmore, Juanita Hernandez, and Walter Josiah Tudor Hollis. Lindsay Weir, mathlete turned wild child, at one point rejoins the matheletes. She automatically assumes and demands that she deserves to be placed back on the first string even though she left the team (she leaves again after one match). Walter Josiah Tudor Hollis is arrogant and constantly at odds with Selena Cott on their journey to photograph the eclipse. He believes Cott to be inferior to himself since she is a woman and does not have a formal education. Schmuyle Goldenberg takes arrogance to the extreme. Learning that his colleague Melvin Schwartz will be given the only tenured spot available, he proceeds to try and convince Schwartz to leave the school since he likes teaching and can find a nice teaching job elsewhere. When Schwartz does not agree to his request, Goldenberg accuses him of molesting a girl.

Stubborn (13 out of 85, or 15.3%). Some characters are determined to have things their way and do not want to yield to others' wishes or desires. The stubborn characters are Arthur Seldom, Max Cohen, Esbeth Walters, Paul Rivers, Hypatia, Selena Cott, Jack Potter, Sofya Kovalevskaya, Jaime Escalante, Sophie Germain, Jayne Smyers, Trevor Strathmore, and Lucas Hutchman. Some characters are stubborn in their determination to study mathematics. Sofya Kovalevskaya and Sophie Germain are both determined to study math no matter what stands in their way. Kovalevskaya enters into a bogus marriage with a man willing to take her to Germany, where women are more accepted in classrooms than in Russia. She spends most of her energy on being able to study math. Germain's mother is her major obstacle. Finding her daughter studying math late at night, she takes away all light sources and insists that math is not meant for girls. Some characters are stubborn in relation to the project or job they are working on, including Trevor Strathmore (trying to crack the supposedly unbreakable Digital Fortress), Lucas Hutchman (trying to render nuclear weapons useless), Jaime Escalante (teaching calculus to a group of students deemed unteachable), Jack Potter (trying to make a life for himself and the few remaining humans), and Selena Cott (working her way west in dangerous territory to photograph an eclipse).

Characteristics Considered But Not Included: Appearance was one characteristic considered for inclusion. However, the physical appearances of characters were not always described in detail and sometimes not at all. Hence, it would be difficult to compare a characteristic that was not always clearly defined. A character's age faced similar problems to appearance. Works did not always give a clear indication of a character's age and some characters aged in the course of the work. It would have been interesting to compare various age groups to see if they are portrayed differently. It would be easier to make a judgment on appearance and age in the films, television series, and the play examined. Of course, the person chosen to play the character would highly affect the character's appearance and age.

Gender Differences. The female mathematicians are Ada Byron King, Jayne Smyers, Agnes Urquhart, Juanita Hernandez, Andrea Aspinall, Leaven, Athene Tilson, Lindsay Weir, Cady Heron, Melanie Prescott, Catherine Liewelyn, Mona Gray, Cynthia May, Mrs Paley, Esbeth Walters, Patricia Moriarty, Eunice Doom, Ruth Foster, Faufi Kovalevskaya, Selena Cott, Frances Montrose, Sofya Kovalevskaya, Hypatia, Sophie Germain, Iphegenia Julia Esker, Susan Fletcher, and Irena Bozinska and the male mathematicians are Adolph Drukker, Isaac Swift, Alan Turing, Jack Potter, Alex Ligon, Jaime Escalante, Archimedes, Jeremy Bremen, Aron Aronov, John Nash, Arthur Seldom, John Wosileski, Arthur Weatherburn, Kazan, Benedikt Waller, Leonard Vale, Bob Howard, Lucas Hutchman, Caspar "Chazz" Lundquist, Luke Williams, Charles Morrison, Martin Smith, Charlie Epps, Max Cohen, Chris Barton, Melvin Schwartz, Daniel Keane, Narrator (Square), Daniel Pratt, Paul Rivers, David Sumner, Petros Papachristos, David Venning, Petros Papachristos's nephew, Dmitri Arkanov, Pierre de Fermat, Dr. Malcolm, Walter Josiah Tudor Hollis, Elisha Pomeranz, Robert Liewelyn, Elliott Wakefield, Ronald Lisbon, Eric Wynn, Schmuyle Goldenberg, Evariste Galois, Shlomi Bardayan, Giacopo Tigor, Sigurd Arnesson, Gordon Henderson, Simon Lynch, Greg Hale, Tom Jericho, Gregory Larkin, Trevor Strathmore, Hamid Tabriz, the Unnamed Argentinian PhD

student, Harold "Hal" Dobbs, and Will Hunting. Women made up 27 (31.8%) of the characters examined, while men made up 58 (68.2%). How do female mathematicians portrayed in the works examined compare to their male counterparts? In general, they tend to be portrayed with fewer negative traits. Comparing men to women, the personality traits are distributed this way:

Table 2: Comparison of Men and Women Mathematicians

Trait	Overall	Women	Men
obsessive	31 36.5%	4 14.8%	27 46.6%
mental health problems	19 22.4%	5 18.5%	14 24.1%
withdrawn	25 29.4%	3 11.1%	22 37.9%
brave	34 40.0%	15 55.6%	19 32.8%
timid	15 17.6%	3 11.1%	12 20.7%
socially inept	24 28.2%	4 14.8%	20 34.5%
escape to mathematics	13 15.3%	3 11.1%	10 17.2%
out-of-touch	19 22.4%	3 11.1%	16 27.6%
arrogant	10 11.8%	3 11.1%	7 12.1%
stubborn	13 15.3%	6 22.2%	7 12.1%

