Desmos Happy Hour

Transcript February 29, 2024

SARA LARKIN: Have you go ahead and start us. We are recording. OK, thank you. So hello. This session is about the Desmos calculators. If you wouldn't mind all muting yourself for now, that would really help us out. And hopefully, you're all here for the Desmos calculator.

My name is Sara Larkin. I am a statewide math consultant for the Iowa Educational Services for the Blind and Visually Impaired. I have Susan Osterhaus here, who does the same thing in Texas, and she is going to help me out with the slides. And then that way I can just leave my screen reader on because we are going to use the entire calculator with the screen reader.

So welcome to everybody. Susan, want to go out and go to the next slide? So basically, there's five things we're going to do today. First, I'm going to give you just an overview of the Desmos calculators, some of the features of the tools that are available, what the accessibility keystrokes are for using a screen reader with it.

We'll actually do a lot of demonstration today so that you can actually see it in use instead of spending a lot of time on the slides. And then we'll end with some useful links that you can access later. So on the next slide some of you may or may-- I think there's one slide before that.

SUSAN OSTERHAUS: Sorry.

SARA LARKIN: Yep. So as far as what is Desmos? Some of you may have heard of it, and some of you may have not heard of it. But what's nice about Desmos is it is absolutely free for students to use and, as far as the calculators goes, Desmos has done a great job of making it accessible for our students who are blind or have low vision, either one.

We're going to focus on the blindness part because everything I do today I will use a screen reader with. What's nice is all of those accessibility features are embedded. And we can even use audio output, which is most of what we'll be using today, but you can also hook up a braille display, and you can get braille input and output as well. But we're going to be focusing on just using the sound.

So go ahead and go to the next slide, Susan. So first of all, what type of calculator does the student need? That's the first thing you want to ask yourself. Students start with a basic four-function calculator, then they get into a scientific, which has some more capabilities, and, of course, the graphing later that has even more capabilities.

Now I will tell you, if the student has screen reader capabilities or has their typing skills and they know how to use a screen reader, they could actually even start with a graphing calculator. You don't have to

go through the four-function, then the scientific, then the graphing because the graphing is also a four-function calculator and it's also a scientific calculator.

When I do this, I'm actually going to go ahead and go to the Desmos page using the screen reader shortly. And I like to just-- there's all kinds of things on the page. I just do a "Control-F," and I find the button for whatever type of calculator I want to access. And we'll go through that in a little bit.

Want to go to the next slide? So basically, the four-function calculator is just desmos.com/fourfunction, with no hyphen. It includes adding, subtracting, multiplying, and dividing, your decimal numbers, parentheses, and it also has a square root and an answer key. The only key that is not on the graphing out of this list is that answer key. That is only available on the four-function and the scientific calculator. And then I've given you a link for all of the shortcuts, but the shortcuts we go through today will be able to allow for basically 90% to 95% of what you might do. So even though there's a long list of functions, we're going to go through your major ones that are going to get you through most everything that you would need.

Next slide. So the scientific calculator then will do absolutely everything the four-function does plus you can do fractions, percents, exponents, other types of roots, even trigonometry, and logarithms. So we'll look briefly at the scientific calculator when I go in, but the actual path for that is desmos.com/scientific. Remember, I usually just go to desmos.com and search for "scientific", and I'll actually show you that in a little bit.

Again, there's a list of shortcuts, and I've given you that link, but most of what we're going to go through today will handle most everything that you would need.

All right, go ahead and go to the next slide. Oops, hang on. Let's go to the tutorial. Sorry, about that. So before we go to the poll-- that means you guys are going to be quizzed on this. So we'll see how well you're paying attention to everything.

All right, so I am going to take over the screen. All right, I have my screen reader running. Oops, I don't think I did sound. Hang on. Let me share one more time. All right.

SCREEN READER: New meeting share screen.

SARA LARKIN: And hopefully you are hearing—

SCREEN READER: You will start a screen share

SARA LARKIN: --my screen reader well.

SCREEN READER: Screensharing--

SARA LARKIN: And I'm going to start from the very beginning. So all I'm going to do is hit the "Windows" key on my PC keyboard. When I hit the "Windows" key, I'm going to be able to search for Google Chrome.

SCREEN READER: Search box edit. C-H-- Google Chrome app. Press right to switch—

SARA LARKIN: So I only had to say two letters, C-H, and my Google Chrome came up. Then I can hit "Enter."

SCREEN READER: "Enter." Address and search—

SARA LARKIN: Now, I'm in a browser. I'm in the Google Chrome browser, and I'm just going to type "desmos.com." Now, if it's the first time, I'll have to enter all of that. I wouldn't if I've been in there before. A lot of times I can just type D-E-S. So I'm going to type desmos.com.

SCREEN READER: D-E-S-- mos.com. --M-O-S period O-M.

SARA LARKIN: And I'm going to hit "Enter."

SCREEN READER: "Enter."

SARA LARKIN: And now I'm already at that Desmos page. And there's all kinds of things on here, but we're going to focus on the calculators because that's most of what the students do. Plus, some of the other classroom materials are not accessible. Some are and some aren't.

SCREEN READER: From Susan Osterhaus—

SARA LARKIN: We're going to focus on the accessible pieces of the calculator.

SCREEN READER: Susan Osterhaus—

SARA LARKIN: So now I'm going to go into the scientific calculator just to show you, briefly, with that answer key. I'm going to do "Control-F" and type "scientific."

SCREEN READER: Virtual, Find, JAWS version-- "S-C-I-E-N-T-I-F-I-C," "Enter." JAWS professional, "Enter." Virtual Find, JAWS Find dialog, "Enter," JAWS professional, "Enter."

