DAY 1: Solution or Not?

Materials

Copies: 1.1 Graphing Review
1.2 Solution or Not?– Part I
1.3 Writing Linear Equations from Word Problems – Part I
Ticket out the Door – Day 1

Supplies: Colored pencils – 2 colors per student
Rulers – one per student

Word Wall Words: Linear Equation
Solution for a Linear Equation

Objective

Students will do a series of activities to review graphing linear equations in preparation for graphing and solving systems of equations. Students will verify if a point is a "solution" to a linear equation and look for patterns in word problems to practice writing equations for linear equations.

Student Talk Strategy

Roundtable for 1.1
Think-Pair-Share for 1.3

Academic Language Use

Linear Equation – An equation that makes a straight line when graphed, and is often written in the form $y = mx + b$.
Solution to a Linear Equation – A solution to a linear equation $y = mx + b$ is an ordered pair (c, d) with the property that when you substitute c for x and d for y in the equation, the equation is satisfied, or is *true.*

Activity Notes

5 minutes: Introduction

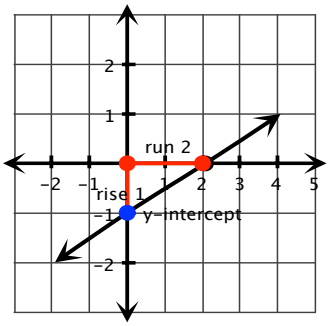
Introduce yourself and the objectives for this 9-day intervention unit. Explain some guiding principles you would like to have established for this unit. Some examples may include the following: 1) the students will be active learners, using manipulatives, drawing and talking with each other and the class; 2) error is a great way to learn and you will reward students who take risks and have consequences for those who would show any form of disrespect to a classmate; 3) it is important that the students *understand* the math and not just memorize or do it without being able to explain.

20 minutes: Graphing Review

Task 1 (5 minutes): Pass out activity sheet 1.1 and have students silently brainstorm and write down everything they can remember about linear equations and graphing them.

Set a timer in the front of the class for 2-minutes. A sample has been given, "slope is represented by *m*." Students may also draw pictures of graphs, to illustrate positive, negative, zero, or undefined slope, as well as other ideas that they are having trouble putting into words. While students are working, walk around and give clues, or ask guiding questions to help them come up with as many items as they can remember about linear equations.
At the end of 2 minutes, have students get into groups of four and have them Roundtable their ideas for 2 minutes, beginning with the person with the longest last name and moving to the right. When students have finished the task, ask if there are any questions or ideas that they would like you to address. Spend a minute or two addressing any concerns or clearing up any misconceptions.

Task 2 (7 minutes): Have students move on to page 2 of activity sheet 1.1 and pass out 2 colored pencils per student (or 1 pack per group). This activity is meant to be a quick review of graphing linear equations in both slope-intercept and standard form. Ask for a volunteer to read through the directions for Task 2 and then randomly select students to reiterate the directions. Have students pick their two colors and write them in the given sentence frame. Model problem 1 with the class as a whole while asking students to tell you the steps to take in graphing. Be sure to remind students how to graph the slope by using slope-triangles. (See sample.



Have students continue to work in groups the next three problems. Each student should be responsible for their own work, but they can, and should be, working together. Let students know that they will have 5 minutes to graph the three problems and set a timer. At the end of 5 minutes, randomly select 3 different groups to present their work and explain how they arrived at their graphed solution. Ask groups if anyone has something different, and clear up any misconceptions, allowing for the presenting groups to first handle the question at hand and stepping in only if necessary.

Task 3 (8 minutes) Ask for a volunteer to read through the directions for Task 3. Task 3 may be more difficult for students but students should feel comfortable to use whichever method is easiest for them. Model problem 1 by using *x*-and *y*-intercepts to graph. Ask students to help you graph by providing you directions. Model problem 2 by converting the equation in to slope-intercept form. Ask students if they recall how to convert an equation in to slope-intercept form. After modeling problems 1 and 2, allow students to continue working on problems 3 and 4 and the concluding sentence frame with their group. Set a timer for 4 minutes. At the end of 4 minutes, randomly select 2 different groups to present their work and explain how they arrived at their graphed solution. Ask groups if anyone has something different, and clear up any misconceptions, allowing for the presenting groups to first handle the question at hand

and stepping in only if necessary. Take a class poll as to which method students prefer, and let them know that part of the beauty of mathematics is that there are often many ways to go about solving a problem.

