Ashley Ferrara

A Mastery-Based Math Teacher's Journey

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About the Author

Ashley Ferrara is a founding faculty member at the Academy for Software Engineering (AFSE), a public high school in New York City. She joined AFSE nine years ago and was an Early Career Fellow and Master Teacher with Math for America for seven of those years. After earning a bachelor’s degree in accounting from the University of Connecticut and working with a big-four accounting firm, she earned master’s degrees in mathematics education from Teachers College, Columbia University and educational leadership and administration from Bank Street College of Education. She also graduated from the New York City Department of Education’s Leaders in Education Apprenticeship Program (LEAP). She welcomes correspondence at ashley.m.ferrara@gmail.com.

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The Aurora Institute’s mission is to drive the transformation of education systems and accelerate the advancement of breakthrough policies and practices to ensure high-quality learning for all. Aurora is shaping the future of teaching and learning for more than 14 million students through its work in policy advocacy, research, field-building, and convening. We work on systems change in K-12 education, promote best practices, examine policy barriers, and make recommendations for change. Aurora has a national and global view of education innovation and lifts up promising policies and practices that yield improved outcomes for students. Aurora envisions a world in which all people are empowered to attain the knowledge, skills, and dispositions necessary to achieve success, contribute to their communities, and advance society.

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FOREWORD

This report describes one math teacher's journey from traditional to mastery-based (or competency-based) learning—from skeptic to devoted practitioner. It can serve as a resource for educators, schools, and districts that are working toward deeper competency-based practice.

Author Ashley Ferrara has spent nine years as a math teacher, instructional coach, and assistant principal at the Academy for Software Engineering, a public high school in New York City. She also shares her expertise as a mentor teacher for the Mastery Collaborative, a national leader in advancing mastery-based and culturally responsive education.

Ashley Ferrara's story of deep devotion, reinvention, and improvement is valuable inspiration for the many educators and school and district leaders who are making the multi-year transition to innovative, competency-based practices. Her experiences and candor provide rich sources of advice for successful practice in mathematics specifically, but also for transitions to competency-based learning and teaching in all academic disciplines.

– Eliot Levine, Ph.D., Research Director, Aurora Institute

Initial (mis)Steps and the "Aha!" Moment

When my school announced it was officially shifting to mastery-based learning, I called its bluff. We hadn't shifted grading platforms, so I wrote it off as a firework that would fizzle in a year. (Not to mention that I believed mastery-based learning was completely impossible in a mathematics classroom. Had anyone seen the number of content standards I had to cover in a single school year?!)

Like clockwork, I continued with each of my algebra units having two quizzes and a cumulative unit test at the end—of course preceded by two days of review in class—and patiently waited to be told that the school was no longer moving in the direction of mastery-based learning. Well, my school called my bluff. Big time. The following year, we shifted fully to mastery-based learning—yes, including that grading platform I was holding out for—and I had to eat my words.

Is this the most politically correct way to start a report that cannot say enough in praise of mastery-based learning? Probably not, but I want you to know that if you are currently where I was back then, I get you. I hear you. I was (and definitely sometimes still am) you. I did not come out of the educational womb pushing mastery-based learning, and it was a bumpy road to get here, but I'm really excited to share with you what I've learned along the way.

We are going to review my transition in stages, because to say it was smooth, seamless, and quick would be an outright lie. Shifting to mastery-based learning is a multi-year process that I am very much still working on. The stages of my journey were:

1. Developing my initial "mastery skill," and my "aha! moment" that mathematics repeats itself.
2. Developing strategies to teach and assess mathematics content that did not repeat itself.
3. Evolving to skills that could be assessed repeatedly throughout the year.
4. Transitioning entirely to a problem-solving approach and removing all content-specific language from my mastery skills.

The first shift was trying to identify what a mastery skill was in the world of algebra. (Mastery skills are the 3–5 big ideas that I want students to continue practicing and strengthening throughout the year.) To be honest, I'm going to more or less skip over that entire first year of transition and call it a loss. I was the definition of a "square peg, round hole" approach to mastery-based learning, and my first set of mastery skills couldn't actually be called a "set," because it never stayed the same. I was making token changes to a traditional unit—describing each of its parts in a sentence with a rubric, and the rubric changed weekly.

