Grade 8 Math Graphing Functions

Teacher: Okay, real quick. Coming around, so leave planners open. If you didn't already get your math book off of the shelf. Thank you. "student", planner? Student-2, can you focus? Write your assignment first before you do anything else. I know you're trying to help, but write your assignment anyways. "student", what's going on? Did you write it in yet? Okay, I'll come back. Thank you. "student", can I see yours? Thanks. I'm going to squeeze by. ["student"00:00:46] I'm going to put a comment in for you. I'm going to put a comment in for you so you don't think it's 910. Thank you. Thank you. "student", real quick. Thank you. Student-7, I need to come back, since yours wasn't open. Peeking in here.

Student: Teacher, can you get a calculator?

Teacher: Do you need a calculator?

Student: Yes.

Teacher: Okay, give me a minute. Student-2, glasses.

Student-2: I don't have them today.

Teacher: Okay, all right. Make sure you bring them. Just says 9 and 10. You're welcome. All right. Take out the worksheet that we were working on yesterday. The one we filled out all the tables, and then we started to put them in a graph form. Take that out. [00:02:00] I'll get mine up. Okay? Did you find yours? Yeah.

Let's review a little bit. What did you do yesterday before we left it? Student-3, what did we do?

Student-3: We filled in these tables.

Teacher: What are these tables?

Student-3: The tables on this worksheet. Then we started graphing, making our graph.

Teacher: All right.

Student-4: Then we started graphing, making our graph.

Teacher: It should be okay. If you can't find yours, hopefully a group member has one, and then you can just look on. You will need to answer a couple questions, so a piece of paper, Student-4, if you can't find it, okay? We're going to get back in the same groups that we had yesterday. Remember, I put your 3 groups into a group of 6. I combined you. We're going to get back in those groups, and then I'll give you your big poster and your next job. I want to kind of go over what we're going to do next so you can kind of see.

Your next job is part 2 of the worksheet, which says for you to ...

Student   Graph the functions.

Teacher: Graph the functions. You're going to take, as a group, green or red. You're going to go ahead and take your functions and you're going to graph them according to the colors. Remember they're all color coded? You're going to plot your points. We've checked all the points. They're all good. Then you're going to start graphing them. Then you're going to see something happening. That's going to help you to answer the question number 3, A and B. Student-4?

Student-4:   Are we sitting in the same spots?

Teacher: Pretty much the same spots. I'm going to kind of put one half of the groups on that side, and the other half on this side. Any other questions right now?

Student   No.

Teacher: You don't have to move with all your things, but you can if you want to, because we're going to come back to this spot in a little bit. This isn't an all period thing. Just do this part so we can do the next part. All right, so if you are in my groups B and D, the green groups, you're going to [00:04:00] be on this side, like you were yesterday. If you are red groups, A ...

Student   We switched around.

Teacher: Are you sure?

Student   Yeah.

Teacher: Sorry. Wherever you were yesterday. Let's go with that. Wherever you were yesterday. Go and get that. I'll get you your posters.

Class: [crosstalk 00:04:20]

Teacher: You've got to move the chairs around. If you want to put the tables together, you can. Just remember, we got to put them back when we're done. All right. I'm going to, "student", I'm putting your guys' stuff right behind you, okay? Why don't you guys get organized. Okay. Here is your poster.

Student   Thank you.

Teacher: Here are your markers. Ruler. Are you sure you have enough space in this area?

Student   [crosstalk 00:05:02] Just move all the papers. We only need one paper.

Teacher:	They sure can. Okay. Make sure the color matches what it says on the paper. You're going to graph out each [crosstalk 00:05:16]. Thank you. Okay. You guys are set. What color are you going to do first? Check the colors.
Student:	Red.
Teacher:	Oh, you're going to do that first? Okay. Then you're going to graph out the points, right? Work together. Graph it. Looking at our time, let's say 7 minutes for this? Graphing all 4. If we go faster, great. If not, that's okay too.
Class:	[crosstalk 00:06:00] [00:06:00]
Teacher:	You got it?
Student 9:	Y equals X plus 3. Y equals X plus 3. Negative 3 [crosstalk 00:06:35]
Teacher:	I see what ... You guys are trying to do the shortcut method of graphing? That's fine.
Student 10:	X would be 1 then?
Teacher:	You tell me. Look at the equation. From the equation, where's the slope?
Student 10:	Oh yeah. Up 1 and to the right.
Teacher:	Yeah, but remember, you're going by what numbers? 2s, right? You got to be careful. You're going to go up 1, which is just really a half, and 1 to the right, which is just really a half. Yeah. Nice and straight so we can look at it. What color is that supposed to be, Student-8?
Student-8:	Red.
Teacher:	Okay. Student-8 is in charge. Pencil first? Okay, good. Student-2, go right there.
Student 9:	It's to the power of. If it's to the power of 2, it's multiplied by itself.
Teacher:	[crosstalk 00:07:28]
Student 9:	Negative is positive.
Teacher:	Does that make sense, Student-2, what he said?
Student-2:	Yes.
Teacher:	You say, whenever you put something to the second power, it means to multiply it to itself 2 times. That's what he was saying to you. Then he was telling you a negative times a negative is a positive.

