**All Aboard! the Beaded Number Line**

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| In this lesson, students are introduced to the beaded number line as a tool to help them solve addition and subtraction problems within 20. This lesson is in two parts and may be taught over more than one day. |

**NC Mathematics Standards:**

 **Operations and Algebraic Thinking**

 **Add and subtract within 20**

**NC.2.OA.2** Demonstrate fluency with addition and subtraction, within 20, using mental

 strategies.

**Additional/Supporting Standards:**

 **Numbers and Operations in Base Ten**

 **Use place value understanding and properties of operations.**

 **NC.2.NBT.5** Demonstrate fluency with addition and subtraction, within 100, by:

* Flexibly using strategies on place value, properties of operations, and/or the relationship between addition and subtraction.
* Comparing addition and subtraction strategies, and explaining why they work.
* Selecting an appropriate strategy in order to efficiently compute sums and differences

**Standards for Mathematical Practice:**

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

2. Reason abstractly and quantitatively.

4. Model with mathematics.

5. Use appropriate tools strategically.

**Student Outcomes:**

* I can fluently add and subtract within 20.
* I can use a beaded number line to show how I add numbers together.
* I can draw and label an example of adding two sets of animals.

**Math Language:**

* add/addition
* subtract/subtraction
* compose
* decompose
* sum
* difference



**Materials:**

* *Animals on Board* by Stuart J. Murphy
* sticky notes
* *Animal Caravan* recording sheet (one per pair)
* pencil
* beaded number lines for each pair of students (other manipulatives can be used)
* 5 clothespins per pair

**Advance Preparation**:

* Use a sticky note to cover up each sum given in the book as well as the list of the total number of each animal given on page 30 of the book.
* Have this data from the book:

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| --- | --- |
| *Animals on Board* Caravan | Total # of each animal |
| 1st Green Truck | 3 tigers | 5 tigers |
| 2nd Green Truck | 2 tigers |
| 1st Purple Truck | 6 swans | 7 swans |
| 2nd Purple Truck | 1 swan |
| 1st Blue Truck | 4 frogs | 8 frogs |
| 2nd Blue Truck | 4 frogs |
| 1st Red Truck | 7 horses | 10 horses |
| 2nd Red Truck | 3 horses |
| Pink Truck | 9 pandas | 9 pandas |
| Red Truck | 0 pandas (empty) |
| Total Number of Animals: | 39 animals |

**Launch:**

**Trucker Jill and the Animal Caravan?** (10 minutes)

1. *I’m so excited about today’s math lesson. We are going to read a story about a caravan of animals and you will use a new tool that you can add to your toolbox of tools to help you solve math problems. What tools have you been using so far?* (Unifix cubes, base ten blocks, hundred charts, etc.) *I’m going to read the story and then you’re going to use this new tool to help you figure out a problem in the story.*
2. Read the story to the class, pausing to notice details about the book (types of animals, color of trucks, how animals are arranged, etc.).
3. Discuss the term *caravan (*a group of vehicles traveling together). *Where was the caravan going?*
4. Ask students, *Do we remember how many of each animal was in the animal caravan? We’re going to try to figure that out using a brand new tool!*
5. Distribute beaded number lines and give them time to explore. Remind them that this is a math tool, not a math toy. Allow several minutes for them to share what they notice about the beaded number lines.
6. Pass out the Animal Caravan recording sheet.
7. Once students have had a chance to explore, tell students, *I am going to reread the story. As I read the story, you and a partner are going to use one beaded number line and your recording sheet to figure out the total number of each animals in the caravan.*
8. Reread the story pausing to record the total number of animal on each truck.
	1. You may want to stop on page 12 to discuss what the word **another** means.
	2. You may want to stop on page 24 to discuss what the word **nothing** means.
9. Once the number of animals on each pair of trucks has been recorded say, *I’m wondering how many tigers were in the animal caravan. How could you use your beaded number line to help figure out how many tigers are in the animal caravan*? Observe as students work together to show 3 + 2 = 5 on the beaded number line. They can place a clothespin after the fifth bead.
10. Continue reading the story pausing to record the number of animals on each truck and the total number of each animal in the caravan. Close the book after reading page 29.
* **Note:** Stop after the frogs if you want to keep the total number of animals within 20, as stated in the standard. You can continue with the story and go beyond 20 with Teacher-Guided practice and discussion.

