**Four Operation Sort**

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| In this lesson, students will apply their understanding of operations to distinguish and sort word problems based on which operation would correctly solve the problem. |

**NC Mathematics Standards:**

**Operations and Algebraic Thinking**

**NC.4.OA.3** Solve two-step word problems involving the four operations with whole numbers.

* Use estimation strategies to assess reasonableness of answers.
* Interpret remainders in word problems.
* Represent problems using equations with a letter standing for unknown quantity.

**Standards for Mathematical Practice:**

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

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

**Student Outcomes:**

* I can compare and make sense of word problems.
* I can determine the primary operation used to solve a word problem.

**Math Language:**

* addition
* subtraction
* multiplication
* division
* sum
* difference
* product
* quotient

**Materials:**

* problem cards and operation posters (1 per group)
* calculators
* index cards

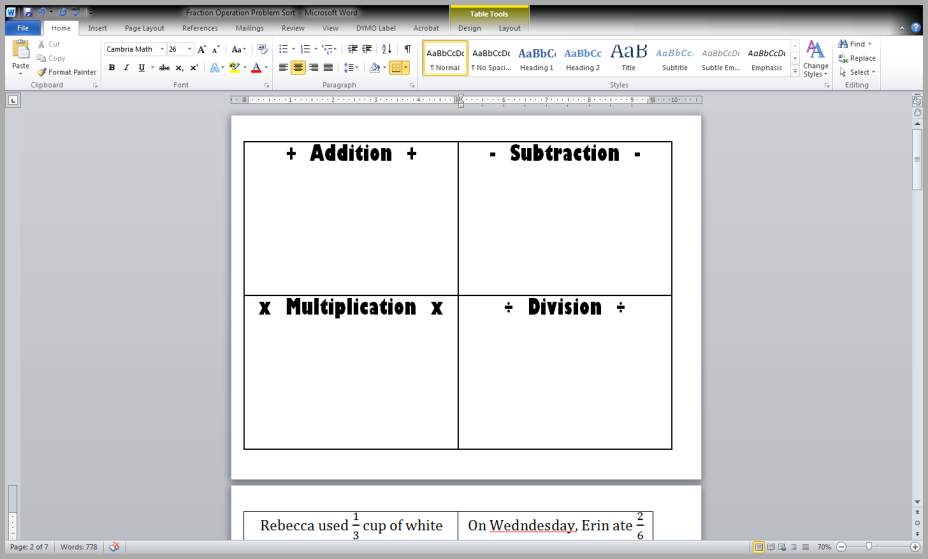
**Advance Preparation**:

* Print problem cards for each group.
* Have operation posters ready for each group.

**Launch:**

1. Introduce Problem (5 minutes)

Give students a set of problem cards and a large poster that displays the four operations (addition, subtraction, multiplication, and division). Instruct students to sort the word problems and place them on the poster according to the operation needed to solve it.



**Explore:**

1. Solving the Problem (20 – 30 minutes)

Give students time to work within their groups to sort and place each problem. As students work, observe students to see how they are making sense of each problem. Encourage students to share their reasoning and rationale for placing the problems in each category.

Observe:

* + How are students interpreting and understanding the problems?
  + How are students explaining and justifying their thinking?
  + How do students make sense of the word problems?
  + How do students determine which operation is used to represent and solve the problem?
  + What misconceptions do students have? (key words, context of problem, etc.)

As students work within their groups, carefully listen to their arguments and justifications. Select various problems or students to present to the class. Look for students who demonstrate reasoning and understanding, possibly display a misconception, or have something interesting to share. Also look for the word problems that cause the most confusion or discussion within the groups.

**Discuss:**

1. Discussion of Solutions (20 – 30 minutes)

Bring the group back together to discuss the problem sort.

Possible points to address and questions to ask:

* Similarities and differences between the problems. What do you notice is the same for all the problems on the poster? What do you notice is different across the categories?
* Discuss how students are making sense of the problem and determining the primary operation of each word problem.
* Discuss commonalities among the operations.
  + What is the same about all of the addition problems? (joining, putting together, combining)
  + What do you notice about all of the subtraction problems? (separating, finding the difference, taking away or apart, comparing)
  + How are all of the division problems alike? (dividing, partitioning into equal groups, splitting or sharing equal groups)
  + How are the multiplication problems related? (equal groups, arrays, repeated addition)
* Discuss problems that caused debate and arguments among students.
* Discuss any misconceptions students might have (key words, understanding the problem or context). You may want to make a list of “key words” found in each type of problem. This will highlight for students that the same types of words are used in all types of problems. This activity could help debunk the notion of looking for key words when determining how to solve word problems.
* Compare a few problems, discussing similarities and differences between them.