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Student-2:	So negative 3 to the second power is negative 3 times negative 3?
Teacher:	I don't know, is it?
Student-2:	Yeah.
Teacher:	Okay, let's keep going. You're okay right now. Keep going. See what happens. What's the next one?
Student-2:	0.
Teacher:	Okay. 0, 0 [00:08:00] A few people have noticed something that's happening with this one. Are the rest of you paying attention? Keep going, you're good. What's the next one, Student-11?
Student-11:	It's negative 1, 1.
Teacher:	1, 1. Positive 1, 1.
Student-11:	Student-2, the last answer is 1, 1.
Teacher:	Okay, good. [crosstalk 00:08:22] Think about what we just talked about. 3 times 3. All right. Student-5 was saying, "I don't see a straight line." Then Student-13 and "student" noticed it too. What is this doing?
Class:	It's curving.
Teacher:	Is that okay?
Class:	Yeah.
Teacher:	Is that still a function?
Class:	Yeah.
Teacher:	Okay, let's connect them. You've got to always connect your points. How's it going over here? What did we get to?
Student 9:	Is this 1 over 2?
Teacher:	Okay, so I know that you did the shortcut for this one, but I'm tell you that it's going to be better if you use the points in the graph, or in the table, excuse me.
Student 10:	So I would do that, so [crosstalk 00:09:04]
Teacher:	What's the first point?

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Class: Negative 3 by 10.

Teacher: Okay, so we're going to graph that point. So negative 3, negative 3, and then up to, okay good.

Student 10:   10, so right here, and that was also 3 by 10.

Teacher: You're going to do it on either side first?

Student 10:   No, in the equation it says ...

Teacher: You're right. I was wondering. You're kind of skipping around. You're going from here to here, and you're doing these 2 first?

Student 10:   Yes.

Teacher: Okay. That's fine. Just make sure everybody knows what you guys are doing. All right, what's the next one you guys are going to graph?

Student 10:   Next one is negative 2, which would be [crosstalk 00:09:42]

Student-8:   It would be a straight line, then?

Teacher: Let's see what happens. Let's keep plotting the points.

Student 10:   Negative 3 by 5.

Teacher: Other way. Negative 2 on the X. Negative 2 on X. Then what's the other?

Student 10:   5.

Teacher: Okay.

Student 10:   Okay.

Teacher: And then?

Student 10:   The last one [00:10:00] is negative 1 by 2.

Teacher: Negative 1, so negative 1. There you go.

Student 10:   2.

Teacher: Okay, that's not all of it, right? What else is there?

Student 10:   There's 0 equals 1. 1 by 2.

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Teacher: 1, 2, okay.

Student   Make this dot bigger.

Teacher: We're going to put it in color, right?

Student 10:   [crosstalk 00:10:27]

Teacher: 2.

Student-8:   It goes by the numbers.

Teacher: Okay, so what do you notice about this one?

Student: It's a V.

Student   It's curved.

Teacher: Is that okay? Is that still a function?

Class: Yes.

Class: No. [crosstalk 00:10:40]

Teacher: How do we know, Student-9, if it's a function or not?

Student-9:   [inaudible 00:10:45] because it's a function.

Teacher: Is it okay?

Student-9:   Yes.

Teacher: Let's connect that with what color next? Good. Okay, are we fixing something? Did something happen?

Class: [crosstalk 00:10:59]

Teacher: Which one do we had help? B?

Student   If it's 0 negative one, or ...

Student: I'll do B.

Student   Oh, 0 negative one. [crosstalk 00:11:07]

Teacher: If I put a 0 in, everybody look at your equation, what happens to the X part?

