

## Video Supplement

### Norms for Watching Video (if not using your own)

- Speak from the “I” perspective. For example: “If I could rewind the tape and ask students a question, I would ask...”
- Be inquisitive, not judgmental. For example: “I wonder what might happen if,” instead of “the teachers should have...”
- Justify your ideas and conjectures based on the video clip, and not other parts of the lesson that you didn’t see. For example: “I think that the student understands...because in the video she...”
- Focus on how what you learned from the video might help you implement this (or similar lessons) with your own students.

### School Context

- School type: Urban Public Specialized High School
- School demographic information (approximate):
  - Students of color: 85%
  - Free and reduced lunch: 60%
  - English language learners: <5%
  - Students with special needs: <5%

### Lesson Context

- Subject: IB Pre-Calculus
- Unit: Functions
- Number of students in class: 28
- Lesson duration: Two 44-minute periods over two days
- Prior preparation: Students have covered relationships between quadratic functions in algebra and geometry, and had reviewed the different forms in past years. This lesson was used to elicit and see what students already knew.

### Video Context

Students completed the pre-assessment and discussion in the previous period, and were working through the dominos in this period. At the time of the first two segments of the video, groups have been given instructions to put together the dominos and then, using different colored pens, explain their thinking behind the matches and fill in the gaps. In the last segment, a group is discussing which dominos they had the hardest time with.

### Discussion Questions

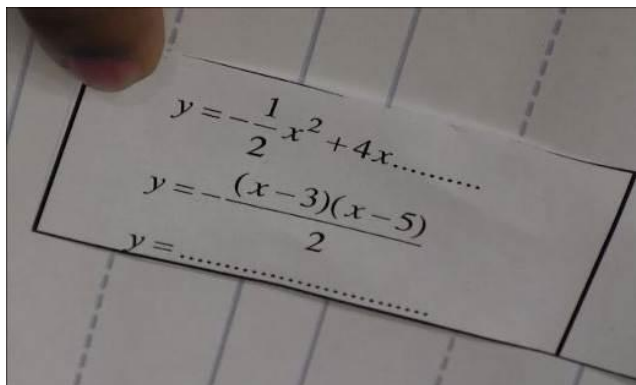
**Formative Assessment:** *Do classroom discussions include my thinking? Does instruction respond to my thinking and help me think more deeply?*

1. What are the different ways that students appear to understand and misunderstand specific mathematical ideas?
2. As a teacher, what questions might we ask or moves might we make that respond to students’ thinking and help them to think more deeply about important mathematical ideas?

### Video Transcript

Legend		
T	Teacher	Per and within dialogue
S1 – S6	Students 1 - 6	Per and within dialogue
C	Class	Per and within dialogue
[ ]	Actions/Non-verbal	Dialogue
{{x}}	Sounds like	Dialogue
{{}}	Inaudible	Dialogue

1. S1: 0:01 Wait wait wait. Wait a second.
2. S2: I'm checking, I'm checking.
3. S1: It's divided by two. So, that leads me to believe that it is not that but there is the possibility that it is.



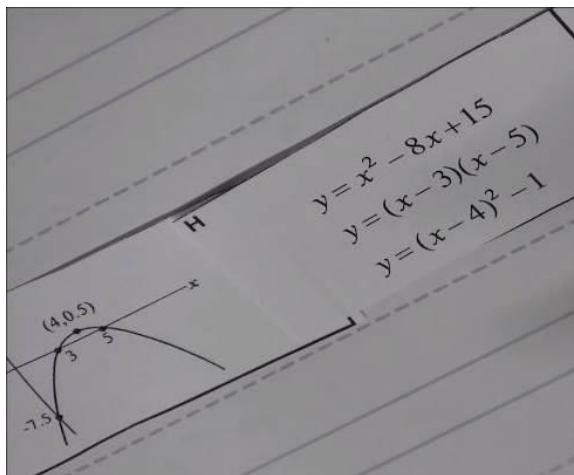
**FIGURE 1: first card they are looking at, right way up.**

4. S3: I mean, it's still zero.
5. S1: No, but the zeros are being divided by two. Oh, it's a factor, it's a factor.
6. S3: Yeah. It's just, times a half.
7. S2: And this one is three five.
8. S1: You know I knew that. I was just testing you guys to see if you guys knew that.

**Now a different group is looking at a new set of cards**

9. S4: Oh, this goes with this.
10. S5: 0:31 Maybe it would be better if we did, how did we do it up there. Does the center fit like this.

11. S4: Yeah, cause x minus three and x minus five so it has to be three and five.



**FIGURE 2: First match of the second group, right side up**

12. S5: So what has a vertex of plus three.

13. S6: Wait, no, that's pointing downwards, if you look at it.

14. S5: Yeah.

15. S6: It has to be this one, because it's half. It's, ummm, the whole equation is divided by two, right, so it's expanding horizontally. If you see all the other ones, the a value is one. This one is one and a half, negative one and a half.