An example of a mastery skill from my first year is in Table 1. It was created for my first unit, which focused on distance-time graphs. It falls into my "what not to do" category for many reasons; I'll note the two most prominent ones after mentioning a few positives and takeaways. The biggest thing to celebrate was simply that I did it, so I would never again have to create my *first* mastery skill and rubric. I also had two major takeaways that influenced the discussions and decisions my co-teacher Stephanie Iovan and I made for the next school year:

- **Takeaway 1:** If the mastery skill appears in only one unit within the course curriculum, you can assess it only during that unit.
- **Takeaway 2:** If the mastery skill progresses just like your curriculum (i.e., teaching the skill at the novice level at the beginning of the unit and at the professional level at the end of the unit), you will not be able to fully assess the skill until the end of the unit.

Table 1 Mastery Skill from First Year of Shifting to Mastery-Based Learning

1.1: Apply knowledge of distance-time graphs to show movement of objects.				
Professional (DOK* Level 4) Grade: 93 - 100	**Practitioner** (DOK Level 3) Grade: 83 - 92	**Apprentice** (DOK Level 2) Grade: 73 - 82	**Novice** (DOK Level 1) Grade: 65 - 72	**Approaching Novice** Grade: Below 65
Student is able to create a detailed scenario and design the appropriate distance-time graph. Student is able to justify their decision making in creating aspects of the graph from the scenario.	Student is able to create a detailed scenario and design the appropriate distance-time graph. Student can identify varying rates of change and represent them graphically.	Student can construct a distance-time graph from a given scenario with a provided scale. Student can identify varying rates of change.	Student can explain what a distance-time graph is and identify the following on a distance-time graph: – an immobile object – a moving object – different speeds of an object	Student lacks key understandings of distance-time graphs including: – how to illustrate an immobile object – how to illustrate a moving object – how to illustrate different speeds

*DOK = Depth of Knowledge. More information at http://bit.ly/DOK_Wheel_Slide

Only assessing a skill once, at the end of the unit, corresponds to the "one and done" unit tests that mastery-based learning shifts away from. When describing later stages of my journey, I'll cover how to create skills that can be repeatedly reassessed throughout both a unit and a school year.

Stephanie and I really started to make headway the second year, in large part due to what we had learned the first year. I remember a meeting we had over the summer to say, "We can't do that again," and really trying to hammer out some consistency among our skills. One thing I'm proud of that we developed was a set of three year-long mastery skills:

- MS1: I can create the appropriate domain and range given any representation.
- MS2: I can graph any function (linear, quadratic, exponential, absolute value, piecewise).
- MS3: I can isolate any variable.

At the time, I was just excited to have something on the page that we could stick with for longer than 72 hours. But in hindsight, this was a really important moment in the mastery journey: ***We had identified that mathematics repeats itself***. You may be saying "duh," but for us, having come right out of a traditional format where every unit feels completely different from the rest, this was huge. We found a way to create a throughline for our students for the year-long course.

With that, I offer two initial reflection questions for teachers who are thinking about mastery-based learning within your classroom: What is your throughline? What big ideas repeat consistently throughout the year? Think big, think little—this is messy stuff! But try to get at least two topics that repeat themselves in your course(s) and write them down. We'll talk more about identifying patterns and trends in the next section.

Refining Mastery Skills and Assessment Strategies

If you thought through those two reflection questions, you probably got frustrated, changed your mind 341 times, and then decided to go with your gut. Or if you didn't do that, then I'm jealous, because that's what my experience was like!

I'm going to talk you through how I took the big topics that repeated themselves in my algebra course (i.e., the three mastery skills mentioned earlier), added a few more, and started to distribute my content within them. At the time, I was teaching Algebra 1 to high school freshmen. During that year, my co-teacher and I encountered the next challenge on the road to mastery.

We had figured out that most of the mathematics in our algebra curriculum repeats itself, but what were we supposed to do with the "one-hit wonders" that didn't repeat themselves? Our solution was to create unit-specific mastery skills that addressed all the one-offs. Let me explain using the examples of one of the year-long mastery skills and one of the unit-specific mastery skills I formally assessed (i.e., put on the unit test) for Unit 2: Linear and Exponential Functions, shown in Tables 2 and 3. For those who want to see more, the remaining skills from the unit are in my Algebra 1 Mastery Skills document.[1]

Table 2 Year-Long Mastery Skill (Assessed in Unit 2 and in Other Units)

MS1: I can create the appropriate domain and range given any representation

- ❑ I can define domain and range
- ❑ I can state the domain and range of a function given any representation
- ❑ I can interpret the domain and range of a function given any representation
- ❑ I can graph a function when given a domain or range

Professional	Practitioner	Apprentice	Novice	Insufficient Evidence
I can do 4 of 4 items.	I can do 3 of 4 items.	I can do 2 of 4 items.	I can do 1 of 4 items.	I can do 0 of 4 items.