Class: [crosstalk 00:11:11]

Teacher: It's 0, right?

Student Yeah. It's 0.

Teacher: What's 0 plus 1?

Class: 1.

Teacher: Okay, so it is 0, 1. So 0, 1. Negative 1, negative 1, it looks like?

Student: Two negative 7.

Student: I thought they said 1, negative 1, so [crosstalk 00:11:32]

Teacher: Oh, I see what you ... Okay. Is it okay?

Student: Yes.

Teacher: Something ... one of the numbers is [inaudible 00:11:42]. Do you see, that this and this, this and this, this and this? So what are we missing? We just forgot to call it out. I like that you guys are putting arrows at the end of that. Okay. Curvy. Let's try the next one. [00:12:00]

Student Negative 1, and then ...

Student 2 X.

Student Yeah.

Student 2 X is your slope. Negative 3, negative 7.

Teacher: Remember, that already is going by 2s.

Student That isn't ... No, it doesn't say the coordinates ...

Teacher: Ask "student" what he's reading and what you're reading. See how they compare. Okay. Are we stuck again?

Student: [crosstalk 00:12:42] I think negative 1, negative 1.5 or is it 1.5?

Student: No, 1.5.

Student: Negative 1, negative 1.5.

Student	We don't actually [inaudible 00:12:51] the square.
Student:	Do the equation again.
Teacher:	Let's do the equation again. Let's go back. We're thinking which one is not right?
Student:	[crosstalk 00:13:03] Negative 1, negative 1.5.
Teacher:	Negative 1, negative 1.5. If I put a 1 in, what's negative 1 squared? What's negative 1 squared? Anybody?
Student:	1.
Teacher:	What's half of 1?
Class:	.5.
Teacher:	.5. What's .5 minus 2? "student", since you have a calculator, let's do that part. .5 minus 2. Negative 1.5. It seems to be okay. Is it not fitting in your graph?
Student	No, we just don't know how [inaudible 00:13:39].
Teacher:	Where to put it? Okay.
Student:	They messed up right here. They put it in 3.
Teacher:	That's okay. We'll just fix it. Let's try negative 1, negative 1.5. Negative 1. Negative 2 is here, so we're just going to go a little bit ...
Student	That would be negative 1.
Teacher:	Negative 1.5. [00:14:00] [ish 00:14:02]. Where the green dot is, negative 1, right? Is this one messed up?
Class:	[crosstalk 00:14:06]
Teacher:	Negative 2, 0 I think is okay. How about this one? Negative 3 and 2 and a half. I think that's okay. This is ... That's more 3?
Class:	[crosstalk 00:14:18]
Student 9:	This might be a positive though.
Teacher:	Oh, it's supposed to be a positive. That's why it's off. Good fix. Fix that. Looks like we need just a little more time. Try and finish all 4 graphs.

Student	Number 2 applies to this?
Teacher:	Yes. Good?
Student	Is their graph the same thing as ours, or they have different?
Teacher:	I don't know. We're going to find out in a minute.
Class:	[crosstalk 00:14:50]
Teacher:	Okay, everybody is done checking? Student-3 has been writing. Is it working out now that you made the fix? You guys taking turns? "student", what part did you do?
Student:	"student" did red. I did green. Student-12 was doing blue. "student" said they're going to do, which one was that?
Student-12:	Black.
Teacher:	The black one? Okay. Good? Check it again, just the ones that we've been doing. Does it looks similar to what you did for the red and the green? Do you have things? Do you see it? Connect it and let's see. Maybe you can see it better when you connect it. Done? Sure.
Class:	[crosstalk 00:15:45]
Teacher:	Now does it look similar?
Class:	Yes.
Student:	Your turn.
Teacher:	Okay, try the next one. You guys got one more. Then we'll catch up and do the next part. You guys finished all that?
Student 10:	[crosstalk 00:15:57] Are we going to have to draw the tables like they did?
Teacher:	[00:16:00] No, they did it a little different than you guys did.
Student 9:	We're just coloring this.
Teacher:	Okay, that's fine.
Student 9:	What color do you guys want to do?
Student-9:	Purple.

