SESSION TWO
MULTIPLICATION OF WHOLE NUMBERS

Outcomes

- To use base ten blocks to represent and add numbers
- To use a counting board and beans to represent and add numbers
- To understand how multiplying numbers using base ten blocks connects to our standard algorithm
- To do investigations involving multiplication

Overview

The second session of Thinking About Numbers focuses on understanding how methods of multiplication work. The activities involve representing numbers and multiplying numbers by using base ten blocks, a counting board and beans, and the standard algorithm. By using the manipulatives, participants will gain a clearer picture of the process of multiplication. The session ends with some multiplication investigations.

Time

20–25 minutes	The first part of the session allows participants to discuss their take home activities.
30–40 minutes	Next participants multiply two numbers using paper and pencil. They then work with a partner to represent and multiply the same numbers using base ten blocks. Afterwards, they explore the area model for multiplication. They have a chance to make connections between the methods. Finally, they make up a word problem.
30–40 minutes	The next activity is an opportunity for participants to make up their own problems and represent them to the class.
15–20 minutes	After exploring word problems, participants do some investigations involving multiplication principles. They involve being able to make sense of conjectures and testing them for validity.
15–20 minutes	In the closing activity, parents think about how they might lead their children into a better understanding of multiplication.

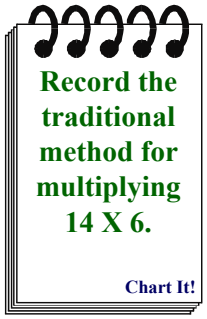
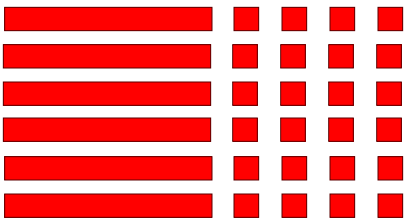
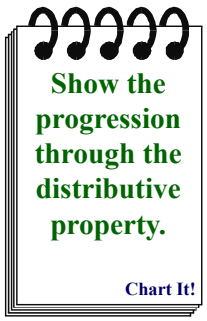
Materials

Facilitator	Transparencies (English & Spanish)
• A set of base ten blocks for the overhead • A classroom set of counting boards on card stock (laminating optional) • Transparent colored chips	*BLM 10: Connecting Multiplication Models*
Participant	**Handouts (English & Spanish)**
• A set of base ten blocks: 20 units, 30 rods, 15 flats, and 3 cubes for each two participants	**Two per participant for class and home** *BLM 10: Connecting Multiplication Models* *BLM 11: Multiplication Principles* **One per participant for home** *BLM 12: Bringing Mathematics Home 2* *BLM 13: Multiplication with Whole Numbers*

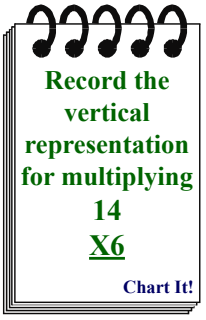
Activities

Preparation of Classroom	Notes
1. Since there are several take home activities in this session, it would help to make a packet for participants ahead of time. 2. Set up the Chart It! 3. Place the name cards from last class near the front of the room where participants can easily find them. 4. Have a supply of base ten blocks on the tables.	
Discussion of Homework (20-25 minutes)	
1. Open the session by asking participants to think of one way that they have used mathematics today. Have them share it with their groups and then ask for a few volunteers to share with the whole class. 2. Invite participants to share with a partner about their experiences working with their children on **Bringing Mathematics Home 1**. 3. Next, ask them to share their solutions to **Addition with Whole Numbers** with the people at their table by discussing these questions. • Do you all agree on your answers? • How many exchanges did you need to make using the counting board? 4. Discuss problem #3: True or False; If $A < B$, then $A + C < B + C$. • In groups, have participants share their understanding of this statement. Have them share examples and counter-examples of the statement. • On a quarter-sheet of chart paper, have each group write an explanation for this statement using examples and/or counter-examples. • Have groups post these and then make supporting comments on the work that they have done.	There will be no counter-examples that match this true/false problem, as it is always true. Because they are displaying their work for the first time, check the groups to see that they have a correct understanding of the inequality.

