**Definition 0.1** ([?])**.** A *nonassociative algebra*[1] is an algebra

$$\mathcal{A} = \langle A; ;, +, \cdot, -, ^{\smile}, 1', 0, 1\rangle$$

with type $\langle 2, 2, 2, 1, 1, 0, 0, 0\rangle$ such that:

- $\langle A; +, \cdot, -, 0, 1\rangle$ is a Boolean algebra,
- $x = x \,;\, 1' = 1' \,;\, x$ for all $x \in A$. That is, $1'$ is an identity element,
- $(x \,;\, y) \cdot z = 0$ if and only if $(x^{\smile} \,;\, z) \cdot y = 0$ for all $x, y, z \in A$,
- $(y \,;\, x) \cdot z = 0$ if and only if $(z \,;\, x^{\smile}) \cdot y = 0$ for all $x, y, z \in A$.

A nonassociative algebra is a *relation algebra* if, for all $x, y, z \in A$,

$$x \,;\, (y \,;\, z) = (x \,;\, y) \,;\, z.$$

**Definition 0.2** ([?])**.** Let $X$ be a set. A *proper relation algebra* with base set $X$ is an algebra $\mathcal{A}$ with nonempty domain $A \subseteq \wp(X \times X)$ and signature $\{\circ, \cup, \cap, \subseteq, ^{-1}, \setminus, \mathrm{id}_X, \mathsf{U}\}$ such that the following hold:

- $A$ together with the operations in $\{\cup, \cap, \setminus, \emptyset, \mathsf{U}\}$ form a field of sets. That is, if $R, S \in A$ then $R \cup S, R \cap S, \mathsf{U} \setminus S \in A$. It follows that $\emptyset, \mathsf{U} \in A$. Also, $\mathsf{U}$ is the biggest binary relation in $A$, and so $\mathsf{U} = \cup A$,
- $\mathrm{id}_X \coloneqq \{(x, x) \colon x \in X\} \in A$, the identity relation over $X$,
- $\mathcal{A}$ is closed under taking converses: $R \in A$ implies $R^{-1} \in A$, where $R^{-1} = \{(y, x) \colon (x, y) \in R\}$,

[1] A more accurate term would be *not-necessarily-associative algebra*.

- $\mathcal{A}$ is closed under composition of binary relations: $R, S \in A$ implies $R \circ S \in A$ where

$$R \circ S = \{(x, y) \colon (\exists z)(x, z) \in R \text{ and } (z, y) \in S\}.$$

**Definition 0.3.** A relation algebra $\mathcal{A}$ over a domain $A$ is *representable* if there exists a proper relation algebra $\mathcal{B}$ over a set $X$ such that $\mathcal{A}$ is isomorphic to $\mathcal{B}$. The isomorphism $h : A \to \wp(X \times X)$ is called a *representation*.

We can break the representation of composition down into two major components: *composition moves* and *witness moves*[2]. Whenever we see a situation as in Figure **??** in a representation we must see it completed to Figure **??**. This makes sense intuitively, since if we can relate $x$ to $y$ via $a$, and $y$ to $z$ via $b$, then we should be able to relate $x$ to $z$ via $a\,;b$ directly.

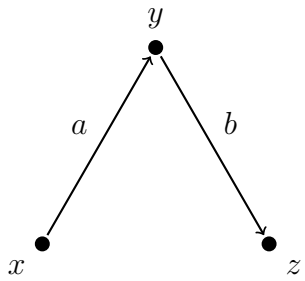



Figure 1: Composition move

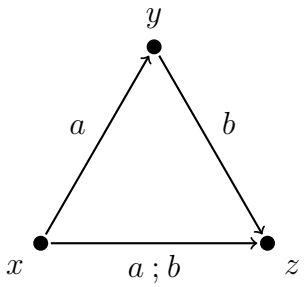



Figure 2: Composition response

If $c \leq a\,;b$, then whenever we can relate $x$ to $z$ by $c$ we should also be able to relate them by $a\,;b$ through some third point $y$. This is a *witness move*, shown in Figures **??** and **??**.

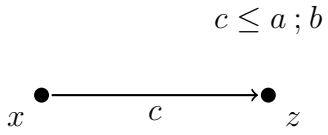



Figure 3: Witness move

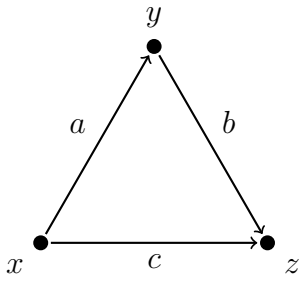



Figure 4: Witness response

Hirsch, Jackson and Kowalski [**?**] introduce a new concept of a *qualitative representation*. Once again, we demand that there are no inconsistent triangles. Unlike a relation algebra representation, we do not require that every consistent triangle appears wherever it can. We

[2]The language of composition and witness moves is borrowed from [**?**], and will be explored in greater detail in Chapter **??**.

simply demand that every consistent triangle appears at least *once* in the representation. That is, a qualitative representation is between a weak and a relation algebra representation.

Just as for weak representations, nonassociative algebras are the ideal abstract setting for qualitative representations. The main reason to prefer qualitative representations to weak representations is that a weak representation need not be isomorphic to the underlying nonassociative algebra. Indeed, different nonassociative algebras can have the same weak representation, and Hirsch et al. give examples.

As is the case for relation algebras and relation algebra representations, there does not exist a finite set of elementary axioms that characterise qualitative representability of nonassociative algebras.

The first clear definition of qualitative representations is given by Hirsch et al. [**?**]. We will define all of these concepts properly, but intuitively, a qualitative representation is stronger than a weak representation but weaker than a relation algebra representation. In a relation algebra representation, every composition must be seen wherever it can be seen; that is, composition must be represented through both composition moves and witness moves. In a weak representation, we require only composition moves. In a qualitative representation, we require composition moves, and that every composition appear at least *once* in the representation. That is, if $c \leq a ; b$, then in a qualitative representation we should see a triangle representing this composition *somewhere*. However, we do not need to witness $a ; b$ above every $c$.

We survey the qualitative representability of all nonassociative algebras on 4 atoms. For each algebra we provide a possible atom table showing composition. Atoms are represented by $1'$ if atomic, or $e_1, e_2, \ldots, e_n$ otherwise. We also note whether or not the algebra is a relation algebra; if so, we give the number used by Maddux [**?**], if applicable. If the algebra is qualitatively representable, we give an example of a representation. The representation is on the smallest number of vertices, but it is not necessarily the only representation up to isomorphism with that property.

If the representation is on too many points to draw in any useful manner, it is represented by a matrix with entries from the atoms of the algebra. To interpret these representations, we interpret the rows and columns of the matrix as vertices of a representation, such that the $uv$-th entry of the matrix is the relation from $u$ to $v$.

# 1 Atoms: two fragment identity and two symmetric

| | atom table | | | | RA | QRNA |
|---|---|---|---|---|---|---|
| #1 | $e_1$ | $e_2$ | $a$ | $b$ | | |
| $e_1$ | $e_1$ | 0 | $a$ | $b$ | | |
| $e_2$ | 0 | $e_2$ | 0 | 0 | no | not simple: $\#2_{\leq 3} \times \#22_{\leq 3}$ |
| $a$ | $a$ | 0 | $e_1$ | 0 | | |
| $b$ | $b$ | 0 | 0 | $e_1$ | | |

| atom table | RA | QRNA |
|---|---|---|

| #2 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | 0 | 0 | $b$ |
| $e_2$ | 0 | $e_2$ | $a$ | 0 |
| $a$ | 0 | $a$ | $e_2$ | 0 |
| $b$ | $b$ | 0 | 0 | $e_1$ |

yes — not simple: $\#4_{\leq 3} \times \#4_{\leq 3}$

| #3 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | 0 | $a$ | $b$ |
| $e_2$ | 0 | $e_2$ | $a$ | 0 |
| $a$ | $a$ | $a$ | $1'$ | 0 |
| $b$ | $b$ | 0 | 0 | $e_1$ |

no — no

| #4 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | 0 | $a$ | $b$ |
| $e_2$ | 0 | $e_2$ | $a$ | $b$ |
| $a$ | $a$ | $a$ | $1'$ | 0 |
| $b$ | $b$ | $b$ | 0 | $1'$ |

no — no

| #5 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | 0 | $a$ | $b$ |
| $e_2$ | 0 | $e_2$ | 0 | 0 |
| $a$ | $a$ | 0 | $e_1 + a$ | 0 |
| $b$ | $b$ | 0 | 0 | $e_1$ |

no — not simple: $\#2_{\leq 3} \times \#23_{\leq 3}$

| #6 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | 0 | 0 | $b$ |
| $e_2$ | 0 | $e_2$ | $a$ | 0 |
| $a$ | 0 | $a$ | $e_2 + a$ | 0 |
| $b$ | $b$ | 0 | 0 | $e_1$ |

yes — not simple: $\#4_{\leq 3} \times \#5_{\leq 3}$

| #7 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | 0 | $a$ | $b$ |
| $e_2$ | 0 | $e_2$ | $a$ | 0 |
| $a$ | $a$ | $a$ | $-b$ | 0 |
| $b$ | $b$ | 0 | 0 | $e_1$ |

no — no

| atom table | RA | QRNA |
|---|---|---|

| #8 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | 0 | $a$ | $b$ |
| $e_2$ | 0 | $e_2$ | 0 | $b$ |
| $a$ | $a$ | 0 | $e_1 + a$ | 0 |
| $b$ | $b$ | $b$ | 0 | $1'$ |

no — no

| #9 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | 0 | $a$ | $b$ |
| $e_2$ | 0 | $e_2$ | $a$ | $b$ |
| $a$ | $a$ | $a$ | $-b$ | 0 |
| $b$ | $b$ | $b$ | 0 | $1'$ |

no — no

| #10 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | 0 | $a$ | $b$ |
| $e_2$ | 0 | $e_2$ | 0 | 0 |
| $a$ | $a$ | 0 | $e_1 + b$ | $a$ |
| $b$ | $b$ | 0 | $a$ | $e_1$ |