Table 3 Mastery Skill for the Linear and Exponential Functions Unit (Assessed Only in Unit 2)

MS6: I can create the equation for a linear function given any representation.				
❑ I can generate the equation of a linear function from a table ❑ I can generate the equation of a linear function from a graph ❑ I can generate the equation of a linear function from a scenario ❑ I can explain how to identify the y-intercept and rate of change from all representations				
Professional	**Practitioner**	**Apprentice**	**Novice**	**Insufficient Evidence**
I can do 4 of 4 items.	I can do 3 of 4 items.	I can do 2 of 4 items.	I can do 1 of 4 items.	I can do 0 of 4 items.

Before offering some constructive criticism about these skills, let me clarify that I'm by no means saying "we should have known better." We didn't know better, and we were trying so hard to figure out how to make this work. As my mom always reminded me after a bad breakup, "hindsight is 20/20." With that said, I'll share three observations that could have helped me back then and that might help you.

First, the unit-specific skills were born out of my need to make sure I had covered anything that could possibly be on the state exam. At the time, I only felt like something was "covered" when I had explicitly taught and assessed it. This is why the three different representations (table, graph, and scenario) were addressed separately in each skill—which also meant that they were taught separately and assessed separately. What I would like to go back in time and ask myself is, "Does treating each topic like its own unique content help students find the throughline across the unit, year, or even their overall academic experience?"

Second, I want to elaborate on what it looked like to teach each of the unit-specific skills separately. This meant that students were receiving a mini-lesson on how to generate the equation of a linear function from a table and then immediately practicing that skill. Then they'd receive another mini-lesson on how to generate the equation of a linear function from a graph and practice that skill. The only time students were given an opportunity to see and practice content covered in previous classes (also known as spiraling) was when a different representation (e.g., tables instead of graphs) was added at the end of a worksheet. Something I'm wondering is whether repeated practice, especially with specific and small skills, helps students with retention and recall weeks or months later when those smaller skills are folded in with many others.

Last, I want to comment on what it looked like to assess each part of the unit-specific skills separately. When my students reached the assessment at the end of the unit, they'd see one question for each subskill. This made our Unit 2 test so long that it had to be split across two class periods. It was a nine-page packet that required 37 unique answers. Thinking back on that now, I'm amazed that my students actually took the assessment; they were probably complying but not really engaging.

For those who want to dive deeper into this section, sources I referenced were my School Year 2017–18 Mastery Skills for Semester One[2] and Semester Two[3], and the Unit 2 Assessment, Part One[4] and Part Two.[5]

The next section explains my evolution to structuring my course around skills that could be assessed repeatedly throughout the year. Before continuing, here are some questions to reflect on:

- What does spiraling look like in your classroom? What would it ideally look like?
- If your course ends in a state exam, how does that impact your decision-making around your curriculum?

Moving Away From "Covering" Everything

As you probably guessed, I no longer recommend aiming to cover every bit of content on the state exam, which resulted in those incredibly long assessments! However, that approach illustrated the next key step in my mastery-based mathematics journey. It was a light-bulb moment, when I realized that function families are part of the repeating mathematics of my Algebra 1 curriculum.

This light bulb did not come easily. It resulted from a great deal of frustration around our curriculum and the anxiety over feeling like I needed to test everything. I had prided myself on being a teacher who did not teach to the test, yet I was staring at mastery skills and rubrics that were created out of a need to cover everything on the state exam. I was a walking contradiction, and it was exhausting.

A mastery-based learning approach is intended to help bring out the "big rocks" of a curriculum, and I had let my anxiety over "covering it all" turn some pebbles into a bunch of boulders. But mastery-based learning is a long game, full of iteration, and this was a pivotal point where Stephanie and I identified yet another repeating pattern in our curriculum—functions—and created the mastery skill and rubric in Table 4, which I'll refer to as "Mastery Skill 11."

Table 4 Mastery Skill and Rubric for Functions

MS11: I can correctly model a scenario.

