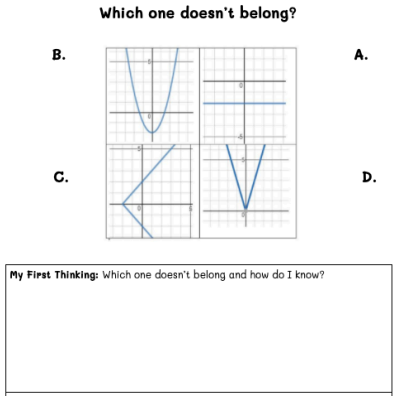
Chapter 1

“What do I think when nobody tells me what to think?”

Thirty 8th-grade students enter the room and get into their teams. They take out their Daily Self Assessments (DSA) and write down the learning targets for the day and clean off their thinking spaces so they only have what they need: DSA, composition book, pencil. The teacher puts the task under the document camera. The task is a “Which One Doesn’t Belong” about Functions. The teacher frames their First Thinking. She says, “You are going to take a look at the four graphs and determine which one, to you, doesn’t belong. Remember, First Thinking is never wrong, it could be mathematically incorrect, but it is what you are thinking first. All right, so on your own, record some thinking on your First Thinking Sheet.” (see below) As the students are working on recording their First Thinking it is silent, yet every voice is in the room as students ponder and jot down their initial thoughts. The teacher walks around the room looking over shoulders. She is making sure that everyone has had a chance to record something before it’s time to think together. She stands next to Angel who is slow to start, but while she pauses there Angel begins to write down some thoughts. Ioana finishes quickly, so the teacher asks her to add a sentence or two more about how she knows her answer is correct. When the teacher sees that everyone has something written down she says, “Okay, your First Thinking is closed for business. You are about to talk to some other people. Your new group thinking will not be better or worse, it just won’t be first.”



First Thinking is a way to have students think on their own. Every day. First Thinking builds and grows mathematical decision-makers. If I want kids to engage in rich mathematical discourse, each student needs to have a chance to bring something to the conversation. The only way to ensure that all kids have a voice in the mathematical discourse of the classroom is to make sure that they all have a chance to find out what they think when no one tells them what to think - a chance to bring their own funds of knowledge to the problem. We get a chance to honor all students' ways of knowing with First Thinking. What I have come to understand is that we should assume that kids know stuff. They can think about mathematics without any math from me. My teachers hear me say, "Kids will think what they think no matter what we hope they'll think, so we might as well find out what they think first."

We often ask kids to jump in and start thinking with their group. It's not a problem to want kids to collaborate. The problem is that if we don't allow them time to gather their own ideas, the same kids' thinking will be out front again and again. The flip side would be that students who need time to formulate their thinking would rarely make it into the conversation. In this situation, Angel would be off the hook because she would just wait and agree with whomever is talking. By giving time for this First Thinking, all voices start out present in the room. First Thinking is a truly equitable practice. Students get to bring their authentic selves into the space and to bring their thinking into the mathematical discourse in the classroom. As the room is silent and students are recording their thoughts, all brains are engaging. Then, when it comes time to share with each other, everyone has something to offer the conversation.

Some Whys of First Thinking:

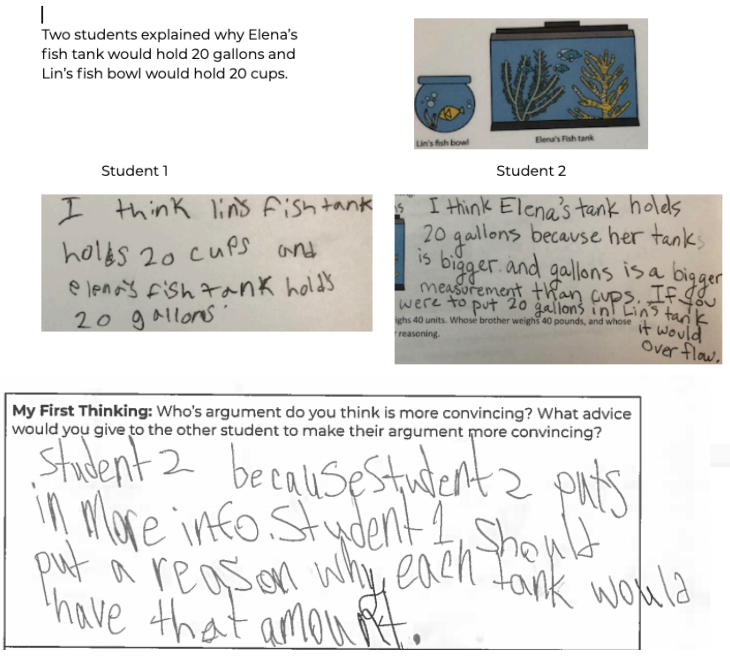
I was observing in a classroom once and the teacher asked a girl to share her First Thinking during the whole group discussion. After the student shared, the teacher asked her, “Well, why would you think that?” Seeing the girl’s face, I immediately realized why we don’t want to share those First Thinkings with the whole group. The girl answered perfectly when she replied, “I don’t know, it was just my First Thinking.” It could be that a First Thinking nugget makes its way to the time we are making meaning together as a class, but in general, First Thinking is just that, First Thinking.

