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Math Across Time

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Hidden Beauty

There seemingly exists a division in society on how to view the content listed in Euclid’s book *The Elements*. While some place their copy of *The Elements* next to the Bible, others find they do not benefit from learning its mathematical proofs because they not apply to real life situations. Personally, I view *The Elements* in a positive light. It provides a rubric for solving real life problems while containing an awe inspiring intellectual beauty. *The Elements*, despite the complaints of critics who narrowly view the book as dry, in reality provides key logical insight through an unmatched arrangement of scholarly instruction.

Disregarding much of the brilliance in Euclid’s book *The Elements*, many people find there isn’t any important content within the book. On an extreme level, many students of geometry wonder the point of learning about abstract knowledge such as finding degree measures and understanding properties of different shapes. An example of this criticism is seen when one of Euclid’s students asks him, “What shall I get by learning these things”. “These things” can be interpreted as the intangible content of the book such as the shapes and degree measures. It is clear that this student, like many others who study geometry, cannot draw the connection between what is said in the book and its actual logical value. Some who even know of the connection between *The Elements* and its real world logic actually do not find the connection to be coherent. These people say that geometry is based on principles that are always true while society does not have a set of principles and its problems are often uncertain. Blaise Pascal, a French Mathematician, states that mathematicians “use definitions and axioms” which are “only right when their definitions are quite clear”. Mathematicians derive their logic from clear and true principles such as definitions and axioms. They have what we call “exact minds”. However, the criticism lies in the fact that the real world is not so exact. The problems faced in society are different than those faced in *The Elements*. Its issues are more diverse and do not have set principles to fall back on. A great example of this can be seen in the Iraq War. Prior to the war, the set definition of warfare was to conquer and restore peace. Thus, we applied this principle to the War in Iraq. However, this time, our set principle for how to do war failed. The situation was much more complex because of the Iraqis extreme beliefs and foreign culture. Thus, one can see that there are times when situations are too difficult to be solved by using the Euclidean logic of relying on set “principles” and “axioms”. In the real world there are many different components to a problem that make it hard to use set principles. Thus, critics view learning the solutions in *The Elements* as “bad practice” because its set guidelines do not contain the logic needed to solve the various types of problems found in the real world.

Though these arguments contain convincing points, I find that *The Elements* actually does connect to real world logic. While abstract in nature, the derivations of the solutions in the book are in fact useful. *The Elements* takes certain things to be true and uses those certainties to prove more dynamic questions in a step by step process. This can be seen in the step by step build up to answering the difficult Pythagorean Theorem in *The Elements* “Book One”. I find this type of logical process actually does connect to solving problems in the real world. Many times I have drawn upon certain truths that I have learned throughout my life and have applied them to solve more complicated problems. Similar to the logic in *The Elements*, I see our entire life is a step by step journey in which we keep acquiring new truths in order to help solve more difficult problems. As people grow older they pick up more “postulates” and “common notions” which they apply to solve more difficult problems. That is why the youth looks up to people older than them for guidance because they have more “common notions” or “postulates” to draw upon in order to solve problems. Thus, studying *The Elements* is beneficial because it provides a way to practice drawing upon a range of facts that we have learned in our own life and using them to solve more complex problems for the future.

Drawing from one of my own experiences, I have found there is a clear connection between the complaints of those learning Latin and those studying *The Elements*. I came from a high school that required its students to take two years of Latin. At first, I dreaded the fact that I had to Latin and did not see any point of trying to learn such an abstract language. It was a dead language and thus was useless. Its language and history was so distant from my own that I began to wonder why I was required to learn such a meaningless language. The revelation of Latin’s importance came when I had to take the S.A.T. I was able to find out the meaning of words that were foreign to me because of their Latin roots. It struck that me I had judged Latin too narrowly. I only judged Latin by looking at the language itself and not examining its concepts that connect directly to the English language. The same defense of Latin can be made for geometry. Many students criticize geometry for its uselessness. They view the logic for finding degree measures and properties of shapes as futile. However, similar to the ignorance I showed in viewing Latin, these students are only looking geometry through a purely mathematical lens. This can be seen by the Euclid’s student who asked him what is there to gain from studying geometry. This lens is too narrow because it does not draw the larger connection between the logic used in geometry to derive answers and that of solving problems in real life. Thus, subjects such as geometry and Latin actually do serve a purpose when you step back, disregard their abstractness, and look at their material from a broader stance.

