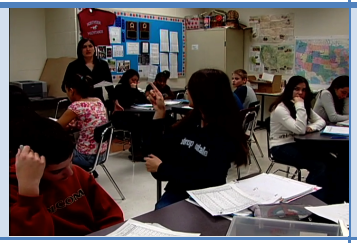
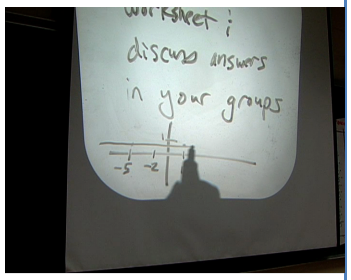
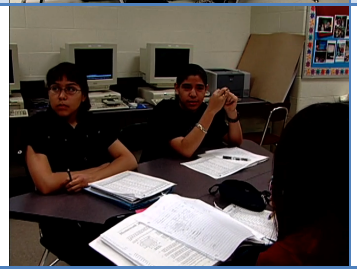
Comparing Slopes — Video Analysis Guide

Segment Focus	Approximate time in video	Line numbers in transcript	Visual Cues	Narrative Summary	Salient quotes
A Line with a Slope of Zero	0:00 – 0:46	1 – 11		Veronica describes the shape of a line with slope of zero.	**Veronica:** "I just know it's a straight line. I'm not sure which way it's going."
Plotting a Horizontal Line	0:46 – 1:50	12 – 23		Patrick responds to the teacher's question about the output for an equation such as y = ¾ with "no x in there." The teacher plots several points on the overhead to illustrate a horizontal line.	**Patrick:** "Since the second number is the y, then y = ¾, it has to be ¾." **Teacher:** "So it's a horizontal line, is maybe a better way to say it than straight."
Explanation of Zero Slope	1:50 – 2:26	24 – 32		Patrick responds to the teacher's question about why the slope of a horizontal line is zero.	**Patrick:** "Cause it's never moving up."
Slope of a Vertical Line	2:26 – 4:36	33 – 58		Arnas, Patrick, and Alfredo describe the slope of a vertical line.	**Arnas:** "It went up and down and didn't like move at all." **Patrick:** "Any division problem that has zero in it has to be zero." **Alfredo:** "In division there can't be a number over zero."

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1. Slope of a Horizontal Line

Central Issues:

How does Veronica talk about a line with a slope of zero?

Veronica refers to a line with a slope of zero as a "straight line." When prompted by the teacher, she says she does not know which way the line would go.

Patrick offers two ideas about a line with a slope of zero. What are the two ideas? How are Patrick's ideas related?

First, Patrick focuses on the individual points in a line with slope zero, noting that they share a single y value. Later he seems to focus on the movement (or lack of movement) involved in a line with slope zero.

Relevant quotes include:

Lines 5-6

Veronica: Um. Well, I think it's like. Wait, I just know it's a straight line. I'm not sure which way it's going.

Lines 14-16

Teacher: If x is the input, what's my output? Using the equation y=3/4?

Patrick: And since the second number is the y then y=3/4, it has to be 3/4.

Lines 23-24

Teacher: And why is the slope 0?

Patrick: Cause it's never moving up.

What does Patrick mean when he says "the second number"?

What do you think Patrick means by "never moving up"?

Additional Issues:

What representations do students use to talk about a line with slope zero? How does each representation help them to make sense of the meaning of a slope of zero?

Why might Veronica use straight to describe the special cases when all lines are straight?

2. Slope of a Vertical Line

Central Issues:

How does Arnas talk about the slope of a vertical line?

Arnas talks about slope of a vertical line in terms of movement up and down from the origin.

How does Patrick talk about the slope of a vertical line?

Patrick claims that the slope of a vertical line is zero. He talks about the slope of a vertical line in terms of the slope formula, but he inverts the formula so it is the change in x over change in y.

How does Alfredo talk about the slope of a vertical line?

Alfredo says that the slope of a vertical line is undefined because there is a zero in the denominator of the equation for slope.

Relevant quotes include:

Lines 38-39

Arnas: Well because if it's horizontal, uh. If the origin is 0,0 and if it went like up and down and didn't like move at all, it would be 0.

Lines 42-44

Patrick: The slope is zero because, since you subtract the change in x and the change in y. So you'd subtract 0 and 0 and 5 and 0. So on the top there'd be 0 and on the bottom there'd be 5 and any division problem that has zero in it, it has to be zero.

Lines 46-49

Alfredo: It's undefined.

Teacher: How are you getting undefined?

Alfredo: 'Cause it, there can't, um, in division there can't be a number over zero. Cause there's no zeros in the number.

What do you think Arnas means by "didn't like move at all" in line 43? What "didn't move?"

Additional Issues:

Is Patrick's idea about slope consistent when he talks about horizontal and vertical lines? What do you think Patrick understands about slope?

How does Alfredo's understanding of slope compare to Patrick's and Arnas's understanding? Does Alfredo seem to have a graphical understanding of why the slope is undefined or is his understanding limited to the formula?

3. Division with Zero

Central Issues:

What does Patrick say about division involving zero?

Patrick claims that any division involving zero will equal zero.

What does Alfredo say about division involving zero?

Alfredo claims that you can't divide a number by zero and the result is undefined.

Relevant quotes include:

Lines 42-44

Patrick: The slope is zero because, since you subtract the change in x and the change in y. So you'd subtract 0 and 0 and 5 and 0. So on the top there'd be 0 and on the bottom there'd be 5 and any division problem that has zero in it, it has to be zero.

Lines 46-49

Alfredo: It's undefined.

Teacher: How are you getting undefined?

Alfredo: 'Cause it, there can't, um, in division there can't be a number over zero. Cause there's no zeros in the number.

What do you think Patrick means when he says that "any division problem that has zero in it, it has to be zero" in line 44? In what contexts is this statement true? Why might Patrick make this claim?

What do you think Alfredo means by "in division there can't be a number over zero. Cause there's no zero in the number" in lines 48-49?