Name ______________________ Date __________________________

Binary Operations - Step-by-Step Lesson

	1	2	3	4
1	2	1	4	3
2	1	2	3	4
3	4	3	1	2
4	3	4	2	1

a. Is this operation commutative?

b. Name the identity element. If no identity element exists, explain why.

c. For each element having an inverse, name the element and its inverse.

Explanation:

Step 1a) First we have to see what is being asked. This table provides us with a rule when combining these two objects.The table shows the operation 

being performed on working data set [1, 2, 3, 4,] The table displays all 16 possible outcomes. To check if the table is commutative, we can draw a diagonal line from the operation to the lower right box. If the line table displays symmetric values over that line, the table is commutative.

	1	2	3	4
1	2	1	4	3
2	1	2	3	4
3	4	3	1	2
4	3	4	2	1

We see that the line follows the values 2-2-1-1

The table is symmetric with respect to the diagonal line. Yes, it is commutative.

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Step 2b) An identity element is a single value that will always return the starting value. The identity element is **2** because this is the element where all of the values in its row or column are the same as the row or column headings.

Step 3c) If an element is an inverse it can undo the affects of other elements. Normally they are reciprocals or negations. An identify element needs to exist for inverses to be possible.

The inverse of **1** is **1**.

The inverse of **2** is **2**.

The inverse of **3** is **4** and

The inverse of **4** is **3**.

	1	2	3	4
1	2	1	4	3
2	1	2	3	4
3	4	3	1	2
4	3	4	2	1