First Thinking is never wrong. It could be mathematically incorrect, but if I ask, “What do you think about this,” whatever your answer is, in fact, what you think. Some very helpful misconceptions can arise from incorrect mathematics. Because we want kids to take a risk during First Thinking, we also want to be sure we do not go directly to whole-group share out from First Thinking as was seen at the beginning of this section. Sharing First Thinking during small group discourse is not only fair game, it is the expectation of “Think With Someone Else.” But it is only after students have had a chance to collaborate that we want to bring ideas to the whole group. First Thinking is not necessarily about answer-getting. If I give a problem to solve as a First Thinking task and some students have no idea where to begin, they will likely not engage. So First Thinking is not just a warm-up. A warm-up tends to be more of a *practice* on your own experience, not so much a *think* on your own experience. There is great intentionality around First Thinking. We are wanting to get the mathematical juices flowing. In a traditional warm-up, we are asking students to do a few skill-based problems. Often, if students know how to do these they don’t really need the warm-up,

and if they don't know how to do them they just sit and wait or reinforce their own misconceptions. First Thinking allows students to ponder and tinker with and about mathematics in a dedicated, almost sacred space. They can begin to see their First Thinking grow over time. When students start to use the academic language and mathematical connections they have been learning about in class in their First Thinking...That's when we know the learning is starting to stick!

Some Hows of First Thinking

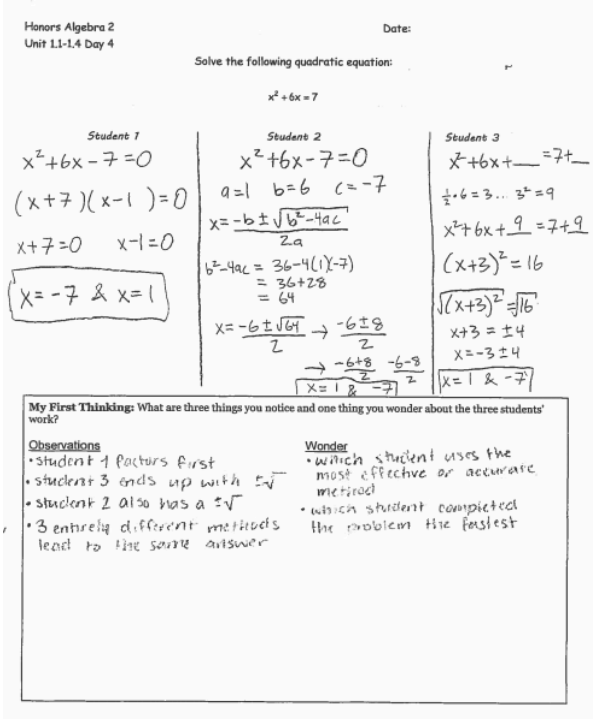
- Describing and labeling someone else's thinking.
    - It's important to make sure all students will have an entry point to approach the task. This is where the idea of low floor, high ceiling tasks comes in. For instance, ask kids to describe someone else's thinking. "Can you explain how Yolanda was making sense of this?" Or, perhaps you take the exit ticket from the day before, use two student's responses and ask students to describe the advice they would give to the student who wasn't as convincing.



- A Good Sort
    - I love a good sort. You can ask students to sort several different math problems that they may or may not have seen before and explain why they sorted them that way, rather than asking them to solve the problems. This gives students a chance to make sense of problems without the stress of solving, which they may not actually know how to do yet. When they label their categories and start to share with each other, we get a chance to layer on some of the academic vocabulary in an authentic, “need to know" kind of way.

