We examine structures of the form $A = (N, f)$ where $f$ is a function from the natural numbers $N$ to $N$ such that at most two inputs map to the same output. If $|f^{-1}(a)| = 2$ for all $a$, then $A$ is a two-to-one (2:1) structure. This extends previous work by the authors on injection structures. There are two types of orbits in a 2:1 structure. First, there are $Z$-chains with attached binary trees. This is an infinite sequence isomorphic to the integers $Z$, where each element maps to its successor, together with, for each point $x$ in the $Z$-chain, a full binary tree in which each node maps to its predecessor and the top node maps to $x$. Second, there are $k$-cycles of the form $x, f(x), \ldots, f^k(x) = x$, with binary trees attached to each node as for the $Z$-chains. The character of a 2:1 structure is specifies the number of $k$-cycles for each $k$. We show that, as for injection structures, a computable 2:1 structure exists for any $\Sigma^0_2$ character and with any number of $Z$-chains. We prove that a 2:1 structure is computably categorical if and only if it has finitely many $Z$-chains. Also, every computable 1:1 structure is $\Delta^0_2$ categorical. We also examine the more complicated structures in which $f$ is not surjective. (Received August 21, 2012)