

Properties: Commutative, Associative, Identity, Property

Summary

Identify and apply properties of addition and multiplication

Materials

scissors and colored paper for foldable
graphing calculators
Color Tiles
Linker Cubes
Worksheet: [Linker Cube Properties](#)
8 large charts and 8 markers for Round The Room Writing

Background for Teachers

Enduring Understanding (Big Ideas):

Properties of Operations exist. Properties expedite computation.

Essential Questions:

How are the outcomes of multiplying by 1 and of adding 0 to an expression similar? Different?
What is the product of any number and 0
Why is division by zero undefined?
How can commutative and associative properties be used to simplify numerical expressions?
Do the commutative and associative properties apply to all operations?

Skill Focus:

Identify properties Simplify expressions using properties

Vocabulary Focus:

Identity property, undefined, commutative property, associative property

Ways to Gain/Maintain Attention (Primacy):

Game, calculators, manipulatives, graphic organize

Instructional Procedures

Starter: Compute using mental math-no calculator

$$42 \div 33 \div 0$$

$$4.9 + 6.8 + 3.2$$

$$2 \div 29 \div 5$$

$$2,900,145 \times 1$$

Lesson Segment 1: Identify Commutative, Associative and Identity Properties

Q. How did you do the problem in the Starter? Did anyone do it differently? Is there another way to work the problem that would make it easier to do?

Go over the essential questions with the students telling them they will need to be able to answer them at the end of the lesson.

A property is simply a true characteristic or attribute of something. Do "Stand Up If" where you as students to stand up if you name a property that is true for them, personally.

Stand up if...

Brown hair is a property for you

Being a good pet owner is a property for you

Texting is a property for you

Being over five foot tall is a property for you

Operations have properties, or true characteristics, too. Addition is an example of an operation. Think

of three other operations.

Have students make a foldable where flaps open in the center to make four sections like this
Have students use the graphing calculator to review commutative, associative and identity properties as explained in the TI-73 Equivalency attachment. After discussing a property, and Trying several examples, have students write three examples of that property and an explanation for how that property works under the appropriate flap of the foldable.

Lesson Segment 2: Properties of 0

Multiplication by 0

Ask each student to write a LONG multiplication problem that has a product of 0. Have student share around their team in a Round Robin. Have a few share with the class. Q. If I want a product of numbers to be 0, what must one of the factors be? Q. Can I ever get a product of 0 if none of the factors is 0? Q. Can I ever get a product other than 0 if one of the factors is 0?

Division by 0

Give students several color tiles. Tell them they will be making various groups using 12 color tiles. They should sketch and record each of the tasks on their own Properties Examples assignment paper. Have them separate the color tiles into groups by:

1. First dividing the tiles into 12 equal groups. Ask, "How many tiles in each group?" Have them sketch the groups and write $12/12 = 1$ tile in the group.
2. Next, have them divide the color tiles 6 equal groups. Ask, "How many tiles in each group?" Sketch the groups, and write $12/6 = 2$ tiles in each group.

3. Next, have them divide the color tiles into 4 groups. Ask, "How many tiles in each group?" Sketch the groups, and write $12/4 = 3$ tiles in each group.

Q. As we divide the 12 into fewer groups, what is happening to the number of tiles in each group?

Predict: Will that pattern continue?

4. Next, have them divide the color tiles into 3 groups. Ask, "How many tiles in each group?" Sketch the groups, and write $12/3 = 4$ tiles in each group.

5. Next, have them divide the color tiles into 2 groups. Ask, "How many tiles in each group?" Sketch the groups, and write $12/2 = 6$ tiles in each group.

6. Next, have them divide the color tiles into 1 group. Ask, "How many tiles in each group?" Sketch the groups, and write $12/1 = 12$ tiles in the group.

Q. Has your prediction proven to be true so far?

7. Last, have them divide the color tiles into 0 groups. As they look for ways to form no groups, they will try to form one group or they will say they will use no tiles. But, that is not what they are being asked to do. Guide their discussion to the fact that there is no way to identify what a no groups look like. So, there is no way to make no groups when you have any number of items. Thus, dividing by 0 is undefined or impossible. Have them try $12/0$ on their calculator. Have them try dividing several numbers by 0. Show them this is different from when we have no tiles and try to make 12 groups.

Have them try this on their calculator.

Have them write examples for multiplying by 0 and for dividing by 0 and write in their own words what happens when multiplying by 0 and when dividing by 0 under the properties of 0 flap of the foldable.

Lesson Segment 3: Modeling, Applying and Recognizing Properties

Linker Cubes can be used to model properties. Give each pair several linker cubes and work with them to model the properties listed on the attached worksheet, "Linker Cube Properties". Have students work with a partner taking turns being the builder to build, and sketch two examples for each of the properties on the paper.

Sing the attached Properties Song with the students a couple of times.

Do Stand-Up-If where students stand up if the statement is true. As they stand or remain sitting, ask them which property helped them to know this.

$$15 \times 1 = 1,$$

$$32 + 8 + 14 = 54$$

$$14/2 = 2/14$$

0/7 is undefined or impossible

$$7/0 = 0$$

$$3 + 28 + 7 = 38$$

Round The Room Writing Properties

Objective: Students will identify and write examples of properties

Materials: Eight Large papers with name of property and variable example on top, eight markers.

Papers will be titled thus

Additive Identity

Multiplicative Identity

Multiplication by 0

0 as a dividend

0 as a divisor

Commutative Property for addition

Commutative property for multiplication

Associative Property for addition

Associative Property for multiplication

Assign rotating roles: Scribe, Editor, Encourager, and Coach(es). The scribe writes only what the coaches suggest. The editor makes sure the expression looks correct and is large enough to be read across the room. As students move to each successive chart, the roles should be rotated giving each a chance to perform all the roles.

Procedure:

Student teams will revolve around the room as directed by the teacher stopping at one of the 8 charts each time they move. When they stop at a chart, they should read any expressions shown and put a small smiley face by the expressions they believe are correct. Then, they will write one or two example on the paper. You may want to instruct them to write an example using fractions or decimals and an example using whole number. When each team has visited all the papers, have the teams return to their first chart where they will decide which of the expressions are correct. They will then explain to the class why the expressions are correct or incorrect and the class members write all corrected expressions.

Lesson segment 4: Practice

Game: Play Concentration (see attached game) by dividing the class in half and having them take turns choosing two squares to be a match. If they choose two that match, their team gets a point.

Students write the numbers and examples from the game on their paper.

Cooperative Activity: Do Round The Room Writing (instructions attached)

Assign any additional text practice as needed.

Using the TI-73 to Verify Equivalency

The graphing calculator may be used whenever checking for equivalency in numerical or algebraic expressions is important such as checking the solution to an equation, checking for proof when using properties, or checking accuracy when simplifying algebraic expressions

To validate a property, press $\frac{\square}{\square}$. Type the expression on the left of the equal sign. Then, curser to the = sign. and press $\frac{\square}{\square}$. Type the expression on the right of the equal sign. Curser to Done and press $\frac{\square}{\square}$. If a 0 appears, the expressions are NOT equivalent. If a 1 appears, the expressions are equivalent.

Try several examples of properties to check for equivalency. Give the students some non examples using subtraction and division. Students should record the expressions on their paper and indicate whether they are equivalent or not.

Assessment Plan

Performance, Stand-Up-If, Game, manipulatives

Bibliography

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