**Juice Pouches**

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| In this two part lesson, students apply concepts of place value to read and write multi-digit whole numbers up to and including 100,000 using numerals, number names, and expanded form. |

**NC Mathematics Standards:**

**Number and Operations in Base Ten**

**NC.4.NBT.1** Explain that in a multi-digit whole number, a digit in one place represents 10 times as much as it represents in the place to its right, up to 100,000.

**NC.4.NBT.2** Read and write multi-digit whole numbers up to and including 100,000 using numerals, number names, and expanded form.

**Supporting Standard:**

**NC4.NBT.4** Add and subtract multi-digit whole numbers up to and including 100,000 using the standard algorithm with place value understanding.

**Standards for Mathematical Practice:**

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.

6. Attend to precision.

7. Look for and make use of structure.

**Student Outcomes:**

* I can explain that a digit in one place represents 10 times as much as it represents in the place to its right.
* I can write multi-digit numbers up to 100,000 using numerals and expanded form.

**Math Language:**

* digit
* place value
* base ten number system - ones, tens, hundreds, thousands, ten thousands, hundred thousands
* expanded form

**Materials:**

* base ten blocks
* student handout – Juice Pouches (1 per student)
* place value chart displayed in room

**Launch Day 1:**

1. Introduce Problem (5 minutes)

Ask students if they have ever had a juice pouch like Capri Sun. Have students turn and talk about their favorite type of juice pouch. Point out that juice pouches are packaged in different ways. A box holds 10 pouches. A case holds 10 boxes. A crate holds 10 cases.

Tell students that today’s math problem involves packages of juice pouches. Give each student the handout – Juice Pouches, and then read the problem aloud as students follow along. Problem:

*Several students brought in juice pouches for fourth grade’s upcoming Field Day.*

*Hank brought - 1 crate, 12 cases, 3 boxes and 6 pouches.*

*Paige brought - 1 crate, 13 cases, 17 boxes, and 2 pouches.*

*Abram brought - 1 crate, 12 cases, 2 boxes and 17 pouches.*

*Ginny brought - 1 crate, 14 cases, 6 boxes, and 9 pouches.*

*How many total drink pouches does each student have? Explain how you found your answer.*

**Explore Day 1:**

1. Solving the Problem (10 – 15 minutes)

Allow students time to work individually and then with partners in order to solve the task. Encourage students to share their strategies with one another and describe how they are answering each question. Provide students with base ten blocks if they need to model the problem.

As students work, observe students to see how they are solving the task. Observe:

* + How are students organizing and representing their thinking?
	+ How do students make sense of the number of juice pouches each student has?
	+ How did students determine how many pouches each student has?
	+ What strategies did students use to figure out how many pouches they have?
	+ Did students organize their information in a way that shows understanding?

Carefully select students to present to the class. Look for students who modeled the problem and kept track of the number of pouches.

**Discuss Day 1:**

1. Discussion of Solutions (15 – 20 minutes)

Bring the group back together and have selected students share their strategies for solving the task. Relate the task to our base ten number system and multiples of 10.

 Possible points to address and questions to ask:

* How did you figure out how many pouches were in a box? case? crate?
* Discuss and relate various modeling strategies (place value blocks, charts or tables, lists, arrays).
* How many pouches did each student have? How did you solve the task?

**Launch Day 2:**

1. Introduce Task 2 (5 minutes)

Introduce students to the second part of the task by saying: *Now that we have figured out how many juice pouches each person brought, they want to determine the total number of juice pouches available for Field Day. All of the juice pouches will be combined and reorganized into the larger containers in order to make it easier to carry to the ball field.*

*If the drink pouches were combined, how many pouches will fourth grade have for Field Day? How many of each type of container will fourth grade have when the juice pouches are combined and reorganized?*

**Explore Day 2:**

1. Solving the Problem (10 – 15 minutes)

Allow students time to work individually and then with partners in order to solve the task. Encourage students to share their strategies with one another and describe how they are answering each question. As students work, observe students to see how they are solving the task.

 Observe:

* + How are students organizing and representing their thinking?
	+ How did students regroup the juice pouches?
	+ Did students start with the crates and cases or the boxes and individual pouches?
	+ Did students focus on the total pouches or on the individual students?
	+ Did students make the connection with place value and number of pouches in the crate, case, and box?

