Representing Linear Relationships (Grade 8)

TEACHER: So, today we are going to be looking at linear relationships. And we looked at proportional relationships over the last few weeks. And we looked at linear and non-linear relationships over the last couple of days with our posters and our tiles.

Today, we're going to jump into a real-world situation with the big race. So we're going to make that connection from just patterns and math into real world. And it's going to relate a lot of the stuff that you did in science-- distance and rate and time. Do you guys remember doing that over the last week or two?

STUDENT: Yes.

TEACHER: Awesome. All right, so what we're going to do is I'm going to start you off with a simple question for the warm up.

A local donut shop sells a baker's dozen of donuts for $12.98. Does anybody know what a baker's dozen is? Logan?

STUDENT: 13.

TEACHER: Yeah, it's k kind of awesome. You get an extra donut for free when you buy 12. So a baker's dozen of donuts for $12.98. And the grocery store sells 6 donuts for $5. If I was going to be the most awesome teacher ever, and I was going to buy donuts for our class, we have 26 students in our class, which place should I buy them from?

And I want you to justify your answer mathematically, and I want you to do this in your warm-up spot, OK? And there probably are some questions you might have. But I want you to think about those. I don't want to answer them just yet.

OK, so think about how you can justify which place I should get the donuts from and why. OK, figuring out the answer is probably very easy, but justifying is going to be a little tricky. Jacob, I'm going to have you put yours under number 2 up on the board in just a minute, OK?

STUDENT: So are you trying to conserve money with this?

TEACHER: Yes, I want to be as cheap as possible. I'm going to have you put your answer up at number 1, OK?

STUDENT: Don't donuts in the grocery store come in, like, packs of 6, right? So you can't get, like, 1 for a lower price?

TEACHER: Well, that's a question that I'm going to let you think about. I didn't tell you for a reason. Chloe, I want you to play your answer up under number 1. So everybody's had a few seconds. I've walked around, and I've looked at a lot of people, and there's some really good ways to justify.

If I told you to go up to the board and write your solution on the board, I have a section for 1, 2, and 3, I'd like you to come up and just write your answer on the board. OK, so they're writing their solutions up, and they're justifying them.

While they're doing that, let's talk about some questions you might have had from that warm-up question. What is a question you had, Logan?

STUDENT: For-- at the grocery store, if you can buy 1 donut at a cheaper price, instead of having to buy a package of 6.

TEACHER: OK, so do you think the donuts were 1-- what was it, 6 for $5?

STUDENT: Yeah.

TEACHER: So would you be able to buy 1 donut at that same rate? What do you guys think?

STUDENT: No.

TEACHER: OK, Alan says no. Why do you think no?

STUDENT: I think that because when they say 6, there are going to be 6, and, like, you can't really take apart a box. You couldn't take apart a box and take out 2 donuts from it and buy it. You can't do that.

TEACHER: OK, so you can't take apart a box. But at the grocery store that I buy my donuts from, they have a big cabinet, and I open it, and I just pull one out. OK? So if they're boxed up, yeah, you can't really take out a box. Anybody think that you should be able to pay that same rate? Donavon, why?

STUDENT: Because like you said, whenever my family buys donuts, we always go to Raley's. And they have-- like you pick and choose the donuts you want, and it's always a fixed rate for each donut.

TEACHER: Everybody has their solutions up. I'm going to let Alex share his first.

STUDENT: All right, for the 6 for $5, it's $0.83 for 1. And for the baker's dozen, it's $1 for 1. And $0.83 is the [INAUDIBLE] 1 of the baker's dozen.

TEACHER: OK, so what did Alex use to figure out his answer? Yes, Matthew?

STUDENT: Unit rate.

TEACHER: A unit rate. So he found a unit rate. Unit rates are really important in proportions. OK, Jacob, what did you do?

STUDENT: I thought the donut store includes a better price. Because 13 donuts for $12.98 is about $1, while 6 donuts for $5 is about $1.20.