$\frac{1}{3}$	-4	$\sqrt{5}$	$\sqrt{9}$	0.25
2	$\frac{1}{4}$	π	0.625	21
$\sqrt{12}$	$\frac{2}{5}$	$0.\bar{3}$	$-\frac{3}{4}$	-15
6.1	$-\frac{12}{3}$	2π	$\sqrt{8}$	1.4121...
$-\frac{3}{5}$	7	$\sqrt{3}$	$\sqrt{100}$	0.5
$-\sqrt{2}$	$\frac{1}{10}$	$1+\pi$	0.55	-1
150	$\frac{1}{9}$	$0.\bar{1}$	$-\frac{10}{2}$	3
$12.\overline{05}$	$-\frac{1}{5}$	$\frac{\pi}{2}$	$\sqrt{10}$	6.513...
4^3	$16^{\frac{1}{2}}$	$\sqrt[3]{8}$	$\sqrt[3]{-1}$	$7^{\frac{1}{3}}$
10^{-2}	$27^{\frac{2}{3}}$	$8^{\frac{1}{2}}$	$\sqrt[3]{20}$	$(-5)^2$

- Noticings and Wonderings
    - Another example of First Thinking involves having students look at a situation and record noticings and wonderings. This allows students to enter into the mathematics in any way they choose. They may notice something mathematical, or they might make a connection to the context. In this example, we see that the student is using academic vocabulary in their explanation. The wondering questions lead right into what the teacher would want to capture when the class begins to collectively make meaning.


Honors Algebra 2
Unit 1.1-1.4 Day 4

Date:

Solve the following quadratic equation:

$x^2+6x=7$

Student 1

$x^2+6x-7=0$

$(x+7)(x-1)=0$

$x+7=0 \quad x-1=0$

$x=-7$ & $x=1$

Student 2

$x^2+6x-7=0$

$a=1 \quad b=6 \quad c=-7$

$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$

$b^2-4ac = 36-4(1)(-7)$
$= 36+28$
$= 64$

$x=\frac{-6\pm\sqrt{64}}{2} \rightarrow \frac{-6\pm8}{2}$

$\rightarrow \frac{-6+8}{2} \quad \frac{-6-8}{2}$

$x=1$ & -7

Student 3

$x^2+6x+\_\_=7+\_\_$

$\frac{1}{2}\cdot6=3 \ldots 3^2=9$

$x^2+6x+\frac{9}{}=7+9$

$(x+3)^2=16$

$\sqrt{(x+3)^2}=\sqrt{16}$

$x+3=\pm4$

$x=-3\pm4$

$x=1$ & -7

My First Thinking: What are three things you notice and one thing you wonder about the three students' work?

Observations
- Student 1 factors first
- Student 3 ends up with $\pm\sqrt{}$
- Student 2 also has a $\pm\sqrt{}$
- 3 entirely different methods lead to the same answer

Wonder
- Which student uses the most effective or accurate method
- Which student completed the problem the fastest

Some things to keep in mind when planning First Thinking experiences:

- No matter what kind of First Thinking experience that you give students, it is important to provide a prompt that will take long enough that no one can

"wait you out." You know the student who will just want to wait until the teacher does the problem on the board. They might not want to be wrong, or maybe they just know that you always do it in the end anyway. It's important to be able to walk all the way around the room and be sure everyone has something recorded in their First Thinking box so the task needs to be open enough that students can keep adding thinking as you wait until that last student gets something on their paper.

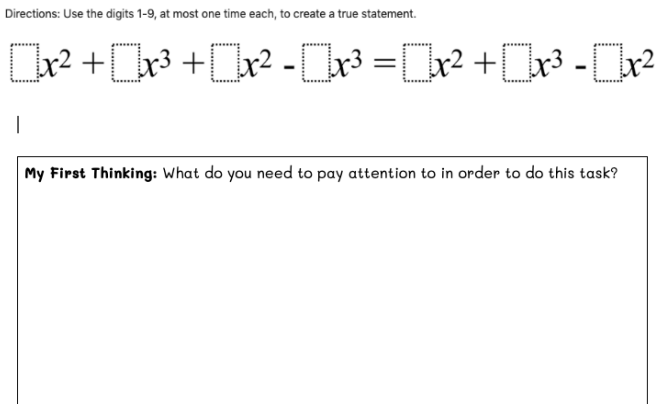
- Don't always expect completion of a First Thinking task. All students do not need to be totally finished, just have some thoughts that they can share so they can enter and be part of the conversation. Keep an eye on the student you know will finish quickly and let them be the bar. For me, that student is Ioana. I can ask her to add some thinking if I need to, but if she's done and everyone has something written down, we are good to go. At that point, we can move into talking and thinking together.
- Pay attention to First Thinking and see how it grows. At what point do kids find their math learning to be part of their toolbox and actually use it in First Thinking? We'll often see students having not so math-rich noticings at first. They might write something like, "I notice that there are even numbers at the beginning" or "I notice that there is an equal sign." We're looking for the moment when students start using academic vocabulary and understanding as their own. We might start to see noticings like, "I notice that all the coefficients are even so we could divide through by two," or "I notice that since the two sides are equal we could write the left side

into an equivalent form that would match the right side." You might create a section in their composition books where they record their First Thinkings. Keep this boxed off so it's clear that this was initial thoughts, and not necessarily mathematically correct. Students can then start to notice their own growth. Where are students going first? What do I think when nobody tells me what to think? These First Thinking experiences give us, as teachers, insight into what students are actually understanding and valuing about their learning.

