**Writing Standards in Action Project**

**Abbreviated Commentary**

Abbreviated Commentary consists of the following:

* A student writing sample that illustrates what performance to grade level standards looks like—in action
* General information about the sample
* Massachusetts learning standards met by the sample
* Highlights that describe how the sample meets standards in the *Massachusetts Curriculum Framework for English Language Arts and Literacy (2017)* and other content frameworks when applicable

| **Please note:**  Student writing samples may contain inaccuracies in wording and content or shortcomings in the use of standard English conventions. |
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**General Information:**

**Writing Sample Title:** Math

**Text Type and Purpose:** Argue/Explain

**Grade level/Content area:** Grade 11 English language arts

**Type of Assignment­­­­­­­­­:** Argument

**Standards Addressed:** (W.11-12.1), (W.11-12.2), (L.11-12.3), (Standards for Mathematical Practice 2, 3, 6)

**Highlights from the Sample:**

This sample of student work exceeds grade level standards. It demonstrates the following attributes of effective writing. The sample:

* Draws the reader into the essay by making a straightforward assertion followed by the use of unexpected, playful use of alliteration and imagery. *(Ever since I can remember, I have loved the subject of math. There’s something quit, beautiful about a math proof, especially one that dips and ducks and dives and dodges its way to the conclusion.).*
* Makes an argument supported by reasons *(The biggest reason I love math is that it deals in absolutes. At the end of a question, no matter how difficult, there is only one answer.)*
* Acknowledges that some readers might disagree with the argument *(Even if math is not your favorite subject, and even if you aren’t the best mathematician in the world, I hope that you find it possible to see why it excites me that e^i𝜋+1=0.)*
* Uses varied syntax for effect *(With another subject, like English or hi story, it becomes much harder to know when to stop. Take this essay, for example. How much work should I invest in it? Obviously, I’m going to invest significant effort into it, but when it’s turned in, will I be able to truthfully say that my work is the best it can be? Can I be completely satisfied with it?)*
* Provides two mathematical concepts as evidence, the first designed to appeal to a reader who might have little interest in math *(One such example is the ability of an infinite number of terms to add up to a finite number. …For example, let’s say you have a full water bottle. You are really thirsty, so you don’t want to run out of water. To conserve your water, you decide to only drink half of it. 5 minutes later and parched as ever, you realize that you’re already halfway out of water, so you again only drink half of what’s left. If you were to continue drinking only half of the remaining water at a time, would you ever run out?)*
* Uses precise mathematical language in the second concept, designed to appeal to the more mathematically inclined reader *(A famous example of an infinite summation series of numbers that diverges, or does not add to a finite number, is the harmonic series, which is 1+½+⅓+¼+⅕+⅙+...+1/∞. It only barely diverges, for it adds up very very slowly. But if we multiply every other term in that series by -1, the series will converge to, it will equal, the natural log of 2. Called the alternating harmonic series, 1-½+⅓-¼+⅕-⅙+... =ln(2)=log base e of 20.693.).*
* Concludes with a paragraph that follows from and supports the argument *(If you take away one thing though, it should be this: Math has never ceased to amaze me, and countless others, for its absoluteness, for its complexity, and in the end for its brutal simplicity.)*

**Math**

Ever since I can remember, I have loved the subject of math. There’s something quite beautiful about a math proof, especially one that dips and ducks and dives and dodges its way to the conclusion. Those are the best, the proofs that start by asking an impossible question, then take a roundabout, and seemingly random, route to its culmination. The ones that leave you asking “why are we looking at this problem in this way?” before immediately showing you the underlying answer that has been there all along. I love to examine the proof and see this answer, the one that has seemingly come out of nowhere, in every single step. But beauty in math is not limited only to proofs and theorems--everyday math can be quite stunning too. There’s no better feeling than being given a problem and starting it without knowing how the technique you’ve chosen will take you to the end, if it does so at all. You’re guided by your intuition through steps you never believed you would encounter, before an incredibly commonplace answer is deposited on your paper like an old friend at the end of a long and meandering tunnel.

People often ask me why it is that I profess this love for math. And I usually tell them that I don’t know, either because I’m too embarrassed to show my true colors, or I can’t think of a satisfying answer to their question. But, when I think long and hard on it, I realize that my partiality to math is due to its exactness and how often I am amazed and interested by it.