Student 10:	I would say blue.
Student:	We already used purple.
Teacher:	Someone help Student-10 out.
Student:	[crosstalk 00:16:21] Negative 2, negative 15.
Teacher:	Negative 2 on X. Maybe you'll need it for the next part.
Student:	[crosstalk 00:16:28] Negative 3, negative 18.
Student:	Negative 2, negative 13.
Teacher:	One at a time. One point at a time.
Student:	[crosstalk 00:16:38] What are you reading?
Student	The first one.
Student:	Oh, the first one. Negative 3, negative 8.
Teacher:	Find negative 3. Then negative ... Don't put the point there. That's okay. [crosstalk 00:16:47] That's all right. That's all right. Okay, since you guys are done, why don't you look at question 3? Student-4, did you find your paper? Okay, you did find your paper. Look at that and then see if you can answer part A and part B. First question, what did the graphs have in common? Not yet.
Student 10:	This graph, or their ...
Teacher:	Yours. Just yours. What do they have in common? What do you ... Then it asks which graph is different. What looks different about it? The equation.
Student 10:	There's another graph?
Teacher:	You have 4 graphs on here. They're all different colors. That's how I can tell. How do they compare to each other? What do the graphs have in common?
Student 10:	They're [inaudible 00:17:39].
Teacher:	You guys talk about it.
Student 9:	They're all constant.
Teacher:	Possibly.

Student 9:	They have to be, to be functions, because it says graph each functions. Because they're all functions.
Teacher:	That's true. We know they're all functions.
Student 10:	Smart.
Teacher:	Go here.
Class:	[crosstalk 00:17:56]
Teacher:	Then it's not a function. Good. [00:18:00] Is there anything else that they have in common that you can think of? Discuss as a group and don't forget to do part B. Then we're going to come back together as a whole group and look at each other's. How's it going over here? Good? Let's use a ruler for this one. I'm going to tell you there's something wrong with ...
Student:	Yes, I do see it, but they graphed it.
Teacher:	Let's try this. Can I have a pencil? Can I borrow a pencil? Let's try this again. Can you read me the points and we're going to check points.
Student:	3, negative 18.
Teacher:	Okay, so positive 3?
Student:	Negative 3.
Teacher:	Negative 3, negative 18. That looks okay.
Student:	Negative 2, negative 13.
Teacher:	Negative 2, negative 13. That looks okay.
Student:	Negative 1, negative 8.
Teacher:	Negative 1, negative 8. All right. What's next?
Student:	0, negative 3.
Teacher:	0. Are you sure it's a negative 3? Is that what everybody got?
Student:	That's what I put.
Student	We had a 13. Oh, no.

Teacher: Okay, so 0, negative 3. We're good right there.

Student: 1, 2.

Teacher: 1 ... Here's where we went wrong. Do you see why this point is wrong? It's supposed to be 1, 2. We went 1 ... Let's keep going. What's the next point?

Student: 2, 7.

Teacher: We put the 2, 7 here. Where's it supposed to go?

Student: Up here.

Teacher: Okay, so go up. Teacher. Hi. Study hall. Yeah, study hall. Okay, you're welcome. Bye. Okay, better? Can we use the ruler that "student" is holding for me? [00:20:00] Yeah, that's fine. You know what's going on. Okay. Good?

Student 9:   We noticed that these 2 are positive and this one is negative. This one's a V.

Teacher: Okay, that's true. That one's a V. We're looking for the one ... Which graph is completely different? Maybe I should add that adjective into it. Tell me that one. Then you're going to look at some more stuff about it. It says, "What's different about the graph?" And the what?

Student-8:   And the equation.

Teacher: Let's look at that too for the green one. Okay, good? Okay, so your job now is to look at question number 3 as a group and have a discussion. First question in question 3 says, "What do the graphs have in common?"

Student: Both cross. The Y intercept, that's what Student-2 said.

Teacher: Okay, that's a good idea. I see that happening. What else?

Student: They're somewhat proportionate

Student-13:   There's a pattern.

Teacher: There's a pattern to them. Maybe that is something you want to add. Pattern you saw in the ... How did you see the pattern? Student-13, here's a question for you. You said you saw a pattern. Where did you see the pattern at?

Student: The curve, or they cross each other.

Teacher: You said pattern. What makes you think of a pattern?

Student-13:   They make loops. [crosstalk 00:21:22]

Student-5:   The dots are going up. [crosstalk 00:21:23]

Teacher: Student-5, say that a little bit louder for everybody.

Student-5:   Because the dots are lined up.

Teacher: Remember, we're looking at how they're, she's calling them lined up. Maybe that's the pattern. Student-2, does that make sense? What they were saying about pattern?

Student-2:   I also have one. I see a pattern that some of the green and black lines, some of the lines are crossing each other.

