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ED458nay17 Teaching Numeracy: Habits to Ignite Math Thinking  
June 22, 2018 500 Level/3 Quarter Credits  
Numeracy #5b

**Raj’s Pumpkin Seeds  
(Lesson Plan – Mathematics)**

**Purpose and Focus**

This lesson will include practice in the representation of multiplication, both as an algorithm and an array. It will include opportunities to assess the following 3rd grade CCSS:

3.OA.1 – Interpret products of whole numbers  
3.OA.3 – Use multiplication within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities.  
3.OA.8 – Solve two-step word problems using the four operations  
3.OA.8 – Assess the reasonableness of answers using mental computations and estimation strategies including rounding  
3.NBT.2 – Fluently add within 1000  
3.MD.6 – Measure areas by counting unit squares  
3.MD.7 – Relate area to the operations of multiplication and addition  
3.MD.7 – Find areas of (rectilinear) figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real world problems

**Ignition (Choose 1)**

* Twenty-four (24) is a multiple of what numbers? Explain why.
* Which number does not belong with the others? Why?
  + 20, 32, 14, 36, 8, 16
* Find as many rectangles with an area of 36 sq. units.

**Bridge to Learning**

This lesson will be a review of pre-learned vocabulary words. This is a good time to review those words and assess student readiness for this activity.

* arrays
* multiples
* sum
* product
* area
* difference
* square units

**Gradual Release in Mathematics**

(This problem was obtained through Teachers Pay Teachers as a freebie, authored by Teaching with a Mountain View. This problem was designed to help students practice multi-step word problems.)

1. Hand out the multi-step word problem, and have students glue it in their math journal.

|  |
| --- |
| **Raj was planting pumpkin seeds at the pumpkin patch. He started with 750 pumpkin seeds. On the first day, he made 15 rows with 25 seeds in each row. On the second day of planting, he made 12 rows with 30 seeds in each row. How many pumpkin seeds did he have left to plant on the third day?** |

1. Read through the problem together. Model visualizing what these two pumpkin patches may look like. Ask the students to visualize as well and have students share out what they notice.
2. Have the students highlight the numbers in the problem, as well as circling the question. What do they think will happen with the beginning number of 750, based on what we have read so far?
3. How many pumpkin patches does Raj plant? A pumpkin patch may look like what tool we have used in math this year? (arrays)
4. Hand out a 15 x 25 array for each student. Discuss how we currently don’t know how to multiply these two numbers together to figure out the area, but we can divide (decompose) these numbers into manageable squares and rectangles.
5. Give the students time to talk to a neighbor about how they may do this. Then, have them outline, shade in, and label smaller squares and rectangles within the larger rectangle.
6. Have students share how they chose to divide the rectangle.
7. Using your 15 x 25 array, have students help you divide your array. Label and cut out the pieces. Glue them on a large sticky note. Taking all the products, have the students help you find the sum of the products to find the area of the first pumpkin patch.
8. Once you have done this, do a “Think Aloud”, asking yourself if there was an easier way to divide the rectangle. Could we have used larger products for the length x width? This would have left us with fewer arrays to find the sum of their products.
9. Add the information you figured out on this first array to student math journals. Can we use the number 750 yet? Review what the question is asking you to find.
10. Hand out the next array for students to decompose, which will be the 12 x 30 array. Students can briefly discuss a strategy with a neighbor.
11. Have students divide this larger array into smaller arrays. Each array needs to be labeled and glued on a 12 x 18 piece of construction paper. Then, students need to find the sum of the products of their individual arrays.
12. Discuss how students chose to divide this newest array.
13. Record the information for the second array in student math journals.
14. How can we use the sums of the two arrays to figure out the answer to the question?

**Debrief**

There are multiple opportunities to debrief in the activity above. This could include:

* Sharing with a neighbor
* Sharing with the class
* Math Journaling
* Making Connections

**Notes/Photos from the Lesson**

**Raj and the Pumpkin Patch**

(This problem was obtained through Teachers Pay Teachers as a freebie, authored by Teaching with a Mountain View. This problem was designed to help students practice multi-step word problems.)

While this problem was not presented in the correct season, the students were not quite ready to tackle such a task in the fall. I wanted them to have opportunities to build more background knowledge around multiplication and arrays before we tried this problem. We did practice with some easier problems in the months leading up to this mathematical task.

The task is as follows:

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| --- |
| **Raj was planting pumpkin seeds at the pumpkin patch. He started with 750 pumpkin seeds. On the first day, he made 15 rows with 25 seeds in each row. On the second day of planting, he made 12 rows with 30 seeds in each row. How many pumpkin seeds did he have left to plant on the third day?** |

Each student had their own copy of this problem in their math journals. We started by reading the problem and visualizing what these two pumpkin patches may look like, beginning with what is a pumpkin patch. Are they large? Small? How are the two pumpkin patches similar? We talked about what may be a reasonable prediction for the number of pumpkins in each patch by using what we know about arrays and multiplication. I was attempting to guide the students to an understanding of splitting numbers apart into chunks we can easily multiply, such as when using the distributive property.

We then highlighted the numbers in the task and circled the questions. We talked about that starting number of 750. Based on what we have read so far, what will happen to that initial number of 750?

I gave each student a 15 x 25 array. I asked them to outline and label arrays within the array. We then shared how we had divided the array and divided my copy of the array together. In sharing, we were able to provide a safe environment for flexible thinking, where students could ask each other questions or comment on their strategies.

Once my array was outlined, I cut out the pieces, and glued them on a large sticky note. We then figured out the sum of all the products. We looked for those compatible numbers to help streamline our adding of numbers. Once we found the number of seeds in the first pumpkin patch, where students made connections to the array cards we practice with, I decided to “Wonder Out Loud”. Would it have been easier to make the largest arrays we could, not going over a 10 x 10? I think this would make it easier to find the sum of the pumpkin patch.

The next step was to give the students a 12 x 30 array. This time, they needed to use their own strategies to divide the new array into smaller arrays, find the product of each array, cut them out, glue them on a piece of paper, and find the sum of the products. Some students altered their thinking, and they chose to make larger array pieces. Others found themselves beginning that way but ending up with some smaller arrays.

Once we had our answer to the second pumpkin patch, we went back to the original problem, and we solved it. This problem was solved over the course of 4 days. We worked through a little bit of it at a time. It showed the students that some problems will take more mental energy. It is so important to pause and check for understanding of the problem and its imbedded vocabulary first. Find a strategy that works, and move through the problem sequentially.

I feel the time spent on this one problem was so much more valuable than spending the 4 days on 100 problems that required memorization, set rules, and low rigor.

Below are some examples from this pumpkin problem. Some you will see have minor errors, but the student’s thought process is correct. In the world of problem solving, minor errors can still illicit a passing score, if the work is shown correctly.