SARA LARKIN: Is it not? Of course, Zoom sometimes affects this.

SCREEN READER: Virtual, Find, JAWS version 2024.23, "Enter." JAWS professional, JAWS version—

SARA LARKIN: It's nice when it stops--

SCREEN READER: Address and search bar. Find edit, blank, type in text.

SARA LARKIN: There we go.

SCREEN READER: "S-C-I-E-N-T-I-G-I--"

SARA LARKIN: Scientific calculator. I'm going to hit "Enter."

SCREEN READER: "Enter." "Enter."

SARA LARKIN: Oh, think Zoom is affecting it a little bit.

SCREEN READER: Desmos vertical—

SARA LARKIN: So usually, I would just be able to hit—

SCREEN READER: --and info.

SARA LARKIN: Usually, would just be able to hit "Enter." So I type "scientific" and hit "Enter." All right, so now it puts me right into my calculator area. And I can just type, using the keyboard, basic computation pieces. So let's say I do a three-digit number plus a three-digit number.

SCREEN READER: 345 + 688. 345 + 678 = 1,023.

SARA LARKIN: Notice it read what I typed, and it read the answer.

SCREEN READER: Nancy [? Cloone ?] says—

SARA LARKIN: At the moment that I pause, it actually gives me that answer. If I keep typing, it's not going to give the answer until I pause. Now, if I hit "Enter" again, I can do a new calculation. And this is the one capability that the scientific calculator has that the others don't. And that is how to use that answer to do something else to it. Let's say I want to use that answer and subtract something from it. So I can just type A-N-S—

SCREEN READER: A-N-S end quote. Ans equals—

SARA LARKIN: --and it's taking my answer of 1,023 and then it's going to let me subtract—

SCREEN READER: Dash, Minus. Ans minus-- you need something on both sides of the apostrophe dash apostrophe.

SARA LARKIN: Yep. It says I need something else over there after that minus sign. So let's type something in—

SCREEN READER: 100.

SARA LARKIN: --and hit "Enter."

SCREEN READER: "Enter." Expression 3:Edit. Blank, type in text.

SARA LARKIN: Now that's blank. I didn't pause. I hit "Enter." If I go back up—

SCREEN READER: Expression 2:ans - 1,000 equals 23. Edit, blank, type in text.

SARA LARKIN: --I can review any of those previous calculations.

SCREEN READER: Expression 1:345 + 6—

SARA LARKIN: So all I'm doing is arrowing between those expressions. All right, I'm going to go ahead and go back to my address bar and go to the graphing calculator because everything-- for calculations that I'm going to do on the graphing calculator for computation I can do on the scientific calculator. So let's go ahead and go back to there.

SCREEN READER: Alt-D, radians. Address and search bar. E-O-O-S, desomos.

SARA LARKIN: Back to-- it might help if I spelled right.

SCREEN READER: D-E-S-M-O-S period O-M, enter. Desmos vertical-- Desmos.

SARA LARKIN: I'm back to that main page.

SCREEN READER: Virtual find, JAWS—

SARA LARKIN: Not the virtual find.

SCREEN READER: Virtual find, JAWS-- virtual find. Virtual find, JAWS version-- G-R-A-P-H, Enter. Graph showing the collection of tangent lines to a-- Desmos vertical bar. Let's learn together. Visited link graphing calculator.

SARA LARKIN: I'm on the graphing calculator. I'm going to hit "Enter."

SCREEN READER: Desmos vertical bar graphing calculator. Loading, dot, dot, dot. Desmos graphing--

SARA LARKIN: And now let's look at some of these other things that I could have done on the scientific. But I just want to show you that I can do the exact same things in this graphing calculator. And what's nice about that is then a student doesn't necessarily have to learn two calculators. They could just start in the graphing calculator.

You can start them on the scientific or the four-function first, but you can go straight to the graphing and not use the graphing part. So let's say I want to do just a basic fraction. Well, somebody tell me what are the first four letters of the word fraction.

SUSAN OSTERHAUS: F-R-A-C.

SARA LARKIN: Thank you, Susan. F-R-A-C. So guess what I'm going to type.

SARA LARKIN AND SCREEN READER: F-R-A—

SCREEN READER: Quote, unquote, C, quote, C, quote.

SARA LARKIN: And the minute I hit C, I have a fraction that shows up on my screen. Now, I can just type the numerator. So let's type a 2.

SCREEN READER: 22.

SARA LARKIN: Halve.

SCREEN READER: Beginning of denominator.

SARA LARKIN: Now I can do the denominator.

SCREEN READER: 33. 2/3—

SARA LARKIN: Now my cursor is down in the denominator, so if I want to add or subtract or multiply or divide another fraction—

SCREEN READER: [INAUDIBLE]

SARA LARKIN: --I want to make sure I get out of that fraction to do it. If I want to add in the denominator, I can stay there. But if I want out of that fraction, I need to "Right Arrow."

SCREEN READER: After start fraction 2/3. End fraction.

SARA LARKIN: Did you see-- hear how it said it was after start fraction 2/3, end fraction. So it's letting you know where you are in that area. So now I can subtract another fraction. And I'm going to give you the second way that I can do a fraction.

SCREEN READER: Dash minus, 2/3 minus, you need something on both sides of the apostrophe dash apostrophe.

SARA LARKIN: Of course, I need something after that minus sign. That's why I have an error there. Now here's the other way I can do a fraction. I can just type the numerator slash denominator. So I can type the first four letters, F-R-A-C, or I can just type the numerator/denominator as long as it's just nice, neat numbers. So let's say I have 1/4.