STUDENT: Wait, do you mean $6 to buy donuts?

STUDENT: 6 donuts.

STUDENT: Yeah, 6 donuts for $5.

STUDENT: Wouldn't that be--

STUDENT: Isn't it 5 divided by 6?

STUDENT: Yeah, it would be 5 divided by 6, right?

STUDENT: Oh, I might have done it.

TEACHER: That's OK. So now we need to look at 6 divided by 5. What would that be?

STUDENT: 120.

STUDENT: Yeah, 1--

STUDENT: About--

[INTERPOSING VOICES]

TEACHER: I'll let you fix that. And Chloe, I'm going to have you share your answer.

STUDENT: OK, so I found the cost per donut from both stores. And the grocery store's donuts are each around $0.83. $0.83 for a donut. And then the donut shop's donuts are about $1 each.

STUDENT: [INAUDIBLE] the box.

STUDENT: --are about $1 each. So therefore, the grocery store's donuts are cheaper.

TEACHER: OK, so what Chloe did was she also figured out what each donut costs. So all three of these guys figured out what each donut cost. But let's go back to what Alan said. Do you think we know for sure that you can pay only-- you're going to pay $1 per donut for the dozen? Or that you're going to pay $0.83 per donut at the grocery store?

Did anybody come up with a different answer? Because all of these said the grocery store was cheaper. OK, William.

STUDENT: Well, my answer is the grocery store is cheaper. But then, instead if getting the unit rate, I found how much it would cost for about 26 kids and eat donuts, and be very happy. So the local donut store, as I labeled LDS, I used a proportion, so it was 13 to 12.98-- $12.98, 12 dollars and 98 cents.

And then so using the proportion, 26 donuts is x. So I got $25.96 for the local donut store. The grocery store, I did three proportions-- well, not proportions but ratios. So 6 to $5 is 1 donut to $0.83, because 26 isn't divisible by 6. And so I multiplied that by 26, and I got $21.58. So the grocery store is cheaper to buy 26 donuts than the local donut store.

TEACHER: OK, and that's using that unit rate that all of these guys showed. Did anybody think that the donut shop would be cheaper than the grocery store?

STUDENT: No.

TEACHER: Logan?

STUDENT: Well, because if-- I'm just assuming that the donuts come in boxes of 6.

TEACHER: Yes.

STUDENT: Then you would have to get more, so it would be $30 to get them at the grocery store. Or no, no-- yes, $30. Because you'd have to get the overflow donuts. You would have to get, like, 32 donuts or something, rather than just 26. And so it'd be more expensive.

TEACHER: OK, so everybody that came up here found a unit rate, and I like that, because unit rates are really important in proportions. OK, you guys, thank you so much for coming up and sharing your solutions.

We're going to move away for this warm-up that we spent an extra long time on today, and we're going to talk about where are we going. So we did tile patterns right here. Did you remember what was the same about all of these tile patterns? Versus these three over here. And I will let you guys think for a second. Talk to the person across from you, and then I'll call on someone.

[INTERPOSING VOICES]

STUDENT: --those two are exactly like the same pattern, because they have the same amount of squares on each and they have the same formulas.

TEACHER: What did you call these types of problems? Yes?

STUDENT: Quadratics

TEACHER: Quadratics. What do you notice about quadratics?

STUDENT: 4.

TEACHER: There's 4. What do you mean 4?

STUDENT: [INAUDIBLE].

TEACHER: Oh, quadratic, "quad" means four. OK, well, we'll make that connection later. But think about an x. And when we have an exponent of 2, what do we call that? x squared. Huh.

STUDENT: [INAUDIBLE].

TEACHER: And these all-- a lot of these have squares in them. So that's our quadratics. These are called non-linear. Because why would I call these non-linear? Can someone give me one reason why I can call these non-linear? Haley?

STUDENT: Because if you were to trace it, like, with a line and a ruler, it wouldn't go all the way straight down. It curves.

