SESSION SEVEN
GRAPHS, TABLES AND EQUATIONS

Outcomes

- To complete a table and a graph for an equation
- To develop skills in interpreting graphs by making a table, writing a rule, and telling a story
- To develop an awareness that different equations will result in graphs of different shapes

Overview

In this session participants apply their knowledge gained from the last few sessions on the relationship between tables, equations, and graphs and how the different representations are connected. They become proficient at using a graph to complete a table or write an equation. Similarly, they use an equation to produce a table and a graph. In exploring these relatinships, they review integers, fractions and decimals.

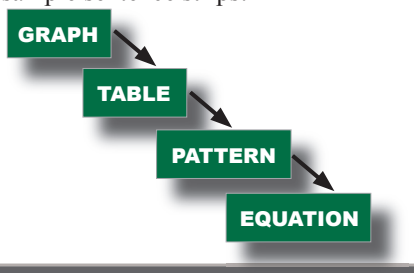
Time

5–10 minutes	The session begins with a discussion on the assignment from the previous session.
10–15 minutes	The participants are asked to recall the concepts associated with graphing that they learned at the previous session.
30-40 minutes	Participants are given two graphs and asked to complete a table and write an equation for each graph.
30–40 minutes	Participants are given equations and asked to complete a table and a graph for each equation. Graphing calculators can be used. Presentations are made.
10-15 minutes	Participants are asked to reflect on their work and are given an assignment to complete at home.

Materials

Facilitator	Transparencies (Eng. & Spanish)
• Overhead graphing calculator (optional) • Transparency of graph paper, 6 each or grid chart paper • 4" x 12" sentence strips made from heavy paper (see Preparation of Classroom for instructions)	**Transparency from Session 6** *BLM 28: At Home with Graphs, Tables and Rules* *BLM 30: Joe's Earned Money* *BLM 31: The Trip*
Participant	**Handouts (English & Spanish)**
• Graph paper, 3 per participant • Graphing calculators, 1 per participant (optional)	**One per participant for class** *BLM 29: From Graphs to Tables to Equations* *BLM 32: From Equations to Tables to Graphs* **One per participant for home** *BLM 10.1-2: Equations and Problem Solving* **(from Session 3)**

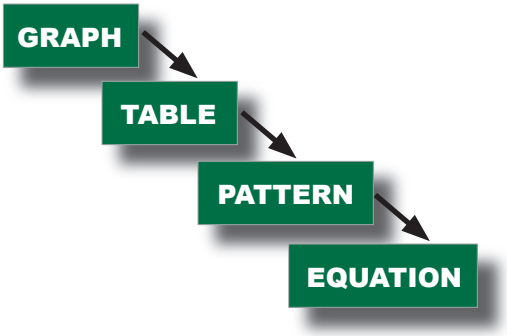
Activities

Preparation of Classroom	Notes
1. Post charts from session 6 to use as a review of important mathematical comcepts. 2. Set up the **Chart It!** 3. Prepare 4 sentence strips made from 4" x 12" heavy paper with the following written on them: Graph, Table, Pattern, Equations and 3 with one arrow on each.	See sample sentence strips: 
Discussion of Homework (5-10 minutes)	
1. Display a transparency of **At Home with Graphs, Tables and Rules**. 2. Ask participants to share their table, the rule and a verbal story for the graph.	
A Look Back (20 minutes)	
1. Review the mathematical ideas from the last session: a) Display the previous class chart of terms and visuals and ask them to talk to their partner about what they recall about the last session. Say: *These are important ideas what we discussed last week. Take a few minutes and discuss what you remember about the mathematics.* b) Hand out graph paper so that participants can take notes. Start with a blank grid chart paper and have volunteers explain each term below then draw it on the grid paper. Say: *Come up and share what you understand about:* • *horizontal axis (x axis)* • *vertical axis (y axis)* • *origin* • *quadrants* • *coordinate points* • *difference between (5,2) and (5, -2)* • *linear and nonlinear graphs from **A Menu of Pattern Activities*** • *using tables to make graphs* 2. Remind them that we used the tables to make a graph. Say: *Last week we used tables to make graphs. Today we are going to use graphs to make tables and find an equation. We are also going to start with an equation, complete a table, and make graphs.*	Have available transparency graph paper or grid chart paper so parents can display their understanding. Some parents use the terms linear and parabolic with ease while others do not. This often depends on the amount of time that was spent on this in the previous session.

Activities

From Graphs to Tables to Equations (30 - 40 minutes)	Notes
1. Distribute **From Graphs to Tables to Equations.** Let them know that they are to use the graph to complete a table and write an equation for the graph. 2. Have participants work in small groups on both problems, Joe's Earned Money and The Trip. Tell participants that they need to assign variables for the number of work days and the amount of money earned. They should label the axes with these variables. 3. Ask them to tell a story from the graph on Joe's Earned Money. To do this, it is sometimes helpful to ask: *What do they know about Joe and the amount of money he earns?* (Joe earns $25 for each day that he works.) *To get the amount of money Joe earns…* (multiply the number of work days by 25) 4. As participants are working on The Trip graph, make sure that they are reading the graph correctly and realize that the vertical axis represents the total cost of the trip. 5. Have participants present their work on these two problems using the overhead transparencies of **Joe's Earned Money** and **The Trip** provided for this purpose. Some examples of questions to ask on Joe's Earned Money are: • *How much money does Joe earn each day? How do you know?* • *How much money does Joe earn on the 9th day? How do you know?* • *If Joe had worked 12 days, how much money would he have earned? How do you know?* • *If Joe had earned $35 each day, what do you think the graph would look like?* • *If Joe had earned $15 each day, what would the graph look like?* 6. Ask similar questions as participants present their work on The Trip. 7. At some point, lead a brief discussion about the common use of x and y. Remind them that in the last session we discussed that the horizontal axis is also called the x-axis and the vertical axis is also called the y-axis.	Assigning variables is usually done with ease as they have been doing this throughout the class. If they use variables other than x and y, then make sure that they label their axes accordingly. Recording the interpretation of the graph in words helps to arrive at the expression. It also helps parents make sense of the equation that was derived from the patterns found in the table. Some parents have interpreted this problem incorrectly assuming that the coordinate (3,150) meant that the 3rd person paid $150 for the trip. These questions could also be used when working with the small groups. The answers to the first two questions can be found in the graph and by using the equation. Discussions have also occurred about how the table can be used to find the answers.