SCREEN READER: 1/4 4. 2/3 minus—

SARA LARKIN: All I did is 1/4. And then at that point, I pause. It reads to me that decimal answer that I get. I can just hit "Enter--"

SCREEN READER: "Enter." Expression 2—

SARA LARKIN: --and now do another expression. And like the other scientific calculator, I can go between these as well. All right, the next thing I want to do that's not as common is the square root. So there's some nice consonants there for me in square root, S-Q-R-T is what I'm going to type, just those four letters. Like four letters in fraction. Instead of the first four letters, I'm going to use S-Q-R-T.

SCREEN READER: S-Q-R quote, R quote, T, quote, T, quote. Start root, end root. Radical cannot be empty.

SARA LARKIN: Of course, it can't be empty. I better put a number in there. So let's put something like 49 in there.

SCREEN READER: 499. Start route, 49. End root equals 7. From unit to everyone, colon, can you get—

SARA LARKIN: So notice it told me start root 49, end root equals 7. Now at this point, I'm underneath that square root. So I could type a minus and put more under the square root.

SCREEN READER: Start root 49 minus end root. You need something on both sides—

SARA LARKIN: You'll notice that minus is inside of it. Or I could just backspace and arrow out of it.

SCREEN READER: After start root 40 dash minus.

SARA LARKIN: And now subtract outside of it.

SCREEN READER: Start root, 49.

SARA LARKIN: So you can do those operations inside of the radical or outside. But when you're done with that radical, be sure you "Arrow Right" to get out of that radical sign. All right.

SUSAN OSTERHAUS: Sara, I have a couple of questions.

SARA LARKIN: Yes.

SUSAN OSTERHAUS: On that fraction one, you got a decimal answer there. Wondering if you could have gotten a fractional answer.

SARA LARKIN: Yes, you can. There is a key for that. Let's see if I can remember it.

SCREEN READER: Expression after start fraction, 1/4, end fraction. Virtual find. JAWS version-- escape. Type and text. "Alt-F," Context Menu, to Nav-- Escape. Leaving menus.

SARA LARKIN: I will look that up and I will add it to the slides before we post.

SCREEN READER: Suzanne raised hand.

SARA LARKIN: I can't remember what that is, but yes it is just a keystroke and that allows you to toggle between those decimals and fractions is just using that keystroke. And then—

SUSAN OSTERHAUS: There was one more question and it was-- and I don't know if you're going to still do something about that, but they were wondering if you wanted to add an index. In other words, if you wanted a third root or fifth root and so forth.

SARA LARKIN: Let's do one, OK? So in that expression—

SCREEN READER: Expression 2:start root.

SARA LARKIN: --I can just type-- like, cube root is C-B-R-T. And then there's nth root for other roots. So if I do C-B-R-T—

SCREEN READER: C-B-R-T, beginning of root—

SARA LARKIN: Now I have the cube root.

SCREEN READER: Start root. 48, 8. Suzanne has lowered hand. Start root.

SARA LARKIN: And now I have the cube root. So yes, it's S-Q-R-T for square root, C-B-R-T for the cube root, and N-T-H-R-T for nth root.

SCREEN READER: From Carrie Floyd to everyone, colon, click the fraction.

SARA LARKIN: So it's so easy to just enter those values in there. Yes, Susan?

SUSAN OSTERHAUS: Whoops. Well, I was just going to say that someone answered. She said click the fraction symbol in the blue box to toggle to fraction answer.

SARA LARKIN: Yeah, I can click in it, but then I can't use a screen reader. So there is a command, yes, to do that. Like I said, I'll look up what that command is. I don't use it a lot. And it's in that list of keystrokes. So if you open up that document that has the list of keystrokes, that's going to have how to convert between the fractions and the decimals. It's just a keystroke while you're in the box.
So at the point that you pause and you do the keystroke, it'll convert it.

All right, so we've taken care of square root, we've taken care of fractions, we've used the answer. Let's do one more thing. Let's do exponent.

SCREEN READER: From Suzanne to everyone, colon, you will be—

SARA LARKIN: Say I want to get out of my square root, I'm going to arrow to the right.

SCREEN READER: After start cube root 8.

SARA LARKIN: And now instead of a radical, I'm going to do an exponent. And I can do any power I want. So let's say I want to add 5 to the fourth power. So I'm going to go ahead and do plus—

SCREEN READER: Plus, plus.

SARA LARKIN: --on my keyboard.

SCREEN READER: Start root, 55.

SARA LARKIN: And then to get the exponent, there's a little caret above the 6 key. So I'm going to do "Shift-6" to get to that caret. So "Shift-6."

SCREEN READER: "Control-6."

SARA LARKIN: Well, it might help if I did Shift.

SCREEN READER: Caret, superscript baseline. Start root, 49. End root, minus-- start cube root 44. Start root 49, end—

SARA LARKIN: Again, my cursor's up in that exponent. So if I want to do something else, I need to arrow to the right to get out of the exponent. So if I have more I want to put in here, I would want to "Arrow Right."

SCREEN READER: After superscript 4.

SARA LARKIN: And it tells me I'm after the superscript. So it's really slick to use the keyboard to do any of those fractions, decimals, exponents, radicals. Really slick. So we are now going to switch over to Susan and take your first poll. Let's see how well you can remember what we just went over. I'm going to stop sharing.

All right, poll number one. Question one, how do you type a square root? Is it the word "square," the word "root," or the letters S-Q-R-T?

Don't put them in the-- you guys are putting them in there. There will be a poll, so we're just going to go over the questions real quick. And then we'll have you add your answers to that. How do you use the previous answer in a new calculation? Do you type the word "answer," type the word "last," or type the letters A-N-S? Don't tell me yet.

Question number three. How do you type a fraction? Type the word "fraction," the letters F-R-A-C, or the numerator/denominator? And the last question. How do you type an exponent? Do you type the word "exponent," the letters E-X-P, or the caret, which is "Shift-6?" So let's launch the poll, Susan, and let's see how everybody does.