TEACHER: Yeah, so right here, when we're looking at those graphs, it's not necessarily-- oh, this group didn't get to their graph quite. That was not a straight line. So what do we hold these over here? Linear. And what are some things you can tell me about linear functions? Donovan?

STUDENT: They're not proportional because they don't go through the origin. But if you were to trace them, they'd go in a straight line.

TEACHER: OK, they'd go in a straight line. These are all not proportional because they don't go through the origin. Are proportional relationships linear? Are all-- let me say this statement. Are all proportional relationships linear?

STUDENT: Yes.

TEACHER: Are all linear relationships proportional?

STUDENT: No.

TEACHER: No, OK. So what we're doing is we're taking proportional relationships, and we're moving them to non-proportional relationships, but they're going to stay linear, OK? So that's the big idea for today is we're going to be looking at a lot of different types of functions, and they're going to be linear. But they're not just going to be tile patterns. They're going to be real-world problems.

So looking around the room, did anybody see any proportional relationships?

STUDENT: No.

TEACHER: I kind of skipped this slide. Got it a little backwards. No? I see one. It's a hard one. It's not one that you guys made.

STUDENT: What's a proportional relationship?

STUDENT: Oh, there.

TEACHER: OK, on my wall of functions? Why would that linear be proportional? Yeah?

STUDENT: It starts at the origin and goes in a straight line.

TEACHER: It starts with the origin, OK? It goes in a straight line. Does anybody know what the unit rate of that one would be? Probably someone in that far group over there could see.

STUDENT: I can't see it.

TEACHER: Will?

STUDENT: 1 to 1.

TEACHER: Yeah, the unit rate is 1 to 1. It goes rise over run, up 1 over 1. So that's our unit rate. OK, we saw a linear relationship. We talked about why that was linear. And we saw a non-linear relationship, and we talked about why that was non-linear.

So today's focus is mainly linear. And we're going to-- I'm going to give you this situation. And it's kind of a fun one. Here's our challenge for today. One of the annual events at the school during spirit week is a tricycle race held in the gym. That would be fun for our team assembly, right?

STUDENT: Miss Leslie won the tri-school race?

TEACHER: OK, it's not Miss Leslie. It's Leslie. OK, "Leslie, a member of your class, has won the race each of the last three years, and is starting to brag about it. The rest of the class is annoyed by this attitude and wants to end the winning streak.

STUDENT: This ending streak.

TEACHER: Win this winning streak. OK, so here is some information I'm going to give you. I'm going to tell you that Leslie rides at a constant rate of 2 meters per second. Dina wants to see if she can win the big race with a 3-meter head start. And she can ride her tricycle 1 meter per second.

Dean estimates he can ride 3 meters every 4 seconds, and wants a 2-meter head start. Bob usually rides 3 meters in 2 seconds, and will get a 5-meter head start. And then last, we have Elizabeth-- oh, wait, we have Brian, too.

Elizabeth rides 1 meter in 4 seconds, and wants a 6-meter head start. And last, Gabrielle, I'm going to have you think thought this for a minute first, OK? Brian starts 3 seconds late, and catches up to Dina 7 seconds after the race begins. So you have a lot of people in this race.

STUDENT: That's a lot.

TEACHER: I'm going to give you guys just 2 minutes in your groups to talk about how could you decide who won the race, and if you have all the information you need to see who won the race.

[INTERPOSING VOICES]

STUDENT: So how long is the race?

STUDENT: I don't know. It seems like we never know how long the race is, so--

STUDENT: Yeah, it doesn't say.

STUDENT: But we have to know the stopping point.

STUDENT: Yeah, so that's why we don't have enough information.

STUDENT: What are we trying to figure out though? Are we trying to figure out how fast Brian goes or--

STUDENT: If anyone can beat Leslie.

STUDENT: 2 meters per second, so that'll be 4 meters in 2 seconds.

STUDENT: 8-- 6 meters in 3.

[INTERPOSING VOICES]

It's a proportional relationship.

STUDENT: And then in 1.5, it would be 1 meter. So 1 meter is 1.5 seconds, right?

