DOCTIAL

Adam Atkinson (ghira@mistral.co.uk)

I’ll come to Big MathsJam if it’s the last thing I do!

What Is Group Theory Useful For?

Combinatorial Game Theory

Misère Play

Commutative Monoids

What are these things?

Semigroup: associative operation

Monoid: as above, plus has an identity

Group: as above, plus has inverses

All of these can be commutative.

n=0

	commutative	all
groups	0	0
monoids	0	0
semigroups	1	1

n=1

	commutative	all
groups	1	1
monoids	1	1
semigroups	1	1

n=2

	commutative	all
groups	1	1
monoids	2	2
semigroups	3	4

n=3

	commutative	all
groups	1	1
monoids	5	6
semigroups	12	18

n=4

	commutative	all
groups	2	2
monoids	19	27
semigroups	58	126

n=5

	commutative	all
groups	1	1
monoids	78	156
semigroups	325	1160

n=6

	commutative	all
groups	1	2
monoids	421	1373
semigroups	2143	15973

n=7

	commutative	all
groups	1	1
monoids	2637	17730
semigroups	17291	836021

n=8

	commutative	all
groups	3	5
monoids	20486	858977
semigroups	221805	1843120128

CRIKEY

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Department Of “Crikey, That IS A Lot!”

n=9

	commutative	all
groups	2	2
monoids	246458	1844075697
semigroups	11545843	52989400714478

n=10

	commutative	all
groups	1	2
monoids	11833361	52991253973742
semigroups	3518930337	12418001077381302684

Table with everything

	Abelian groups	Groups	Comm. monoids	Monoids	Comm. semigroups	Semigroups
0	0	0	0	0	1	1
1	1	1	1	1	1	1
2	1	1	2	2	3	4
3	1	1	5	6	12	18
4	2	2	19	27	58	126
5	1	1	78	156	325	1160
6	1	2	421	1373	2143	15973
7	1	1	2637	17730	17291	836021
8	3	5	20486	858977	221805	1843120128
9	2	2	246458	1844075697	11545843	52989400714478
10	1	2	11833361	52991253973742	3518930337	1241800107738130268 4