Ooh, it's going up. Good. Lots of correct answers here. All right, let's see if you're right. We have most of the respondents. There's probably about six people that haven't entered it. First question. Go ahead and end the poll, Susan, if you would. And we'll take the 28 out of 33 answers.

And I'm going to go over the correct answers. So for the first question, for square root it is S-Q-R-T. 100% of the people got that right. Second question, how do you use the previous answer in a new calculation? 89% got it right.

SPEAKER: I can't see what they're doing.

SARA LARKIN: Someone is not muted that's on the phone. So if you would mute yourself, please, that would be great. So you type the letters A-N-S. 89% got that one right. For fraction there are two ways. So most people liked the F-R-A-C, 93%. And another 29% caught that there is a second way, numerator/denominator for doing a fraction. And the exponent, the last one, 86% got it right. Type the caret with a "Shift-6." Nice work.

All right, go ahead and go to the next slide, Susan, please. OK, so we can do a lot more on the graphing calculator other than just calculations. So we want to make sure and hit some of those additional pieces as well. We can do tables, we can graph both equations and inequalities, we can do statistics, we can even generate random numbers. And so, again, I've included all of the graphing shortcuts for you in the link.

Let's go to the next slide, and then we'll go to our demo again. The graphing keyboard entry-- a few things that come in handy as we do our graphing. It helps to know how to get to a new expression, how to get rid of expressions, and how to add tables. So first of all, anytime I get somewhere out of the calculator, or let's say I'm on the graph, I can do "Control-Alt-E" to get back to my expressions list. The other thing I can do is "Control-Alt-X." So notice it's kind of three keys there, Control with the Alt to add an expression. Expression is "Control-Alt-X" for expression.

And delete the current expression is "Control-Shift-D" for delete. It's "Control-Shift" this time instead of "Control-Alt." To add a table, I can do it two ways. I can do "Control-Alt-T" or I can just type the word "table". And to do an audio trace to go to the graph, I'm going to do "Alt-T."

This last bullet, you don't even have to remember. Because when you pause, it will tell you if you want to graph to do "Alt-T." So I'll let my screen reader kind of tell me that. All right, so we are going to go ahead and go to the demo again. Share screen.

SCREEN READER: Button, Zoom meeting. Share screen.

SARA LARKIN: Back to my calculators. So the first thing I'm going to do is get rid of my other stuff.

SCREEN READER: Participants can now—

SARA LARKIN: And the fastest way to get rid of my other stuff is to do that delete an expression, which is "Control-Shift-D." So I'm going to do "Control-Shift-D."

SCREEN READER: "Control-Shift-D," expression—

SARA LARKIN: "Control-Shift-D" and get rid of the next one.

SCREEN READER: "Control-Shift-D."

SARA LARKIN: And now I'm back to my page. I can also do a refresh-- a page refresh, and it will just get rid of everything and start over again. All right, so in this one I want to talk about actual graphs of equations. So I can just type in an equation, something like $y = -3x$—

SCREEN READER: y = dash quote 3x, quote, quote, + 4.

SARA LARKIN: --+ 4.

SCREEN READER: Quote y—

SARA LARKIN: And now it has graphed that expression. And if I want to graph another expression on the same graph, I can just hit Enter or I can do that Control-Alt-X to get a new expression. Either way will work. I'm going to do that.

SCREEN READER: Alt-Control-X, Add Expression.

SARA LARKIN: So now I have a new expression. I'm going to type another equation in here. Sometimes we only deal with one, but I'm going to deal with two here. So let's do y = 4x -1.

SCREEN READER: y equals 4x quote, quote, quote dash, -1. Quote y quote, equals 4 quote, end quote -1. Graph to audio trace, press "Alt-T."

SARA LARKIN: Did you hear it say to graph press "Alt-T?" "Alt-T." So it tells me that. So I'm going to go ahead and do Alt-T to go to that graph.

SCREEN READER: "Alt-T." Graph paper. x-axis visible from -10 to 10. y-axis visible from -5—

SARA LARKIN: It says graph paper. I don't really need all the rest of that right now, unless I want to try to change things. But I usually just go straight to the graph now. And if I let it go through all of that, it would actually tell me, "to hear the graph, press H." So I could just hear the graph by pressing the letter H on the keyboard.

SCREEN READER: "H." "H."

[SCALE RISES]

SARA LARKIN: Did you hear how it rose up? The pitch rose. If I want to go into my other graph, there's actually a key to maneuver between those graphs.

SCREEN READER: Expression 1 intercepted—

SARA LARKIN: "Alt-Up arrow," or "Function-Up Arrow." It's that page up for my keyboard.

SCREEN READER: Virginia Berkeley has left. Virginia Berkeley has joined the-- "H." "H." "H."

[SCALE DESCENDS]

SARA LARKIN: Here we go. I think the Zoom is interfering just a little bit with it. But you heard how the graph went down. And then I can also go back to my home, which is the beginning of the graph. And if I go just "Function-Home." Mine's a function key.

SCREEN READER: Home. x:-10, y:34.

SARA LARKIN: And it told me what that first point on the graph was, negative 10, whatever it was. But now I can also tab and get key points on this graph. So I can get the x where it crosses the x, where it crosses the y, where that intersection point is. So I'm just going to hit "Tab."

SCREEN READER: Intercept at x:0, y:4.

SARA LARKIN: So it said x:0, y:4

SCREEN READER: Froman, she/her.

SARA LARKIN: So my point is 0,4 for that y-intercept. Hit "Tab" again.

SCREEN READER: Intersection with expression 2 at x:.714, y:1.857.