STUDENT: Wait, for which one?

STUDENT: 3 meters is 1.5?

STUDENT: Yeah, because for the 3 meters every 4 seconds--

STUDENT: Yeah, 1.5. Yeah--

STUDENT: No, no, it's not.

STUDENT: 3 seconds.

STUDENT: No, no, no, it's not. It's not. It's 0.75 Because it's--

STUDENT: For 1 second?

STUDENT: Plus 2 meters, so 2.75.

STUDENT: For 1 second, it's 0.75 meters per second.

STUDENT: Only the paper.

STUDENT: That's what Dean goes.

STUDENT: Well, it would be 2 meters for second. For Leslie, though.

STUDENT: For Leslie.

STUDENT: It would be 2 meters per seconds. So then for 3 seconds, it would be--

TEACHER: You guys, I'm going to have you come back, and I'm going to give you some tools to help you solve this problem.

STUDENT: Plus, the finish line is 25 meters.

TEACHER: I will get those for you in a minute. Let's, really quick, talk, and then I'm going to give you some more directions, because this was really a hard question. This group over over was talking about what's something that you think you're missing. Hey, Alex?

STUDENT: How far the race is.

TEACHER: How long is that race? Because do we even know how long the race is? What did you say?

STUDENT: It could be anywhere-- it could be 2 meters long, and it's over in a second, or it could be, like, 20 meters long and take-- or you would never know exactly who was going to win, because someone can be in the lead, but it doesn't matter, because the distance.

TEACHER: Yeah, so this whole problem and who's the winner really kind of does depend on how long is a race. If it was 2 meters long, and he gets a 5-meter head start, he's starting 3 meters past the finish line. So that's kind of silly.

But if it was 20 meters long, does that give him enough of an advantage? I heard some really cool stuff from this group over here. So what were some thoughts that you had about each of the rates?

STUDENT: We were looking to see how much it would be per second for each person. But we couldn't figure out who would win again if we didn't have the ending distance.

TEACHER: OK, so I liked what Haley's group was saying. They were saying, well, Dina goes 1 meter. But you get to add 3 meters, 1 meter per second. But you get to add 3 meters on to her amount that she's gone because she's getting a head start.

So how would that look on a graph, if you were to graph this, with a 3-meter head start? That's something you guys are going to have to ask each other when you're working on this problem. OK, so here is what I'd like you to do. All the data I gave you with who rides at different rates is right here.

I want you to try number 1, 2, 3, and 4. And I'm going to give you guys about 10 minutes, and then we'll stop and see where you're at in another five, 10 minutes, OK?

[INTERPOSING VOICES]

STUDENT: So she would finish the race--

STUDENT: We're assuming that these are, like, a lot of people that don't tire?

TEACHER: Yes. They ride at a constant rate, so means they don't slow down, and they don't get tired.

STUDENT: Bob wins.

STUDENT: What is it, by 1.--

STUDENT: 11. Yeah, because it's 11.

STUDENT: Oh, no, no, no, by, like, 0.7 is like 0.8 seconds.

TEACHER: If you need rulers, you know where to find them.

STUDENT: But this is her time--

STUDENT: 22.

STUDENT: But Bob's time would be longer then. Because 12 seconds, then Leslie would win.

STUDENT: Never mind--

TEACHER: It says it right in the top of your description too.

STUDENT: Wait, oh-- OK, so yeah, so what's this?

STUDENT: Wait, he starts at 20, right? So that's 20 meters. 3 doesn't go into 20. 3 goes into 18.

TEACHER: And then Elizabeth, are you writing out?

STUDENT: That's his sister.

STUDENT: Elizabeth is going at 0.25.

TEACHER: David here is using in figuring out how many meters per second they go, are--

STUDENT: How long it would take them to finish this, especially with--

TEACHER: With the head starts, OK. And then-- Haley is making a graph.

STUDENT: Oh, we need 5's.

STUDENT: So then Bob would go 1 meter in 1.5 seconds.