- ☐ I can identify the function family given a representation (table, graph, and/or scenario)
- ☐ I can justify the function family classification given a representation (table, graph, and/or scenario) using one piece of evidence
- ☐ I can create an equation or inequality (or system of equations or inequalities) to model a scenario
- ☐ I can explain the significance of a solution in the context of a scenario

Professional	Practitioner	Apprentice	Novice	Insufficient Evidence
I can do 4 of 4 items.	I can do 3 of 4 items.	I can do 2 of 4 items.	I can do 1 of 4 items.	I can do 0 of 4 items.

Let's break down how Mastery Skill 11 can "absorb" many of my unit-specific (and function-specific) mastery skills. I'll also address how I do not feel that this would harm my ability to know where students are at with function-specific content, because that was a big concern of mine when I made this leap. First, I think the strongest part of the Mastery Skill 11 rubric was "I can identify the function family given a representation (table, graph, and/or scenario)."

The major evolution here is that we combined the representations. Previously, we had treated each representation separately, both in the mastery rubric and in class. We taught each one explicitly, with its own tips and tricks, and then moved onto the next. Instead of teaching about linear functions holistically, one day we were asking students to memorize "how to figure out if a table is linear," the next day they had to memorize "how to tell if a graph is exponential," and so on. Additionally, I realized that my classwork, homework, and assessments were strongly signaling to students which function family to use, whereas the New York state exam rarely did—and neither do most problems in real life.

In not teaching function families and their different representations interchangeably, I was not giving my students the opportunity to deeply understand the different function families. The unit title told students what type of function they needed to use for their answer. The state exam did not provide this luxury.

> **Mastery-based learning is a long game, full of iteration.**
>
> — Ashley Ferrara

Mastery Skill 11 allowed us to shift our instruction, because it allowed us to shift our assessments. Teachers often hear about "starting with the end in mind," and my end (i.e., my mastery skills and rubrics) had always been function-family-specific. Naturally, my teaching had mirrored that. But Mastery Skill 11 enabled me to present a table, graph, or scenario and allow students the space to share what they were noticing and wondering, and to define functions based on commonalities they observed, rather than the ones I had pointed out to them. This was powerful.

Because the light-bulb moment came mid-semester, the most significant shift happened in our mastery skills for the following school year, which you can see in our School Year 2018–19 Year-Long Algebra Mastery Skills.[6] Over the span of a few years, we had gone from 16 specific, standards-based, state-exam-driven skills down to six skills that were mostly year-long and showcased how mathematics repeats itself:

- MS1: I can reflect the appropriate domain and range given any representation.
- MS2: I can graph any function (linear, quadratic, exponential, absolute value, piecewise).
- MS3: I can isolate any variable.
- MS4: I can correctly model a function of a table, graph, and/or scenario.
- MS5: I can factor a polynomial.
- MS6: I can identify all parts of a quadratic function given any representation (graph, table, or equation).

One of our assessments shows these year-long skills in action.[7] To boot, this assessment wasn't created by me—it was taken directly from a prior New York state exam, and the mastery skills still worked! This was a huge moment for me, because for years, I had felt like my state exam requirements were at odds with my mastery journey, yet here they had finally worked cohesively! Another massive bonus was the demise of the impossibly long assessments I had administered in the past.

Notably, two of our six mastery skills—the ones focused on quadratic equations and quadratic functions—were content-specific rather than year-long. My co-teacher and I made this decision because, even though our instruction and assessment had evolved, the high-stakes state exam had not gone away. In recent years, students had needed to get about 32 percent of the exam correct to earn a passing score, and questions about quadratic functions had comprised about a quarter of the exam content. As much as we embraced mastery-based learning, there were real-world considerations we needed to keep in mind to ensure success for our students. Moreover, we used many aspects of mastery-based learning in our work on quadratic functions, which we recognize as an important set of functions to understand, regardless of the exam.

Here is another reflection question for teachers who are thinking about mastery-based learning within your classroom: Ten years from now, what skills do you want your students to still have from your class? We'll dive into my own response to this question in the next section, which discusses my strategies for mastery-based learning in a mathematics program.

Embracing Problem-Solving and Further Refining Mastery Skills

We've covered a lot of ground so far. First, we explored my not-so-positive initial reaction to the shift to mastery-based learning, my first mastery skill (and its limitations), and the "aha!" moment that mathematics repeats itself. Next, I described how I approached the mathematics content that did not repeat itself. Then I documented my evolution to structuring my course around mostly year-long mastery skills that were assessed repeatedly throughout the year.