In Table 2 it is interesting to note traits with more than a ten percent difference between the genders. More men than women are portrayed as obsessive (44.8% of men versus 14.8% of women), withdrawn (37.9% of men versus 11.1% of women), socially inept (34.5% of men versus 14.8% of women), and out of touch (27.6% of men versus 11.1% of women). More women were brave (55.6% of women versus 32.8% of men) and stubborn (22.2% of women versus 12.1% of men). Perhaps one reason for this has to do with the fact that the women are in careers where men dominate. Selena Cott faces ridicule and discrimination by her colleague Hollis. Sofya Kovalevskaya has to do a lot of work, struggling and conniving in order to be educated at the same level as her male colleagues. Hypatia's strength and position of power results in her death at the hands of people who deem her to be a sort of witch. Esbeth Walters helps investigate a murder and even gets held hostage, all while in her seventies. Possessing such negative personality traits as being withdrawn, timid, having mental problems, and being socially inept can only hinder women in a male-dominated field. Perhaps the creators of the works had this in mind when writing the female characters.

Characters Possessing More than Five Traits. Max Cohen possesses eight personality traits (obsessive, mental health problems, withdrawn, timid, socially inept, uses math to escape reality, out of touch, and stubborn). In an attempt to explain everything from nature to the stock market, Cohen spends much of his time withdrawn from society working on math. He has few social interactions with others. He is obsessed with his work, which results in migraines. Benedikt Waller possesses seven personality traits (obsessive, mental health problems, withdrawn, timid, socially inept, uses math to escape reality, and is out of touch). His parents died when he was young and his grandmother ruled the estate. As a child, he would escape to his room and do mathematics. Later in life, his only close bond is with his sister. He has a few sexual encounters, the most recent being with a married man. One day, he decides to place an ad to adopt a child. What he gets is a Russian woman and her child, who he becomes obsessed with (the child ignores him). Waller only manages to get close to the child once the father returns. David Sumner also has seven traits (mental health problems, withdrawn, brave, timid, socially inept, uses math to escape reality, and out of touch). Sumner begins the film as a timid mathematician who is unable to confront anyone, especially the men doing work on his house. When problems arise, he goes to his office to do math. Finally, when he harbors a crime suspect, he begins defending his home from the vigilante mob trying to get the man. Risking his and his wife's life, he snaps and violently attacks any of the men trying to enter his home. Elliott Wakefield also possesses seven of the traits (obsessive, mental health problems, withdrawn, timid, socially inept, uses math to escape reality, and is out of

touch). Wakefield's past catches up to him as a lawyer investigates a murder witnessed by Wakefield and two friends. He makes his living by counting cards and gambling. He falls for a female friend, who does not share his feelings. His only close relationship is with his father, who he lies to about his true source of income. At one point, his female friend tells the lawyer that Wakefield had mental health problems in the past. Wakefield reluctantly helps the lawyer once his two friends die. John Nash (based upon a real person) has six of the traits (obsessive, has mental health problems, is withdrawn, socially inept, uses math to escape reality, and is out of touch with reality). Nash has schizophrenia. His first close relationship at college is with his roommate and friend, who does not exist. However, Nash's friend shows up regularly throughout his life, later with a niece in his care. His mind later invents government agents and a job with the government. He obsesses over his fictional work for the government and hides his work from his wife.

Characters Possessing None of the Traits. Ada Byron King is portrayed in the movie as a promiscuous woman who stands up for herself. She argues with Charles Babbage when he changes something she has written. She is also portrayed as an intelligent woman who believes computers will be used for anything from creating music to predicting horse races. She believes she was never able to be who she should have been. Eunice Doom takes in her cousin Cosmo after his father sends him to live with her in Oxford, UK. She seems rather unscientific for a mathematician, as she believes in a family curse, poltergeists, and other paranormal events. Harold Dobbs is a math student who wants to examine the late Robert Liewelyn's works. He and Catherine Liewelyn begin to develop feelings for each other. Dobbs is in a rock band. At first, Catherine's sister believes Harold to be a figment of Catherine's imagination. Dobbs actually believes Catherine's mathematics to be her own after he recognizes that the writing is not her father's.

Conclusion. In their study "Nerds? Or Nuts? Pop Culture Portrayal of Mathematicians" Janelle L. Wilson Carmen M. Latterell found similar traits, including mental problems, social ineptitude, and possessiveness. The authors present a view that both male and female mathematicians in fictional works are portrayed rather negatively. However, from the examination of the characters in the present study, it appears that the women fare much better than the men. A smaller percentage of the women than the men possess all of the negative traits except for being stubborn. A larger percentage of women than men are brave. Thus, the women mathematicians got better portrayals in these works. While it seems that the characters possess a lot of negative traits, it is important to note that in reality the majority do not. Examining Table 2, one can see that no negative personality trait is possessed by a majority of characters. In fact, the most common trait was bravery. The characters range from possessing several negative personality traits to possessing none. Some characters, such as rock band member Hal Dobbs, seem to be the opposite of what many would picture when thinking of a mathematician. The gender comparison showed that women were generally portrayed with fewer negative traits than men in these works.

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