Practice Task: Cereal Arrays

Approximately 3-4 days

STANDARDS ADDRESSED FOR MATHEMATICAL CONTENT

MCC2.OA.4. Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns; write an equation to express the total as a sum of equal addends.

STANDARDS FOR MATHEMATICAL CONTENT

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

*****Mathematical Practices 1 and 6 should be evident in EVERY lesson*****

BACKGROUND KNOWLEDGE

(Information quoted from Van de Walle and Lovin, Teaching Student-Centered Mathematics: Grades K-3, page 80)

"When students solve simple multiplication story problems before learning about multiplication symbolism, they will most likely write repeated-addition equations to represent what they did as an equation. This is your opportunity to introduce the multiplication sign and explain what the two factors mean." Although this is true, the focus in second grade is not learn the multiplication symbolism or fact, it is to gain understanding through repeated addition.

"The usual convention is that 4x8 refers to four sets of eight, not eight sets of four. There is absolutely no reason to be rigid about this convention. The important thing is that the students can tell you what each factor in their equations represents."

ESSENTIAL QUESTIONS

- What is an array?
- What is repeated addition?
- How can rectangular arrays help us with repeated addition?
- How are arrays and repeated addition related?
- How does skip counting help us solve repeated addition problems?
- How can we use model repeated addition equation with an array?

MATERIALS

- Cereal
- Glue

GROUPING

Small Group

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Each part of this task is designed to take one class period. Once the students have completed the task a version of it can be placed in a center for repeated practice throughout the year.

Part I
Explain to students that sometimes people use arrays as a model for repeated addition and that today we are going to make sure they understand what columns and rows look like in arrays. Tell students that arrays are made up of rows and columns. Ask students to think of some places that they have gone to where they might have had to sit in rows. Allow them to share and record their experiences. Show students pictures of rows in a movie theatre and at a football stadium (some examples are provided). Explain to students that rows are horizontal or they go in direction from left to right or right to left. Next ask the students if anyone knows what a column is or if they can point to an example of a column in the room or the school. If they need a hint tell them that columns travel in the opposite direction as rows. Once students have figured out that columns run "up and down." tell them that we use the word vertical to describe this direction (up and down). Ask students to think of places where they may have seen columns, and again record their ideas. Show students pictures of columns on various buildings such as a local home or the White House. (Some examples have been provided)

Allow students time to demonstrate their understanding of these new words (rows/horizontal; columns/vertical) by playing a short game of *Simon Says*. Have students get into a horizontal position by lying on the floor when you say "Simon says show me a row" or have them point to or locate things in the room that run in a horizontal direction (i.e. tray of the chalk board, bottom of the doorframe, edge of a rug, etc). For a vertical position they can just stand up when you say, "Simon says show me a column", or point to places in the room that have lines running in a vertical direction (i.e. the flag pole, a music stand, leg of a table, etc.).

Once it is clear that students understand what columns and rows are, and the difference between them you can introduce what an array is to them using a picture that is a combination of rows and columns. Demonstrate for students an example of objects organized in an array. You may have tubs on a shelf or desks organized in an array or using a block of tiles on the hallway floor. Ask students how these things organized as an array helps you. One possible reason would be to help you find things faster. Create a chart where you can list additional arrays they may notice in the classroom or mention having seen elsewhere. Draw several arrays on chart paper or white board large enough for students to see and be able to discuss in small groups.

Give the students some items (buttons, cubes, counters, etc.) and have them organize them into a rectangle array. You can partner students for this or have them work independently. Once they have their items in an array ask the students figure out what shape they have created (rectangle). Ask them to describe their array to the class by telling how many columns and how many rows they have made. As they are describing what they have made, have a student draw it on the chart paper or white board. Be sure to ask, "Does the picture I have drawn match your array?"

Part II

Assign each student a certain number of cereal pieces and have them decide the number of rows and columns that the array would have and then create the repeated addition. They could also create more than one based on their number. Once students come together and share their work, discuss that the number of rows is the addend that will be repeated and the number of columns is how many times you will repeat the addend. Have a student share their addition sentence and explain their reasoning for writing it that way. For example, 5+5+5 creates an array that is 5 rows and three columns. Once they show emergent understanding, allow students to explain or describe the array with an addition sentence. You can challenge students to describe the array with different kind of clues. For example, "I have an array that is 3+3+3+3." Or, "Who has an array that is 2+2+2?" You will need to have several examples of different arrays on the board for them to use as examples.

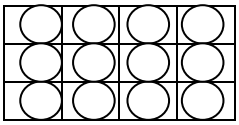
Part III

Tell students that they will now have the opportunity to create their own arrays using cereal. Have each student draw a repeated addition sentence. Encourage each student to create an array using the cereal to illustrate the card. As students create their cereal arrays, move about the room and ask questions from the formative assessment list.

Have students glue down their cereal arrays so they can hold them up to share with the class. After students have completed the task, allow them to share their arrays. Invite discussion about how two students might view or describe the same array differently. For example:

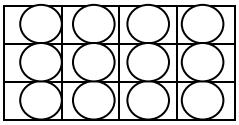
Student 1

I see 3 pieces of cereal in each column and there are 4 columns. So I added: 3 + 3 + 3+ 3. That equals 12.