Teacher: That's true. What's another word for crossing each other?

Student-2:   Intercept.

Teacher: Yeah. All right, what about the second part? You've got lots for the first. The second part says, "Which graph is different?" What looks different about the graph and the equation? There's one that doesn't belong. So you guys talk about that. I'm going to step away. You guys talk. [00:22:00] Good?

Student   Yes.

Teacher: All right.

Student-3:   I need a Band-Aid. Mine's coming off.

Teacher: What was I going to say? You guys, we're going to go ahead and then we're going to show. Because you guys had different graphs than they did. We're going to share out. Then you're going to explain the things you found out in number 3.

Student   Okay.

Teacher: Student-3, I can't get to the Band-Aids right now. They're blocked by the camera tripod.

Student-3:   Okay.

Teacher: Okay, sorry. Which one's different?

Student: The black one.

Teacher: Why?

Student-2:   Because it's straight and the other ones are looped.

Teacher:	What do you notice about the equation part of that?
Student:	Blue is shorter, black is longer.
Teacher:	This is true, but could I make the blue longer?
Student:	Yes.
Teacher:	You have those arrows on it. It could keep going, right? How about, the second part of the question says, and the what? Second part of B.
Student:	What is different about the graph and equation?
Teacher:	Equation. If you say the black is different, look at your paper and look at the black equation compared to all the other ones.
Student:	It has the B at the Y intercept, and the equation, and how much they're dividing and multiplying by.
Teacher:	It might. A doesn't have an intercept either. There's no plus B there. Why isn't the red one different than the other ones? Maybe it's not just the intercept. Maybe it's something else.
Student:	It doesn't have powers.
Teacher:	What do you mean, doesn't have powers?
Student:	It's the only equation without a power.
Teacher:	What do you mean by without a power?
Student:	It doesn't have a power, to the second power.
Teacher:	All right. Write that down. Once you guys finish this, we're going to share out. You guys had different graphs than the other group did. [00:24:00] You're going to share your picture. Then you're also going to talk about your answer to 3, okay?
Student:	Got it.
Teacher:	Student-3? Yeah, sorry. Go ahead. It's on the side. You're making it neater? Can I take it to hang up? Because they're done too. Yes, Student-9?
Student	What do we do when we're done?
Teacher:	They're just about done too, so we're all going to talk about it in a second. After Student-9 comes back inside. You guys good with this one? Can I take it and hang it up?

Student	Yup.
Teacher:	Thank you. I should put your guys' on. Different? They are. Yes, Student-4. Okay, can I get your attention? We're going to all look this way. Stay where you are, just turn your bodies if your back is facing me. Excuse me. You had to answer the question number 3. It says, "Answer the following questions about the functions." I put your graphs up. We're going to take a look at them in a little bit. What do the graphs have in common? Which graph is different? What looks different about the graph and the equation? If you look at the 2 groups, what do you notice about the [00:26:00] graphs? Either in your own group, or now that you're comparing 2 of them, what do you notice about the graphs? "student", what do you notice?
Student:	That the one from the other group are more straight, and ours are curved.
Teacher:	This group had mostly straight, is what Student-10 noticed. This group has mostly curved, because that's the group that he worked in. What else do you notice? Student-13, what else do you notice?
Student-13:	They have 1 curved line, and we have one straight line.
Teacher:	Okay, that kind of leads me to the second part of the question, which one is different for you guys? So which one was different from you guys?
Student	That we had 1 curved.
Teacher:	What was the difference for you guys?
Student:	1 line.
Teacher:	1 straight one, right? 1 line. What do you notice about the second part of it, the equation part? What do you notice that's different about the ones that were straight, compared to the ones that were curved? Student-11, what do you notice?
Student-11:	They probably had to the second powers on ours, but they didn't have. We only had one.
Teacher:	Is that the same thing? What did you guys write down, what was different about the equation?
Student	Only one of the was squared.
Teacher:	Squared. Second power, squared, all saying the same. What is being squared? Which part of the equation?
Class:	The X.