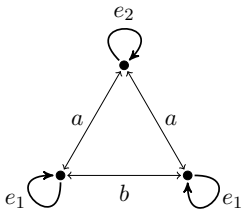
yes — not simple: $\#2_{\leq 3} \times \#12_{\leq 3}$

| #11 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | 0 | 0 | $b$ |
| $e_2$ | 0 | $e_2$ | $a$ | 0 |
| $a$ | 0 | $a$ | $e_2 + b$ | $a$ |
| $b$ | $b$ | 0 | $a$ | $e_1$ |

no — no

| #12 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | 0 | $a$ | $b$ |
| $e_2$ | 0 | $e_2$ | $a$ | 0 |
| $a$ | $a$ | $a$ | $-a$ | $a$ |
| $b$ | $b$ | 0 | $a$ | $e_1$ |

no —



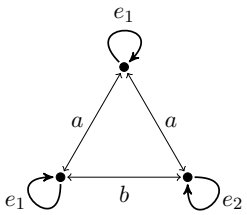

| #13 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | 0 | $a$ | $b$ |
| $e_2$ | 0 | $e_2$ | 0 | $b$ |
| $a$ | $a$ | 0 | $e_1 + b$ | $a$ |
| $b$ | $b$ | $b$ | $a$ | $1'$ |

no — no

| atom table | RA | QRNA |
|---|---|---|

| #14 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $a$ | $b$ |
| $e_2$ | $0$ | $e_2$ | $a$ | $b$ |
| $a$ | $a$ | $a$ | $-a$ | $a$ |
| $b$ | $b$ | $b$ | $a$ | $1'$ |

no




| #15 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $a$ | $b$ |
| $e_2$ | $0$ | $e_2$ | $0$ | $0$ |
| $a$ | $a$ | $0$ | $-e_2$ | $a$ |
| $b$ | $b$ | $0$ | $a$ | $e_1$ |

yes

not simple:
$\#2_{\leq 3} \times \#14_{\leq 3}$

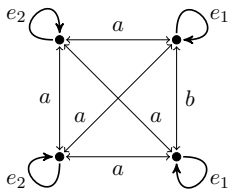
| #16 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $0$ | $b$ |
| $e_2$ | $0$ | $e_2$ | $a$ | $0$ | 
| $a$ | $0$ | $a$ | $-e_1$ | $a$ |
| $b$ | $b$ | $0$ | $a$ | $e_1$ |

no

no

| #17 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $a$ | $b$ |
| $e_2$ | $0$ | $e_2$ | $a$ | $0$ |
| $a$ | $a$ | $a$ | $1$ | $a$ |
| $b$ | $b$ | $0$ | $a$ | $e_1$ |

no



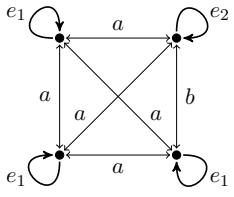

| #18 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $a$ | $b$ |
| $e_2$ | $0$ | $e_2$ | $0$ | $b$ |
| $a$ | $a$ | $0$ | $-e_2$ | $a$ |
| $b$ | $b$ | $b$ | $a$ | $1'$ |

no

no

| #19 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $a$ | $b$ |
| $e_2$ | $0$ | $e_2$ | $a$ | $b$ |
| $a$ | $a$ | $a$ | $1$ | $a$ |
| $b$ | $b$ | $b$ | $a$ | $1'$ |

no



| atom table | RA | QRNA |
|---|---|---|

| #20 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $a$ | $b$ |
| $e_2$ | $0$ | $e_2$ | $0$ | $0$ |
| $a$ | $a$ | $0$ | $e_1+a$ | $b$ |
| $b$ | $b$ | $0$ | $b$ | $e_1+a$ |

yes

not simple:
$\#2_{\leq 3} \times \#13_{\leq 3}$

| #21 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $0$ | $b$ |
| $e_2$ | $0$ | $e_2$ | $a$ | $0$ |
| $a$ | $0$ | $a$ | $e_2+a$ | $b$ |
| $b$ | $b$ | $0$ | $b$ | $e_1+a$ |

no

no

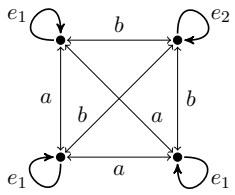
| #22 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $a$ | $b$ |
| $e_2$ | $0$ | $e_2$ | $a$ | $0$ |
| $a$ | $a$ | $a$ | $-b$ | $b$ |
| $b$ | $b$ | $0$ | $b$ | $e_1+a$ |

no

no

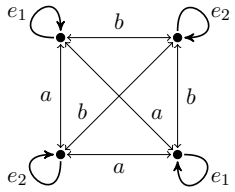
| #23 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $a$ | $b$ |
| $e_2$ | $0$ | $e_2$ | $0$ | $b$ |
| $a$ | $a$ | $0$ | $e_1+a$ | $b$ |
| $b$ | $b$ | $b$ | $b$ | $-b$ |

no




| #24 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $a$ | $b$ |
| $e_2$ | $0$ | $e_2$ | $a$ | $b$ |
| $a$ | $a$ | $a$ | $-b$ | $b$ |
| $b$ | $b$ | $b$ | $b$ | $-b$ |

no




| #25 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $a$ | $b$ |
| $e_2$ | $0$ | $e_2$ | $0$ | $0$ |
| $a$ | $a$ | $0$ | $e_1+b$ | $a+b$ |
| $b$ | $b$ | $0$ | $a+b$ | $e_1+a$ |

yes

not simple:
$\#2_{\leq 3} \times \#16_{\leq 3}$

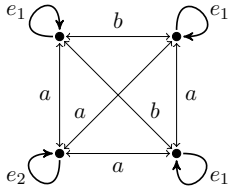
| atom table | RA | QRNA |
|---|---|---|

| #26 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $0$ | $b$ |
| $e_2$ | $0$ | $e_2$ | $a$ | $0$ |
| $a$ | $0$ | $a$ | $e_2+b$ | $a+b$ |
| $b$ | $b$ | $0$ | $a+b$ | $e_1+a$ |

no — no

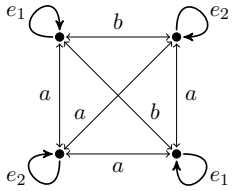
| #27 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $a$ | $b$ |
| $e_2$ | $0$ | $e_2$ | $a$ | $0$ | 
| $a$ | $a$ | $a$ | $-a$ | $a+b$ |
| $b$ | $b$ | $0$ | $a+b$ | $e_1+a$ |

no




| #28 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $a$ | $b$ |
| $e_2$ | $0$ | $e_2$ | $a$ | $b$ |
| $a$ | $a$ | $a$ | $-a$ | $a+b$ |
| $b$ | $b$ | $b$ | $a+b$ | $-b$ |

no




| #29 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $a$ | $b$ |
| $e_2$ | $0$ | $e_2$ | $0$ | $0$ |
| $a$ | $a$ | $0$ | $-e_2$ | $a+b$ |
| $b$ | $b$ | $0$ | $a+b$ | $e_1+a$ |

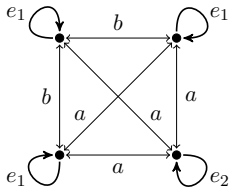
yes — not simple: $\#2_{\leq 3} \times \#17_{\leq 3}$

| #30 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $0$ | $b$ |
| $e_2$ | $0$ | $e_2$ | $a$ | $0$ |
| $a$ | $0$ | $a$ | $-e_1$ | $a+b$ |
| $b$ | $b$ | $0$ | $a+b$ | $e_1+a$ |

no — no

| #31 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $a$ | $b$ |
| $e_2$ | $0$ | $e_2$ | $a$ | $0$ |
| $a$ | $a$ | $a$ | $1$ | $a+b$ |
| $b$ | $b$ | $0$ | $a+b$ | $e_1+a$ |

no



| atom table | RA | QRNA |
|---|---|---|

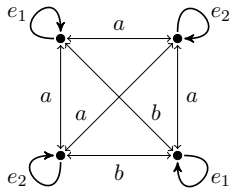
| #32 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $a$ | $b$ |
| $e_2$ | $0$ | $e_2$ | $0$ | $b$ |
| $a$ | $a$ | $0$ | $-e_2$ | $a+b$ |
| $b$ | $b$ | $b$ | $a+b$ | $-b$ |

no

no

| #33 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $a$ | $b$ |
| $e_2$ | $0$ | $e_2$ | $a$ | $b$ |
| $a$ | $a$ | $a$ | $1$ | $a+b$ |
| $b$ | $b$ | $b$ | $a+b$ | $-b$ |

no




| #34 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $a$ | $b$ |
| $e_2$ | $0$ | $e_2$ | $0$ | $0$ |
| $a$ | $a$ | $0$ | $e_1+a$ | $0$ |
| $b$ | $b$ | $0$ | $0$ | $e_1+b$ |

no

not simple:
$\#2_{\leq 3} \times \#24_{\leq 3}$

| #35 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $0$ | $b$ |
| $e_2$ | $0$ | $e_2$ | $a$ | $0$ |
| $a$ | $0$ | $a$ | $e_2+a$ | $0$ |
| $b$ | $b$ | $0$ | $0$ | $e_1+b$ |

