

Dialogue #3: From Herbel-Eisenmann, B. & Breyfogle, M. L. (2005) Questioning our patterns of questions. *Mathematics Teaching in the Middle School*, 10, 484-489.

Teacher: (0, 0) and (4, 1) are two points on the line in graph B. Great. What's the slope?

[Long pause – no response from students.]

Teacher: What do you think of when I say slope?

Kara: The angle of a line.

Teacher: What do you mean by the angle of a line?

Kara: What angle is sits at compared to the x - and y -axis.

[Pause for students to consider.]

Teacher: What do you think Kara means?

Sam: I see what Kara's saying, sort of like when we measured the steps in the cafeteria and the steps that go up to the music room – each set of steps went up at a different angle.

Teacher: How did we know they went up at a different angle?

Sam: The music room steps were steeper than the cafeteria steps.

Teacher: How did we decide that the music room steps were steeper?

Lana: We measured how far up the step went and then we measured how far back the step went and then we divided the numbers.

Teacher: Lana, could you draw us an example of what you mean?

Lana: Hmm. Yea. [She draws stair steps on the board where the height is 12 inches and the depth is 12 inches.] So here the steepness is 1, because $12 \div 12$ is 1.

Teacher: Okay. Let's say the height was 10 inches and the depth was 12 inches – which set of stairs is steeper? Jennifer?

Jennifer: I would say the first set, because you are going up as much as you are going forward, but in the second set you aren't going up as much as forward.

Teacher: Tom, do you agree?

Tom: Yes, because I think the steepness of the second is $10/12$, which is not as big as 1.

Teacher: So, let's consider what Jennifer and Tom are saying. If I were to lean a board against the two sets of stairs, the 12 by 12 steps have a steepness, or slope, of 1 and are steeper than the second set of steps, which have a slope of $10/12$. Is this right?

[Class nods and says "yes."]

Teacher: So, let's go back to our original problem and think through it again. This time I need to think about leaning a board against the points $(0, 0)$ and $(4, 1)$. How steep would it be – or what is its slope?

Jennifer: Well, we would go up 1 and over 4.

Teacher: Okay, so how could we determine the value of the slope?

Lana: We have to divide the numbers.

Teacher: How do we divide them?

[Students respond with both $1/4$ and $4/1$.]

Lana: I would say that it's 4, because you should do 4 divided by 1.

Jennifer: But 4 is bigger than $1/4$ and 4 would be steeper than the 12 by 12 we looked at, so to me that would mean that we went up 4 and over 1, not 1 and over 4.

Tom: Right, I say its $1/4$.

Teacher: Tom, why do you say it is $1/4$?

Tom: Because like we talked about with the music stairs, it's the amount we go up or down divided by the amount that we went over. It was $10/12$, not $12/10$.

Teacher: Lana, what do you think about what Tom and Jennifer are saying?

Lana: Yes, I agree, it makes sense what they said – steeper would mean up more than over. And, the slope of 4 would be much steeper than the slope of the 12 by 12, but this line is not as steep as that.

Teacher: Now, I would like you to consider the points $(-1, 3)$ and $(2, 5)$ and write down the value of the slope and what you thought about to arrive at your answer.