Rules and Insights: Connecting the Mathematical and Linguistic Abilities of C.S. Lewis

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While most biographical works on C.S. Lewis give passing reference to Lewis' problems with elementary mathematics, few have made an attempt at diagnosing the difficulty or exploring its impact on his writing. A careful study of family correspondence, however, makes it clear that his learning difficulties were not with mathematics alone and suggests connections between attitudes toward and abilities in both mathematics and language. This paper will make these connections clear and will illustrate their ties to Lewis' effective mathematical references.

As is probably the case for most C.S. Lewis readers, I first encountered Lewis' work as a child, reading (or, more accurately, having read to me) several books in *The Chronicles of Narnia*. It was not until 15 years later that I learned of Lewis' work in apologetics, later still that I began to read samplings of his non-*Narnia* work. In these other texts, I began to notice Lewis' unusual mathematical references. *The Problem of Pain*, for one, includes an interesting use of variables:

> *We suppose ourselves to be not much worse than Y, whom all acknowledge for a decent sort of person, and certainly (though we should not claim it out loud) better than the abominable X. Even on the superficial level we are probably deceived about this. Don't be too sure that your friends think you as good as Y. The very fact that you selected him for the comparison is suspicious: he is probably head and shoulders above you and your circle. But let us suppose that Y and yourself both appear 'not bad.' How far Y's appearance is deceptive is between Y and God. His may not be deceptive: you know that yours is.* (Lewis, 1962)

One could argue (very convincingly) that this is a shallow, at best, use of mathematics. Indeed, many writers have used initials to refer to individuals in their stories or journals: Lewis himself had a tendency to do so, with W referring to his brother Warren in letters and diary entries and H referring to his late wife (whose first name was Helen, though she used her middle name, Joy) in *A Grief Observed*. His use of X and Y here struck me as unusual for a number of reasons, however. First, as a former English major I have personal experience with the distaste for all things mathematical proclaimed by many of those with more literary gifts. My colleagues in English classes couldn't understand why I would want to take more math courses than mandated by the university; one, horrified that an English class had been scheduled to meet in the mathematics building, went so far as to beg the professor to switch our location to any other building on campus. Second, while it is indeed common (or was, at any rate, in earlier times) for writers to use initials to represent particular people or characters, Lewis is using X and Y not in that sense but rather as variables in a predicate: the resulting statement may be true for any number of "values" chosen for X and Y rather than just for two specific individuals he has in mind.

Another example of Lewis' use of mathematics is his description, in *Out of the Silent Planet*, of the relationship between the walls and the floor of a room in a spherical spaceship. Drugged and kidnapped, Ransom, the main character, wakes up in odd surroundings, noting that "all the walls looked as if they sloped outwards to make the room wider at the ceiling than it was at the floor, but each wall as you stood beside it turned out to be perfectly perpendicular—not only to sight but to touch also if one stooped down and examined with one's fingers the angle between it and the floor" (Lewis, 1977). The understanding Lewis shows here of the relationship between tangents and normals to spheres, while commonplace to a mathematically-minded audience, is far less natural to many people, possibly because they cannot easily picture geometric concepts in their minds and are not trained to attempt to illustrate a difficult description with a drawing. In this case, a child's version of the sun, together with an indication that the surface of the sun would be the floor and two rays would be opposite walls, brings rapid understanding.

More examples of Lewis' use of mathematics are available in work by David Neuhouser. In "Higher Dimensions in the Writings of C.S. Lewis," Neuhouser illustrates Lewis' frequent use of analogies to higher dimensions. "C.S. Lewis and Mathematics" discusses Lewis' difficulties with elementary mathematics—difficulties which would have prevented him from attending Oxford University had military service not provided another avenue for entrance—yet emphasizes his appreciation for the broader subject in general and geometry in particular, citing portions of a number of Lewis' works and letters. Neuhouser's work whetted my appetite for Lewis and made me wonder why someone whose struggles with mathematics nearly kept him from university study would go on to use mathematical references so effectively in his writing.

The Memoirs of the Lewis Family, an eleven-volume set of letters and documents compiled, edited and typed by Lewis' brother Warren after the death of their father, proved to be an excellent source of information about Lewis' background. It includes a few school reports for Lewis' parents. For his mother, Flora: "very high judgments assigned…which are First Plus in Geometry…[and] First Plus Three in Algebra. This is an unusually high score" (W. Lewis, 1933). For his father, Albert: "in Euclid and Algebra hardly so far on as most members of his class" (W. Lewis, 1933). Despite his own mathematical difficulties, however, Albert Lewis seems to have tried not to pass on a distaste for mathematics, noting in a letter to Warren that "Your aversion to maths. is a very strange trait in your character. Altho' I was not good at maths., I didn't hate them and I could have learned them, while on the other hand, as you know, Mummy was a brilliant mathematical scholar. I believe you will come to them yet" (W. Lewis, 1933). This plug for mathematics is equivocal at best, however, incorporating as it does the phrase—"I was not good at math"—dreaded by every mathematics teacher as a parental defense for a child's mathematical struggles.

