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On biselective operations

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Let X be a nonempty set and let $i,j \in \{1,2,3,4\}$. We say that a binary operation $F\colon X^2 \to X$ is (i,j)-*selective* if it satisfies the functional equation

$$F(F(x_1,x_2),F(x_3,x_4)) \ = \ F(x_i,x_j), \qquad x_1,x_2,x_3,x_4 \in X.$$

Also, we say that an operation $F\colon X^2 \to X$ is *biselective* if there exist $i,j \in \{1,2,3,4\}$ such that F is (i,j)-selective. We provide a full description of the class of (i,j)-selective operations when $i < j$. Particular focus is given to the $(1,3)$-selective operations (resp. $(1,4)$-selective operations) as they are solutions of the transitivity functional equation (resp. associativity and bisymmetry functional equations); see, e.g., [1].

References

[1] J. Aczél, *Lectures in Functional Equations and Their Applications*, Dover Publications, New York, 2006.

[2] J. Devillet, G. Kiss, *Characterizations of some classes of biselective operations*, Working paper.