STUDENT: Bob would go what? 1 meter in 1.5-

STUDENT: Oh, no, 1.5 meters in 1 second. Yeah, that's what that is.

STUDENT: You have to subtract 2 meters. So, like, say--

STUDENT: You don't subtract. You add it. They're head starts. They're not disadvantages. They're advantages.

STUDENT: Oh, she got 11.

STUDENT: Yeah, it's a head start.

STUDENT: No, she said 14.

TEACHER: So when they start, instead of being--

[INTERPOSING VOICES]

STUDENT: No, don't start them at that number. Start them at where we were starting with all of them.

TEACHER: Alex, I want you to share your graph with these guys, just to kind of explain what are you doing on the side here. Just explain that, and then see if that makes sense to them, or if they have something that would make it different.

STUDENT: So, the meter head starts, a 2 meter head start, you just put it out 2 meters already.

TEACHER: Can you tell John and Alan what you guys are doing?

STUDENT: We're finding how much they have to go for the race. So [INAUDIBLE] starts. And then how many meters they can go for the second.

TEACHER: OK, so they're figuring the meters per second and then subtracting the head start. And then Alan and John, how are you guys attacking this?

STUDENT: We're just putting in the head start then to see how long each distance is. And then whoever has the shortest graph, the straighter graph wins.

TEACHER: So how are you putting in the head starts into your graph?

STUDENT: Just putting 3.

TEACHER: OK, so you're putting in 3, like, right there?

STUDENT: Yeah.

TEACHER: OK.

STUDENT: So basically this let's us find out what's going on.

TEACHER: So you guys are attacking it numerically. You guys are attacking it graphically.

STUDENT: How do you figure out Brian--

TEACHER: Which one?

STUDENT: Brian.

TEACHER: Brian, hmm--

STUDENT: Starts at the second.

TEACHER: I'm going to let you struggle with that for a minute.

STUDENT: 5, OK, he starts with a 5.

TEACHER: Think out how-- what would his rate have to be to catch up. OK? Do you like the graph or the numbers?

STUDENT: I like the graph better. I think the graph is way easier.

STUDENT: It kind of just shows you who's going where.

STUDENT: I wish we had done the graph first.

TEACHER: Well, no, both ways are useful.

STUDENT: Yeah, but I just think it's easier to do the graph because--

TEACHER: Leslie rides at a constant rate of 2 meters per second. This is the distance from the starting line. And this is-- 0 is 0 time. That's where you're starting. So where is Leslie going to start?

STUDENT: At negative 3

STUDENT: She's going to-- no, no, this is Leslie. This is--

TEACHER: OK, so what you're telling me right now is Leslie is starting-- this is time. Leslie is starting 2 seconds late. Does Leslie start at 2 seconds?

STUDENT: So Leslie starts 2 seconds--

TEACHER: OK, how about we start Leslie at 0, 0. And I'm going work you through Leslie, and then we'll kind of work on going through Dina. Because she's gone.

STUDENT: Does Bob win?

TEACHER: In 0 seconds, how far has Leslie gone?

STUDENT: Did Bob win on yours?

TEACHER: Yeah, so we're going to put a dot right there for Leslie.

STUDENT: On my graph, Brian tied.

TEACHER: No, this is 1 second to right here.

STUDENT: Where's your Brian graph?

TEACHER: OK?

STUDENT: Brian is--

[INTERPOSING VOICES]

TEACHER: Are you getting it now? It's pretty good. I would be a little bit more precise on your graph. Because--

STUDENT: [INAUDIBLE].

TEACHER: Or-- Haley, can I borrow your graph for just a second? But like you said, I would probably do the dots and then connect it. So because there's a lot of dots in here. But you can see who's here. Thank you.

I see that you guys did it all with calculations. How would you draw the graphs?

STUDENT: We did a scatter plot.

STUDENT: We did a scatter plot with 12 seconds.

STUDENT: 12 seconds.