SARA LARKIN: So it told me the point-- the x-coordinate and y-coordinate. But let's say that's too much for a student to remember at once. They can also just type X for x-coordinate.

SCREEN READER: "X" x:.714.

SARA LARKIN: And they can type Y for y-coordinate.

SCREEN READER: "Y." Y:1.857.

SARA LARKIN: So if can't remember that whole point, I can just get the two pieces for it. Now if I hit "Tab" again, it'll go to the x-intercept.

SCREEN READER: 0 at x:1.333, y:0.

SARA LARKIN: So notice it's just really easy to just hit a key and get those key points that I need. Where does it cross the x? Where does it cross the y? Where do they intersect? And all I did was get "Function-Home" to get to the beginning of the graph, and then "Tab" to find those points.

SCREEN READER: From Merrick to everyone—

SARA LARKIN: So it's just really, really slick.

SUSAN OSTERHAUS: We have a couple of questions, Sara, with as far as when you're playing the line, can you slow the speed down? In other words, the duration time. Is that—

SARA LARKIN: You can. So on the Hear Graph, if I tab through my different functions, I can change the volume and I can change the speed. Yeah, in the Hear Graph.

SUSAN OSTERHAUS: And then someone said, I'm confused. How do you know what point it is reading?

SARA LARKIN: Oh. Which of the three points it's reading? Really just by the coordinates. So if the point starts with a 0, then I know it's a y-intercept if the x is 0. And I know it's an x-intercept if the y is 0. And it does say intercept. So it does tell you. Intercept is a y-intercept if it says intercept. So I'm going to go through these backwards. If I do "Shift-Tab--"

SCREEN READER: Intersection with expression 2 at x:0.714, y:1.857.

SARA LARKIN: It said intersection. It said intersection. If I go back again, it's going to say intercept, which is always the y-intercept.

SCREEN READER: Intercept at x:0, y:4.

SARA LARKIN: Gonna go back to my tab. It'll say intersection.

SCREEN READER: Intersection with expression 2 at x:0.71—

SARA LARKIN: And I'm gonna "Tab" again, and it will say 0, which is an x-intercept. Because another name for an x-intercept is a 0.

SCREEN READER: 0 at x:1.333, y:0.

SARA LARKIN: So it will say intercept for y-intercepts. It'll say intersection for intersection points, and it will say 0 for any x-intercepts. So it does give an indication. And if I do tab again, it's going to say there's no more points. So I know there's no more to find.

SCREEN READER: No more points of interest. 0 at—

SARA LARKIN: Yeah?

MARY: Oh, I'm confused. So you just highlight the equation you want of the line, and then when you're there, you just keep hitting "Tab" to hear those things?

SARA LARKIN: Correct. Yes. And I did "Function-Home" so I knew I was at the beginning of the graph. And then I hit the Tabs going through those points. OK. So "Function-Home" gets me to the beginning of

the graph, and then "Tab" gets me through the key points on the graph. Yeah. I can always "Tab" and "Shift-Tab" through the points, but I always like to do that "Function-Home" to make sure I'm at the beginning before I start tabbing. That's just me. And then I could keep going till I don't have any more. Go ahead.

SUSAN OSTERHAUS: I was just going to say and just to let them know-- remember at the beginning of the graph, we're talking the left most part.

SARA LARKIN: Left most point of the graph.

SUSAN OSTERHAUS: So that's what a graph-- we're going through the graph from left to right. So keep that in mind.

SARA LARKIN: And then if I want to switch to-- if I only have one graph in here, then I'm going to be on that graph. If I have two graphs, like I do right now, then that's where I can do that "Alt-Down Arrow--"

SCREEN READER: Expression 2 intersect at x:0, y:-1.

SARA LARKIN: Now I'm on my second graph. So I can use that "Alt-Down Arrow" to go to other equations and then explore those, if I have more than one. "Alt-Down Arrow" goes down to lower equations, and "Alt-Up Arrow" goes back up to higher equations. And by that I mean, of the equations that I have on the left side. The reason I did two is because I wanted you guys to hear an intersection. If I only have one, there's not going to be any intersections. Any other questions related to that piece?

ANNE SPITZ: Sara, this is Anne Spitz. I'm the one who mentioned about the slowing it down. I think it's really helpful. I actually know you can slow it down. I just meant, I think it's helpful for people to hear as it moves through the different quadrants and you hear the sounds. And maybe you'll talk about that, but—

SARA LARKIN: Yeah, let's go ahead and do that for the graph that I'm on. Well, let's switch first to the other graph. I think you'll hear it a little better on—

SCREEN READER: Expression one intercepted—

SARA LARKIN: All right, so we'll slow it down first.

SCREEN READER: Graph playback speed 1/4x

SARA LARKIN: All right, then let's go ahead and hear the graph.

SCREEN READER: "H."

[SCALE RISES]

[STATIC INTERFERENCE]

SARA LARKIN: So what happened is it started clear as it was above the x-axis. When it got below the x-axis, it gave you a static kind of with it. And did you hear some plops? Those were key points along the way where those plops.

SCREEN READER: [? Gabe ?] [? Walton ?] has left the meeting.

SARA LARKIN: Any other questions related to that?

SCREEN READER: From units to—

SARA LARKIN: OK, so we're going to go to the second poll, and then I'm going to talk about also some other functions in-- functionality in here.

SUSAN OSTERHAUS: There was one more question here. They want to know about what's it going to do with horizontal and vertical lines?

SARA LARKIN: Well, let's do one, and then you'll be able to hear it. So I'm going to do my delete—

SCREEN READER: "Control-Shift-Z."

SARA LARKIN: --to go back to my equations. "Alt-D" will take me back.