**Explore:**

**The (39) Animal Caravan** (15-20 minutes)

1. *Wow! That was a lot of animals! What if I wanted to know the total numbers of animals in the caravan? How could I use my beaded number line and my clothespins to help me figure out the total number of animals in the caravan? Could you work with your partner to figure out a way to help me?*
2. Give students time to work with their partner to determine the total numbers of animals in the caravan. As you walk around the classroom, take note of the strategies students are using to find the total number of animals and have them share their strategies during the discussion part of this lesson.

**Discuss:**

**The 39 Animal Caravan** (15-25 minutes)

1. Gather students together. Ask the partners you observed to share the strategies with the class, noting that:
	1. when they added the 7 swans to the 5 tigers, 5 of the swans **made a ten (friendly number)** and they still needed two more swans for a total of 12
	2. when they added the 8 frogs onto the caravan of 12 animals so far they made another 10! (for a total of 20)
	3. when they needed to add the 10 horses to the total of 20 animals, their clothespin ended up at the end of the next color on their beaded number line (for a total of 30)
	4. when they added the 9 pandas, they still had one bead left to make another 10 (for a total of 39)
2. Once students have clipped 39, remove the previous clothespin so that the groups of ten on the beaded number line are clearly defined. Have students count groups of ten shown on beaded number line with you as you find the total number of animals (39).

Possible questions

*How did you use the beaded number line to show how many animals were on each page?*

*What strategy did you use to find the sum of \_\_\_ & \_\_\_\_?* Follow up to clarify with questions such as, *What did you do to add on?*

*Where did you place your clothespin? Why? How did that help you to represent the animals on the page?*

Part 2

**Launch**

In this portion of the lesson, students refer back to the book

*"Have you ever thought about the thinking authors and illustrators do when they write a book like this?* (Students may mention prior experiences, interest in the topic, matching text to illustrations, etc.)

*Let's find out what it's like to write our own version of Animals On Board. What do we notice about the format of these pages?* (Guide a quick discussion on how the author and illustrator get you to think about the quantities and how they are combined. For instance, first one load of animals is shown and then another load of those same animals arrives. Except for zero, “some” animals drive by and then “some” more drive by before the author has us think about the total. )

*Let's use this format/pattern to write our own examples.*

(One pattern they may notice is that the “larger” number comes first on each page. It’s important that we clarify that the larger number does not need to be first and that they can break away from this in their examples.)

**Explore**

They draft and revise each other's pages and then show how to represent the stories with their beaded number lines.

How do you think your friends might use the beaded number line to find the total number of animals on your page?

**Discuss**

During the discussion, students share some of the pages and talk through the process. They share how they can use the number lines to represent their thinking.

Later they can create final pages and add the book to your library. Students can try different numbers or animals to make the book interesting.

**Evaluation of Student Understanding**

Informal Evaluation:

Write anecdotal notes on students’ thinking and what you see.

Formal Evaluation/Exit Ticket:

Show an example of how you can use the beaded number line to show your thinking for addition.

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

**Intervention:** Use Unifix cubes to solve the problems. Act out the problem.

**Extension:**

* When the students come back from Winter Break read *P. Bear’s New Years Party*. Have them determine the total number of animals invited to the party.

**Possible Misconceptions/Suggestions:**

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| **Possible Misconceptions** | **Suggestions** |
| Students are confused with the beaded number line. | Use a different material such as Unifix cubes and work with smaller numbers. |

**Special Notes: What do you really need to know to teach this lesson?**

* This lesson encourages student use of a beaded number line yet this lesson can also be done using Unifix cubes, base ten blocks, hundred charts, etc.

**Possible Solutions:**

**Animal Caravan**

|  |  |
| --- | --- |
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