Student 2

I see 4 pieces of cereal in each row and there are 3 rows. So I added 4 + 4 + 4. That equals 12.



Encourage students to ask questions of their peers and make comments about the work and strategy used to figure out how to make their arrays.

Part IV
Start off with the question, "What happens if you rotate/turn the cereal array that you made? Does it change the number sentence you write? How and why?"
Invite further discussion about what happens when you rotate or turn someone's array a ¼ turn. Allow students to come up and act it out by actually rotating their paper. Have the class generate the new repeated addition equation that now goes with the array. Record these new repeated addition sentences on the board. Have students return to their seats, give them enough cereal to create the "new" array (the rotated one) and have them record the repeated addition equation that goes with this recreated array. This supports understanding of the commutative property, and allows students to remain flexible in their thinking.

Part V
Students will work together to play, *I have, Who has?* on the following pages.
Tell students that they are going to have to do some detective work. Detectives are really good at figuring things out, therefore they are going to have to put on their thinking caps as they pretend to be "Detective Dan" and "hunt/search" to find out, "Who Has It?"

FORMATIVE ASSESSMENT QUESTIONS

- Describe how you know how to rotate/turn your array? How does the sentence change when it turns? Does the answer change?
- What is your repeated addition number sentence?
- How many rows should you include?
- How many columns should you include?
- Why are arrays important?

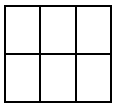
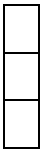
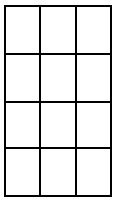
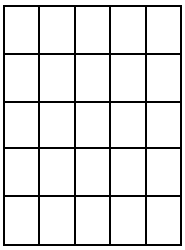
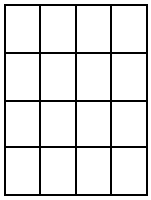
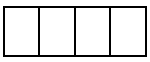
DIFFERENTIATION

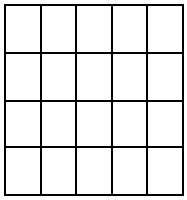
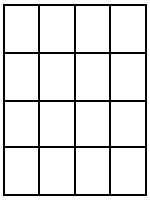
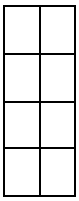
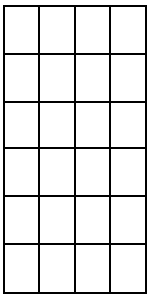
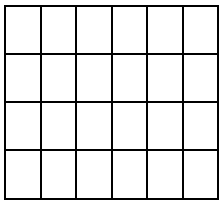
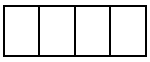
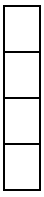
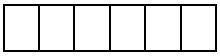
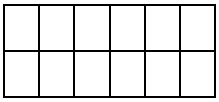
Extension
- Supply cards with larger addends. These students may also be encouraged to create as many arrays as possible with the same number of items.

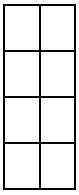
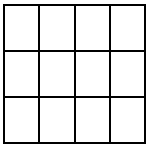
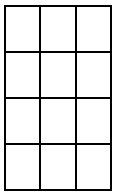
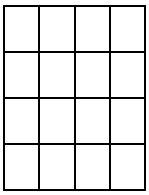
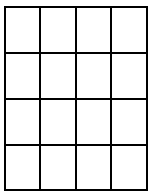
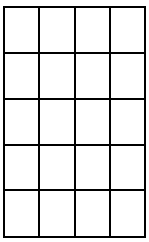
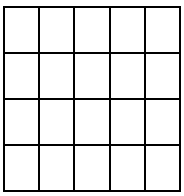
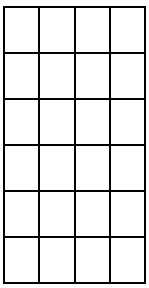
Intervention
- Use 1 inch graph paper to line up the cereal correctly in arrays.

Sample Pictures for Repeated Addition

Clue Cards

Teacher Clue Card: My clue card has 2 rows:  Who has a card with 3 rows?	My clue card has  Who has a card with 3 columns?
My clue card has  Who has a card with 5 rows?	My clue card has  Who has a card with 4 columns?
My clue card has  Who has a card with 1 row?	My clue card has  Who has a card with 5 columns?

My clue card has  Who has a card with 4 rows?	My clue card has  Who has a card with 2 columns?
My clue card has  Who has a card with 6 rows?	My clue card has  Who has a card with 6 columns?
My clue card has  Who has a card with 1 row?	My clue card has  Who has a card with 1 column?
My clue card has  Who has a card with 1 row?	My clue card has  Who has a card with 6 columns?
My clue card has  Who has a card with 2 rows?	My clue card has  Who has a card with 2 columns?

My clue card has  Who has a card with 3 rows?	My clue card has  Who has a card with 3 columns?
My clue card has  Who has a card with 4 rows?	My clue card has  Who has a card with 4 columns?
My clue card has  Who has a card with 5 rows?	My clue card has  Who has a card with 5 columns?
My clue card has  Who has a card with 6 rows?	My clue card has  Who has a card with 6 columns?