SCREEN READER: "Alt-D" expression list region. Expression—

SARA LARKIN: "Control-Shift-D" will delete.

SCREEN READER: "Control-Shift-D." Expression—

SARA LARKIN: All right, so let's do, first of all, a horizontal line. I think that's the easiest one first. So we'll do y =, let's do -2.

SCREEN READER: Quote y quote = negative—

SARA LARKIN: Now, -2 is below the x-axis, so we should get a static all the way across. So let's go ahead and do "Alt-T" to go over to my graph.

SCREEN READER: "Alt-T," graph paper, x-axis visible from -10 to 10. Y-axis visible—

SARA LARKIN: And we'll hear it.

SCREEN READER: "H."

[STATIC INTERFERENCE]

SARA LARKIN: Hear that static now, don't you? Sorry.

SUSAN OSTERHAUS: I'm sorry.

[LAUGHTER]

SARA LARKIN: The pitch is not changing because it's horizontal. OK, now I'm going to go "Alt-T," back to my expressions.

SCREEN READER: "Alt-T," audio trace off. Expression list region.

SARA LARKIN: Let's delete out the one that's in there. "Control-Shift-D."

SCREEN READER: "Control-Shift-D." Expression 1:edit.

SARA LARKIN: Now I'm going to do x= for a vertical.

SCREEN READER: x= x4. Quote x=4. As graph to audio trace, press Alt-T.

SARA LARKIN: See?

SCREEN READER: "Alt-T." Graph paper. x-axis visible from negative—

SARA LARKIN: Now, I'm going to hear the graph. Here we go. H to hear it.

SCREEN READER: H.

[CONSTANT TONE]

SARA LARKIN: And that was constant too. So that sounded very much like your horizontal, didn't it—

SCREEN READER: From Manuel to everyone—

SARA LARKIN: --in that it stayed the same pitch? So the students almost need to know a little bit about that horizontal versus vertical. I wish that the one thing it did do was give me more static when I started below, so I could hear it with static for part of it and not static for part of it. And then I would know that it crossed that x-axis. That's the one thing that for vertical, I don't hear that static very well for vertical lines.

SUSAN OSTERHAUS: Sara, for some reason, a couple of people are not hearing anything. But I don't know why because I'm hearing everything loud and clear. No, I don't—

SARA LARKIN: The other thing is we will post this, so it should also-- you should be able to hear everything on the post, if you want to come back in when those are posted.

SCREEN READER: From Joanne—

SUSAN OSTERHAUS: And Joanne says she can hear it all too. So I'm thinking it's on-- I'm sorry, guys, but I think it's on your end.

SARA LARKIN: Computer. All right, so let's go ahead and bring up the next poll, Susan, please.

SUSAN OSTERHAUS: All right, so let me do that.

SARA LARKIN: This is poll number two. This is kind of that maneuvering between the different parts. Oh, wait, hang on. Nope, I got to show one more thing. Otherwise, you're not going to be able to know about the poll.

SUSAN OSTERHAUS: OK, talk about it.

SCREEN READER: Zoom meeting, share screen. "Alt-X" button, you have started screen share.

SARA LARKIN: So press "Alt-Shift-D--"

SCREEN READER: "Control-Shift-D," Desmos vert-- "Control-Shift-D," expression one.

SARA LARKIN: So the last thing I want to show before we do that poll is the table. We didn't show you the table yet. So if I want to do a table, here's what's really cool. I could memorize a keystroke, which happens to be "Control-Alt-T," but watch what happens if I just type "table."

SCREEN READER: T-A-B-L-E, grid with three columns and three rows.

SARA LARKIN: That's all I had to do was type the letters. Now I can just put in the values of my table and hit "Tab" between each of them. So let's say I had -8.

SCREEN READER: Dash 8.

SARA LARKIN: "Tab," -4.

SCREEN READER: Dash 4. Row two, poll one edit.

SARA LARKIN: And then let's add -6, -3.

SCREEN READER: Row two, -3. Row three colon edit, blank. Column 0.

SARA LARKIN: Column 0. 0 and let's throw some positives.

SCREEN READER: Colon edit, blank. Column two. Row five colon 4. Row five colon 2 colon edit. Blank column two. Type in text.

SARA LARKIN: Let's do 4,3 for this one. So these points are not on a straight line. They're just kind of random points there. So let's go ahead and put up that second poll. Now you know how to do tables. I'm going to stop sharing.

OK, so the questions are how do you create a table? Type the word "table," the letters T-A-B, or "Control-Alt-T?" How do you add a new expression? "Control-Alt-X," "Control-X," or "Alt-X?" How do you delete an expression? "Control-Alt-D," "Control-Shift-D," or "Alt-D?" And the fourth one, how do you use the audio trace toggle to go between the equation and the graph? That's what it told you when you're done with the equation. That command tells you how to get to the graph.

All right, go ahead and launch the poll, Susan. Boy, we have some strong ones here. Answer those four questions. Are there more considering their answers? Nice.

OK, let's go ahead and stop the end of the poll there, and we'll go through the results. The first question-- how do you create a table? There's two answers for that. You can type "table" or you can do Control-Alt-T. 69% chose table and 65% said "Control-Alt-T." How do you add a new expression? Yay, 88% got "Control-Alt-X" for expression. And, probably the tougher one because we're used to "Control-Alt" for a lot of things. It's "Control-Shift-D" for deleting an expression. That's 58%. And yay, 78% said "Alt-T" for going to the graph-- toggling between the equation and the graph.

Nice work. OK, so we'll go ahead and have you go to the next slide, Susan. So the keystrokes-- we went through some of these. You can hear the graph. You could also press "P," and it will tell you how many points of interest there are. But it won't tell you what they are. So don't use "P" a lot. I usually will just tab to find out all of those key points.