15 minutes: Solution or Not

Put students in pairs and pass out activity sheet 1.2. Instruct them to complete 1 a, b and c and let them know they will have 4 minutes to complete the problems. Set a timer for 4 minutes. After 4 minutes, randomly select one pair of students to present their solutions to a, b, and c. The answer to c should be something similar to: "I know the two points are ***solutions*** because *the line passes through the points."* Prompt the class using thumbs up/down as to whether they agree with the students' solutions. Ask the class if anyone has any different points for question *b*. Ask them the question: "How many solutions do you think there are for this line?" Students will offer many answers, such as 8, 50, 100, and possibly infinite. If not, you can ask the class to agree that there are "many" solutions to a linear equation, including coordinates that contain fractions and/or decimals (point out (0.5, 1.5)). (This is setting the students up for the activity on Day 2 in which they will learn that a linear equation has *many solutions*, but the solution to two linear equations when graphed typically has only *one solution*.)

Chorally read through the next statement: "All of the points you plotted, and the two you wrote down in question *b* are called ***solutions***." Introduce the word wall word, ***solution to a linear equation*** and post it in your classroom.

Go through problems c and d as a class and ask students if there are other coordinates that would not be a solution.

Instruct students that they have two minutes to complete letters e and f, which are another method to verify if a point is on a line. If students are struggling, complete letter e as a class and have them complete f with their partner. After two minutes randomly select students to present solutions to e and f. Be sure to ask after each problem if anyone has a different solution. (Everyone should be in agreement.)

Students will now have a chance to practice what they have learned by completing problems 2-5, on their own. Let them know that they will have four minutes (one minute per problem) to complete the task; set a timer so the entire class can see it. Circulate to monitor students. After four minutes have passed have students check their work with their partner. Answer questions if partners disagree.

15 minutes: Writing a Linear Equation from a Word Problem

Pass out activity sheet 1.3, and have students move next to a partner, if they are not already with a partner. Ask for a volunteer to read through Task 1. Have students read number one silently and answer the question. Use think-pair-share and then randomly select a student to answer the question. Use thumbs up/down to see if the class agrees. Model number two with the class as a whole, asking questions to guide them to fill in the blanks. Questions could include: "What is the flat rate the phone company charges?"; "How much do they charge for long distance calls?"; How many minutes did we use?" The answer responses are:

long distance 0.10 (10 minutes) + flat rate $12 = total

$1 + $12 = total

I would pay $13 for one month and a 10-minute long distance call.

Instruct students to complete questions 3 and 4 with their partner; set a timer for 3 minutes. The first row of the table has been completed for the students, and the second and third rows are the responses to questions 2 and 3. If students are doing well, have them complete number 5 on the next page. If students are struggling, stop the class and work on the table as a group. It is important that this is set up correctly as the patterns that they will be looking for will help them learn to write an equation for a linear equation.

Have students think-pair-share number 6. Randomly select students/pairs to share their responses. Responses should be something similar to, "The x is being multiplied by 0.10 because x represents the number of long-distance minutes, which can change from month to month." The 12 never changes because "it is a flat rate or a 'constant' number every month."

To check for understanding, ask the students to write what the equation would be if the price per minute changed to $0.08. Use think-pair-share once again. If students are demonstrating an understanding of how the price per minute is effecting the equation, move on to task 2. If not, ask more questions, such as "what would the equation be if the monthly rate was $7 and the price per minute for long distance calls was $0.04?"

Instruct students to move on to Task 2, and work with their partner to complete the task. Give them 3-4 minutes and then have partners join with another set of partners to check their work. Randomly select one group to come up and share their work, after checking with another set of partners. Be sure to prompt them to explain what they did, and what patterns they saw to help them answer the questions.

5 minutes: Ticket out the Door

Pass out the Ticket out the Door and collect it as soon as each student finishes (so that you can discuss mistakes with students as they turn it in).