- Low floor, high ceiling prompts are key. All kids need to be able to access the tasks somewhere. It is about finding out what their brains tell them. We want students to answer the question, "What does my brain think when no one tells me what to think?" When we don't allow students to think on their own, we end up surprised when they don't do well on an assessment. Even if we are good about having students collaborate, students need time to develop their own understanding before they share it with their peers. We will dig into the "Think With Someone Else" in the next chapter, but this promise only works if students have had a chance to really dig into Promise 1 - Think On My Own.
- A First Thinking experience can be used to launch a class and can be the focus for the whole class period.
- It can also be smaller, taking maybe 20 minutes to get through the whole cycle with new group thinking, making meaning and holding some thinking before presenting some new learning that they are now ready to

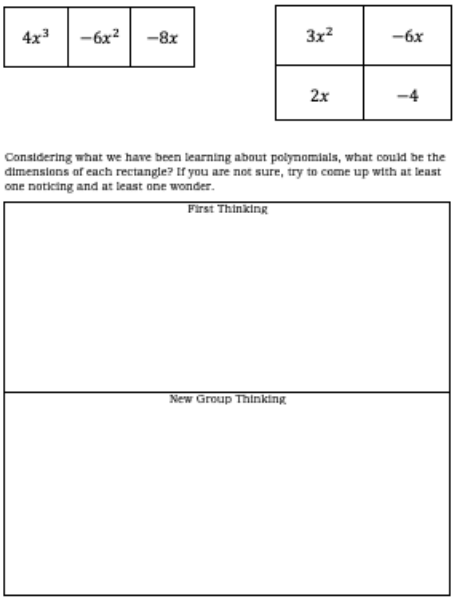
experience as a mini-lesson since their own brains got the chance to engage upfront.

(include multiple sample First Thinkings with (and maybe without) student work. Middle and high school examples)


Directions: Use the digits 1-9, at most one time each, to create a true statement.

$\square x^2 + \square x^3 + \square x^2 - \square x^3 = \square x^2 + \square x^3 - \square x^2$

My First Thinking: What do you need to pay attention to in order to do this task?



$4x^3$	$-6x^2$	$-8x$

$3x^2$	$-6x$
$2x$	-4

Considering what we have been learning about polynomials, what could be the dimensions of each rectangle? If you are not sure, try to come up with at least one noticing and at least one wonder.

First Thinking

New Group Thinking

Why this matters to our cast of characters:

- Angel needs to think on her own because she will normally just wait and agree with her group. She might even think the group's thinking is her own thinking, but she will actually not be able to do the work on her own at all. By at least recording her noticings and wonderings she has something to add to the group. She might need some encouragement early on to get her to record her thoughts. I would peek over her shoulder first to make sure she gets started.

- Julio needs to think on his own because he does not always trust his own thinking. He wants validation, but first thinking forces him to get his own ideas down on paper without knowing for sure if he is “right.” As Julio gets better at recording his First Thinking, he will have more powerful ideas to share with his group. He is willing to grow his First Thinking, but it’s important that he knows how his own ideas connect with others’ ideas.
- Ioana needs to think on her own because she will be very motivated to understand and think through a task while it is quiet and she can focus. She might well be the first to finish, so as long as it has been enough time for the rest to get some thoughts down, she might be my indicator of when it’s time to switch to some new group thinking.

A note about Thinking On My Own in a remote setting:

Use an online discussion tool to offer up a First Thinking task - maybe, “Which One Doesn't Belong” or a,”What do you notice and wonder” to start off with. Using student work as a way to critique and make sense works great here, too. You might have students compare two students’ work from the same task and have them give advice to one student on how to improve their response from a "3" to a "4". You might have students look at a worked problem that they can label and explain the thinking they are seeing. Use the feature that makes kids respond first before they can see anyone else's response.

Use student work from the day before, and you could do a video to frame the learning. Students would then do a First Thinking around this student work. Students then start to look forward to seeing if/when their work gets highlighted. It is critical that we

elevate student thinking and break down mathematical hierarchies of who gets access and acknowledgment in the mathematics classroom, even when we are in a remote setting.

We'll have dug into some of this last paragraph from the 8 Effective Mathematics Teaching Practices in the chapter that shares some of the research.