Student	The X multiplies it by itself.
Teacher:	Right. If we looked at it, it said that there was something with an X to the second power. All the ones that were straight just had an X. That's the difference between the 2 equations. When they're straight, do you remember what kind of function this is, when they're nice and straight? Do you remember what the name of it is?
Student:	Proportional?
Teacher:	They can be proportional. It can be constant. What else?
Student:	Linear.
Teacher:	The linear. Good, "student". Say it a little bit louder for everybody to hear.
Student:	Linear.
Teacher:	Yeah. They are linear. These are linear. What do you think the curved ones are called, then?
Student	Non-linear.
Teacher:	Non-linear. That's kind of what we're going to be focusing on today. Looking at [00:28:00] what makes something linear, what makes them non-linear. You were able to graph them just by making a table of values. We're going to do a quick cleanup and then we have something additional to do. We're going to do a little bit of notes. You're going to move back to your seat. Turn back all the chairs. Bring me the ruler. Hold on to your paper. That group, you've got to spread apart the tables. "student", [inaudible 00:28:25]. "student". Ruler? Markers? Thank you, thank you. [crosstalk 00:28:35] Yes, I had that on the warm-up today. Thank you. Watch out for everybody. Careful, careful.
Student:	Be careful.
Teacher:	How'd that chair get all the way over there?
Student	I got it.
Student:	That's his favorite chair.
Teacher:	That's his favorite chair? We're going to start by taking everything that you did with the graphs and what you talked about in your small groups and what you shared out, and put it in a formal notes section. Need something to write with. Preferably a pencil.
Student	Notebook?

Teacher:	You will need your notebook. Go ahead and take out your notebooks. We're not ready to do that part just yet. Can you make sure "teacher-2" gets one? You're going to hold onto that. That one got cut off. When you get yours, can you check it? I accidentally cut some of them. Did I give you 3? Thanks. Do you guys have 4 or 5? 5, okay. I actually cut some of them in half. Does anybody have a cut one?
Student	Someone does in our group.
Teacher:	No, theirs looks okay. Yours is okay though, because you have the half top off. [00:30:00] We're going to take what we've been talking about, and how can we compare them? You told me already that you know the straight one is called what kind of function?
Class:	Linear.
Teacher:	The ones that are curved are called ...
Student	Quadratic.
Teacher:	You guys are reading off your paper already. We said it was called ...
Class:	Non-linear.
Teacher:	Where's my graph? Okay, for some reason my graph isn't up here. I'm just going to put it up here then. It didn't get saved. There it is. There are many non-linear types of graphs. We looked at them. We know that they're functions. They don't have to be this shape. Which shape do you see when we look at these ones?
Student	Loop.
Student:	V.
Teacher:	A V, or a loop. They're actually a U shape. It's called a parabola. This actually curves here. A different type of function makes it into a V. These types of functions, with the X squared, makes it into a U, a parabola. Those are called, as you can see on your Venn diagram, a quadratic function. We're going to use a Venn diagram. Why do we use Venn diagrams? What are they for? "student"?
Student:	Compare and contrast.
Teacher:	Yeah. Very good. To compare. That's basically what we're doing. To compare and contrast. See what's similar, what's different. In the middle go the what?
Student	The same things.

Teacher:	The same things. For each one, we're going to put the different stuff. Somebody tell me something you know about either one of them, or something that they have that's similar? Remember, I'm going to write upside down. It might be a little messy. "student"?
Student:	Linear equations are straight.
Teacher:	We're going to go to linear functions, and we're going to write that they are straight. All right, so linears are straight. Student-8, what do you want to say?
Student-8:	Quadratics are curved.
Teacher:	Very good. We're going to go here. Quadratics are curved. Anything ... [00:32:00]
Student 10:	Can we do the same?
Teacher:	Yeah, sure, if you want to fill in the middle. What's in the middle?
Student 10:	They can both be functions.
Teacher:	They are both functions, good. Hence the name functions underneath them. They're both functions. They pass the function test.
Student	Vertical line test.
Teacher:	That vertical line test. They can both intercept the ...
Student	Y intercept.
Teacher:	Y ... What's that called?
Student	Axis.
Teacher:	Y axis, sure. They have Y intercepts. Sorry. That's messy. What else? What else can you say about them? Student-11?
Student-11:	For the quadratics, they go by squared.
Teacher:	What gets squared again?
Student-11:	The X.
Teacher:	The X. Quadratic functions, their equation comes in the form Y equals something with X squared.
Student-14:	Meaning that linear functions go by just X.