Regarding the reflection question about what skills you want your students to still have from your class 10 years from now, I was asked this during a professional development session at school a few years ago. To say my answer surprised me would be an understatement! I wanted students to walk away from my class with stronger comprehension, communication, and problem-solving skills so they were prepared for life after high school.

Clearly, my response has nothing to do with Algebra 1 content. Solving an equation or graphing a line were the furthest from my mind when asked. At the time I was asked this question, my advisees—a group of 14 students I had met with daily from their first day of freshman year to the day they graduated—had graduated a year earlier and most had just finished their first year of college. During that year, I had fielded so many questions from them about how different college was, how difficult some of their classes were, and how unprepared they felt. Unfortunately, this resulted in some of them taking a break from college after their first semester. I just kept thinking, "What could I have done differently to prepare them better? What could we as a school have done?"

The questions I was (and still am) asking are huge, complex questions. Just like with mastery-based learning, I am never going to pop out of a cake and tell you I've been hiding the answer from you this whole time and all you have to do is follow my simple instructions. During the current and past school year, my way of addressing these big questions was to remove all content-specific language from my mastery skills and rubrics.

Wait ... what? Yes, you read it right. I removed all content-specific language from my mastery skills. Mastery skills are the pillars of your curriculum. They guide what you teach, how you teach, and what you assess. So, if I wanted students 10 years from now to have stronger comprehension, communication, and problem-solving skills as a result of being in my class, then I needed my pillars (mastery skills) to reflect that. In a math-department meeting, my co-worker brought up Polya's Problem Solving Techniques,[8] and they became the inspiration behind my (millionth?) mastery skill revision. My four current mastery skills are shown in Table 5.

Table 5 Current Mastery Skills

Mastery Skill 1: I can analyze a problem.			
Professional (4)	**Practitioner (3)**	**Apprentice (2)**	**Novice (1)**
Practitioner column plus: I can make connections between other subjects as well as global issues.	Apprentice column plus: I can apply a variety of resources to thoroughly break down a problem and unknown information.	Novice column plus: I can break down a problem to identify given, key, relevant, information and unknown information needed to solve the problem.	I can do a basic breakdown of the problem and identify the known or given information.

Mastery Skill 2: I can devise a plan to find a solution to a problem.			
Professional (4)	**Practitioner (3)**	**Apprentice (2)**	**Novice (1)**
Practitioner column plus: I can predict potential changes in circumstances and how to modify my plan when/if the changes were to happen.	Apprentice column plus: I can consider one or more strategies and coordinate several resources into my strategy.	Novice column plus: I can articulate essential components of my strategy.	I can demonstrate the ability to invert a process (work backwards) to form a general plan.

Mastery Skill 3: I can implement a plan.			
Professional (4)	**Practitioner (3)**	**Apprentice (2)**	**Novice (1)**
Practitioner column plus: I can identify areas where I diverted from or had to adjust my plan and justify why.	Apprentice column plus: I can map my plan to my work/implementation.	Novice column plus: I can implement my plan.	I can partially implement my plan.

Mastery Skill 4: I can reflect on and revise my work.			
Professional (4)	**Practitioner (3)**	**Apprentice (2)**	**Novice (1)**
Practitioner column plus: I can plan for my ways to improve my areas of growth in the future.	Apprentice column plus: I can use my strengths and areas of growth to determine areas of revision for my plan and/or implementation.	Novice column plus: I can identify my strengths and areas of growth taking into consideration my experience and the feedback I received.	I can demonstrate the ability to invert a process (work backwards) to form a general plan.

I know, I took a *big* turn right at the end! However, I felt it was important to reflect my authentic mastery journey, which has gone through a lot of changes across a relatively short time. The new mastery skills have, again, shifted how I teach, what I teach, and how I assess. While it's been difficult to shift yet again, I am very excited about what's happened so far.

Prior to making this shift, I asked myself, "Am I really ready to do this? Can this work with my content?" I mapped out a few ideas for what each of my four current mastery skills could look like, which I share below in the hope that it may spark some ideas for you. Overall, my clearest vision for how these skills would come to life is that they would be taught holistically—always. During class, we would dive deeply into one rich problem and cycle through each of the mastery skills within that problem. The content would be taught through the problems we were tackling as a class. I also want to share that because problem-solving is a universal skill, I am beginning to explore ways to extend this work outside of the mathematics classroom in an interdisciplinary context.

Mastery Skill 1: I can analyze a problem.

