**Rows of Donuts**

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| This lesson focuses on repeated addition and skip counting to provide a conceptual understanding of multiplication. The lesson also provides opportunities for teachers to discuss the role of collaboration with classmates.  |

**NC Mathematics Standards:**

**Operations and Algebraic Thinking**

**Represent and solve problems involving multiplication and division.**

**NC.3.OA.1** For products of whole numbers with two factors up to and including 10:

* Interpret the factors as representing the number of equal groups and the number of objects in each group.
* Illustrate and explain strategies including arrays, repeated addition, decomposing a factor, and applying the commutative and associative properties.

**Standards for Mathematical Practice:**

1. Make sense of problems and persevere in solving them.

3. Construct viable arguments and critique the reasoning of others.

4. Model with mathematics.

6. Attend to precision.

**Student Outcomes:**

* I can make connections between repeated addition and multiplication.
* I can identify errors and correct them.

**Math Language:**

* Error
* Multiple
* Repeated Addition
* Skip Count

**Materials:**

* Paper, pencil
* hundreds board
* multi-link (pop) cubes
* What Do You See? Images
* Rows of Four Donuts Activity sheets

**Advance Preparation**:

* Gather materials

**Launch:**

1. How Many Boxes? and Introduce the Task (10 minutes)

Display the first image. Ask students to think of two different strategies to find the total number of boxes. Ask students to think of an equation to find the total number of boxes. Repeat these steps for the other images.

Introduce Rows of Four Donuts activity sheet. Pass out the activity sheet. Say to the class, “One of the things that mathematicians do is identify mistakes and work on correcting them. On the activity sheet there are some errors in skip counting. You will work with your classmates to identify the errors in skip counting and correct the errors.

**Explore:**

1. Working Together to Solve Problems (20-25 minutes)

Pair students up and make sure students have multi-link (pop) cubes and the Rows of Four Donuts activity sheet. Encourage students to use their cubes or pictures to build representations of the rows of donuts.

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| **Observation** | **Questions to Ask** |
| Students attempt to complete the activity without pictures or cubes. | * “Can you build a row of cubes to show what 1 row of donuts looks like?”
* “When you look at your picture/cubes how can you find how many donuts are in one row? How can you tell how many row there are?
 |
| Students are unable to find the total number of donuts in multiple rows.  | * “How can you find the total number of donuts we have?”
* “What counting strategy can we use to help us?”
 |
| Students finish quickly and have accurate answers. | * “Can you work on this task if there were 7 donuts in each row?”
 |

**Discuss:**

1. Class Discussion of Task (15 minutes)

Once students have completed most or all of the Rows of Four Donuts activity sheet, bring them back together for a discussion. Have a student build or tell you how to build what it would look like to have 3 rows of donuts.

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| **Sample Questions** | **Possible Responses or Talk Frames** |
| How can I find the total number of donuts in my 3 rows? | * “You can count all of them 1 at a time.”
* “You can count by 2s. There are 2 2’s in each row.”
* “You can count by 4s since there are 4 in each row.”
* “I know that 3 groups of 4 is 12 and I can use the picture to check my answer.”
 |
| What equations can I write if I have 3 donuts?” | *The goal is to have students connect the repeated addition equation 4+4+4 = 12 to the multiplication equation 4x3=12*. * “I can add up 4+4+4 since I have 3 rows of 4.”
* “I can add up 3+3+3+3 since I have 4 columns of 3.”
* “If I think about each row as a group I have 3 groups of 4 which I can write as 3x4 =12.”
 |

Ask students, “How did you feel working with someone today on the task?” What went well? What was a challenge?

Tell students, “Mathematicians need to work together and collaborate with others in order to solve problems.”

Conclude the discussion by saying, *Think about what we did today. Can you help me finish the sentence “Mathematicians are people who \_\_\_\_\_\_.”*

**Additional Activities:**

These activities can either be done by everyone in the class or as part of centers/math workshop.

 **Rows of Six Donuts**

Students can work independently or in pairs/groups on Rows of Six Donuts, which is a continuation of the Explore task.

**Hundreds Board Patterns**

Students need a copy of a hundreds board and crayons or colored pencils. They should color all of the multiples of 2, 4, and 8 in different colors on the hundreds board. They can also use a different hundreds board to look at multiples of 3, 6, and 9.

 **Tic Tac Toe Array**

See directions and materials in this document.

**Evaluation of Student Understanding:**

**Informal Evaluation:**

* Observe students and ask questions as they Explore the task. Make note of specific strategies to have certain students share during the Discuss phase of the lesson.
* Since this is a collaborative activity make note of which students work well with others and take initiative on the Explore task.

**Formal Evaluation:**

* Students’ work on the activity sheet can be collected for a formal evaluation.
* If you need an exit ticket you can pose the following task: If there are 6 donuts in a row how many donuts are in a box with 4 rows? Draw a picture and write an equation.

**Meeting the Needs of the Range of Learners:**

**Interventions:**

* Work with students as they build with cubes and ask questions about how many donuts are in one row and what it would look like to make 2 rows?

**Extensions:**

* This lesson provides a conceptual foundation of skip counting and how skip counting relates to multiplication. Students may work with different numbers of donuts in each row, such as 7, 8, or 9.

**Possible Misconceptions/Suggestions:**

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| **Possible Errors****and Misconceptions** | **Suggestions** |
| Students attempt to complete the activity without pictures or cubes. | * “Can you build a row of cubes to show what 1 row of donuts looks like?”
* “When you look at your picture/cubes how can you find how many donuts are in one row? How can you tell how many row there are?
 |
| Students are unable to find the total number of donuts in multiple rows.  | * “How can you find the total number of donuts we have?”
* “What counting strategy can we use to help us?”
 |

**Special Notes:**

* The How Many Boxes? Activity can be revisited at various times during the year.
* The Additional Activities can be done at various times during the year.

**How Many Boxes?**

 Image A

|  |  |
| --- | --- |
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|  |  |
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Image B

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| --- | --- | --- |
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Image C

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Image D

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**Rows of Four Donuts**

The Dublin Donut Shop has different sizes of boxes for their donuts. The smallest box of donuts has 4 donuts in a straight line or row. Larger boxes have rows of donuts with 4 on each row. Use your cubes and draw pictures of the following boxes:

A small box of 4 donuts. A box with 2 rows of donuts

A box with 3 rows of donuts A box with 4 rows of donuts

A box with 5 rows of donuts A box with 6 rows of donuts

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| --- | --- | --- |
| **Rows** | **Addition Equation** | **Multiplication Equation** |
| 1 |  | 1 x 4 = 4  |
| 2 |  |  |
| 3 |  |  |
| 4 |  |  |
| 5 |  |  |
| 6 |  |  |

How did the addition equations help you write the multiplication equations? Give a specific example from your table.

**Rows of Six Donuts**

The Dublin Donut Shop has different sizes of boxes for their donuts. The smallest box of donuts has 6 donuts in a straight line or row. Larger boxes have rows of donuts with 6 on each row. Use your cubes and draw pictures of the following boxes:

A small box of 6 donuts. A box with 2 rows of donuts

A box with 3 rows of donuts A box with 4 rows of donuts

A box with 5 rows of donuts A box with 6 rows of donuts

|  |  |  |
| --- | --- | --- |
| **Rows** | **Addition Equation** | **Multiplication Equation** |
| 1 |  | 1 x 6 = 6 |
| 2 |  |  |
| 3 |  |  |
| 4 |  |  |
| 5 |  |  |
| 6 |  |  |

How did the addition equations help you write the multiplication equations? Give a specific example from your table.

Hundreds Board