16. S5: 1:08 Oh, you're right.

17. S6: So you just have to, yeah, put that in there.

18. S4: But this goes.

19. S5: Yeah, these go together.

20. S4: These go together.

21. S5: So we just have to figure out, well it's either one of these.

22. S6: Seven and five. Oh it's this one.

23. S4: Yeah. Well...

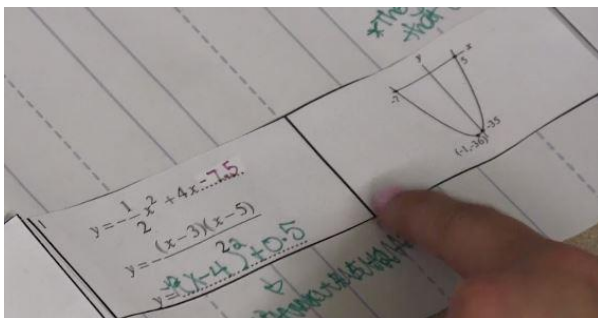
24. S5: Wait, this tells us.

25. S4: Oh yeah, cause that's the y....

26. S5: 1:28 This tells us the y-intercept and that has a y-intercept of -35 which matches this

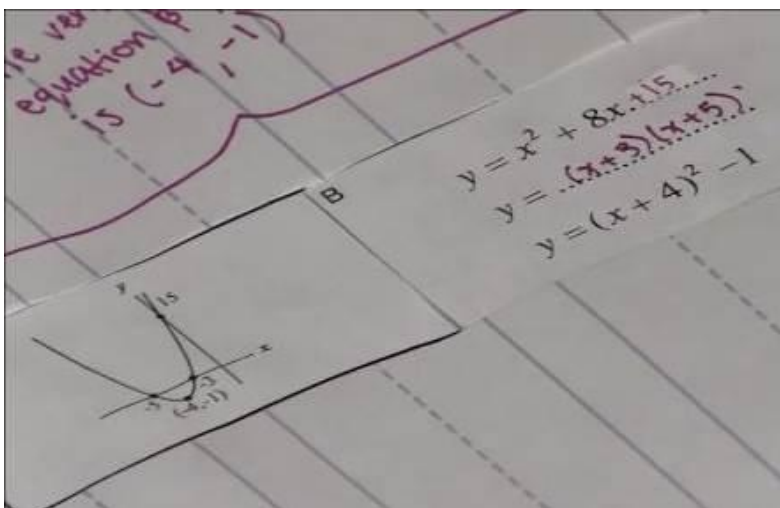
**At this point, first group is reflecting over the process of matching the dominos**

27. T: That are on the screen.
28. S3: Okay. What was the hardest match to justify?
29. S2: It was that one where it doesn't make any sense at all. With the vertex.
30. S7: Was it this one? The negative half x squared plus four x minus 7.5.



**Figure 3. One figure that was hard to explain**

31. S3: I mean I feel like it's not that they're all hard, it's just that some of them have the same, or it looks like at first they would have the same zeros but you have to pay attention to the other features of the graph so you have to look for the y-intercept and then realize "oh no, this one's negative, this one's positive".
32. S2: 2:12 I think the one that I had a tough, uhmm, it was this one.
33. S3: This one.



**Figure 4. Another match that was hard to explain, right side up**

34. S2: Cause I didn't understand it was negative four negative one. And that was before we put the rest in these. The x squared plus eight x plus fifteen.

35. S7: Wasn't this one the one he was talking about how we had to look at the y-intercept and see it was fifteen.
36. S2: 2:31 But there was also one where she didn't know that it was that graph because she forgot that in intercept form the x value becomes negative. So she's like "wait, but it doesn't match". And I was like, well.
37. S3: Yeah, I didn't even see this equation and I was just like  $x^2$  plus eight  $x$ .
38. S2: Like, what happens now.
39. S3: Yeah, okay. How often did you need to do algebraic manipulation?
40. S1: Not really. Maybe we did it subconsciously but it just seems natural now that we look at it and then for this you'd just... I don't really think you'd need to do it actually. Maybe when you're filling in these I guess.
41. S7: 3:07 Uh, yeah.
42. S3: We started to do completing the square and then we realized we didn't need to.
43. S7: Yeah, it was like... without the graph we would need it though.
44. S3: Yeah, without the graph.

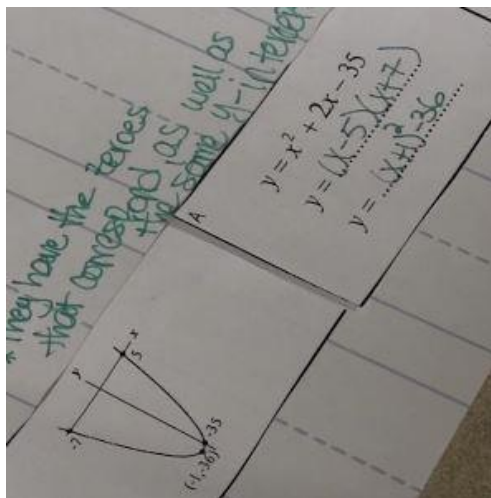


Figure 5. "Axis of symmetry" example

45. S1: For this you had to, because you couldn't just assume that because the y-intercept is that that this is going to match, you had to figure out the zeros or at least find the axis of symmetry.
46. S7: Yeah.