

## Collaborations between binary operations

Given two operations on a set  $S$ , a third operation  $\star$  on  $S$  is said to be a collaboration between the two if for all  $a, b \in S$ ,  $a \star b$  is the result of one of the two operations acting on the pair  $(a, b)$ . For this talk, we discuss, Plus-Minus operations (i.e. collaborations between addition and subtraction on an abelian group) as an initial experiment. We will also consider Plus-Times operations, collaborations between the addition and multiplication operations on a semiring. Our discussion of Plus-Minus operations will focus on the additive integers. However, it extends to ordered groups. For Plus Times operations, we produce an exhaustive list of associative collaborations between the usual addition and multiplication on the natural numbers  $N$ . We shall see that the Plus-Times operations we found are all examples of a type of construction which we define here and call Augmentations by Multidentities. If time allows, we will discuss connections between group collaborations and skew braces.