**More Sticker Stumpers**

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| In this lesson students explore sticker stumpers in the context of multi-step problems. This is intended for Cluster 4 of Grade 3.  |

**NC Mathematics Standard(s):**

**Operations and Algebraic Thinking**

**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.

**Additional/Supporting Standards:**

 **Operations and Algebraic Thinking**

**NC.3.OA.3** Represent, interpret, and solve one-step problems involving multiplication and division.

* Solve multiplication word problems with factors up to and including 10. Represent the problem using arrays, pictures, and/or equations with a symbol for the unknown number to represent the problem.
* Solve division word problems with a divisor and quotient up to and including 10. Represent the problem using arrays, pictures, and/or equations with a symbol for the unknown number to represent the problem.

**NC.3.NBT.3** Use concrete and pictorial models, based on place value and the properties of operations, to find the product of a one-digit whole number by a multiple of 10 in the range 10–90

 **Measurement and Data**

**NC.3.MD.7** Relate area to the operations of multiplication and addition.

• Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths.

• Multiply side lengths to find areas of rectangles with whole-number side lengths in the context of solving problems, and represent whole-number products as rectangular areas in mathematical reasoning.

• Use tiles and/or arrays to illustrate and explain that the area of a rectangle can be found by partitioning it into two smaller rectangles, and that the area of the large rectangle is the sum of the two smaller rectangles.

**Standards for Mathematical Practice:**

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

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

SMP 6. Attend to precision.

**Student Outcomes:**

* I can find the area of a rectangle by multiplying the length and width of the rectangle.
* I can solve multi-step problems involving addition, subtraction, and multiplication
* I can communicate my strategies to find the area of rectangles and compare areas.

 **Math Language:**Array, Dimensions, Length, Width, Multiply, Sides, Rows, Columns

**Materials/Advance Preparation**:

* Sticker Stumper sheet (1 per student)
* Centimeter Grid Paper (1 per student)
* Colored pencils or crayons or pencil to use on grid paper

**Launch:**

1. Introducing Sticker Stumper (2-3 minutes)

 Ask students:

* “Do you like stickers?”
* “Now or when you were younger, what were your favorite kinds of stickers?”
* “How are stickers usually packaged?”

The goal is to have students discuss the idea that stickers come in groups and often these groups are printed and packaged on sheets of stickers.

You are owners of the Stuck on Stickers factory. Your factory makes sticker sheets for customers according to their requirements. Working in pairs or small groups you need to solve the following problems about stickers.

**Explore:**

1. Sticker Stumper Activity (5-7 minutes)

Make sure students each have a copy of the More Sticker Stumper Activity Sheet.

Students work through the activity to answer questions 1 and 2.

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| Observation | Question |
| General for all students | “How did you get started?” |
| Students unable to get started. | “What does the problem tell you?"“If you know the length and width of the sheet how can that help you?”“Can you draw a picture of what you think vp |
| Students unable to recognize that the tasks are two-step tasks. | “What is the problem asking?”“Now that you have solved that have you answered the question or do you still have to do more?” |
| Students who choose an incorrect operation. | “What in the problem helped you determine what operation to use? “Based on the information in the problem what operation(s) should you use? Why?  |

**Discuss:**

1. Discussion of More Sticker Stumpers (8-10 minutes)

The discussion of student solutions after the completion of Order 2 provides students with the opportunity to share and listen to multiple solution strategies. The discussion also leads students toward the connection between factors and dimensions.

Possible questions:

* + How did you determine the answer to Problem <choose which problem>?
	+ What in the problem led you to choose that (those) operation(s)?
	+ How did you determine the equations?

The goal of the discussion is for students to hear about various strategies for determining the number of stickers on each sheet.

**Additional Activities (40-45 minutes):**

Possible activities include:

 More Sticker Situations - See the activity sheet attached. Students will need grid paper for this. These focus on two-step situations (NC.3.OA.8).

Exploring Tile Rectangles

Provide 24, 30, or 36 plastic square tiles and grid paper. Have students make as many rectangles using all tiles. Students should record all of the possible dimensions of the rectangles that they create.

Journal Prompt

Have students draw arrays for the following dimensions 4x3, 8x3 and 8x6. Ask students to determine the size of each array. Ask students, “how many 4x3 arrays will fit inside of an 8x3 array?” Ask students “how many 8x3 arrays will fit inside of an 8x6 array?” Ask students “how many 4x3 arrays will fit inside of an 8x6 array?”

**Evaluation of Student Understanding**

Informal Evaluation:

Observe students during the tasks. What do you notice about their understanding of multiplication? Remember to ask students, “How are you using the information to help you solve the problem?”