TEACHER: OK, oh, so 12 seconds where are they at.

STUDENT: Yeah.

TEACHER: OK, I want you to make a linear graph. So where would they be at at 0 seconds? Where would each of them be at?

STUDENT: Oh, that's easy.

STUDENT: Yeah, you count the head starts.

TEACHER: OK, so where would Leslie be?

STUDENT: Leslie still would be at 0.

TEACHER: So Leslie would be at 0.

STUDENT: It does not have the--

STUDENT: Sorry.

STUDENT: Leslie.

TEACHER: OK.

[INTERPOSING VOICES]

TEACHER: So after 1 second, where is Leslie at now?

STUDENT: After 1 second, she is--

STUDENT: Leslie is at 2.

TEACHER: And then after another second, where is she at?

STUDENT: Oh, OK, so you want us to do, like, just a little better.

TEACHER: OK, so this is saying, after 2 seconds, she hasn't gone anywhere.

STUDENT: Oh, oh, upwards.

TEACHER: After 1 second, she's gone 2. Yeah, so you'd be at 1, 2. Yeah. What do you think you would do if you connected Leslie's starting point with where she ended up at for the 25 meters? What do you think about these dots?

STUDENT: Elizabeth is really depressing. And she got a 3-meter head start.

STUDENT: Alex was right.

[INTERPOSING VOICES]

STUDENT: I was right!

TEACHER: Why do you think this graph would be a little more useful than just having the end times?

STUDENT: Because then all you know is where the person was at the start when you're timing. You don't know [INAUDIBLE] rate, per se. I wish you could find that based on that information.

TEACHER: This just gives me one piece of information. Where are we at at 12 seconds. Whereas this one I can say, where are they all at at 5 seconds, where are they all at at 10 seconds.

How many people just started pouring out, like, their arithmetic, and started dividing and figuring out what the rate was that each person went per second, and then added on head starts? In this group, how many people started that way?

OK. Hagan, Jacob? In this group back here? I think the whole group did. You guys were, we're going to get this figured out using unit race and arithmetics.

OK, what about this group right here? Did anybody start right away with doing calculations versus a graph?

STUDENT: Yeah.

STUDENT: Well, we kind of used the graph. We used the graph with the calculations.

TEACHER: So they did a little bit of calculation but then showed that on the graph.

STUDENT: --we used the number 12. Because it was divisible by all of their seconds.

TEACHER: Oh, so did you hear what Parker said she did? Every rate that they had could easily be fixed or be used with 12 seconds?

STUDENT: Yeah.

TEACHER: OK so all the unit rates would end up at a certain place at 12. So they did 12 seconds as a baseline to see where everybody was at 12 seconds, OK? Over here, John and

Allen, you guys jumped right into the graphs. And Gabriel kind jump into the graphs. Hanna and Ryan, you guys did the calculations. Why do you think using the graph was helpful for you in solving this problem?

STUDENT: Because you don't want to do any of that math-ey stuff. You just had to put in the dots on the graph, and then you kind of know who finished first by whoever the graph is straighter and whoever reached 25 first.

STUDENT: The person who likes to do calculations. But I know this is a really bad reason, but I just did the graph fist because it's what I got first.

TEACHER: OK, so you got the graph paper first, so you started with the graph. Who won the race at 25 meters? Chloe?

STUDENT: WE knew it was Leslie, because when we calculated-- we didn't really do the-- well, we sort of did. We started off with the unit rate, and then we just figured out how long it would take them to get to 25 years, and then calculated their head starts and everything.

And then-- and Brian's starting 2 seconds late. And Leslie won the race with 12.5 seconds as her time, from 0 to 25 meters, which was the least amount.

TEACHER: OK, so Leslie got first. Did anybody figure out who got second? Well, this group probably did. Alex, but who did you guys get for second?

STUDENT: Bob.

TEACHER: Who?

STUDENT: Bob.

TEACHER: And how many seconds did it take Bob?

STUDENT: [INAUDIBLE] for which race?

