

We introduce the structure constants of sl_2
We show the Killing-Cartan metric

```
-8.00 0.00 0.00
0.00 8.00 0.00
0.00 0.00 8.00
```

and its determinant
-512.0

In what follows we expand sl_2 with all the abelian semigroups of order 4
and identify the ones that leads to a semisimple algebra.

A semisimple algebra has been found, expanding with the semigroup #59

```
1 1 1 1
1 2 1 1
1 1 3 1
1 1 1 4
```

The metric of the expanded algebra is:

```
-8.00 -8.00 -8.00 -8.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
-8.00 -16.00 -8.00 -8.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
-8.00 -8.00 -16.00 -8.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
-8.00 -8.00 -8.00 -16.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 8.00 8.00 8.00 8.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 8.00 16.00 8.00 8.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 8.00 8.00 16.00 8.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 8.00 8.00 8.00 16.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 8.00 8.00 8.00 8.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 8.00 16.00 8.00 8.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 8.00 8.00 16.00 8.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 8.00 8.00 8.00 16.00
```

whose determinant is: 6.8719476736E10

A semisimple algebra has been found, expanding with the semigroup #62

```
1 1 1 1
1 2 1 1
1 1 3 3
1 1 3 4
```

The metric of the expanded algebra is:

```
-8.00 -8.00 -8.00 -8.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
-8.00 -16.00 -8.00 -8.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
-8.00 -8.00 -16.00 -16.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
-8.00 -8.00 -16.00 -24.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 8.00 8.00 8.00 8.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 8.00 16.00 8.00 8.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 8.00 8.00 16.00 16.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 8.00 8.00 16.00 24.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 8.00 8.00 8.00 8.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 8.00 16.00 8.00 8.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 8.00 8.00 16.00 16.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 8.00 8.00 16.00 24.00
```

whose determinant is: 6.8719476736E10

A semisimple algebra has been found, expanding with the semigroup #64

1 1 1 1

1 2 1 1

1 1 3 4

1 1 4 3

The metric of the expanded algebra is:

-8.00	-8.00	-8.00	-8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-8.00	-16.00	-8.00	-8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-8.00	-8.00	-24.00	-8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-8.00	-8.00	-8.00	-24.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	8.00	8.00	8.00	8.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	8.00	16.00	8.00	8.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	8.00	8.00	24.00	8.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	8.00	8.00	8.00	24.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	8.00	8.00	8.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	16.00	8.00	8.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	8.00	24.00	8.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	8.00	8.00	24.00

whose determinant is: 4.398046511104E12

A semisimple algebra has been found, expanding with the semigroup #68

1 1 1 1

1 2 1 2

1 1 3 3

1 2 3 4

The metric of the expanded algebra is:

-8.00	-8.00	-8.00	-8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-8.00	-16.00	-8.00	-16.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-8.00	-8.00	-16.00	-16.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-8.00	-16.00	-16.00	-32.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	8.00	8.00	8.00	8.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	8.00	16.00	8.00	16.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	8.00	8.00	16.00	16.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	8.00	16.00	16.00	32.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	8.00	8.00	8.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	16.00	8.00	16.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	8.00	16.00	16.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	16.00	16.00	32.00

whose determinant is: 6.8719476736E10

A semisimple algebra has been found, expanding with the semigroup #83

1 1 1 1

1 2 2 2

1 2 3 2

1 2 2 4

The metric of the expanded algebra is:

```

-8.00 -8.00 -8.00 -8.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
-8.00 -16.00 -16.00 -16.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
-8.00 -16.00 -24.00 -16.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
-8.00 -16.00 -16.00 -24.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 8.00 8.00 8.00 8.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 8.00 16.00 16.00 16.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 8.00 16.00 24.00 16.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 8.00 16.00 16.00 24.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 8.00 8.00 8.00 8.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 8.00 16.00 16.00 16.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 8.00 16.00 24.00 16.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 8.00 16.00 16.00 24.00

```

whose determinant is: 6.8719476736E10

A semisimple algebra has been found, expanding with the semigroup #86

```

1 1 1 1
1 2 2 2
1 2 3 3
1 2 3 4

```

The metric of the expanded algebra is:

```

-8.00 -8.00 -8.00 -8.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
-8.00 -16.00 -16.00 -16.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
-8.00 -16.00 -24.00 -24.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
-8.00 -16.00 -24.00 -32.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 8.00 8.00 8.00 8.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 8.00 16.00 16.00 16.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 8.00 16.00 24.00 24.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 8.00 16.00 24.00 32.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 8.00 8.00 8.00 8.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 8.00 16.00 16.00 16.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 8.00 16.00 24.00 24.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 8.00 16.00 24.00 32.00

```

whose determinant is: 6.8719476736E10

A semisimple algebra has been found, expanding with the semigroup #88

```

1 1 1 1
1 2 2 2
1 2 3 4
1 2 4 3

