

CONSTRUCTING TASK: THE POWER OF PROPERTIES

STANDARDS FOR MATHEMATICAL CONTENT

MCC.3.NBT.2 Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.



STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
4. Model with mathematics.
6. Attend to precision.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

“Property” is just one of many words in the English language that has more than one meaning. While mathematical meanings may seem obvious to adults, children may not be able to understand “mathematical properties” and “difference” without some explanation and discussion. Also, the word “sum” and its homophone “some” may require clarification. This is particularly true for students who are not yet proficient in the English language.

Most children find it easy to understand the commutative property of addition and the identity property of addition, especially if they have seen them modeled and tried them themselves many times with manipulatives. Some areas where students may have more difficulty are listed below.

- For subtraction there is no commutative property and no associative property.
- The number “zero” should not be referred to as (the letter) “O” since this will cause confusion when working with variables.
- It is important that students first simplify what is inside the parentheses when using the associative property.

Be careful about making an inaccurate statement such as, “You cannot subtract a larger number from a smaller number.” It is possible to subtract a larger number from a smaller number; however, the result is a negative number. You want students to have access to correct mathematical information, even though they will not study positive and negative numbers until middle school. Therefore, you might say, “You cannot take away 12 pennies when you only have 8 pennies.” Or use a similar example with concrete materials.

ESSENTIAL QUESTIONS

- What are the properties that relate to addition and subtraction?
- How can we verify the results of an addition problem?

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- How does knowing the commutative property help us add numbers easily and quickly?
- How does knowing the identity property help us add numbers easily and quickly?
- How is zero different from any other whole number you might add or subtract?
- How does knowing the associative property help us add numbers easily and quickly?
- How do properties work in subtraction problems?

MATERIALS

- Counters (i.e., connecting cubes, cardboard cutouts, beans, or paper clips)
- “The Power of Properties” Student Recording Sheet

GROUPING

Individual/Partner Task

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

In this task, students will use counters to demonstrate various addition properties and explore these properties with subtraction. They will do this by working through the recording sheet.

FORMATIVE ASSESSMENT QUESTIONS

- Explain how you represented the property.
- What do you notice about the sum of an addition problem if you switch the order of the digits?
- What do you notice about the difference of a subtraction problem if you switch the order of the digits?
- How is understanding the commutative property helpful?
- What happens to a number when you add zero to it?
- What happens to a number when you subtract zero from it?
- How is understanding the identity property helpful?
- What do you notice about the sum of three addends if you change the pair of numbers you add first?
- What do you notice about the difference of three numbers if you change the pair of numbers you subtract first?
- How is understanding the associative property helpful?

DIFFERENTIATION

Extension

- Have students create story problems that include use of the properties of addition and subtraction.

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- Have students compute addition problems that involve larger numbers of addends and prove in more than one way, using parenthesis, that the sums are the same.
- Have students model the properties with larger numbers.

Intervention

- Have students draw a picture to go along with their number sentences that will also demonstrate what happened. Pay close attention to how students model the problem. Have them explain their thinking.
- Pose a story problem to students and have them use counters or other manipulatives to model the problem.

An example is:

Rashad gave his two sisters some of his chewing gum. He gave Samantha 2 pieces in the morning and 5 pieces after lunch. In the evening, he gave Samantha 8 more pieces of gum.

Rashad gave his other sister, Tina, 8 pieces in the morning and 5 pieces after lunch. Tina said he did not give her as much gum as he gave Samantha because he only gave her 2 pieces that evening.

Is Tina correct? Use your mathematical skills to explain whether or not Rashad gave both sisters the same amount of gum.

TECHNOLOGY CONNECTION

- <http://www.aaamath.com/pro.html> Students practice identification and application of arithmetic properties

Name _____ Date _____

The Power of Properties

Use the boxes below to model and correctly identify the properties of addition. For this task, you may use connecting cubes, paper clips or any other small objects your teacher has provided. For each property, decide on the numbers you will use and the correct symbols to use in each number sentence.



Commutative Property of Addition

1. Choose two different numbers for addends. Write a number sentence to show the sum.

2. Now change the order of the addends and write a new number sentence to show the sum.

3. Draw a picture to illustrate your two number sentences and explain how they are alike and how they are different.

4. Explain the commutative property of addition in your own words.

Identity Property of Addition

1. Write an addition number sentence with zero as one of the addends.

2. Explain the identity property of addition in your own words.

Associative Property of Addition

1. Decide on three different numbers to use as addends. Write two number sentences following the given format. Keep the order of the addends the same in both equations. Remember to add what is in the parenthesis first.

a. $(___ + ___) + ___ = ___$

b. $___ + (___ + ___) = ___$

2. Draw a picture to illustrate your two number sentences and explain how they are alike and how they are different.
3. Explain the associative property of addition in your own words.

What about Subtraction?

Use counters to model each property again, this time with subtraction.

Do the properties for addition also work for subtraction? Use words, pictures and numbers to explain what happens for each property.

1. Commutative Property

2. Identity Property

3. Associative Property