Ironically, Euclid would find that my belief that geometry is useful because of its real world connection to be too narrow. Euclid’s answer to the student who asked him the benefits of studying geometry was, “Give this man three *obols*, since he must profit from what he learns”. Thus, Euclid believes that it is not always important to gain something from what one studies. For Euclid, I’m sure the pride in completing a proof was the driving force in his desire to study geometry. Though noble, I find Euclid’s belief to be unrealistic and outdated. In society today, students find there is there is not enough time to learn things based on pride alone. Everything must be useful or they render themselves useless. Though sad, it is the truth. Students do not go to medical school or law school or even attend college just based on pride alone. The reality is that there is some purpose in everything a student studies whether it is finding a job or going into a professional profession. Thus, the sole fact that geometry translates well into the real world makes it a useful subject to study by modern day standards.

Aside from *The Elements* real world connection, the book is also useful and unique because of its purity of truth and connection to the natural world. *The Elements*, if one believes in its postulates and axioms, is not subject to opinion. It is one of the few things that can be described as “certain knowledge”. Contrarily, the world around us is filled with problems that are not certain and subject to opinion. For example, when I write a thesis arguing a certain belief there will always be another thesis that can disprove what I say. For this reason, the unmitigated truth laid out in *The Elements* is something special. Edna St. Vincent Millay states that “Euclid alone has looked on Beauty bare”. When something is bare it is naked or at its truest form. The solutions found in *The Elements* are true and pure in form. Through the books deductive logic, there is nothing that one can say to disprove its solutions. Aside for the books purity of truth, the geometry laid out in *The Elements* also has the ability to provide answers about our natural world. For example, the astronomer Aristarchus was able to compute the circumference of the earth by using simple Euclidean geometry. I find it fascinating that at a time when the earth’s position in the solar system was unknown, Aristarchus was able to find out the difficult question of the earth’s circumference by using geometry. As once can see, geometry truly is a powerful tool and is unique in the fact that it has the power to uncover facts about our natural world. Ironically, geometry also has the power to depict our natural world as well. Many artists use geometry as a device to depict the natural world in a more realistic way. This can be seen by Raphael’s *School of Athens*. Here, Raphael used different aspects of geometry such as squares, semicircles, and parallels in order to depict the paintings setting more realistically. Thus, the multifaceted uniqueness of geometry makes the subject matter special. It contains a rarity of truth and a way of both explaining and depicting the natural world. As a summary of geometry, the poet Millay goes on to state that we are stuck on this world like ignorant geese who “Gabble and hiss” while the truth laid out by Euclid in *The Elements* delivers us from that ignorance and “dusty bondage” and brings us into the “luminous air” of pure truth.

For me, geometry and *The Elements* contain a certain logic that I find lacking in most other types of math. I find the deductive reasoning that Euclid uses extremely impressive. Many people argue that *The Elements* is a poor instructional book because its solutions are in their finished form. Though this is true, I find the finished forms of these proofs to be even more impressive. The finished forms seem so simple and the logic that Euclid uses flows smoothly from step to step. *The Elements* truly is an impressive book because of its neat and rational logic. Moreover, I have found doing geometry extremely gratifying. After finishing the last problem set, I have never felt so empowered and happy with myself. It felt great when I logically was able to prove one of the problems by using the different postulates and propositions that we learned as a class. For me, I really have not found anything gratifying about solving math problems until now. Usually I just plug in a formula and find the answer. In geometry there is no one set formula to draw upon. There are multitudes of propositions, postulates, and common notions. It is neat to figure out which proposition or postulate to use in order to solve what the problem asks.

There are so many different aspects that make both geometry and *The Elements* unique. Though some criticize geometry for being obsolete and abstract, the concepts of the subject matter translate well into real world problems. Also, *The Elements* purity of truth and connection to the natural world makes the book truly one of a kind. For me, linking together the various postulates, propositions, and common notions to solve a proof was a process I found extremely gratifying. Thus, the relatable logic, rarity of truth, and rewarding subject matter of The Elements made me realize its usefulness, beauty, and exceptionality.