yes

not simple:
$\#5_{\leq 3} \times \#5_{\leq 3}$

| #36 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $a$ | $b$ |
| $e_2$ | $0$ | $e_2$ | $a$ | $0$ |
| $a$ | $a$ | $a$ | $-b$ | $0$ |
| $b$ | $b$ | $0$ | $0$ | $e_1+b$ |

no

no

| #37 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $a$ | $b$ |
| $e_2$ | $0$ | $e_2$ | $a$ | $b$ |
| $a$ | $a$ | $a$ | $-b$ | $0$ |
| $b$ | $b$ | $b$ | $0$ | $-a$ |

no

no

| atom table | RA | QRNA |
|---|---|---|

| #38 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $a$ | $b$ |
| $e_2$ | $0$ | $e_2$ | $0$ | $0$ |
| $a$ | $a$ | $0$ | $-e_2$ | $a$ |
| $b$ | $b$ | $0$ | $a$ | $e_1+b$ |

yes

not simple:
$\#2_{\leq 3} \times \#15_{\leq 3}$

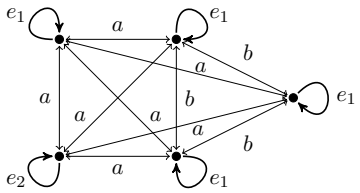
| #39 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $0$ | $b$ |
| $e_2$ | $0$ | $e_2$ | $a$ | $0$ |
| $a$ | $0$ | $a$ | $-e_1$ | $a$ |
| $b$ | $b$ | $0$ | $a$ | $e_1+b$ |

no

no

| #40 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $a$ | $b$ |
| $e_2$ | $0$ | $e_2$ | $a$ | $0$ |
| $a$ | $a$ | $a$ | $1$ | $a$ |
| $b$ | $b$ | $0$ | $a$ | $e_1+b$ |

no



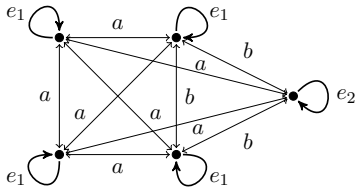

| #41 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $a$ | $b$ |
| $e_2$ | $0$ | $e_2$ | $0$ | $b$ |
| $a$ | $a$ | $0$ | $-e_2$ | $a$ |
| $b$ | $b$ | $b$ | $a$ | $-a$ |

no

no

| #42 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $a$ | $b$ |
| $e_2$ | $0$ | $e_2$ | $a$ | $b$ |
| $a$ | $a$ | $a$ | $1$ | $a$ |
| $b$ | $b$ | $b$ | $a$ | $-a$ |

no




| #43 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $a$ | $b$ |
| $e_2$ | $0$ | $e_2$ | $0$ | $0$ |
| $a$ | $a$ | $0$ | $-e_2$ | $a+b$ |
| $b$ | $b$ | $0$ | $a+b$ | $-e_2$ |

yes

not simple:
$\#2_{\leq 3} \times \#18_{\leq 3}$

| atom table | RA | QRNA |
|---|---|---|

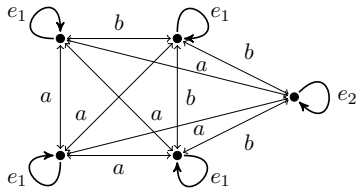
| #44 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $0$ | $b$ |
| $e_2$ | $0$ | $e_2$ | $a$ | $0$ |
| $a$ | $0$ | $a$ | $-e_1$ | $a+b$ |
| $b$ | $b$ | $0$ | $a+b$ | $-e_2$ |

no

no

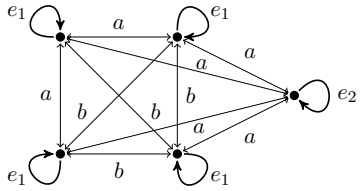
| #45 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $a$ | $b$ |
| $e_2$ | $0$ | $e_2$ | $a$ | $0$ | 
| $a$ | $a$ | $a$ | $1$ | $a+b$ |
| $b$ | $b$ | $0$ | $a+b$ | $-e_2$ |

no




| #46 | $e_1$ | $e_2$ | $a$ | $b$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $a$ | $b$ |
| $e_2$ | $0$ | $e_2$ | $a$ | $b$ |
| $a$ | $a$ | $a$ | $1$ | $a+b$ |
| $b$ | $b$ | $b$ | $a+b$ | $1$ |

no




## 2 Atoms: two fragment identity and one nonsymmetric

| atom table | RA | QRNA |
|---|---|---|

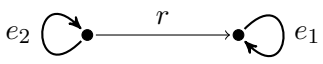
| #47 | $e_1$ | $e_2$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $r$ | $r^\smile$ |
| $e_2$ | $0$ | $e_2$ | $0$ | $0$ |
| $r$ | $r$ | $0$ | $0$ | $e_1$ |
| $r^\smile$ | $r^\smile$ | $0$ | $e_1$ | $0$ |

no

not simple:
$\#2_{\leq 3} \times \#21_{\leq 3}$

| #48 | $e_1$ | $e_2$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $0$ | $r^\smile$ |
| $e_2$ | $0$ | $e_2$ | $r$ | $0$ |
| $r$ | $r$ | $0$ | $0$ | $e_2$ |
| $r^\smile$ | $0$ | $r^\smile$ | $e_1$ | $0$ |

yes



| atom table | RA | QRNA |
|---|---|---|

| #49 | $e_1$ | $e_2$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $r$ | $r^\smile$ |
| $e_2$ | $0$ | $e_2$ | $r$ | $0$ |
| $r$ | $r$ | $0$ | $0$ | $1'$ |
| $r^\smile$ | $r^\smile$ | $r^\smile$ | $e_1$ | $0$ |

no — no

| #50 | $e_1$ | $e_2$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $r$ | $r^\smile$ |
| $e_2$ | $0$ | $e_2$ | $r$ | $r^\smile$ |
| $r$ | $r$ | $r$ | $0$ | $1'$ |
| $r^\smile$ | $r^\smile$ | $r^\smile$ | $1'$ | $0$ |

no — no

| #51 | $e_1$ | $e_2$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $r$ | $r^\smile$ |
| $e_2$ | $0$ | $e_2$ | $0$ | $0$ |
| $r$ | $r$ | $0$ | $r$ | $-e_2$ |
| $r^\smile$ | $r^\smile$ | $0$ | $-e_2$ | $r^\smile$ |

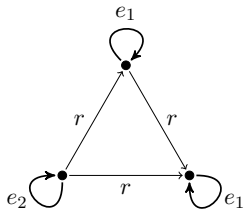
yes — not simple: $\#2_{\leq 3} \times \#10_{\leq 3}$

| #52 | $e_1$ | $e_2$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $0$ | $r^\smile$ |
| $e_2$ | $0$ | $e_2$ | $r$ | $0$ |
| $r$ | $r$ | $0$ | $r$ | $-e_1$ |
| $r^\smile$ | $0$ | $r^\smile$ | $-e_2$ | $r^\smile$ |

no — no

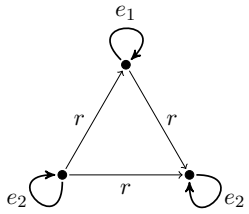
| #53 | $e_1$ | $e_2$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $r$ | $r^\smile$ |
| $e_2$ | $0$ | $e_2$ | $r$ | $0$ |
| $r$ | $r$ | $0$ | $r$ | $1$ |
| $r^\smile$ | $r^\smile$ | $r^\smile$ | $-e_2$ | $r^\smile$ |

no




| #54 | $e_1$ | $e_2$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $r$ | $r^\smile$ |
| $e_2$ | $0$ | $e_2$ | $r$ | $r^\smile$ |
| $r$ | $r$ | $r$ | $r$ | $1$ |
| $r^\smile$ | $r^\smile$ | $r^\smile$ | $1$ | $r^\smile$ |

no



| atom table | RA | QRNA |
|---|---|---|

| #55 | $e_1$ | $e_2$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $r$ | $r^\smile$ |
| $e_2$ | $0$ | $e_2$ | $0$ | $0$ |
| $r$ | $r$ | $0$ | $r^\smile$ | $e_1$ |
| $r^\smile$ | $r^\smile$ | $0$ | $e_1$ | $r$ |

yes

not simple:
$\#2_{\leq 3} \times \#9_{\leq 3}$

| #56 | $e_1$ | $e_2$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $0$ | $r^\smile$ |
| $e_2$ | $0$ | $e_2$ | $r$ | $0$ |
| $r$ | $r$ | $0$ | $r^\smile$ | $e_2$ |
| $r^\smile$ | $0$ | $r^\smile$ | $e_1$ | $r$ |

no

no

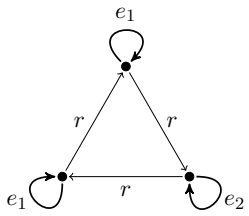
| #57 | $e_1$ | $e_2$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $r$ | $r^\smile$ |
| $e_2$ | $0$ | $e_2$ | $r$ | $0$ |
| $r$ | $r$ | $0$ | $r^\smile$ | $1'$ |
| $r^\smile$ | $r^\smile$ | $r^\smile$ | $e_1$ | $r$ |

no

no

| #58 | $e_1$ | $e_2$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $r$ | $r^\smile$ |
| $e_2$ | $0$ | $e_2$ | $r$ | $r^\smile$ |
| $r$ | $r$ | $r$ | $r^\smile$ | $1'$ |
| $r^\smile$ | $r^\smile$ | $r^\smile$ | $1'$ | $r$ |

no




| #59 | $e_1$ | $e_2$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $r$ | $r^\smile$ |
| $e_2$ | $0$ | $e_2$ | $0$ | $0$ |
| $r$ | $r$ | $0$ | $r + r^\smile$ | $-e_2$ |
| $r^\smile$ | $r^\smile$ | $0$ | $-e_2$ | $r + r^\smile$ |

yes

not simple:
$\#2_{\leq 3} \times \#11_{\leq 3}$

| #60 | $e_1$ | $e_2$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $0$ | $r^\smile$ |
| $e_2$ | $0$ | $e_2$ | $r$ | $0$ |
| $r$ | $r$ | $0$ | $r + r^\smile$ | $-e_1$ |
| $r^\smile$ | $0$ | $r^\smile$ | $-e_2$ | $r + r^\smile$ |