While their mother, who died when Lewis was nine years old, was still alive, Warren notes in a letter home from school that he has heard that Jack is having problems with basic arithmetic (W. Lewis, 1933). Even while he was struggling with mathematical computation, however, Jack was showing an interest in geometry, apparently working out geometric problems for fun (W. Lewis, 1933). There is evidence that their mother tutored Warren in mathematics when he was home from school on holidays and it seems likely that she would have continued working with Jack as well had she lived into his school years, perhaps preventing the difficulties that lay ahead (W. Lewis, 1933).

Letters to the boys' father from William Kirkpatrick, the tutor who prepared Warren for acceptance to the military academy at Sandhurst and, later, Jack for a scholarship to Oxford, give some insight into Lewis' difficulties with mathematics, as much for what is missing as for what is included. When Warren was under Kirkpatrick's tutelage, regular letters home discuss Warren's at first abysmal but eventually adequate performance in computational problems. Warren notes in a description of his lessons with Kirkpatrick that

> within an hour of entering his house I was seated at the dining room table tackling mathematical problems with an energy which I had not displayed in such a cause since my early days at Wynyard…A few weeks of Kirk's generous but sparing praise of my efforts…restored my long lost self confidence: I saw that whilst I was not brilliant or even clever, I had in the past been unsuccessful because I was lazy, and not lazy because I was unsuccessful. (W. Lewis, 1933)

Kirkpatrick refers often to Warren's work in mathematics. In one early letter, Kirkpatrick records that Warren "is distinctly weak in maths.—in some cases absurdly so. For instance, he could not tell me how many cubic inches were in a cubic foot, nor determine it for himself" (W. Lewis, 1933). Within a few weeks, the tutor notes improvement:

> Since I wrote to you before, Warren and I have gone carefully into the questions set in past papers on the practical part of the maths. exam for Sandhurst. The result has been a considerable modification of the views I expressed in my former letter….In facing any problem and thinking for himself, he was woefully deficient when he came. In this respect there has been a great improvement already, and I hope for more. But I see now, it is the mental training, the intelligent grasp of Math. principles he required, far more than any skill in manipulation. (W. Lewis, 1933)

In Warren's case, at least, Kirkpatrick seems to have been able to determine the root of the mathematical difficulties and address it.

Once Warren was off to Sandhurst and Jack began studying with Kirkpatrick in the fall of 1914, however, the tutor's frequent letters do not mention mathematics for at least 18 months. In fact, the early letters indicate that if mathematics is being studied at all, it is in passing. "Since Clive came, our reading has been almost exclusively Classical," Kirkpatrick writes in October of 1914 (W. Lewis, 1933). It is important to note here that the word "reading" probably is used to indicate "studying:" a few years later Lewis writes that he will be "reading for Responsions," the elementary Oxford entrance examination (W. Lewis, 1934). Another letter from Kirkpatrick speaks of Lewis' gift in "literary judgments" and notes his deficiencies in Greek and Latin grammar but makes no mention of struggles with mathematics (W. Lewis, 1933). Two letters the next year indicate that Kirkpatrick did not likely put his star pupil to much of what today might be called "grunt work." First Kirkpatrick notes that Lewis "is keen and eager to learn of his own impulse. That is if the subjects are congenial to his tastes, and so far he has had no other" (W. Lewis, 1933). Given Lewis' struggles with arithmetic, this suggests the absence of computational work, a hypothesis supported further by yet another praise of Lewis' literary gifts: "He is the most brilliant translator of Greek plays I have ever met. Are we to expect such a soaring Pegasus to get into harness and pull a cart? Something must be conceded to such an unusual literary efflorescence at such an early age" (W. Lewis, 1934). Though there are no specific discussions of mathematical study in this period, Kirkpatrick's letters include several interesting comments regarding Lewis' ability (or lack thereof) in other areas, comments which offer clues to Lewis' difficulties with computation. In one, Kirkpatrick notes that despite Lewis' gift in translation, his

pupil is less adept at other aspect of foreign language learning: "He will forget the most ordinary words, or confuse them, or go wrong in the inflections….it is because of his literary originality and judgment that he finds the laborious imitativeness of classical composition so uncongenial" (W. Lewis, 1934). In another, the tutor writes that Lewis "has no real affinity for Modern languages—not an uncommon characteristic with boys of his temperament—for they are a matter of SHEER MEMORY" (W. Lewis, 1934). Kirkpatrick is not intending to cast doubt on Lewis' memory—which, indeed, became quite well known for its apparent boundlessness—but is instead disparaging the type of subject whose mastery requires a focus on memorization rather than on logical and intuitive thought. Those who excel and thrive in such thinking, suggests Kirkpatrick, cannot be expected to lower themselves to mere memorization; if logic and intuition are to play no substantial role, the subject is not worth their effort.

