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 \( F: X^2 \to X \) is \((i,j)\)-selective if it satisfies the functional equation

\[
F(F(x_1, x_2), F(x_3, x_4)) = F(x_i, x_j), \quad x_1, x_2, x_3, x_4 \in X.
\]

Also, we say that an operation \( F: X^2 \to X \) 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