

GRPS1024

**Utilities for iterating through the groups
of order 1024 with p-class at least 3**

0.0.1

20 June 2022

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Chapter 1

Groups of Order 1024

1.1 Overview

This package gives access to all of the groups of order 1024 with p-class 3 and greater. The groups are sorted first by their parent group ids and then by the pc codes of the standard presentations for the groups. These groups were used in the 2021 enumeration of the groups of order 1024 [\[Bur21\]](#)

Chapter 2

Functionality

2.1 Methods

This section will describe the functions available in GRPS1024

2.1.1 NumDescendants

▷ NumDescendants(*Order*, *ID*) (function)

Returns: an integer

returns the number of immediate descendants of order 1024 of SmallGroup(*Order*,*ID*)

2.1.2 LoadDescendants

▷ LoadDescendants(*Order*, *ID*) (function)

Loads the immediate descendants of SmallGroup(*Order*,*ID*) into global variable GRPS1024_DESC.*(Order)*[*ID*] if the descendants are available else it loads into global variable GRPS1024_ENUM.*(Order)*[*ID*] the number of immediate descendants of order 1024 of SmallGroup(*Order*,*ID*)

2.1.3 CheckoutDescendants

▷ CheckoutDescendants(*arg*) (function)

Returns the immediate descendants of SmallGroup(*Order*,*ID*) as a list. If the list is empty this implies that the immediate descendants of SmallGroup(*Order*,*ID*) are not available, this might be because it doesn't have any or that SmallGroup(*Order*,*ID*) has *p*-class 1 and the presentations are not available. To see if the group has immediate descendants use NumDescendants.

2.1.4 IsAvailable

▷ IsAvailable(*N*) (function)

Returns: true or false

Checks if the *n*th group of order 1024 is available, there are 49487367289 groups of order 1024 and those which have *p*-class three and greater are available.

2.1.5 FindGroupN

▷ FindGroupN(N) (function)

Returns: list if available or else nil

Finds the N th group of order 1024 in storage and returns a list [Order, ID, step, n-offset, grp] which consists of the order of the parent group, the ID of the parent group, the step size, the position relative to its siblings, and the last entry is the pcode of the actual group. if the group is not available then an informative message about the groups heritage is printed.

2.1.6 FindNthAvailableGroup

▷ FindNthAvailableGroup(arg) (function)

Of the available groups returns the N th one. This should be the main function used to iterate through the 683,875,133 available groups.

2.1.7 AvailableMap

▷ AvailableMap(arg) (function)

This takes handles the translation between the ordering of the groups of order 1024 and the available groups of order 1024. For $1 \leq i \leq 683,875,133$ this will return the position of the i th available group among all the groups of order 1024.

Example

```
gap> S5 := SymmetricGroup(5);
Sym( [ 1 .. 5 ] )
gap> Order(S5);
120
```

References

- [Bur21] D. Burrell. On The Number of Groups of Order 1024. *Communications in Algebra*, 0(0):1–3, 2021. [3](#)

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