By January of 1916, Kirkpatrick is writing to Albert Lewis about Jack's progress much as he had about Warren's a few years earlier, but in this case the improvement is in Latin and Greek writing: "The composition was as you know his one weak point, and I am glad to say there is much improvement" (W. Lewis, 1934). But where Warren's difficulties with mathematics learning had been diagnosed and dealt with, Jack's problems seem to be written off as a mere quirk of character: "I think I made it clear that he labours under a temperamental disability in this respect" (W. Lewis, 1934). While Kirkpatrick is referring to composition rather than to computational work, the difficulties seem to be of the same type, perhaps because arithmetic and grammar both involve substantial amounts of "laborious imitativeness" and "sheer memory," things detested (or at least not embraced) by Lewis, or so his tutor suggests, and no less requirements for mastery of computational skills than for mastery of the rules of grammar. Lewis himself connects these skills and demonstrates his distaste for their study in a letter home: "How can people advocate a 'modern' education? What could be better or more enjoyable than reading the great masterpieces of all time, under a man who has made them part of himself? And against this some are foolish enough to oppose algebra and French verbs!" (W. Lewis, 1933). In other places, Lewis acknowledges his difficulties in basic rules of both mathematics and language. Spelling gave him particular trouble: "I have heard of the failings of my spelling in many places, at many seasons, and from many sources (even the 'for a boy of your age it is scandalous' or sometimes 'ludicrous' has a familiar ring) and I am only too well aware of the truth" (W. Lewis, 1934). Foreign language grammar, as his tutor had noted, was also an issue: "As to 'Accidents' I really can't see on what principle my Latin and Greek proses may be quite good for five days and come out with some awful blunder on the sixth—which is what happens. I am sure I take as much trouble on one day as on another. It is at times a bit disheartening, but we pray that the exam may not come on an 'off' day" (W. Lewis, 1934). Lewis specifically connects writing and computation again in the autobiography *Surprised by Joy*:

> *At Easter I was handsomely plowed in Responsions, having been unable as usual to get my sums right. 'Be more careful,' was the advice that everyone gave me, but I found it useless. The more care I took the more mistakes I made; just as, to this day, the more anxiously I fair copy a piece of writing the more certain I am to make a ghastly clerical error in the very first line*. (Lewis, 1966)

Despite these difficulties, Lewis obviously overcame any issues he may have had with the rules of language. Misspellings in daily work apparently continued, but a logical solution to a non-mathematical problem is not overly dependent upon correct spelling or even proper verb endings; such things can be cleaned up easily in the editorial process. Mess up a simple

mathematical computation, however, and you've blown the whole problem, risking a conclusion which is far off base. Lewis also worked hard to overcome his deficiencies in language learning (W. Lewis, 1933); similar work does not appear to have taken place in mathematics, and indeed Kirkpatrick indicates in several letters that there was no time for such work. "Literary scholars are forced to be content with the minimum in maths in order to excel in their own line," writes Kirk to Albert in explaining why Jack would not have the necessary mathematical background for admission to a military academy (W. Lewis, 1934). Discussing the upcoming entrance examination with Albert, Kirk notes "as mathematics form an important element in this exam, [Jack] could very usefully employ a good part of the day in working up a subject for which he has not only no taste, but on the contrary a distinct aversion, and which we were obliged by stress of work in other directions to treat very cavalierly, and latterly, frankly to ignore entirely" (W. Lewis, 1934). After Lewis has taken the exam and fears (for good reason, as it turns out) failure, Kirkpatrick apologizes:

> *I am sorry that Algebra shd. have caused you any anxiety, and no doubt it was partly my fault. That is to say, knowing the elementary nature of the exam, and that in order to invest it with any dignity, the examiners had to make the questions as long and tedious as they could, I ought to have kept you working away every day at long, intricate examples in the simple rules.* (W. Lewis, 1934)