Teacher:	Just by X. Can we put that over there? Y equals X. What do you guys know the equation to actually be? Y equals ...
Student	M X plus B.
Teacher:	Very good. I'm going to tell you that for quadratics, there are also coefficients, or numbers in front of the X squared. We can also add things to it, but we'll just leave it as X squared for now. Anything else that you want to add about linear and quadratic functions, or both? Student-4, what do you want to say? Never mind? If they both have Y intercepts, what else could they have?
Student	B.
Teacher:	X intercepts. Yeah. Not all the time, but ... I'm going to re-write that, because I was messy in my spelling on the last one. If I look at my pictures, not only do they cross the Y axis somewhere, [00:34:00] but they also cross the X axis. The same is true, not all the time. Look at the green one, it didn't cross the X, but they can. Anything else that you want to add? I'll give you a hint. What if you look at your tables? Can you tell me something about the difference between the tables of linear and the tables of non-linear? What do you notice about those tables that we did? What do you want to say about the tables? Student-14, what do you want to say?
Student-14:	In the pattern of a quadratic function, they are all powered. Negative 3, negative 3, they are both [inaudible 00:34:40].
Teacher:	If you look at the one that was quadratic, the curved one, the one with X squared, the pairs match. I think Student-5 called them lining up, remember when we were looking at it? You said that they line up. They're basically what is called a mirror image of each other. If I take this and fold it, they're going to match. That's always going to be the case. When you look at your table, you're always going to have matching pairs. What's a good way for us to describe that in here so we remember? What do you want to call them?
Class:	[crosstalk 00:35:13]
Teacher:	Reflections. I like that word. Let's put that there. Points are reflections. I ran out of room, so I'm going to go outside my circle.
Student-3:	Linear functions, the dot can be anywhere, as long as it's a straight line?
Teacher:	As long as it's a straight line. It makes a straight line when we look at points. What do we have to know about those points? Those patterns? Student-3? They have to be ...
Student-3:	Constant.

Teacher:	Remember when we were looking at it, what's the abbreviation for the constant? What's the letter we used to use?
Student-3:	M.
Teacher:	M is our slope, yeah. We also use what other letter, do you remember?
Student:	B.
Student	K.
Teacher:	K, [00:36:00] there it is. Constant K. The constant of proportionality. Doesn't necessarily have to be proportional, but it does have to be constant. I'm going to add one more to that. Has to have a constant rate of change. Since you mentioned slope, I'm going to call it constant rate of change. I'm going into the wrong thing. We have something about the equation, something about the graph, something about the table. Is there anything else that you want to add, either for differences or the same? Student-3?
Student-3:	All the X values are the same in the tables.
Teacher:	That's true. We use all the X values that are the same. Do we have to, though?
Class:	No.
Teacher:	No. We did in this case, so you can see a good picture of it, but we didn't have to. Is there anything else that you want to add? Okay, so I think we did a good job filling this in. This is going to help you to do the homework for today. The keys are looking at the type of equation and noticing that they're different. You picked up on it right away because of the power. Remember, this one is for quadratics. We can do other curves, as long as this is bigger than 1, it will be a curve. What's the exponent over here?
Class:	[crosstalk 00:37:23]
Teacher:	If we don't see one, what numbers are here?
Class:	1.
Teacher:	1. This has a 1. This is more than 1, it's going to be curved. The other thing to remember is this has a constant rate, while this one does not. The points are reflections. This is straight and this is curved. Questions on that? We're going to paste, so let me get the baskets passed out. Help me out. What page are we on?
Student-3:	Page 43.
Teacher:	43? Can any of you guys confirm? I only heard Student-3 say it. So we can confirm?

Student	Can we cut off the edges?
Teacher:	Yeah, [00:38:00] you can cut off the excess if you want to.
Student	Are we doing right or left?
Teacher:	We're going to go right ... No, I'm sorry, left. No, wait, what do I want to say? I'm sorry. I do want to do the right. Can we give one to Mr. Shane, guys? 43, then. [crosstalk 00:38:20] Don't lose this, then. We'll just paste it in later.
Student:	I'm on 34.
Teacher:	You're only on 34? Are you sure?
Student:	Yeah.
Teacher:	Let me see. Maybe because you haven't been putting some of yours in. Okay, why don't you go ahead and number up to 43. Can we work on this during Monday action period?
Student:	Yeah.
Teacher:	Thank you. "student", just put it in a safe place so we don't lose it.
Student-3:	Teacher, towards the top
Teacher:	43. It doesn't actually matter. This is the only thing we're going to put in this section. Student-3 asked, "Towards the top?" I said, it doesn't really matter. You can put it anywhere you want. I had to put mine in sideways because I didn't think to cut off the edge. You can just put yours wherever you want. Student-4?
Student-4:	Can I throw away my rubbish?
Teacher:	Yeah, you can throw away your rubbish. Remember your 5 dot method. Don't put too much glue. Some of your pages are starting to stick. Once you do that, you throw away your trash. Put the glue back together. We're done with the notes for right now. You can put that away. We're going to look at the math book next. I give everybody a minute to finish gluing in.
Student:	I did this, but some is missing.
Teacher:	Yes, because you didn't have all of it. Remember that one? You just did the rest of it? Okay, I'll check it right now.
Student:	This one is 42?
Teacher:	43. [00:40:00] That's okay. Student-5 [inaudible 00:40:06].