Function-Home or your home key, however you get to your home key will get you to the beginning of the graph. That's going to be at whatever -10 whatever is, if your graph is going from -10 to 10. x for your x-coordinate, y for your y-coordinate. Just the letter "O" if you want to go to the origin.

And you can type "Alt-S," and that will just give you a summary. It says, there's an x-intercept at a y-intercept, an intersection point. It'll tell you how many of those there are in that summary of it. And then we got to the previous or next graph using either "Alt-Up Arrow" or "Alt-Down Arrow." "Alt-Page Up" or "Alt-Page Down" will also work. All right, go ahead and go to the next slide.

SUSAN OSTERHAUS: I think you're going to—

SARA LARKIN: I'm going to go ahead-- just because of time, I kind of moved through this a little bit. I'm going to show the next thing later. But we have enough to do the next poll real quick.

SUSAN OSTERHAUS: All right.

SARA LARKIN: To hear the graph, type this key. Number one, "F," "G," or "H." Number two, to find a point of interest, type this key. "I," "P," or "Tab." And this is a particular point of interest.
Three, to say the x-coordinate of the point, type this key. And four, to say the y-coordinate of the point type this key. Number four. Did you get number four to show up there, Susan? There you go.

SUSAN OSTERHAUS: You ready?

SARA LARKIN: Go ahead and launch that poll real quick. And this will be the last poll we're taking. Hopefully, everybody will get 100% for this one. Pretty darn close anyway.

SUSAN OSTERHAUS: Remember, hear the graph.

SARA LARKIN: We kind of gave away the answer on some. All right, let's go ahead and end that poll because I want to make sure we have time for just a few more things. All right, to hear the graph-- we had 92% caught the H for hear. H for hear.

To find a point of interest-- so the number of points is going to be a "P." 73% chose that. Or if you want the particular point with the coordinates, a "Tab" will get you the particular coordinates for that point. And that was 23%. To say the x-coordinate-- yay, 96%. And to say the y-coordinate, just y, 96%. All right, let's go ahead and go to the next slide, if you would, please.

Because we're going to do the line of best fit next. This is a common activity for eighth graders. So this isn't even in high school. A lot of times, they'll do line of best fit at eighth grade. So we just made a table of points. Then, all we have to do is create a new expression using "Control-Alt-X."

Type in "y1 Tilde." "Tilde" is above your "Tab" key. "Shift-Tilde" mx1+b. And then we can find out the slope and the y-intercept of that best fit line that we created. So I'm going to go ahead and show that, and then we'll come back for the final slides as I show you a few things here. Yeah. All right, so I'm going to share screen.

SCREEN READER: New meeting. Share screen. "Alt-S" button. You have started screen share. Press "F6" to switch between participants.

SARA LARKIN: I already have a table, so I'm going to do "Alt-Control-X."

SCREEN READER: "Alt-Control-X." Row five colon 2. "Alt-Control-X." Desmos—

SARA LARKIN: So now I'm on an equation. I already have my points on there, so now I can just type "y1--"

SCREEN READER: y1 subscript 1 base quote—

SARA LARKIN: "--Tilde--"

SCREEN READER: "--Tilde," quote m, quote x1—

SARA LARKIN: "--mx1--"

SCREEN READER: --subscript, quote b—

SARA LARKIN: "=b.+

SCREEN READER: --quote b quote, y quote subscript 1, baseline tilde, quote m, quote x, quote subscript.

SARA LARKIN: At the point that I do that, there's all sorts of data in there. The big thing students need to find is the m and the b. So if I "Tab," I'm going to get to that m, which is the slope, and the b, which is the y-intercept. So I'm just going to "Tab--"

SCREEN READER: Delete expression, statistics region, residuals, parameters region, quote unquote equals 0.533582.

SARA LARKIN: So that's my slope, about a half, and then my y-intercept—

SCREEN READER: Quote b quote equals 0.253731.

SARA LARKIN: I now know my equation is y equals 0.5, approximately, x + 0.25.

SUSAN OSTERHAUS: Sara, how did you put your subscript in? They want to know.

SARA LARKIN: I just typed the number. So if you just type "y1," any time the number's right after the letter, it's a subscript in Nemeth. So all I had to type was y1 and it made it a subscript. Good question.

SUSAN OSTERHAUS: Also, I don't know if you're going to do this, but somebody would-- what if you have a parabola? They want to know how do you-- does it find the vertex for you?

SARA LARKIN: Yes, it does. So I can do y1 "Tilde" equals ax1 squared. So I can find the equation of that parabola or I can find the vertex. So let's go ahead and do "Alt-Control-X" to get rid of—

SCREEN READER: "Alt-Control-X." Expression five.

SARA LARKIN: I want to delete. Might help if I delete it.

SCREEN READER: "Control-Shift-D." "Control-Shift-D." Expression—

SARA LARKIN: I'm going to do a parabola this time. Let's say I want to do y equals—

SCREEN READER: y equals X quote, X quote.

SARA LARKIN: "Shift-6" for caret.

SCREEN READER: Caret superscript, baseline 22. After super dash, minus 5. Quote y quote = quote x quote squared minus—

SARA LARKIN: I could do plus something x minus 5. So now when I go over to my graph, "Alt-T--"

SCREEN READER: "Alt-T," graph paper. x-axis visible from -10 to 10. And y-axis—

SARA LARKIN: I can hear it. Let's do the "H."

[SCALE DESCENDS]

[STATIC INTERFERENCE]

[SCALE RISES]

So it started clear, then it got static when it got under the x-axis, and then it got clear again. Now, to get to my leftmost point, I'm going to do my "Function-Home."

