



Enrich

The Closure Property

You have learned about several properties and have seen how they can be true for only certain operations. For example, the Commutative and Associative Properties only apply to addition and multiplication. Now, you will learn about a new property, the Closure Property.

The Closure Property involves thinking of operations and sets of numbers. It states that for a set of numbers, and for a given operation, the set of numbers is closed under that operation if the result of performing the operation belongs to that same set of numbers.

Before looking at examples, define two number sets.

Counting Numbers: 1, 2, 3, ...

Whole Numbers: 0, 1, 2, 3, ...

Notice that neither set includes fractions or decimals. The whole numbers are the counting numbers plus 0.

Example 1

The set of counting numbers is closed under addition because the result of adding any two counting numbers is another counting number.

Example 2

The set of counting numbers is *not* closed under subtraction because the result of subtracting two counting numbers does not have to be another counting number. For example, $3 - 3 = 0$.

Exercises

Tell if the set is closed under the given operation. If not, provide a counter example.

1. whole numbers, addition _____
2. whole numbers, multiplication _____
3. counting numbers, division _____
4. whole numbers, division _____
5. even numbers, addition _____
6. odd numbers, addition _____
7. even numbers, multiplication _____
8. odd numbers, multiplication _____