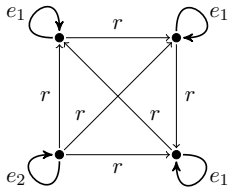
no

no

| atom table | RA | QRNA |
|---|---|---|

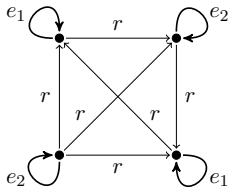
| #61 | $e_1$ | $e_2$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $r$ | $r^\smile$ |
| $e_2$ | $0$ | $e_2$ | $r$ | $0$ |
| $r$ | $r$ | $0$ | $r+r^\smile$ | $1$ |
| $r^\smile$ | $r^\smile$ | $r^\smile$ | $-e_2$ | $r+r^\smile$ |

no




| #62 | $e_1$ | $e_2$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $r$ | $r^\smile$ |
| $e_2$ | $0$ | $e_2$ | $r$ | $r^\smile$ |
| $r$ | $r$ | $r$ | $r+r^\smile$ | $1$ |
| $r^\smile$ | $r^\smile$ | $r^\smile$ | $1$ | $r+r^\smile$ |

no




# 3 Atoms: three fragment identity

| atom table | RA | QRNA |
|---|---|---|

| #63 | $e_1$ | $e_2$ | $e_3$ | $a$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $0$ | $a$ |
| $e_2$ | $0$ | $e_2$ | $0$ | $0$ |
| $e_3$ | $0$ | $0$ | $e_3$ | $0$ |
| $a$ | $a$ | $0$ | $0$ | $e_1$ |

yes

not simple:
$\#2_{\leq 3} \times \#2_{\leq 3} \times \#4_{\leq 3}$

| #64 | $e_1$ | $e_2$ | $e_3$ | $a$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $0$ | $a$ |
| $e_2$ | $0$ | $e_2$ | $0$ | $a$ |
| $e_3$ | $0$ | $0$ | $e_3$ | $0$ |
| $a$ | $a$ | $a$ | $0$ | $e_1+e_2$ |

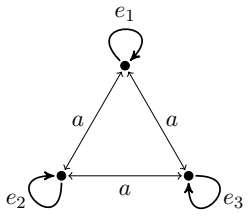
no

not simple:
$\#2_{\leq 3} \times \#19_{\leq 3}$

| #65 | $e_1$ | $e_2$ | $e_3$ | $a$ |
|---|---|---|---|---|
| $e_1$ | $e_1$ | $0$ | $0$ | $a$ |
| $e_2$ | $0$ | $e_2$ | $0$ | $a$ |
| $e_3$ | $0$ | $0$ | $e_3$ | $a$ |
| $a$ | $a$ | $a$ | $a$ | $1'$ |

no

no

| atom table | RA | QRNA |
|---|---|---|
| #66 $e_1$ $e_2$ $e_3$ $a$<br>$e_1$ $e_1$ 0 0 $a$<br>$e_2$ 0 $e_2$ 0 0<br>$e_3$ 0 0 $e_3$ 0<br>$a$ $a$ 0 0 $e_1+a$ | yes | not simple:<br>$\#2_{\leq 3} \times \#2_{\leq 3} \times \#5_{\leq 3}$ |
| #67 $e_1$ $e_2$ $e_3$ $a$<br>$e_1$ $e_1$ 0 0 $a$<br>$e_2$ 0 $e_2$ 0 $a$<br>$e_3$ 0 0 $e_3$ 0<br>$a$ $a$ $a$ 0 $-e_3$ | no | not simple:<br>$\#2_{\leq 3} \times \#20_{\leq 3}$ |
| #68 $e_1$ $e_2$ $e_3$ $a$<br>$e_1$ $e_1$ 0 0 $a$<br>$e_2$ 0 $e_2$ 0 $a$<br>$e_3$ 0 0 $e_3$ $a$<br>$a$ $a$ $a$ $a$ 1 | no |  |

# 4 Atoms: four fragment identity

| atom table | RA | QRNA |
|---|---|---|
| #69 $e_1$ $e_2$ $e_3$ $e_4$<br>$e_1$ $e_1$ 0 0 0<br>$e_2$ 0 $e_2$ 0 0<br>$e_3$ 0 0 $e_3$ 0<br>$e_4$ 0 0 0 $e_4$ | yes | not simple:<br>$\#2_{\leq 3} \times \#2_{\leq 3} \times \#2_{\leq 3} \times \#2_{\leq 3}$ |

# 5 Atoms: atomic identity and three symmetric

| atom table | RA | QRNA |
|---|---|---|

| #70 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'$ | $0$ | $0$ |
| $b$ | $b$ | $0$ | $1'$ | $0$ |
| $c$ | $c$ | $0$ | $0$ | $1'$ |

no

no

| #71 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+a$ | $0$ | $0$ |
| $b$ | $b$ | $0$ | $1'$ | $0$ |
| $c$ | $c$ | $0$ | $0$ | $1'$ |

no

no

| #72 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+b$ | $a$ | $0$ |
| $b$ | $b$ | $a$ | $1'$ | $0$ |
| $c$ | $c$ | $0$ | $0$ | $1'$ |

no

no

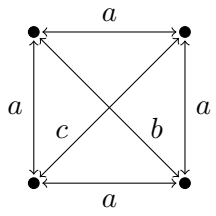
| #73 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-c$ | $a$ | $0$ |
| $b$ | $b$ | $a$ | $1'$ | $0$ |
| $c$ | $c$ | $0$ | $0$ | $1'$ |

no

no

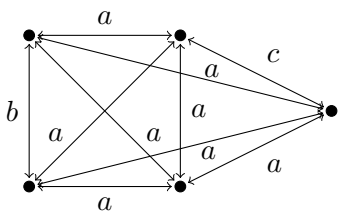
| #74 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-a$ | $a$ | $a$ |
| $b$ | $b$ | $a$ | $1'$ | $0$ |
| $c$ | $c$ | $a$ | $0$ | $1'$ |

no




| #75 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a$ | $a$ |
| $b$ | $b$ | $a$ | $1'$ | $0$ |
| $c$ | $c$ | $a$ | $0$ | $1'$ |

no



| | atom table | RA | QRNA |
|---|---|---|---|

| #76 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+a$ | $b$ | $0$ |
| $b$ | $b$ | $b$ | $1'+a$ | $0$ |
| $c$ | $c$ | $0$ | $0$ | $1'$ |

no

no

| #77 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+b$ | $a+b$ | $0$ |
| $b$ | $b$ | $a+b$ | $1'+a$ | $0$ |
| $c$ | $c$ | $0$ | $0$ | $1'$ |

no

no

| #78 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-c$ | $a+b$ | $0$ |
| $b$ | $b$ | $a+b$ | $1'+a$ | $0$ |
| $c$ | $c$ | $0$ | $0$ | $1'$ |

no

no

| #79 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+c$ | $b$ | $a$ |
| $b$ | $b$ | $b$ | $1'+a$ | $0$ |
| $c$ | $c$ | $a$ | $0$ | $1'$ |

no

no

| #80 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-b$ | $b$ | $a$ |
| $b$ | $b$ | $b$ | $1'+a$ | $0$ |
| $c$ | $c$ | $a$ | $0$ | $1'$ |

no

no

| #81 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-a$ | $a+b$ | $a$ |
| $b$ | $b$ | $a+b$ | $1'+a$ | $0$ |
| $c$ | $c$ | $a$ | $0$ | $1'$ |

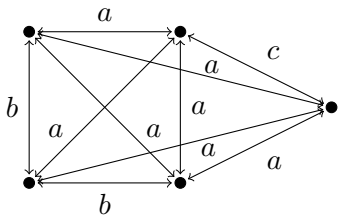
no

no

| atom table | RA | QRNA |
|---|---|---|

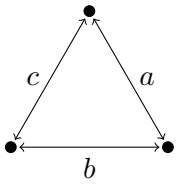
| #82 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a+b$ | $a$ |
| $b$ | $b$ | $a+b$ | $1'+a$ | $0$ |
| $c$ | $c$ | $a$ | $0$ | $1'$ |

no




| #83 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'$ | $c$ | $b$ |
| $b$ | $b$ | $c$ | $1'$ | $a$ |
| $c$ | $c$ | $b$ | $a$ | $1'$ |

yes
$25_{65}$
RRA



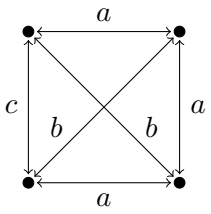

| #84 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+a$ | $c$ | $b$ |
| $b$ | $b$ | $c$ | $1'$ | $a$ |
| $c$ | $c$ | $b$ | $a$ | $1'$ |

no

no

| #85 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+b$ | $a+c$ | $b$ |
| $b$ | $b$ | $a+c$ | $1'$ | $a$ |
| $c$ | $c$ | $b$ | $a$ | $1'$ |

no




| #86 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-c$ | $a+c$ | $b$ |
| $b$ | $b$ | $a+c$ | $1'$ | $a$ |
| $c$ | $c$ | $b$ | $a$ | $1'$ |

no

no

| #87 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-a$ | $a+c$ | $a+b$ |
| $b$ | $b$ | $a+c$ | $1'$ | $a$ |
| $c$ | $c$ | $a+b$ | $a$ | $1'$ |