Summarize today’s lesson focusing on problem-solving and the strategies that students used to determine the primary operation of the problems. Have students share what they have learned about problem solving and how this will help them on future assessments.

**Evaluation of Student Understanding:**

**Informal Evaluation:**

* Observe and monitor students as they solve the problem. How are they making sense of the word problems? Are they reading the problems all the way through or are they trying to just look for “key words?”

**Formal Evaluation/Exit Ticket:**

* At the end of the lesson, have students create their own word problem based on information discussed today. They will then trade their problem with a classmate and see if the classmate can determine what operation to use in order to solve this problem correctly.

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

**Interventions:**

* Give students a smaller number of cards in the beginning.
* Have students use manipulatives to model the problem and determine what operation to perform.

**Extensions:**

* Have students create their own word problem to fit each operation and record the problem on an index card. Students can trade their problems with another group and have them determine the primary operation for solving each problem.
* Have students select one of the problems and change the wording to fit a different operation.

**Possible Misconceptions/Suggestions:**

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| **Possible Misconceptions** | **Suggestions** |
| * Students cannot distinguish between the four operations to determine what operation to perform in each problem. | * In small groups, act out what is taking place in the problem so that students can visually see what is happening. * Have students use manipulatives to model the problem. |

**Special Notes:**

* Make sure students understand that this is a task of determining what operation to perform, not solving the word problems. You may want students to solve the problems on another day.

**Possible Solutions:**

**Addition:**

* Keith places $24 into his wallet and banks $265.  How much money does Keith have?
* Tom and Ben ordered two pizzas – one pepperoni and one cheese. Tom ate 5 slices of the pepperoni pizza and Ben ate 4 slices of the cheese pizza. How much pizza was eaten?
* During the first round of the NCAA basketball tournament, the Carolina Tarheels had 2,584 fans attend the game.  During the second round of the tournament, 3,000 more fans attended the second game than the first.  How many Tarheel fans attended the first two games of the tournament?

**Subtraction:**

* After a class party 3¼ cartons of orange juice remained from the ten cartons the teacher purchased.  How much juice was used at the party?
* Kim had 120 Pokémon cards in a box. She gave 84 of the Pokémon cards to her best friend Maddy. What is the total number of Pokémon cards that Kim has left in her box?
* The distance from John Lawrence Elementary School to Walt Disney World in Orlando, Florida is 617 miles.  The distance from John Lawrence Elementary School to Disneyland in Anaheim, California is 2,488 miles.  What is the difference between the two measures?
* This year Elizabeth exceeded her sales record by selling 108 boxes of Girl Scout cookies.  Kelli sold only 32 boxes of Girl Scout cookies.  How many more cookies did Elizabeth sell than Kelli?

**Multiplication:**

* The math team went to the aquarium to do research.  Each team member paid $12 for the trip.  There were 25 team members on the trip.  What was the total amount the team members paid?
* Tammy is decorating for an upcoming party.  She plans to use 6 vases to decorate the tables and will place 19 tulips of various colors in each vase.  What is the total number of tulips Tammy will need for her decorations?
* To stay healthy, Sally runs 3 miles each day. How many miles will Sally run if she runs every day from Monday to Saturday of this week?
* At the party, Emile ate 2 donuts.  Lucas ate four times as many donuts as Emile. How many donuts did Lucas eat?

**Division:**

* The local Walmart sold 336 DVD players last year. The store sold 8 different brands of DVD players and sold the same number of each brand. How many of each brand of DVD player did Walmart sell?
* There are 26 fourth grade students in Ms. Frazier’s class.  Each table in the classroom seats 6 students.  How many tables will be needed in Ms. Frazier’s classroom?
* Kate baked 84 blueberry muffins.  If each muffin tray held 9 muffins, how many trays did Kate use?
* Ms. Redding plans to order cheese and pepperoni pizzas for an upcoming class party.  Each pizza will be cut into 8 slices.  There will be 82 people at the party.  How many pizzas should Ms. Redding order so that each person can have one slice?
* With a speed of 270 mph, the Hennessey Venom is one of fastest cars in the world.  This is nine times as fast as the Aixam Coupe, one of the world’s slowest cars.  What is the speed of the Aixam Coupe?

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| + Addition + |
| - Subtraction - |
| x Multiplication x |
| ÷ Division ÷ |
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