When working on this skill, students annotate, define the unknown(s), clarify what they are being asked to do, define key vocabulary words, etc.

Mastery Skill 2: I can devise a plan to find a solution to a problem.

When working on this skill, students create a plan of attack for reaching the solution. This can include creating a step-by-step list of how they will reach the solution, locating and citing resources such as anchor charts or previous lessons with models of how to complete the work, practicing a new method that has been presented to them that would help solve the problem, etc.

Mastery Skill 3: I can implement a plan.

When working on this skill, students follow their very detailed plan. This part of the problem-solving process also helps students identify possible missteps or holes in their plans, perhaps when they run into a "mathematical roadblock." This is also a great place to push students to try to find a different strategy to arrive at the solution (e.g., how many different ways can you isolate that variable?)

Mastery Skill 4: I can reflect on and revise my work.

When working on this skill, students implement feedback from teachers, peers, and themselves. This skill is visited often, and it is a back and forth between Mastery Skills 2, 3, and 4, as students revise their plan based on issues they run into while implementing it. This is also the time when students assess the validity of their solution (e.g., if you're being asked how many tickets were sold, is "negative 47" a reasonable answer?)

As I wrap up this overview of my own mastery-based math journey, I hope that my reflections have resonated with you and possibly given you some clarity or ideas about what this could look like in your own practice. Over the years, I have found that talking about mastery-based learning and learning what others are doing has impacted and inspired my work the most. As you start, or continue, this journey, I encourage you to create and find communities to support your own work. I intentionally used the term "communities," because I have found in my own practice that the diversity of perspectives and experiences I've shared a virtual or physical space with has only helped. There is no single solution to this work and no wrong mix of thought partners or critical friends. The work requires constant iteration and ingenuity—especially as we navigate education during and after a pandemic—and the communities you engage with can give you the energy you will likely need. Communities can include families, students, administrators, department teams, grade teams, teachers within a district or state, and the list goes on. The "who" is not as important; what's most important is the conversation—so happy talking!

Acknowledgments

This was not a solo journey, and the "a-ha's," "oh-no's," and everything in between were a result of countless conversations with my colleagues at the Academy for Software Engineering who kept sitting down with me despite knowing that I always said it was a "quick question," but it never was. I'd also like to thank the team at the New York City Department of Education's Mastery Collaborative for creating opportunities and pathways for educators to connect and discuss this important work. Lastly, I'd like to extend a massive thanks to my co-teacher through it all, Stephanie Iovan, who I am honored to have ridden every wave alongside.

References

1 Ferrara, A. (2018). *School year 2017–18 Common Core Algebra I mastery skills.* https://docs.google.com/document/d/1QPUyVZyAFh2om8SlVK5fzqefk-s6x8-tdU_KhyTZV8E/edit

2 Ferrara, A. (2018). *School year 2017–18 Common Core Algebra I mastery skills.* https://docs.google.com/document/d/1QPUyVZyAFh2om8SlVK5fzqefk-s6x8-tdU_KhyTZV8E/edit

3 Ferrara, A. (2018). *Common Core Algebra I: Spring semester 2018 mastery skills.* https://docs.google.com/document/d/1OnICvxommkuav2EAKRaxZafwbhBWh9xHOZqHLCawrOo/edit

4 Ferrara, A. (2018). *Unit 2 mastery skill assessment: MS1 and MS2.* https://docs.google.com/document/d/1gxycnu36MHFoV7IUorXSbGL7e4wuF4FCSzjudkjODRs/edit

5 Ferrara, A. (2018). *Unit 2 mastery skill assessment: MS6, MS7, MS8.* https://docs.google.com/document/d/1-Z7yP2V77msLKbxZS7Gj3QjP8dnHiwEiOaOR1qK154g/edit

6 Ferrara, A. (2019). *School year 2018–19 year-long Algebra mastery skills.* https://docs.google.com/document/d/1FmyFxxWG7YWXsOiC5spnPHAutSppP9iKRsIalKGmfPc/edit

7 Ferrara, A. (2019). *MS2, MS3, MS5 assessment. Item #35 from Algebra I Common Core Regents Exam, January 2019.* https://docs.google.com/document/d/1Eas-RG_DLxaC5XlnJCnYRCL_MmYFQMdB7Zy1oexyos8/edit

8 Melvin, G. (n.d.). *Polya's problem solving techniques.* https://math.berkeley.edu/~gmelvin/polya.pdf

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