Efficieny as the measure. In the moment, impotent worry over outcomes might be exchanged for learning to use a general tool, say Redfield enumeration.

Semigroup. A *semigroup* is a set X together with a set of functions $\mathfrak{F}$ from X itself.

Monoid. A *monoid* is a semigroup where $\mathfrak{F}$ contains the identity function.

Group. A *group* is a monoid where for each $f \in \mathfrak{F}$, there is $g \in \mathfrak{F}$ so that applying f and then applying g gives the identity function.

Danger. A semigroup is *dangerous* if it has a fixed-point-free element.

Graphical. A semigroup $\mathfrak{S} := (X, \mathfrak{F})$ is *graphical* if, for some directed graph $\mathcal{G} := (V, \mathfrak{E})$, there is a representation of X as $X = \prod_{v \in V} \mathbb{Z}_2$ such that f is in $\mathfrak{F}$ just in case for each $v \in V$, the function f^v given by $f^v(x) := f(x)_v$ is independent of $V - N^+(v)$. Such a $\mathcal{G}$ is a *witness* for $\mathfrak{S}$.

Witnesses. For each semigroup $\mathfrak{S}$, write $\mathcal{W}(\mathfrak{S})$ for the witnesses of $\mathfrak{S}$. Note that if $\mathfrak{S}$ is not graphical, then $\mathcal{W}(\mathfrak{S}) = \emptyset$.

Problem. Classify the dangerous graphical semigroups by their witness sets.