Formal Evaluation/Exit Ticket:

Student work on the Sticker Stumper activity sheet can be collected. If you would like to give an additional task you may pose the following task:
 “Mrs. Younts had a sheet with 7 stickers in each row. If there are 6 rows on each sheet and she gives 15 away. How many stickers does she now have?”

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

**Intervention:**

Provide struggling students with paper to draw pictures (sets or arrays) or counters to make groups will support their work in finding the various multiplication combinations.

**Extension:** Students could be given more tasks that involve two-steps, such as determining the stickers on a sheet then determining how many they would have if they gave away some. For example, *how many stickers would I have if I had 7 rows of 6 stickers and gave away 26 stickers?*

**Possible Misconceptions/Suggestions:**

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| **Possible Misconceptions** | **Suggestions** |
| Students may add the number of stickers in each row to the number of rows instead of multiply them.  | Have students count the number of stickers on smaller sheets and then have them use the strategy of repeated addition to determine the number of stickers on a sheet.  |
| Students may not be able to come up with the number of stickers on a sheet in an efficient way and they may need to count them all or use repeated addition. | The use of repeated addition is appropriate and an acceptable strategy. Continue to support students’ development of seeing equal groups and understanding that they could use repeated addition or other multiplication strategies such as breaking a factor apart to determine the answer.  |

**Possible Solutions:**

Exit ticket: The activity sheet could be used as an informal assessment. If desired pose the following, “Mrs. Younts had a sheet with 7 stickers in each row. If there are 6 rows on each sheet and she gives 15 away. How many stickers does she now have?”

 7x 6 – 15 = 42 – 15 = 27

More Sticker Stumpers

Bernise: 9x4= 36; 63 – 36 = 27 Catey: 8 x 3 = 24; 30 – 24 =6

Deja: 7 x 4 = 28; 42 – 28 = 14 Hank: 5 x 4 x 2 = 40

Gigi: 6 x 5 x 3 = 90 Fred: 6 x 5 x 4 = 120

Elise: 8 x 5 x 2 = 80

More Sticker Situations

Lenard: 8x7=56; 56+19=75; 103-75 = 28; Bridget: 9 x 4 = 36; 36 28 = 64; 103-64= 39

Kendrick: 7x5=35; 35+59=94; 103-94=9; Beatrice: 5x9=45; 8x4=32; 45 + 32 = 77; 103-77 = 26

Susan: 7x 5 = 35; 35 + 24 = 59
Vera has 28. Elise has 28-3 = 25. Total: 25 + 28 = 53
Nina has 7x8 = 56. Journee has 56 + 19 = 75. Total: 75 + 56 = 131

####  More Sticker Stumpers

Individuals Ordering on Monday

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Person | Length | Width | Number of Stickers They Want | Equations to Find Stickers Needed  | Number of Stickers Still Needed |
| Bernise | 9 stickers | 4 stickers |  63 |  |  |
| Catey | 8 stickers | 3 stickers |  30 |  |  |
| Deja | 7 stickers | 4 stickers |  42  |  |  |

Individuals Ordering On Tuesday

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| --- | --- | --- | --- | --- | --- |
| Person | Length | Width | Number of Sheets of Stickers  | Equation to Find Total Number of Stickers  | Number of Stickers Ordered  |
| Hank | 5 stickers | 4 stickers |  2 sheets |  |  |
| Gigi | 6 stickers | 5 stickers |  3 sheets |  |  |
| Fred | 4 stickers | 6 stickers |  5 sheets |  |  |
| Elise | 2 stickers | 8 stickers |  5 sheets  |  |  |

Grid Paper

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Multi-Step Sticker Stumpers

Part 1. Each of the following children want to collect 103 stickers. How many more does each need?

1. Lenard has a sheet with 8 rows and 7 stickers in each row and 19 stickers on a different sheet.
2. Bridget had 28 stickers. Then she got a sheet with 4 rows and 9 stickers in each row.
3. Kendrick has 59 stickers. Then he got a sheet with 7 rows and 5 stickers in each row.
4. Beatrice has a sheet with 5 rows and 9 stickers and another sheet with 8 rows and 4 stickers in each row.

Part 2. These people gave some of their stickers away. Help them figure out the answer to their question.

1. Susan gave 24 stickers away and now has a sheet with 7 rows and 5 stickers in each row. How many stickers did Susan first have?
2. Vera had 28 stickers. Vera had 3 more stickers than Elise. How many stickers did Vera and Elise both have?
3. Nina has a sheet of stickers with 7 rows and 8 stickers in each row. Nina has 19 fewer stickers than Journee. How many stickers do Nina and Journee both have?