The GAP functions contained here are intended to be used for analyzing several properties of groups E defined by ordinary group presentations of the form $\langle a, x : a^n, W(a,x)\rangle$ where:

- $W(a,x)$ is a word in the free group $F(a,x)$;
- $a \in E$ has order n; and
- E is finite.

To this end, it will be assumed that, in GAP, the group `e` is defined via the presentation with $a =$ `e.1` and `M` is the coset table resulting from `CosetTable(e,Subgroup(e,[e.1]));;`.

`MakeUnified (M, n[, f])`
This function creates the list

`[M, MakeTree(M), ShiftOrder(M), n]`

where `n` $= n$ is the order of $a \in E$. Optionally, an integer `f` may be input when there exists a retraction $\nu^{\mathtt{f}} : E \to \langle a\rangle$ satisfying $\nu^{\mathtt{f}}(a) = a$ and $\nu^{\mathtt{f}}(x) = a^{\mathtt{f}}$. In such a case, the kernel $\ker \nu^{\mathtt{f}}$ is cyclically presented. See citation. If `f` is input, then it becomes the fifth entry in the list. Otherwise, there is no default value for `f`. For the functions below, the result of `MakeUnified` is assumed to be defined to `U`.

`ShiftOrder (M)`
Used by `MakeUnified`. Intended to return the value of the shift of the cyclically presented kernel $\ker \nu^{\mathtt{f}}$ when a retraction $\nu^{\mathtt{f}} : E \to \langle a\rangle$ exists.

`MakeTree (M)`
Used by `MakeUnified`. Creates a list containing data used to determine a coset representative for each coset in $\langle a\rangle\backslash E$. Each entry in the list is a list itself containing two values. The first value is either `0` or `1` corresponding to x or a respectively. The second value is an index corresponding to the coset obtained by multiplying the chosen coset on the right by either x^{-1} or a^{-1} (as determined by the first value).

`ModifyRetraction (U[, f])` Used to modify the `U[5]` data about a retraction $\nu^{\mathtt{f}} : E \to \langle a\rangle$ if one exists. If `f` is not input, the retraction data is removed from `U`.
`MakeOrbit (U, pos[, row])`
This function creates a list of the column indices in `U[1]` that correspond to the cosets in $\langle a\rangle\backslash E$ in the orbit of the coset with index `pos` under successive right multiplication by the element $a^{\pm 1}, x^{\pm 1} \in E$ that corresponds to the row index of `U[1]` given by `row`. By default, `row` has a value of one, corresponding to multiplication by a.

`OrbitSizes (U[, row])`
This function creates a list containing two lists of equal length. The entries in the first list are the distinct sizes of the orbits made by the `MakeOrbit` function taken over every column index of `U[1]`. The second list contains the number of distinct orbits of the size given in the first list in the same index. If `row` is input, it is used as an optional parameter when calling `MakeOrbit`. By default, `row` has a value of one.

`FixedPoints (U[, pow, prim])`

MakeWordList
TraceWordlist
MakePowers
Orderlist
MakeCenter
MakeGroupFromList
DuplicateFree
MakeWord
CentralizingIndices