Scaffolding Task: Brain Only!

STANDARDS FOR MATHEMATICAL CONTENT

MCC4.NBT.5 Multiply a whole number of up to four digits by one –digit whole number, and multiply two tow digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular, arrays, and /or area models.
MCC4.NBT.6 Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

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.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning

BACKGROUND KNOWLEDGE

In fourth grade, students build on their third grade work with division within 100. Students need opportunities to develop their understandings by using problems in and out of context. Example: A 4th grade teacher bought 4 new pencil boxes. She has 260 pencils. She wants to put the pencils in the boxes so that each box has the same number of pencils. How many pencils will there be in each box?

Using Base 10 Blocks: Students build 260 with base 10 blocks and distribute them into 4 equal groups. Some students may need to trade the 2 hundreds for tens but others may easily recognize that 200 divided by 4 is 50.

Using Place Value: $260 \div 4 = (200 \div 4) + (60 \div 4)$

Using Multiplication: $4 \times 50 = 200$, $4 \times 10 = 40$, $4 \times 5 = 20$; $50 + 10 + 5 = 65$; so $260 \div 4 = 65$
Some students may need to use manipulatives and other strategies to model their thinking until they begin to "see" the patterns and understand what is happening. The teacher should not point these relationships out for the students. Instead, they should guide the thinking of the students through questions and allow students to discuss their thinking with peers; the teacher should act as a facilitator.

Example:
There are 592 students participating in Field Day. They are put into teams of 8 for the competition. How many students are on each team?

Student 1	**Student 2**	**Student 3**
592 divided by 8 There are 70 8's in 560 592 - 560 = 32 There are 4 8's in 32 70 + 4 = 74	592 divided by 8 I know that 10 8's is 80 If I take out 50 8's that is 400 592 - 400 = 192 I can take out 20 more 8's which is 160 192 - 160 = 32 8 goes into 32 4 times I have none left I took out 50, then 20 more, then 4 more That's 74	Student 3 I want to get to 592 8 x 25 = 200 8 x 25 = 200 8 x 25 = 200 200 + 200 + 200 = 600 600 - 8 = 592 I had 75 groups of 8 and took one away, so there are 74 teams

ESSENTIAL QUESTIONS

- How are multiplication and division related to each other?
- What are some simple methods for solving multiplication and division problems?
- What patterns of multiplication and division can assist us in problem solving?

MATERIALS

- "Brain Only!" recording sheet

GROUPING

Small Group or Partner Task

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

In this task, students analyze multiplication and division expressions to find patterns and make connections among division and multiplication problems...

Comments

It is critical for students to understand the relationship that exists between multiplication and division as well as the strong relationship between the dividend, divisor, and quotient. This task is designed to allow students to further explore these relationships.

Task Directions

Students will follow the directions below from the "Brain Only!" recording sheet.

It's true! You can really use one problem to solve related problems just by using your brain!

Use this problem to answer the following ones with your brain.

$$1240 \div 4 = 310$$

1. Be able to explain the relationship of each problem to the one above.

$$1240 \div 8 = q$$

$$620 \div d = 155$$

$$155 \times 4 = p$$

$$620 \div 2 = q$$

$$310 \times 8 = p$$

$$620 \div d = 310$$

2. Make up at least 3 more problems that are related to these.

_____ _____ _____

3. Swap with your partner and see if you can use only your brain to solve their related problems.

4. Be able to explain the relationship of each of your partner's problems, too.

FORMATIVE ASSESSMENT QUESTIONS

- What patterns do you notice in the sets of numbers?
- How is each multiplication or division expression related to the others?
- What shortcuts do you think you can learn from analyzing these expressions?
- Can you think of other related multiplication or division problems?

DIFFERENTIATION

Extension

- Ask students if they think these ideas extend to larger numbers. Encourage them to use four and five digit numbers in the problems they create for the final step. Have them explain their thinking when choosing the numbers they did and provide evidence that the pattern continues even when the numbers become much larger.

Intervention

- The times table chart is an excellent visual cueing device that can be used to help students discover patterns in multiplication and division. Do not neglect to use this excellent teaching tool frequently for students who have not developed the ability to see connections and relationships between numbers easily.

Name _____ Date _____

Brain Only!

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6. Make up at least 3 more problems that are related to these.

_____ _____ _____

7. Swap with your partner and see if you can use only your brain to solve their related problems.

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