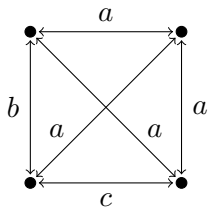
no

no

| atom table | RA | QRNA |
|---|---|---|

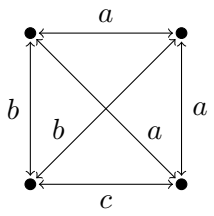
| #88 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a+c$ | $a+b$ |
| $b$ | $b$ | $a+c$ | $1'$ | $a$ |
| $c$ | $c$ | $a+b$ | $a$ | $1'$ |

no




| #89 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+a$ | $b+c$ | $b$ |
| $b$ | $b$ | $b+c$ | $1'+a$ | $a$ |
| $c$ | $c$ | $b$ | $a$ | $1'$ |

yes
$26_{65}$
RRA



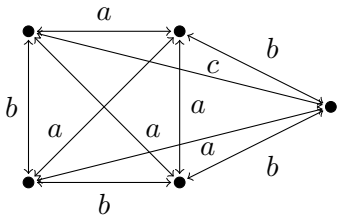

| #90 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+b$ | $0'$ | $b$ |
| $b$ | $b$ | $0'$ | $1'+a$ | $a$ |
| $c$ | $c$ | $b$ | $a$ | $1'$ |

no

no

| #91 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-c$ | $0'$ | $b$ |
| $b$ | $b$ | $0'$ | $1'+a$ | $a$ |
| $c$ | $c$ | $b$ | $a$ | $1'$ |

no




| #92 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+c$ | $b+c$ | $a+b$ |
| $b$ | $b$ | $b+c$ | $1'+a$ | $a$ |
| $c$ | $c$ | $a+b$ | $a$ | $1'$ |

no

no

| #93 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-b$ | $b+c$ | $a+b$ |
| $b$ | $b$ | $b+c$ | $1'+a$ | $a$ |
| $c$ | $c$ | $a+b$ | $a$ | $1'$ |

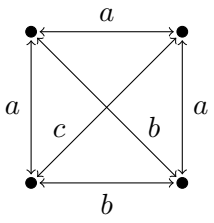
no

no

| atom table | RA | QRNA |
|---|---|---|

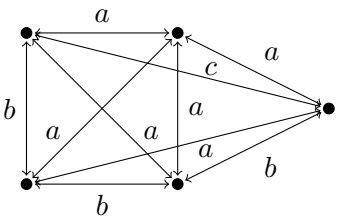
| #94 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-a$ | $0'$ | $a+b$ |
| $b$ | $b$ | $0'$ | $1'+a$ | $a$ |
| $c$ | $c$ | $a+b$ | $a$ | $1'$ |

no




| #95 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $0'$ | $a+b$ |
| $b$ | $b$ | $0'$ | $1'+a$ | $a$ |
| $c$ | $c$ | $a+b$ | $a$ | $1'$ |

no




| #96 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'$ | $b$ | $c$ |
| $b$ | $b$ | $b$ | $1'+a$ | $0$ |
| $c$ | $c$ | $c$ | $0$ | $1'+a$ |

no

no

| #97 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+a$ | $b$ | $c$ |
| $b$ | $b$ | $b$ | $1'+a$ | $0$ |
| $c$ | $c$ | $c$ | $0$ | $1'+a$ |

no

no

| #98 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+b$ | $a+b$ | $c$ |
| $b$ | $b$ | $a+b$ | $1'+a$ | $0$ |
| $c$ | $c$ | $c$ | $0$ | $1'+a$ |

no

no

| #99 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-c$ | $a+b$ | $c$ |
| $b$ | $b$ | $a+b$ | $1'+a$ | $0$ |
| $c$ | $c$ | $c$ | $0$ | $1'+a$ |

no

no

| | atom table | RA | QRNA |
|---|---|---|---|

| #100 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-a$ | $a+b$ | $a+c$ |
| $b$ | $b$ | $a+b$ | $1'+a$ | $0$ |
| $c$ | $c$ | $a+c$ | $0$ | $1'+a$ |

no

no

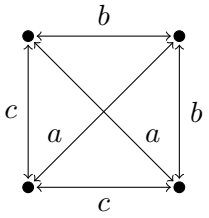
| #101 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a+b$ | $a+c$ |
| $b$ | $b$ | $a+b$ | $1'+a$ | $0$ |
| $c$ | $c$ | $a+c$ | $0$ | $1'+a$ |

no

$$\begin{bmatrix} 1' & a & a & b & a & a \\ a & 1' & a & a & c & a \\ a & a & 1' & b & a & a \\ b & a & b & 1' & a & a \\ a & c & a & a & 1' & c \\ a & a & a & a & c & 1' \end{bmatrix}$$

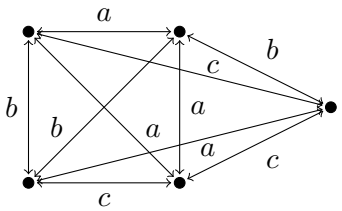
| #102 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'$ | $b+c$ | $b+c$ |
| $b$ | $b$ | $b+c$ | $1'+a$ | $a$ |
| $c$ | $c$ | $b+c$ | $a$ | $1'+a$ |

no




| #103 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+a$ | $b+c$ | $b+c$ |
| $b$ | $b$ | $b+c$ | $1'+a$ | $a$ |
| $c$ | $c$ | $b+c$ | $a$ | $1'+a$ |

yes
$28_{65}$
RRA



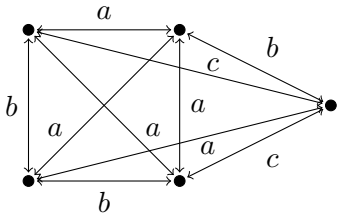

| #104 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+b$ | $0'$ | $b+c$ |
| $b$ | $b$ | $0'$ | $1'+a$ | $a$ |
| $c$ | $c$ | $b+c$ | $a$ | $1'+a$ |

no

no

| #105 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-c$ | $0'$ | $b+c$ |
| $b$ | $b$ | $0'$ | $1'+a$ | $a$ |
| $c$ | $c$ | $b+c$ | $a$ | $1'+a$ |

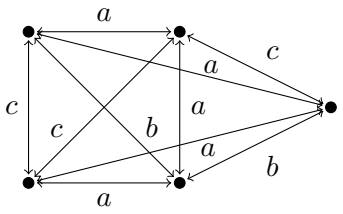
no



| atom table | RA | QRNA |
|---|---|---|

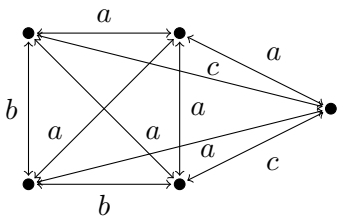
| #106 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-a$ | $0'$ | $0'$ |
| $b$ | $b$ | $0'$ | $1'+a$ | $a$ |
| $c$ | $c$ | $0'$ | $a$ | $1'+a$ |

no




| #107 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $0'$ | $0'$ |
| $b$ | $b$ | $0'$ | $1'+a$ | $a$ |
| $c$ | $c$ | $0'$ | $a$ | $1'+a$ |

yes
$32_{65}$
RRA




| #108 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+a$ | $0$ | $0$ |
| $b$ | $b$ | $0$ | $1'+b$ | $0$ |
| $c$ | $c$ | $0$ | $0$ | $1'$ |

no — no

| #109 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-c$ | $a$ | $0$ |
| $b$ | $b$ | $a$ | $1'+b$ | $0$ |
| $c$ | $c$ | $0$ | $0$ | $1'$ |

no — no

| #110 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+c$ | $0$ | $a$ |
| $b$ | $b$ | $0$ | $1'+b$ | $0$ |
| $c$ | $c$ | $a$ | $0$ | $1'$ |

no — no

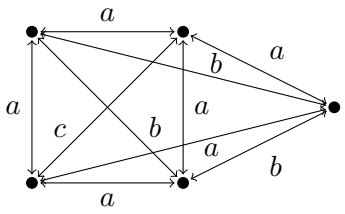
| #111 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-b$ | $0$ | $a$ |
| $b$ | $b$ | $0$ | $1'+b$ | $0$ |
| $c$ | $c$ | $a$ | $0$ | $1'$ |

no — no

| atom table | RA | QRNA |
|---|---|---|

| #112 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-a$ | $a$ | $a$ |
| $b$ | $b$ | $a$ | $1'+b$ | $0$ |
| $c$ | $c$ | $a$ | $0$ | $1'$ |

no



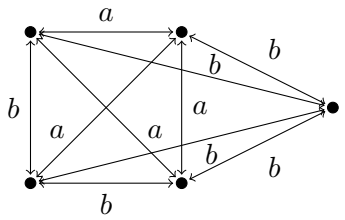

| #113 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a$ | $a$ |
| $b$ | $b$ | $a$ | $1'+b$ | $0$ |
| $c$ | $c$ | $a$ | $0$ | $1'$ |

no

$$\begin{bmatrix} 1' & a & a & b & a & b \\ a & 1' & a & a & c & a \\ a & a & 1' & a & a & a \\ b & a & a & 1' & a & b \\ a & c & a & a & 1' & a \\ b & a & a & b & a & 1' \end{bmatrix}$$