Activities

The Concept of Multiplication (30-40 minutes)	Notes
Basic Concept 1. Discuss the meaning of multiplication. Ask: *Can you think of a way to model 8 X 7?* • Discuss the two ways that this can be represented: as 8 repeated 7 times and as 7 repeated 8 times. • Make connections to the real world: • There are 7 days in a week. How many days in 8 weeks? • A team has made 8 touchdowns, making the field goal each time, how many points do they have? • Igor caught 7 spiders and pulled off all their legs, how many legs does he have in his collection? 2. Hand out **Connecting Multiplication Methods**. • Have participants do the problem: 14 X 6. • Record the process • Have participants think about the following question, and maybe get an idea or two, but do not model or explain it yet. Ask: *Why do we write down the 4 and carry the 2?* • Tell them that they will now explore this idea through manipulatives. **Multiplication with Base Ten Blocks** Have participants use the base ten blocks to model the problem. • Have them record it with a drawing on their sheet. • Have participants record their process using numbers. • Have a volunteer come up and model it with overhead blocks and explain their process. Most participants will record the process as: 10 + 4 six different times Show them how: (10 + 4) X 6 Progresses to 10 X 6 + 4 X 6 Or 60 + 24 84	  

Activities

The Concept of Multiplication (continued)	Notes
Now show how this process looks when doing it vertically: 14 X6 24 60 84 **Multiplication as an area** • Ask participants to read question 3 and draw a picture of their room. • Check to see that everyone is comfortable representing his or her room. • Have participants answer question 4, discussing it with their group after they have a chance to think about it on their own. • Lead a discussion of the participants' thoughts on question 4. (If an explanation for why we carry the 2 in this problem does not come up, help them make connections to that process.) **Applications** • Ask the participants to write a word problem that relates to 14 X 6. Tell them they can make it humorous. • Have them share it with their group. • Have groups pick one story problem to share with the class.	 

Applying Multiplication Concepts (30-40 minutes)	Notes
1. Have participants make up a humorous story for a multiplication problem. 2. Have them create a poster that: • States their word problem • Shows the standard algorithm for doing the problem • Shows a model of their choice. • Connects that model to the standard algorithm 3. Have each group present their problem to the class and post it at the front of the room.	Sometimes it is best to assign roles for the chart making: Master of Humor *(writing the word problem)*, Master of Models *(illustrating the model)*, Master of Tradition *(writing the traditional algorithm)* and Master of Connections *(writing the connections)*. The chart paper can be folded into 4ths, and each can work on their portion of the chart at the same time *(by the way, they do not have to face the same direction, the group just turns the chart as they present)*.

Activities

Multiplication Principles (15-20 minutes)	Notes
Remind participants that each session will include an exercise in mathematics logic connected to the subject of the session. This format is used on many standard tests for students today, and will give them an idea of what is expected with mathematical reasoning. Since the focus of this session has been multiplication, the mathematical reasoning will be about multiplication. 1. Hand out **Multiplication Principles**. Have them look at problem 1 and ask if the following statement is true or false: $A \times B = B \times A$ • Have participants vote on whether the statement is true or false. • Have participants write an example of this situation by themselves and then check with their group to see if they all understand this statement. • After checking to see that everyone has grasped the concept of the statement, have them look for counter- examples. • The class should come to the conclusion that they cannot find an example where it is not true. • Remind them that if they find a counter-example, then they have proven the statement false. However, if they do not find a counter-example, they have not proven it true. We only have a stronger suspicion that it is true. • Ask participants to find a model that will further convince us that this statement is always true 2. Have the participants explore the second statement, problem number 2 on the handout. • Ask them to look for examples and counter-examples of the statement. • After some minutes, have a volunteer show an example that fits this statement. • Tell them that you have seen people use A = 4 as a counter-example. What do you think of this? • If participants have not found a counter-example, ask them is there are any numbers between 4 and 5 that could be tried. Have participants multiply 4.1 x 4.1. Reason through the placement of the decimal: Is the number larger or smaller than 25?	The model could be base ten blocks, an area model using grid paper, groups of things, etc. The discussion about the 2nd problem might include what > 4 means. Some participants might use A = 4 as their counter-example. Keep their names anonymous, as they are not ready to have their misunderstanding be a focus of discussion. Reassure them that these common misunderstandings of the language of mathematics lead to wonderful discussions. In today's classroom, common misunderstandings are openly discussed, and students do not feel that they have to have the right answer to contribute to the discussion. Such a discussion long ago led to the need for another inequality symbol: $\geq$.

Activities

Closure (15-20 minutes)	Notes
Participants reflect on the session. • What kinds of experiences will your child need to help them understand the concept of multiplication? • How do you lead a child into understanding the traditional way of multiplying? • What steps in our traditional multiplication are not shown? Ask a few volunteers to share their reflections	
Take Home Activities (5 minutes)	
1. There are four handouts for participants to take home: • **Bringing Mathematics Home 2** • **Multiplication with Whole Numbers** • **Connecting Multiplication Models** • **Multiplication Principles** 2. Have participants look through the packet of materials as you explain them. The object of the take home activities is for them to practice with their children. They have fresh copies of the session's activities. 3. There are also some new challenges for the participants in **Multiplication with Whole Numbers.** 4. Let participants know that they should be ready to share their experiences at the next session.	
Preparation for the Next Session (5 minutes)	
1. Collect name cards for use in the next sessions. 2. Save the **Chart It!** and bring it to the next class. If desired, you may have the log typed and distributed to participants at the next class.	