TEACHER: For the 25-meter race.

STUDENT: Oh, 25.

TEACHER: Alec?

STUDENT: 13.3333333--

TEACHER: 13.3 repeating?

STUDENT: Exactly.

TEACHER: Who came in third place?

STUDENT: Someone.

STUDENT: Dean--

STUDENT: Dina.

TEACHER: Hailey?

STUDENT: I think it was Brian.

TEACHER: Brian. And how many seconds did it take Brian?

STUDENT: Oh, well that's because that wasn't add.

STUDENT: 14.5

TEACHER: 14.5? OK, I'm going to pull up a graph, and just to show you guys what the graph would look like. Chloe?

STUDENT: I was just going to say, but with Brian, don't you have to add on to the 14.5 the 3 seconds that he wasn't moving at all?

TEACHER: OK, so Haley, when you figured out 14.5-- you guys were the ones who said 14.5, right? OK, did you add that 3 seconds that he was--

STUDENT: Well, I mad a graph originally, so I started him at 0 meters at 3 seconds.

TEACHER: OK, so right here?

STUDENT: Yeah.

TEACHER: OK, so here we have Brian. How can I use this graph to figure out who won a 25-meter race? Logan, do you want to come up and show?

STUDENT: I'm assuming I got it right, but--

TEACHER: How could you use that to decide who won the race? Jacob?

STUDENT: Well, it kind of-- if you put it on a graph, the larger the slope there is, that's how fast they're going.

TEACHER: So the greater rate means they're going-- or the greater slope is a greater rate or faster rate? OK, so we're looking at this line at 25 meters. Anybody want to talk about how I could use this line at 25 meters to decide? Donovan?

STUDENT: Whoever has the farthest to the left is the winner at the 25 meters.

TEACHER: Right here. Why would this one be the winner?

STUDENT: Because it's the closest to 0.

TEACHER: Yeah, if you go down to seconds, they went the fastest. And then, after that we have Brian, Bob, Dina, Dean. And Elizabeth is never going to make it. Just give up. If we decided to make our race go 35 meters, who would win? Brian.

STUDENT: But we did 25. But--

TEACHER: At 25 is really close.

STUDENT: But if Brian wasn't stupid and--

[INTERPOSING VOICES]

STUDENT: This guy was off. This guy was off. Instead, you should move it this way, like put the starting point right there. And then that will make a difference.

TEACHER: But Brian started 3 seconds late.

STUDENT: Oh, yeah, huh.

TEACHER: Yes. OK, but we took it to a real-world side instead of just the tile patterns like we did the last time. What do you think about this?

STUDENT: It was good.

TEACHER: It was good? I'm going to hand out a little half sheet for a check for understanding. The first question is, if you were in fourth-- if you came in fourth place in this race, what could one of your rates be?

So if you came in fourth place, what could a rate be that would have made you come in fourth place instead of first, second, or third? What rate could yours have been? Justify your answer, and the name at least two different ways you can represent linear relationships and why. Sorry, Chloe, and Logan.

I would look at, like, what are some rates that these guys are going. 14.5 seconds per 4 meter-- or per 25 meters. So could you come up with a rate that would put you somewhere between third and fourth place?

I want you to answer these questions as best you can, OK? And when you're done, you're going to leave your check for understandings in the middle of the desk, and I'll collect those. We're kind of in a different format today, so I don't have the real folders out.

Did you fill this part out? Did anybody in your group fill that part out? This could help you. Write your name on it. Leave it in the middle blank.

STUDENT: [INAUDIBLE].

TEACHER: Yeah, what would be your rate. What I want you to do is fill it out the best you can, leave it in the middle. Finish this up for homework. And then when you come back tomorrow, and I hand it to you, I want you to think about that question again, OK?

And again, we're trying to see that connection between linear relationships. And these patterns that we looked at yesterday with now real-world situations. Chloe?

STUDENT: [INAUDIBLE]?

TEACHER: Yes, finish the first side if you didn't get the first side all the way done.