```

The metric of the expanded algebra is:

```

-8.00 -8.00 -8.00 -8.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
-8.00 -16.00 -16.00 -16.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
-8.00 -16.00 -32.00 -16.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
-8.00 -16.00 -16.00 -32.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 8.00 8.00 8.00 8.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 8.00 16.00 16.00 16.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 8.00 16.00 32.00 16.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 8.00 16.00 16.00 32.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 8.00 8.00 8.00 8.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 8.00 16.00 16.00 16.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 8.00 16.00 32.00 16.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 8.00 16.00 16.00 32.00

```

whose determinant is: 4.398046511104E12

A semisimple algebra has been found, expanding with the semigroup #93

1 1 1 1

1 2 2 4

1 2 3 4

1 4 4 2

The metric of the expanded algebra is:

-8.00	-8.00	-8.00	-8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-8.00	-24.00	-24.00	-8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-8.00	-24.00	-32.00	-8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-8.00	-8.00	-8.00	-24.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	8.00	8.00	8.00	8.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	8.00	24.00	24.00	8.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	8.00	24.00	32.00	8.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	8.00	8.00	8.00	24.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	8.00	8.00	8.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	24.00	24.00	8.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	24.00	32.00	8.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	8.00	8.00	24.00

whose determinant is: 4.398046511104E12

A semisimple algebra has been found, expanding with the semigroup #99

1 1 1 1

1 2 3 4

1 3 4 2

1 4 2 3

The metric of the expanded algebra is:

-8.00	-8.00	-8.00	-8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-8.00	-32.00	-8.00	-8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-8.00	-8.00	-8.00	-32.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-8.00	-8.00	-32.00	-8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	8.00	8.00	8.00	8.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	8.00	32.00	8.00	8.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	8.00	8.00	8.00	32.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	8.00	8.00	32.00	8.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	8.00	8.00	8.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	32.00	8.00	8.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	8.00	8.00	32.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	8.00	32.00	8.00

whose determinant is: -1.352605460594688E15

A semisimple algebra has been found, expanding with the semigroup #108

1 1 1 4

1 2 1 4

1 1 3 4

4 4 4 1

The metric of the expanded algebra is:

```

-16.00 -16.00 -16.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
-16.00 -24.00 -16.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
-16.00 -16.00 -24.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 -16.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 16.00 16.00 16.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 16.00 24.00 16.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 16.00 16.00 24.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 16.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 16.00 16.00 16.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 16.00 24.00 16.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 16.00 16.00 24.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 16.00

```

whose determinant is: 4.398046511104E12

A semisimple algebra has been found, expanding with the semigroup #110

```

1 1 1 4
1 2 2 4
1 2 3 4
4 4 4 1

```

The metric of the expanded algebra is:

```

-16.00 -16.00 -16.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
-16.00 -24.00 -24.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
-16.00 -24.00 -32.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 -16.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 16.00 16.00 16.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 16.00 24.00 24.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 16.00 24.00 32.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 16.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 16.00 16.00 16.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 16.00 24.00 24.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 16.00 24.00 32.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 16.00

```

whose determinant is: 4.398046511104E12

A semisimple algebra has been found, expanding with the semigroup #112

```

1 1 1 4
1 2 3 4
1 3 2 4
4 4 4 1

```

The metric of the expanded algebra is:

```

-16.00 -16.00 -16.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
-16.00 -32.00 -16.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
-16.00 -16.00 -32.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 -16.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 16.00 16.00 16.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 16.00 32.00 16.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 16.00 16.00 32.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 16.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 16.00 16.00 16.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 16.00 32.00 16.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 16.00 16.00 32.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 16.00

```

whose determinant is: 2.81474976710656E14

A semisimple algebra has been found, expanding with the semigroup #118

1 1 3 3

1 2 3 4

3 3 1 1

3 4 1 2

The metric of the expanded algebra is:

-16.00	-16.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-16.00	-32.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	-16.00	-16.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	-16.00	-32.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	16.00	16.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	16.00	32.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	16.00	16.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	16.00	32.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.00	16.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.00	32.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.00	16.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.00	32.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.00	16.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.00	32.00

whose determinant is: 2.81474976710656E14

A semisimple algebra has been found, expanding with the semigroup #122

1 1 3 4

1 2 3 4

3 3 4 1

4 4 1 3

The metric of the expanded algebra is:

-24.00	-24.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-24.00	-32.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	-24.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	-24.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	24.00	24.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	24.00	32.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.00	24.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.00	32.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.00	0.00

whose determinant is: -1.352605460594688E15

A semisimple algebra has been found, expanding with the semigroup #125

1 2 3 4

2 1 4 3

3 4 1 2

4 3 2 1

The metric of the expanded algebra is:

```

-32.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 -32.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 -32.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 -32.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 32.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 32.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 32.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 32.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 32.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 32.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 32.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 32.00

```

whose determinant is: 1.15292150460684698E18

A semisimple algebra has been found, expanding with the semigroup #126

1 2 3 4

2 1 4 3

3 4 2 1

4 3 1 2

The metric of the expanded algebra is:

```

-32.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 -32.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 -32.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 -32.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 32.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 32.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 32.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 32.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 32.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 32.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 32.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 32.00

```

whose determinant is: -1.15292150460684698E18

There are 58 commutative semigroups of order 4

And 16 expansions that give a semisimple algebra