Kirkpatrick is, of course, correct. It takes long hours and concerted effort to master the basics of any foreign language, a category which for most people includes the language of mathematics. Instead of ensuring such time and effort, however, Kirkpatrick allowed his student's distaste for the study and practice of mere rules (not to mention overwhelming gifts in creativity and originality) dictate the focus of time leading up to the scholarship exam. Even after Lewis had won a scholarship, Kirkpatrick did not emphasize mathematics but put Lewis to work on another foreign language, shown in a letter sent after Lewis had first failed the entrance examination:

> *It is easy to see what occurred. As the course in Algebra is elementary, they make the questions long and intricate. Clive has gone wrong in the working and therefore got incorrect answers. There was always the danger of that, and I knew it; but he did enough of this elementary sort of stuff during the past term as in my opinion ought to have made him safe. Instead of keeping his nose to the grindstone at this sort of drudgery all day, I conceived, with the enthusiastic assent of the pupil, of course, the bold conception of mastering the Italian language in half a term.* (W. Lewis, 1934)

The purpose of Italian language study was to prepare Lewis for the possibility of a position in the Foreign Office (W. Lewis, 1934). Lewis writes that he is studying German for the same reason: in case "all my ideas about Oxford fall through and I were reduced to something really desperate" (W. Lewis, V:185). Since the main thing that stood in the way of success at Oxford at this point was mathematics, however, it is particularly curious that Kirkpatrick would not drop all else and focus on that.

Ancient language composition, spelling, modern foreign language learning—in all these, Kirkpatrick found Lewis' skills not up to the standards of his abilities in Latin and Greek translation. Yet never once in the many letters from Kirk to Albert prior to Lewis' sitting for the Oxford exams does Kirkpatrick mention lack of skill in mathematics. He does refer to Lewis' lacking some of the necessary background in math were he to pursue a path different from literary study at Oxford, but he never ties this deficiency to inability or particular difficulty (W. Lewis, 1934). While Kirkpatrick had quickly diagnosed Warren as suffering from a lack of

conceptual understanding rather than of computational skill, Jack's trouble went unrecognized, perhaps because Kirkpatrick noted his pupil's superior grasp of conceptual thinking in a variety of arenas and assumed that, in mathematics at least, basic skills must surely follow.

Apparently Kirkpatrick did not allow Lewis to avoid mathematics entirely, however. In the same letter in which he attempts to explain Lewis' failure in the entrance examination, the tutor notes that he had spent more time with Lewis doing theoretical geometry than algebra, following Lewis' preference (W. Lewis, 1934). As Lewis notes in *Surprised by Joy*, referring to his childhood schoolmaster, "though he [Oldie] taught geometry cruelly, he taught it well. He forced us to reason, and I have been the better for those geometry lessons all my life" (Lewis, 1962). Whether Lewis already recognized this benefit of his childhood geometric study as he worked with Kirkpatrick is debatable, but Lewis' preference for geometry is certainly not surprising given his distaste for drudgery: geometry is a field more dependent on insight and understanding than on computational accuracy. When determining a student's aptitude for further mathematical study, in fact, it is often more helpful to delve into the student's response to the work required in high school geometry than to note the student's performance on the mathematics portion of the ACT or SAT exams. "I hated geometry" tells a mathematics professor more clearly than anything else that the student is unlikely to thrive in the theoretical thinking required for serious mathematical work.

Arithmetic and grammar are studies dominated by rules which have no obvious logical base. This is not to say that these subjects have no logical base at all but rather that many of the rules are somewhat arbitrary. Why do we set off certain phrases with commas? Why do we compute powers before sums? The logic behind such conventions can be difficult to explain well and sometimes clouds the basic issue: that these rules are essential and must be memorized and correctly applied in order to communicate effectively. While Lewis clearly chafed at such studies, many of the mathematical references in his writing make use of his recognition of their essential nature. In *Mere Christianity*, he ties the idea of mathematical rules to our moral choices: "It seems…we are forced to believe in a real Right and Wrong. People may be sometimes mistaken about them, just as people sometimes get their sums wrong; but they are not a matter of mere taste and opinion any more than the multiplication table" (Lewis, 2001). Again focusing on rules, in *Miracles* Lewis uses a similar analogy to describe the difference between description and causation in scientific understanding:

> *The rules of arithmetic state the pattern to which all transactions with money must conform…if only you can get hold of any money…To think the laws [of motion] can produce [actual events] is like thinking that you can create money simply by doing sums. For every law, in the last resort, says 'If you have A, then you will get B.' But first catch your A; the laws won't do it for you.* (Lewis, 2001)