The biggest reason I love math is that it deals in absolutes. At the end of a question, no matter how difficult, there is only one answer. Even if two numbers satisfy the needs of the problem, they both make up a singular answer. When I finish a problem, I am just that--finished. Yes, I can go back and check my work if I need to, but there is no need for me to continue otherwise. I am either right or I am wrong. I feel much more accomplished when I know there’s nothing more I can do to better my answer. I tend to be slightly perfectionist, so it is painful to turn in something, like an essay, that I know could be better *if only* I had more time. *If only* I had put in more effort. With a math problem, I know I have the right answer. I can feel good about my work when I turn it in, knowing that it is the best that it can possibly be.

It’s not so much that I dislike the endless pursuit of perfection. Hardly so--I think that it is often necessary to have something to strive towards. But it’s absurd to think that you would spend an unlimited amount of time working on a single assignment. There’s a point in every task where good enough is good enough. With math, it’s easy to know when the time has come to stop working--it’s when you finish the problem. With another subject, like English or history, it becomes much harder to know when to stop. Take this essay, for example. How much work should I invest in it? Obviously I’m going to invest significant effort into it, but when it’s turned in will I be able to truthfully say that my work is the best it can be? Can I be completely satisfied with it? The answer is no. But that’s the way it is with subjective assignments--no matter how much time and effort I pour into my work it can always be just *that* much better. My essay on success, especially, showed this. I don’t think I’ve ever invested so much effort into an assignment; I easily spent 25 hours slaving away on it. But when it came time to turn it in, I worked right up to the deadline; I was still not happy with it. It wasn’t perfect, and I doubt it would be no matter how much time I put into it. While I genuinely enjoy reading and writing, I appreciate the sense of fulfillment I have when I know that my work is the best it can be even more. My writing is just never there; it never will be. I have to learn to find good enough in my writing.

It is much easier to call it quits in math, though. Not because you give up, but because you can be finished completely and absolutely with a problem. Once you get an answer (assuming it’s correct), besides checking your work there’s nothing more to do! It doesn’t make sense to go back and keep working on the problem in the endless pursuit of perfection. I’m not pained when I turn in a math problem, because I know there’s nothing more I can do to better my results. I don’t have anything against working in the pursuit of perfection, but I’d rather be able to easily discern when my work is good enough--something much more easily done in math than in English.

Math is also incredibly interesting. One such example is the ability of an infinite number of terms to add up to a finite number. If you think about it, though, it’s not so crazy at all. For example, let’s say you have a full water bottle. You are really thirsty, so you don’t want to run out of water. To conserve your water, you decide to only drink half of it. 5 minutes later and parched as ever, you realize that you’re already halfway out of water, so you again only drink half of what’s left. If you were to continue drinking only half of the remaining water at a time, would you ever run out? Common sense would say yes, but from a mathematical standpoint you would never run out of water. You could take as many sips as you like but with every drink you never get the full distance to empty--only halfway there. But eventually, if we’re honest, after an infinite number of sips you will have emptied the entire water bottle. And what’s more, using limit notation we can prove this to be true. So when you add together all the drinks you’ve taken--an infinite amount of them--you’ll see that these infinite terms add together to equal a finite number (the size of your water bottle).

There are other summation series; however, that add together to reach an infinity. Common sense tells us this much, if we add 1+2+3+4+5+6+7+8+... all the way up to infinity it won’t equal, it won’t converge to, a finite number. This is really interesting because we can have some infinite summation series that converge, but others that do not. A famous example of an infinite summation series of numbers that *diverges*, or does not add to a finite number, is the harmonic series, which is 1+½+⅓+¼+⅕+⅙+...+1/∞. It only *barely* diverges, for it adds up very very slowly. But if we multiply every other term in that series by -1, the series will converge to, it will equal, the natural log of 2. Called the alternating harmonic series, 1-½+⅓-¼+⅕-⅙+... =ln(2)=log base e of 20.693. How can something so complex as an infinite summation series yield something so simple as an exact number?

All in all, I love math because it deals in absolutes and is incredibly interesting. Math yields an exact and absolute answer, when done correctly. This exactness is what interests me. Even if math is not your favorite subject, and even if you aren’t the best mathematician in the world, I hope that you find it possible to see why it excites me that e^*i*𝜋+1=0. That equation, called Euler’s Equation, has key logarithmic and exponential constants, the ratio of a circle's circumference to its diameter, *and* imaginary numbers, all in one neat little packet. How is that possible? I hope the examples in this essay have been able to at least hint at math’s infinite complexity and beauty, for while they are some of the more interesting mathematical concepts to me, they might not resonate for everybody. If you take away one thing though, it should be this: Math has never ceased to amaze me, and countless others, for its absoluteness, for its complexity, and in the end for its brutal simplicity.