SCREEN READER: Home. x:-10, y:95.

SARA LARKIN: What starts at -1095 on the left side there? And then I can "Tab" to those key points.

SCREEN READER: 0 at x:-2.236, y:0

SARA LARKIN: That's my 0.

SCREEN READER: Intercept extremum at x:0, y:-5.

SARA LARKIN: So it said intercept because it's a y-intercept, but it also said "extremum" meaning it's an extreme. That extreme is your low points or your high points. And I know it's a low point because the pitch went down before it came back up. So I know from the pitch, it's a minimum. And then if I "Tab" again it will give me my other 0.

SCREEN READER: 0 at x:2.236, y:0

SARA LARKIN: So it'll say extremum for a vertex. And if you have a cubic, there will be a couple of-- could be a couple of extremums. The way it pronounces it. Those are your extreme values. Yeah, good question.

OK, the last thing I want to share because I know we're down to the last five minutes is how do I, let's say I'm a student and I want to share this graph that I've done with a teacher. Or I'm a teacher and I want to share this particular graph with a student. I can do it either way.

I can do it by grabbing a link and emailing it to the other person. And so the easiest way to do this, and this is in the slides as well, is to hit "Control-Alt-S" for share. "Control-Alt-S."

SCREEN READER: "Alt-Control-S," Desmos vertical bar, graphing calculator. Dash Google Chrome.

SARA LARKIN: Then I can just "Tab--"

SCREEN READER: "Copy" button. To activate, press "Enter."

SARA LARKIN: --to the "Copy" button, and it says to hit "Enter." So I can hit "Enter" to copy it.

SCREEN READER: Enter link to this graph edit.

SARA LARKIN: So now I've copied it and I can literally paste it into an email. I can paste it into an assignment. Any of those things. And then the teacher will have the link or the student will have the link, whichever person is sending it to the other. Let's say all of a sudden the teacher wants to use a graph and didn't get a tactile graphic, then they could literally just share the link and the student access that web page with that particular graph. The other thing is, if you have a graphics embosser, you can export image in that same area.

SCREEN READER: File format button—

SARA LARKIN: And it, under "Size--" it's kind of weird. But under the size—

SCREEN READER: Dropdown options. List box item. Medium square. Two of five. Dropdown options list with four items. Dropdown Desmos vertical bar.

SARA LARKIN: Try that again.

SCREEN READER: Link to this graph edit.

SARA LARKIN: Export.

SCREEN READER: Export your graph dialog. File format. Drop down options list with five items. Medium square, large square.

SARA LARKIN: Oh, because I have my screen reader running. I'm going to shut off my screen reader real quick here.

SCREEN READER: Unloading JAWS with-- "Enter." Desmos vertical bar.

SARA LARKIN: It works with a screen reader but I don't know if, again, Zoom is affecting this somehow. I see it just brought me to a different page. Maybe it closed it. Nope, it didn't close it. I'm just going to go to Desmos right now. So in that graphing calculator, when I have a graph in there and I go to Share Graph and go to Export Image-- yeah, it's still showing. It looks like they switched something. Of course. I did this literally this morning, and it was on there. I'm going to have to ask them. I wonder if I switch it to my braille code. That's what they did. They've now-- they've literally today, it looks like, switched it. So you can select either Nemeth or UEB. And once you do that, you can select your embosser.

SUSAN OSTERHAUS: Wow.

SARA LARKIN: If you have any of the Romeo or PageBlaster, you can do the Romeo/Juliet. If you have any of the Tiger embossers, you would do the VP Max and decide the paper size you have. And when you do that, it tells you then how to emboss it. So it gives you the directions.

SUSAN OSTERHAUS: They knew you were presenting today, so—

SARA LARKIN: I guess so. They decided to change it up on me a little bit. There are other features in the wrench for some of the low-vision. There's reverse contrast in there. You can do braille mode if you want to have a braille display attached, but most of our students just use the screen reader most of the time to access it and don't even bother hooking a braille display up to it.

All right, we're coming up on the last couple of minutes. So I'm going to stop sharing. And then the rest of the PowerPoint presentation that will be attached to the-- so you will get the recording of this video and then you will also have this particular presentation on there.

SUSAN OSTERHAUS: I'm just showing a slide for anybody who might be looking at the recording.
SARA LARKIN: It's got all links. It even has .brf files for the list. Next Thursday, we are announcing a Mathlete competition. And it doesn't matter if your student uses Nemeth or UEB, they can participate.

They need to be a braille reader. And there are four rounds. So next week, we will announce what those rounds look like. You'll get to see some of the sample problems. And these are the dates when we will have practices the competition, and an awards program.

If you do have any additional questions, my email was on the presentation, and so you'll have that as well. And you're welcome to email me at sara.larkin@IAEDB.org. I can put that in the chat as well. SUSAN OSTERHAUS: And Sara, I put-- when I went to put that in, I was going to interrupt you. So I just threw in all that information into the chat. You want to read that real-- from the chat. You want to read that real quickly to them maybe?

SARA LARKIN: Sure. So Tina Herzberg is seeking individuals that are working with braille readers, using either Chromebooks or Android apps, for math. We want to learn more about-- we know what people are kind of using with PCs, with notetakers. There aren't a lot of students out there using Chromebooks or Android apps. So if you have students using those, we want to learn about those experiences. So email Tina Herzberg.

And then a reminder that we just opened up this Project INSPIRE Mathlete competition, and the website link is in there as well. So we'll have more information next Thursday related to that. Thanks, everybody. And have a good rest of the week. We got one more day left and then you get to enjoy the weekend. Although, I'll tell you, every chance I get with the students, I cherish. Oh, so you guys have a great night. Susan, is the-- yeah, go ahead--