| #114 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-c$ | $a+b$ | $0$ |
| $b$ | $b$ | $a+b$ | $-c$ | $0$ |
| $c$ | $c$ | $0$ | $0$ | $1'$ |

no




| #115 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+c$ | $b$ | $a$ |
| $b$ | $b$ | $b$ | $-c$ | $0$ |
| $c$ | $c$ | $a$ | $0$ | $1'$ |

no

no

| #116 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-b$ | $b$ | $a$ |
| $b$ | $b$ | $b$ | $-c$ | $0$ |
| $c$ | $c$ | $a$ | $0$ | $1'$ |

no

no

| #117 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-a$ | $a+b$ | $a$ |
| $b$ | $b$ | $a+b$ | $-c$ | $0$ |
| $c$ | $c$ | $a$ | $0$ | $1'$ |

no

no

| atom table | RA | QRNA |
|---|---|---|

| #118 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a+b$ | $a$ |
| $b$ | $b$ | $a+b$ | $-c$ | $0$ |
| $c$ | $c$ | $a$ | $0$ | $1'$ |

no

$$\begin{bmatrix} 1' & a & a & b & a & b \\ a & 1' & a & a & c & a \\ a & a & 1' & b & a & b \\ b & a & b & 1' & a & b \\ a & c & a & a & 1' & a \\ b & a & b & b & a & 1' \end{bmatrix}$$

| #119 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+a$ | $c$ | $b$ |
| $b$ | $b$ | $c$ | $1'+b$ | $a$ |
| $c$ | $c$ | $b$ | $a$ | $1'$ |

no

no

| #120 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-c$ | $a+c$ | $b$ |
| $b$ | $b$ | $a+c$ | $1'+b$ | $a$ |
| $c$ | $c$ | $b$ | $a$ | $1'$ |

no

no

| #121 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+c$ | $c$ | $a+b$ |
| $b$ | $b$ | $c$ | $1'+b$ | $a$ |
| $c$ | $c$ | $a+b$ | $a$ | $1'$ |

no

no

| #122 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-b$ | $c$ | $a+b$ |
| $b$ | $b$ | $c$ | $1'+b$ | $a$ |
| $c$ | $c$ | $a+b$ | $a$ | $1'$ |

no

no

| #123 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-a$ | $a+c$ | $a+b$ |
| $b$ | $b$ | $a+c$ | $1'+b$ | $a$ |
| $c$ | $c$ | $a+b$ | $a$ | $1'$ |

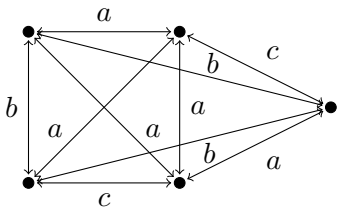
no

no

| atom table | RA | QRNA |
|---|---|---|

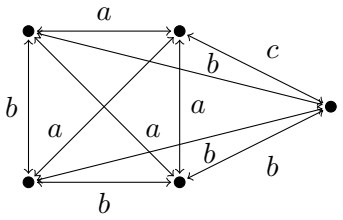
| #124 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a+c$ | $a+b$ |
| $b$ | $b$ | $a+c$ | $1'+b$ | $a$ |
| $c$ | $c$ | $a+b$ | $a$ | $1'$ |

no




| #125 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-c$ | $0'$ | $b$ |
| $b$ | $b$ | $0'$ | $-c$ | $a$ |
| $c$ | $c$ | $b$ | $a$ | $1'$ |

yes
$27_{65}$
RRA




| #126 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+c$ | $b+c$ | $a+b$ |
| $b$ | $b$ | $b+c$ | $-c$ | $a$ |
| $c$ | $c$ | $a+b$ | $a$ | $1'$ |

no

no

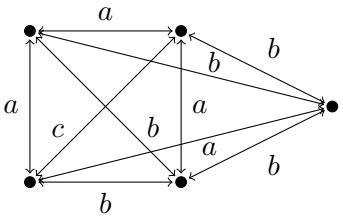
| #127 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-b$ | $b+c$ | $a+b$ |
| $b$ | $b$ | $b+c$ | $-c$ | $a$ |
| $c$ | $c$ | $a+b$ | $a$ | $1'$ |

no

no

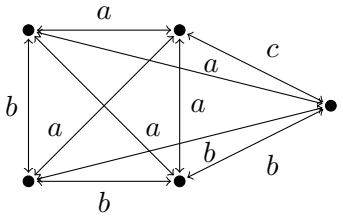
| #128 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-a$ | $0'$ | $a+b$ |
| $b$ | $b$ | $0'$ | $-c$ | $a$ |
| $c$ | $c$ | $a+b$ | $a$ | $1'$ |

no




| #129 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $0'$ | $a+b$ |
| $b$ | $b$ | $0'$ | $-c$ | $a$ |
| $c$ | $c$ | $a+b$ | $a$ | $1'$ |

no



| | atom table | RA | QRNA |
|---|---|---|---|

| #130 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+a$ | $0$ | $c$ |
| $b$ | $b$ | $0$ | $1'+b$ | $0$ |
| $c$ | $c$ | $c$ | $0$ | $1'+a$ |

no | no

| #131 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+b$ | $a$ | $c$ |
| $b$ | $b$ | $a$ | $1'+b$ | $0$ |
| $c$ | $c$ | $c$ | $0$ | $1'+a$ |

no | no

| #132 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-c$ | $a$ | $c$ |
| $b$ | $b$ | $a$ | $1'+b$ | $0$ |
| $c$ | $c$ | $c$ | $0$ | $1'+a$ |

no | no

| #133 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+c$ | $0$ | $a+c$ |
| $b$ | $b$ | $0$ | $1'+b$ | $0$ |
| $c$ | $c$ | $a+c$ | $0$ | $1'+a$ |

no | no

| #134 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-b$ | $0$ | $a+c$ |
| $b$ | $b$ | $0$ | $1'+b$ | $0$ |
| $c$ | $c$ | $a+c$ | $0$ | $1'+a$ |

no | no

| #135 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-a$ | $a$ | $a+c$ |
| $b$ | $b$ | $a$ | $1'+b$ | $0$ |
| $c$ | $c$ | $a+c$ | $0$ | $1'+a$ |

no | no

| atom table | RA | QRNA |
|---|---|---|

| #136 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a$ | $a+c$ |
| $b$ | $b$ | $a$ | $1'+b$ | $0$ |
| $c$ | $c$ | $a+c$ | $0$ | $1'+a$ |

$$\begin{bmatrix} 1' & a & b & a & a & b \\ a & 1' & a & c & a & a \\ b & a & 1' & a & a & b \\ a & c & a & 1' & c & a \\ a & a & a & c & 1' & a \\ b & a & b & a & a & 1' \end{bmatrix}$$

| #137 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'$ | $b$ | $c$ |
| $b$ | $b$ | $b$ | $-c$ | $0$ |
| $c$ | $c$ | $c$ | $0$ | $1'+a$ |

no

no

| #138 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+a$ | $b$ | $c$ |
| $b$ | $b$ | $b$ | $-c$ | $0$ |
| $c$ | $c$ | $c$ | $0$ | $1'+a$ |

no

no

| #139 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+b$ | $a+b$ | $c$ |
| $b$ | $b$ | $a+b$ | $-c$ | $0$ |
| $c$ | $c$ | $c$ | $0$ | $1'+a$ |

no

no

| #140 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-c$ | $a+b$ | $c$ |
| $b$ | $b$ | $a+b$ | $-c$ | $0$ |
| $c$ | $c$ | $c$ | $0$ | $1'+a$ |

no

no

| #141 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+c$ | $b$ | $a+c$ |
| $b$ | $b$ | $b$ | $-c$ | $0$ |
| $c$ | $c$ | $a+c$ | $0$ | $1'+a$ |

no

no

| | atom table | RA | QRNA |
|---|---|---|---|

| #142 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-b$ | $b$ | $a+c$ |
| $b$ | $b$ | $b$ | $-c$ | $0$ |
| $c$ | $c$ | $a+c$ | $0$ | $1'+a$ |

no

no

| #143 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-a$ | $a+b$ | $a+c$ |
| $b$ | $b$ | $a+b$ | $-c$ | $0$ |
| $c$ | $c$ | $a+c$ | $0$ | $1'+a$ |

no

no

| #144 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a+b$ | $a+c$ |
| $b$ | $b$ | $a+b$ | $-c$ | $0$ |
| $c$ | $c$ | $a+c$ | $0$ | $1'+a$ |

no

$$\begin{bmatrix} 1' & a & a & b & a & a & b \\ a & 1' & a & a & c & a & a \\ a & a & 1' & b & a & a & b \\ b & a & b & 1' & a & a & b \\ a & c & a & a & 1' & c & a \\ a & a & a & a & c & 1' & a \\ b & a & b & b & a & a & 1' \end{bmatrix}$$

| #145 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+a$ | $c$ | $b+c$ |
| $b$ | $b$ | $c$ | $1'+b$ | $a$ |
| $c$ | $c$ | $b+c$ | $a$ | $1'+a$ |

no

no

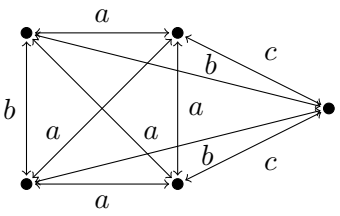
| #146 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+b$ | $a+c$ | $b+c$ |
| $b$ | $b$ | $a+c$ | $1'+b$ | $a$ |
| $c$ | $c$ | $b+c$ | $a$ | $1'+a$ |