Carefully select students to present to the class. Look for students who modeled the problem and determine how many they had combined as well as how many of each type of container they had. Also look for strategies that will generate discussion to help others move toward a deeper understanding of reading and writing multi-digit whole numbers. Be sure to bring up the connection to the place value chart with the crate, case, and box.

**Discuss Day 2:**

1. Discussion of Solutions (20 – 30 minutes)

Bring the group back together and have selected students share their strategies for solving the task. Relate the task to the place value chart.

 Possible points to address and questions to ask:

* How did you figure out how many pouches were in a box? Case? Crate?
* Discuss and relate various modeling strategies (base ten blocks, charts or tables, lists, arrays).
* How does this task relate to our place value system?

Close the lesson by having students write in their math journals. Ask students to reflect on the task and relate it to our base ten place value system. Have a few students share their responses to end the lesson.

Possible writing prompts:

* How does today’s task about juice pouches relate to base ten place value system? What connections do you notice?
* How did you use place value to help you solve this task?
* How did you use multiples of 10 as you solved this task?

**Evaluation of Student Understanding:**

**Informal Evaluation:**

* Observe and monitor students as they solve the problem. How are they making sense of the problem? Are they using place value to better understand the problem? Are they able to use place value to solve how many pouches they have and then dividing them into containers?

**Formal Evaluation/Exit Ticket:**

* Give students this exit ticket and have them solve independently.

*Another student, Kendall, brought in 1 crate, 20 cases, 2 boxes and 2 pouches. How many pouches of juice did Kendall bring in? If you combined Kendall’s pouches with the others, how many of each type of container would you have if you wanted to use as many of the largest containers as possible?*

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

**Interventions:**

* Suggest that students use base ten blocks to help visualize the pouch (ones), box (tens), case (hundreds), and crate (thousands).
* Remind students of the place value chart by asking probing questions.

**Extensions:**

* Ask students to create an ordered list - from the student who had the most juice pouches to the student with the smallest number of juice pouches. Have students create comparison statements using the symbols <, >, or =.
* Extension Problem: If all of the boxes were going to be split evenly among the six grades at the school, how many boxes would each grade receive? Would there be any leftovers?

**Possible Misconceptions/Suggestions:**

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| **Possible Misconceptions** | **Suggestions** |
| * Students do not understand the problem.
* Students do not make a connection to place value.
* Students do not understand what it means by largest container possible.
 | * Have students read aloud the problem with their group and explain to partners in their own words.
* Ask students how they might relate this problem to base-ten blocks. What would represent pouches, boxes, cases, and crates? Have students model the problem with blocks.
* Have place value charts for students to refer to. Use probing questions to help students make connections to the task.
* Continue using base-ten blocks to help them understand the largest container possible.
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**Special Notes:**

* This lesson is broken into two parts and can be extended over two days. The reason for this is to make sure that students deeply understand place value - how to read and write numbers in various ways and that a digit in one place represents 10 times as much as it represents in the place to its right.

**Possible Solutions:**

Part 1: Hank - 2,236 pouches, Paige - 2,472 pouches, Abram - 2,237 pouches, Ginny - 2,469 pouches

Part 2: Total: 9,414 pouches; Regrouped: 9 crates, 4 cases, 1 box, and 4 pouches

Exit Ticket: Kendall - 3,022 pouches; Regrouped and added to total from existing problem: 12 crates, 4 cases, 3 boxes, and 6 pouches.

**Juice Pouches**



Juice pouches are packaged in different ways. A box holds 10 pouches. A case holds 10 boxes. A crate holds 10 cases.

Several students brought in juice pouches for fourth grade’s upcoming Field Day.

Hank brought - 1 crate, 12 cases, 3 boxes and 6 pouches.

Paige brought - 1 crate, 13 cases, 17 boxes, and 2 pouches.

Abram brought - 1 crate, 12 cases, 2 boxes and 17 pouches.

Ginny brought - 1 crate, 14 cases, 6 boxes, and 9 pouches.

**Part 1:**

How many total drink pouches does each student have? Explain how you found your answer.

**Part 2:**

If the drink pouches were combined, how many pouches will fourth grade have for Field Day? How many of each type of container will fourth grade have when the juice pouches are combined and reorganized?