Student:	I didn't know whether [inaudible 00:40:09].
Teacher:	This one. If I connect these, and I do ... Do you see it? Now see why it's not? [crosstalk 00:40:17] This is actually ... Be careful. There's 2 in a row. Checking, checking. Okay, good. Otherwise it's good. I'll put it in later today.
Student	Can I go sit in the back?
Teacher:	Yes. Let's look at the page I asked you to do for homework. Everybody has their math book? If you didn't get your math book, get it off the shelf. Are you all right? Was there a bug in there?
Student	What is it? What was it?
Teacher:	All right, "student". You're all right. We'll just shake it out. Oh, it's just a picture? All right. What page are we on?
Class:	165.
Teacher:	Let's go ahead and rip it out. Rip out your page 165. Did you already rip it out? Rip out your page. I asked you to do 9 and 10. It's going to be very similar to what you did in your group work today. You're going to take the points. You're going to plot them, and then you're going to answer questions about it. Remember, the focus is linear and non-linear. You got to look at the picture and answer questions dealing with that. Questions on what you have to do for homework?
Student	No.
Teacher:	No? Yes? [00:42:00]
Student	[crosstalk 00:42:03]
Teacher:	Nope, just 9 and 10. Nope, just 9 and 10.
Student:	Can we do it now?
Teacher:	You can start. Go put your book bag on the shelf so that we don't have to worry about the bell ringing. That's not even on anyways. You guys all right?
Student:	He was hyperventilating for a few minutes. [crosstalk 00:42:46]
Student-3:	Are you collecting the function families?
Teacher:	I am not. The worksheet that you did with your group, you're going to hold on to that. It's going to be a study tool for ... [crosstalk 00:43:08] We have a couple minutes. We went a little faster than I thought. You guys were quick to pick up. Is that a bee?

Student   I can pick it up if you want.

Student: What is it?

Teacher: Just leave it. Okay, since we have a couple minutes, we ended a little earlier. You guys were pretty quick to figure it out. I'm going to put up linear or non-linear, and then you're going to tell me linear or non-linear. We'll do it this way. If you think it's linear, you're going to hold up and put an L with your fingers. If you think it's non-linear, hold up the other side, where it's not an L. Do you understand what I'm saying?

Student: Is this L?

Teacher: Your right hand makes the L to me. Your left hand makes the L to yourself, so it would be not an L to me. Okay, got that? Right hand, L if it's linear. Left hand, not an L if it's non-linear. Ready? Here's the first one. [00:44:00] Is this linear or non-linear? Linear or non-linear? Hold up your L or not L. L is right hand. Not L is left hand. Hold up your right hand if you think it's linear.

Student: Can we just do you say linear and then we raise our hands?

Teacher: I guess we could. I thought it would be kind of fun to hold up Ls, though. Am I confusing you with the Ls? Okay, good. How do you know that this is linear? How do you know? Student-14, how do you know?

Student-14:   It is linear because it does not contain the square of X.

Teacher: It doesn't have an exponent that's bigger than 1. How about this one ... This is linear, yes. How about if I draw a picture? Linear or non-linear? Linear or non-linear? Confusing Ls, let's do hands instead. How many thing this is linear? How many say this is non-linear? How do you know, Student-7? How do you know this is non-linear?

Student-7:   Because it doesn't pass through the thing.

Teacher: No, it doesn't have to pass through the thing.

Student-7:   I wasn't here for the last couple of days.

Teacher: You were just here, just now.

Student-7:   I mean like ...

Teacher: Student, help her out. Why is this not linear?

Student: It's not straight.

Teacher: It's not straight. If it has a curve, it's not linear. All right. Thank you guys. Do your homework this weekend. I'll see you on Monday.