Activities

From Graphs to Tables to Equations (continued)	Notes
8. Remember that some parents still use x to signify multiplication. Use these problems to remind that that there are various ways to show multiplication. You may refer back to the class chart and/or have parents share the different ways to write 25 times x (25x, (25)(x); 25 * x, x*25, etc). 9. Have parents focus on the title of this past activity, **From Graph to Tables to Equations**. Ask: *How do you use a graph to get a table and find a rule or equation?* Participants need to understand that they can record the coordinates on a table, look for a pattern in the table and use the pattern to find an equation or rule.	You may already have this written on your class chart based on sesson 2 activities. The sentence strips can be used to highlight the movement from graphs to table to equations and put some closure on this aspect of the sesson. See example below: 
From Equations to Tables to Graphs (30-40 minutes)	
1. Use the previous activity to transition to starting with equations. Ask: • *Can we start with an equation and end with a graph?* • *How do you think we could do that?* • *Will any of these steps (pointing to sentence strips) help?* • *If you had an equation such as, y = 3x + 4, and you were asked to graph it, what would you do first?* Ask them to talk to their partners or group to decide. After giving them a minute or two, have a whole group discussion about the need to complete a table and then graph. 2. Distribute **From Equations to Tables to Graphs** and graph paper. Model the first equation (x + y = 5) by asking: *If we need to complete a table for this equation, what are we looking for?* (Two numbers added together that equal 5?) 3. Make a table with x and y at the top. Lead them through completing part of the table. • *So, pick a number for x.* (3) • *If x is 3, then y is ___?* (2) • *Pick another number for x.* • *Now y is ___? How do you know?* Optional questions: • *Can x be a negative number?* • *If x is –2, what will y equal?*	Recall that in sesson 4, parents completed a table from an equation that they developed and then gave the table to others to determine their equation. The discussions at the tables vary dependent upon the experiences of the parents. A small number of parents remember the slope, y-intercept method of graphing equations. This discussion on negative numbers can be left to discussions in the small groups. The experiences of the individuals will help make that decision. It is not unusual to have some of the class graphing by hand and other using the graphing calculators. Their experiences and their questions will determine when to use the calculators

Activities

From Equations to Tables and Graphs (30-40 minutes)	Notes
4. Use the idea of a debt of $2 to help parents understand why y is equal to 7. *If I owed Anna $2 and I was going to pay her back as soon as I had some money, how much money would I need in order to be left with $5?* Continue with this process including questions that will lead to thinking about using fractions and/or decimals. As you ask questions, have them work in their groups to answer before they discuss the answers in the whole group. 5. When the table is complete, ask the parents to make a graph for the table. 6. Ask parents to work with a partner to graph the remaining eleven problems. As they are working in small groups, ask questions that lead to discussions on graphing negative numbers: • *Why do some lines slant left and other right?* • *Will the graph look any different if negative numbers are included?* • *What would make the graph have more of a slant?* • *What could you make the graph move up or down?* 7. Both $x^2 = y$ and $24 = x(y)$ can lead to interesting investigations. Some that have occurred are : • *If –x makes a line graph lean left (a negative slope), then what would $- x^2 = y$ look like?* • *If the graph of $24 = x(y)$ is in both the first and 3rd quadrant, then could the graph ever be in the other quadrants? What would the equation have to be to have the graphs in the 2nd and 4th quadrants?* 8. If time permits, have the parents use the graphing calculators to further investigate the equations. They can change the numbers to investigate the effect. Before they graph the equations, ask. *What do you think will happen when you . . . ?* 9. Approximately 20 minutes before the class ends, hand out overhead transparencies to some groups and have them prepare a presentation on what they learned from graphing one set equations. It is not necessary to present all equations. Choose presentations based on the experiences and findings of the groups.	

Activities

Closure (5 - 10 minutes)	Notes
Ask participants to discuss the following with a partner • *What does an equation look like if its graph is a line?* • *What does the graph of an equation look like if the x is squared and the y is not?* • *What is one question that you have about tonight's session or what is one other thing that you learned?*	
Take Home Activities (5 - 10 minutes)	
Distribute **Equations and Problem Solving** (from Session 3) as a homework assignment. Ask participants to choose one or two problems to graph.	
Preparation for the next Session	
1. Collect name cards if applicable. 2. Save the **Chart It!** and bring it to the next session. 3. Optional: • Type the notes on the **Chart It!** and distribute at the next session. • Take digital pictures of each chart. Prepare handouts of these pictures. 4. The next session will address solving equations. Use the sentence strip cards as a display in the next session.	