Even Lewis' intimate familiarity with mathematical error is put to good use in a number of examples, including the following analysis of recovery from human mistakes: "I do not think that all who choose wrong roads perish; but their rescue consists in being put back on the right road. A sum can be put right: but only by going back till you find the error and working it afresh from that point, never simply by <u>going on</u>" (Lewis, *The Great Divorce*, 2001). And, it is perhaps possible to see both Lewis' history of computational errors and his recognition that there is more to mathematics than computational perfection in the following look at religious truth through the lens of mathematical work:

If you are a Christian, you do not have to believe that all the other religions are simply wrong all through…But, of course, being a Christian does mean thinking that where Christianity differs from other religions, Christianity is right and they are wrong. As in arithmetic—there is only one right answer to a sum, and all other answers are wrong; but some of the wrong answers are much nearer being right than others. (Lewis, *Mere Christianity*, 2001)

Geometry and translation, however, are not driven by mere "rules" but focus on imagination, creativity, and understanding. As David Neuhouser has shown, Lewis regularly uses geometric analogies to bring deeper insight. In <u>Miracles</u>, for example, Lewis describes the difficulty of perceiving the Trinity:

God has a positive structure which we could never have guessed in advance, any more than a knowledge of squares would have enabled us to guess at a cube. He contains 'persons' (three of them) while remaining one God, as a cube contains six squares while remaining one solid body. We cannot comprehend such a structure any more than the Flatlander could comprehend a cube. (Lewis, 2001)

This same analogy is returned to and deepened in several of his writings, including one which spells out the Flatland aspect in more detail. Flatland is a two-dimensional world conceived of by English schoolmaster Edwin A. Abbott and described in a story of the same name. Since Flatlanders have no concept of a third dimension, the idea of six squares coming together into one cube cannot be accurately presented: a Flatlander, Lewis points out, "would either imagine the six squares coinciding, and thus destroy their distinctness, or else imagine them set out side by side, and thus destroy the unity" (Lewis, *Christian Reflections*, 1967). It is hard to imagine that there might be a more insightful image of our struggles with the concept of the Trinity than the one Lewis presents.

Flatland and its theme make regular appearances in Lewis' writing, demonstrating again and again both his interest in geometry and his ability to find geometric insights into difficult theological ideas. For example, Lewis describes what it means to be children of God by noting that "Divine Sonship is, so to speak, the solid of which biological sonship is merely a diagrammatic representation on the flat", giving a sense of the deeper nature of the love and connection of human-divine versus human-human relationships (Lewis, *Miracles*, 2001). He also considers the geometric nature of time: in looking at the difference between the human perception of time and God's perception, Lewis surmises that "All times are eternally present to God. Is it not at least possible that along some one line of His multidimensional eternity He sees you forever in the nursery pulling the wings off a fly?" (Lewis, *The Problem of Pain*, 1962). In *A Grief Observed*, he expresses his longing for his wife and his recognition of her eternal nature in geometric terms:

Suppose that the earthly lives she and I shared for a few years are in reality only the basis for…two…eternal somethings [which] could be pictured as spheres or globes. Where the plane of Nature cuts through them…they appear as two circles…that touched. But those two circles, above all the point at which they touched, are the very thing I am mourning for, homesick for, famished for. You tell me, 'she goes on.' but my heart and body are crying out, come back, come back. Be a circle, touching my circle on the plane of Nature. (Lewis, 2001)

As these examples illustrate, it appears that to Lewis arithmetic, like grammar, was a land of rules and laws—important, but in a utilitarian way. Geometry, on the other hand, was a field of insight and of creative connections, much as the literary field to which he was drawn at an early age and the fields of fiction and apologetics in which he made his name. To succeed in all these fields requires mastery of logic, argumentation, creativity, and insight—all qualities of a good mathematician. But, while we tend to think that conceptual and computational abilities go hand in hand, it is certainly possible to excel in one without the other. Math professors everywhere are confronted in their offices by struggling students who are failing to grasp the concepts of college-level mathematics but don't understand the failure because they have always been "good in math" (by which they mean arithmetic). At the same time, teachers find joy in the occasional C-student who asks more astute questions than the rest of the class. Lewis likely would have been in this second group. His use of mathematical concepts indicates that he understood and appreciated not only the insights of geometry but also the fact that mathematical laws are at the root of the workings of the world: as Galileo put it, "[The universe] cannot be read until we have learnt the language and become familiar with the characters in which it is written. It is written in mathematical language, and the letters are triangles, circles and other geometrical figures, without which means it is humanly impossible to comprehend a single word" ("Mathematical Quotations", 2007). And Lewis, master of a variety of literary forms, effectively incorporated that language into his own writings, illustrating as he did so both the relevance of mathematical ideas and the connections between his own attitudes toward and abilities in mathematics and linguistics.

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