no

no

| #147 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-c$ | $a+c$ | $b+c$ |
| $b$ | $b$ | $a+c$ | $1'+b$ | $a$ |
| $c$ | $c$ | $b+c$ | $a$ | $1'+a$ |

no



| | atom table | RA | QRNA |
|---|---|---|---|

| #148 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+c$ | $c$ | $0'$ |
| $b$ | $b$ | $c$ | $1'+b$ | $a$ |
| $c$ | $c$ | $0'$ | $a$ | $1'+a$ |

no

no

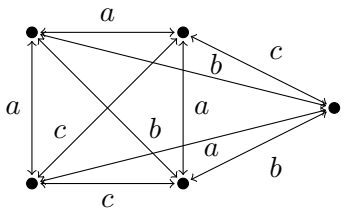
| #149 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-b$ | $c$ | $0'$ |
| $b$ | $b$ | $c$ | $1'+b$ | $a$ |
| $c$ | $c$ | $0'$ | $a$ | $1'+a$ |

no

no

| #150 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-a$ | $a+c$ | $0'$ |
| $b$ | $b$ | $a+c$ | $1'+b$ | $a$ |
| $c$ | $c$ | $0'$ | $a$ | $1'+a$ |

no




| #151 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a+c$ | $0'$ |
| $b$ | $b$ | $a+c$ | $1'+b$ | $a$ |
| $c$ | $c$ | $0'$ | $a$ | $1'+a$ |

yes
$30_{65}$
RRA

$$\begin{bmatrix} 1' & a & a & b & c & b \\ a & 1' & a & a & a & c \\ a & a & 1' & a & b & c \\ b & a & a & 1' & a & b \\ c & a & b & a & 1' & a \\ b & c & c & b & a & 1' \end{bmatrix}$$

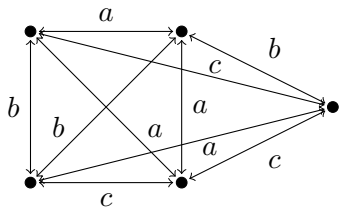
| #152 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'$ | $b+c$ | $b+c$ |
| $b$ | $b$ | $b+c$ | $-c$ | $a$ |
| $c$ | $c$ | $b+c$ | $a$ | $1'+a$ |

no

no

| #153 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+a$ | $b+c$ | $b+c$ |
| $b$ | $b$ | $b+c$ | $-c$ | $a$ |
| $c$ | $c$ | $b+c$ | $a$ | $1'+a$ |

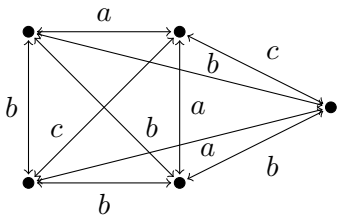
no



| atom table | RA | QRNA |
|---|---|---|

| #154 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+b$ | $0'$ | $b+c$ |
| $b$ | $b$ | $0'$ | $-c$ | $a$ |
| $c$ | $c$ | $b+c$ | $a$ | $1'+a$ |

no




| #155 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-c$ | $0'$ | $b+c$ |
| $b$ | $b$ | $0'$ | $-c$ | $a$ |
| $c$ | $c$ | $b+c$ | $a$ | $1'+a$ |

no

$$\begin{bmatrix} 1' & a & a & b & c & b \\ a & 1' & a & a & b & c \\ a & a & 1' & b & c & b \\ b & a & b & 1' & a & b \\ c & b & c & a & 1' & a \\ b & c & b & b & a & 1' \end{bmatrix}$$

| #156 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+c$ | $b+c$ | $0'$ |
| $b$ | $b$ | $b+c$ | $-c$ | $a$ |
| $c$ | $c$ | $0'$ | $a$ | $1'+a$ |

no

no

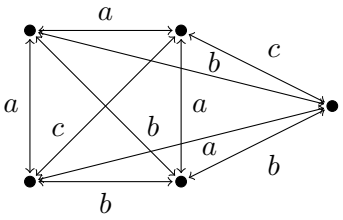
| #157 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-b$ | $b+c$ | $0'$ |
| $b$ | $b$ | $b+c$ | $-c$ | $a$ |
| $c$ | $c$ | $0'$ | $a$ | $1'+a$ |

no

no

| #158 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-a$ | $0'$ | $0'$ |
| $b$ | $b$ | $0'$ | $-c$ | $a$ |
| $c$ | $c$ | $0'$ | $a$ | $1'+a$ |

no




| #159 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $0'$ | $0'$ |
| $b$ | $b$ | $0'$ | $-c$ | $a$ |
| $c$ | $c$ | $0'$ | $a$ | $1'+a$ |

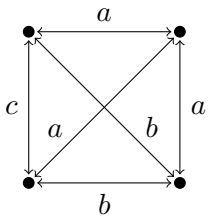
yes
$33_{65}$
RRA

$$\begin{bmatrix} 1' & a & a & b & c & b \\ a & 1' & a & a & a & c \\ a & a & 1' & b & c & b \\ b & a & b & 1' & a & b \\ c & a & c & a & 1' & a \\ b & c & b & b & a & 1' \end{bmatrix}$$

atom table | RA | QRNA

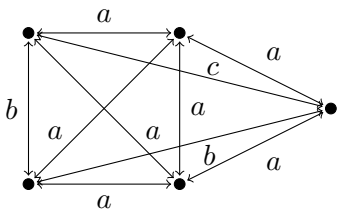
| #160 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-a$ | $a$ | $a$ |
| $b$ | $b$ | $a$ | $1'+c$ | $b$ |
| $c$ | $c$ | $a$ | $b$ | $1'$ |

yes
$1_{65}$
RRA



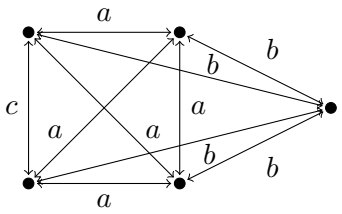

| #161 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a$ | $a$ |
| $b$ | $b$ | $a$ | $1'+c$ | $b$ |
| $c$ | $c$ | $a$ | $b$ | $1'$ |

yes
$5_{65}$
RRA



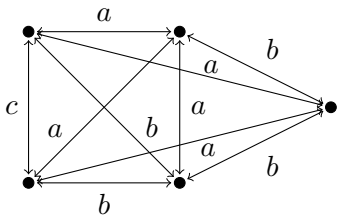

| #162 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-b$ | $b$ | $a$ |
| $b$ | $b$ | $b$ | $-b$ | $b$ |
| $c$ | $c$ | $a$ | $b$ | $1'$ |

yes
$3_{65}$
RRA



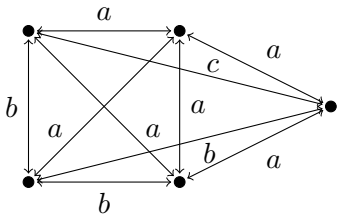

| #163 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-a$ | $a+b$ | $a$ |
| $b$ | $b$ | $a+b$ | $-b$ | $b$ |
| $c$ | $c$ | $a$ | $b$ | $1'$ |

yes
$15_{65}$
RRA



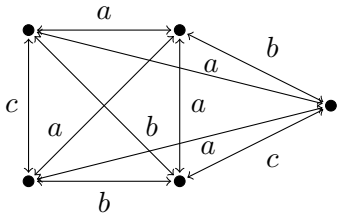

| #164 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a+b$ | $a$ |
| $b$ | $b$ | $a+b$ | $-b$ | $b$ |
| $c$ | $c$ | $a$ | $b$ | $1'$ |

yes
$16_{65}$
RRA




| #165 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-a$ | $a+c$ | $a+b$ |
| $b$ | $b$ | $a+c$ | $1'+c$ | $a+b$ |
| $c$ | $c$ | $a+b$ | $a+b$ | $1'$ |

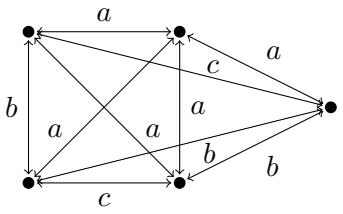
no



| atom table | RA | QRNA |
|---|---|---|

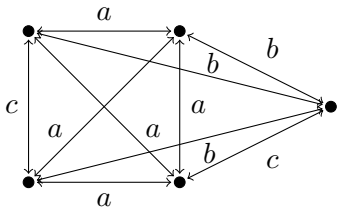
| #166 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a+c$ | $a+b$ |
| $b$ | $b$ | $a+c$ | $1'+c$ | $a+b$ |
| $c$ | $c$ | $a+b$ | $a+b$ | $1'$ |

no



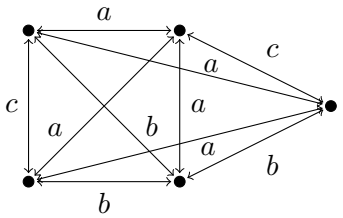

| #167 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-b$ | $b+c$ | $a+b$ |
| $b$ | $b$ | $b+c$ | $-b$ | $a+b$ |
| $c$ | $c$ | $a+b$ | $a+b$ | $1'$ |

no



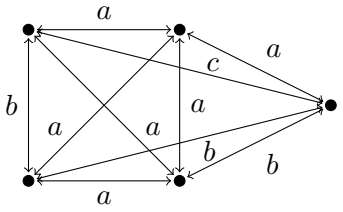

| #168 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-a$ | $0'$ | $a+b$ |
| $b$ | $b$ | $0'$ | $-b$ | $a+b$ |
| $c$ | $c$ | $a+b$ | $a+b$ | $1'$ |

no




| #169 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $0'$ | $a+b$ |
| $b$ | $b$ | $0'$ | $-b$ | $a+b$ |
| $c$ | $c$ | $a+b$ | $a+b$ | $1'$ |

no




| #170 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+b$ | $a$ | $c$ |
| $b$ | $b$ | $a$ | $1'+c$ | $b$ |
| $c$ | $c$ | $c$ | $b$ | $1'+a$ |

no

no

| #171 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-c$ | $a$ | $c$ |
| $b$ | $b$ | $a$ | $1'+c$ | $b$ |
| $c$ | $c$ | $c$ | $b$ | $1'+a$ |

no

no

| | atom table | RA | QRNA |
|---|---|---|---|

| #172 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-a$ | $a$ | $a+c$ |
| $b$ | $b$ | $a$ | $1'+c$ | $b$ |
| $c$ | $c$ | $a+c$ | $b$ | $1'+a$ |

no

no

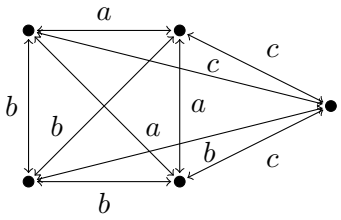
| #173 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a$ | $a+c$ |
| $b$ | $b$ | $a$ | $1'+c$ | $b$ |
| $c$ | $c$ | $a+c$ | $b$ | $1'+a$ |

no

$$\begin{bmatrix} 1' & a & a & b & c & a \\ a & 1' & a & a & a & c \\ a & a & 1' & a & a & c \\ b & a & a & 1' & b & a \\ c & a & a & b & 1' & a \\ a & c & c & a & a & 1' \end{bmatrix}$$

| #174 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+a$ | $b$ | $c$ |
| $b$ | $b$ | $b$ | $-b$ | $b$ |
| $c$ | $c$ | $c$ | $b$ | $1'+a$ |

yes
$2_{65}$
RRA



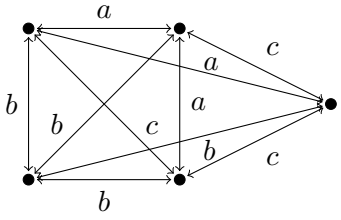

| #175 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-c$ | $a+b$ | $c$ |
| $b$ | $b$ | $a+b$ | $-b$ | $b$ |
| $c$ | $c$ | $c$ | $b$ | $1'+a$ |

no

no

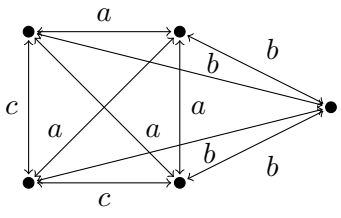
| #176 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+c$ | $b$ | $a+c$ |
| $b$ | $b$ | $b$ | $-b$ | $b$ |
| $c$ | $c$ | $a+c$ | $b$ | $1'+a$ |

yes
$9_{65}$
RRA




| #177 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-b$ | $b$ | $a+c$ |
| $b$ | $b$ | $b$ | $-b$ | $b$ |
| $c$ | $c$ | $a+c$ | $b$ | $1'+a$ |

yes
$10_{65}$
RRA



| | atom table | RA | QRNA |
|---|---|---|---|

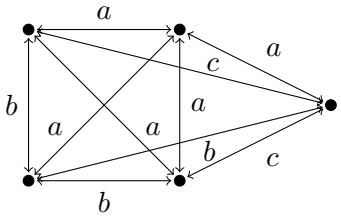
| #178 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-a$ | $a+b$ | $a+c$ |
| $b$ | $b$ | $a+b$ | $-b$ | $b$ |
| $c$ | $c$ | $a+c$ | $b$ | $1'+a$ |

no

no

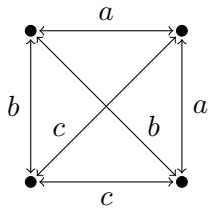
| #179 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a+b$ | $a+c$ |
| $b$ | $b$ | $a+b$ | $-b$ | $b$ |
| $c$ | $c$ | $a+c$ | $b$ | $1'+a$ |

no



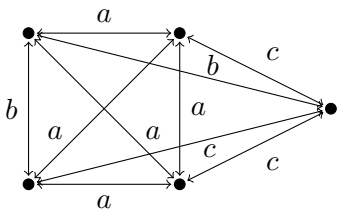

| #180 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+b$ | $a+c$ | $b+c$ |
| $b$ | $b$ | $a+c$ | $1'+c$ | $a+b$ |
| $c$ | $c$ | $b+c$ | $a+b$ | $1'+a$ |

yes
$39_{65}$
RRA



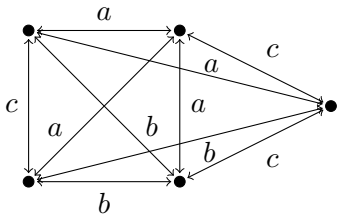

| #181 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-c$ | $a+c$ | $b+c$ |
| $b$ | $b$ | $a+c$ | $1'+c$ | $a+b$ |
| $c$ | $c$ | $b+c$ | $a+b$ | $1'+a$ |

yes
$40_{65}$
$\notin$ RRA



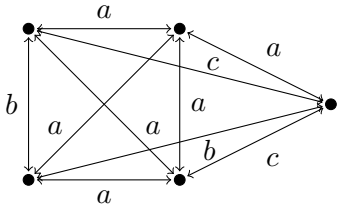

| #182 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-a$ | $a+c$ | $0'$ |
| $b$ | $b$ | $a+c$ | $1'+c$ | $a+b$ |
| $c$ | $c$ | $0'$ | $a+b$ | $1'+a$ |

yes
$43_{65}$
$\notin$ RRA




| #183 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a+c$ | $0'$ |
| $b$ | $b$ | $a+c$ | $1'+c$ | $a+b$ |
| $c$ | $c$ | $0'$ | $a+b$ | $1'+a$ |

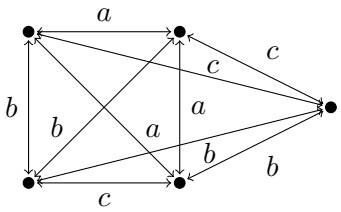
yes
$44_{65}$
$\notin$ RRA



| atom table | RA | QRNA |
|---|---|---|

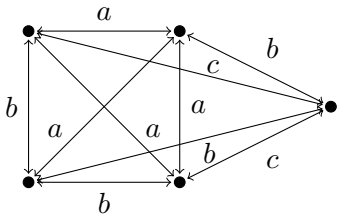
| #184 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+a$ | $b+c$ | $b+c$ |
| $b$ | $b$ | $b+c$ | $-b$ | $a+b$ |
| $c$ | $c$ | $b+c$ | $a+b$ | $1'+a$ |

no



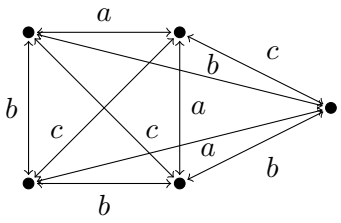
| #185 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-c$ | $0'$ | $b+c$ |
| $b$ | $b$ | $0'$ | $-b$ | $a+b$ |
| $c$ | $c$ | $b+c$ | $a+b$ | $1'+a$ |

yes
$45_{65}$
$\notin$ RRA



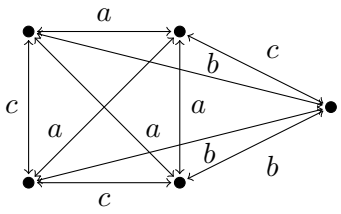
| #186 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+c$ | $b+c$ | $0'$ |
| $b$ | $b$ | $b+c$ | $-b$ | $a+b$ |
| $c$ | $c$ | $0'$ | $a+b$ | $1'+a$ |

no



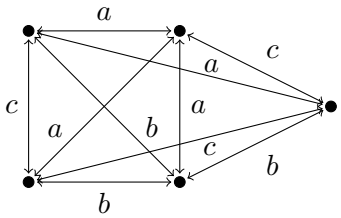
| #187 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-b$ | $b+c$ | $0'$ |
| $b$ | $b$ | $b+c$ | $-b$ | $a+b$ |
| $c$ | $c$ | $0'$ | $a+b$ | $1'+a$ |

no



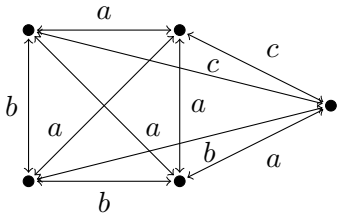
| #188 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-a$ | $0'$ | $0'$ |
| $b$ | $b$ | $0'$ | $-b$ | $a+b$ |
| $c$ | $c$ | $0'$ | $a+b$ | $1'+a$ |

yes
$54_{65}$
$\notin$ RRA



| #189 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $0'$ | $0'$ |
| $b$ | $b$ | $0'$ | $-b$ | $a+b$ |
| $c$ | $c$ | $0'$ | $a+b$ | $1'+a$ |

yes
$55_{65}$
RRA



| atom table | RA | QRNA |
|---|---|---|

| #190 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-b$ | $0$ | $a$ |
| $b$ | $b$ | $0$ | $-a$ | $b$ |
| $c$ | $c$ | $a$ | $b$ | $1'$ |

no

no

| #191 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a$ | $a$ |
| $b$ | $b$ | $a$ | $-a$ | $b$ |
| $c$ | $c$ | $a$ | $b$ | $1'$ |

yes
$7_{65}$
RRA

$$\begin{bmatrix} 1' & a & a & b & c & b \\ a & 1' & a & a & a & a \\ a & a & 1' & a & a & a \\ b & a & a & 1' & b & b \\ c & a & a & b & 1' & b \\ b & a & a & b & b & 1' \end{bmatrix}$$

| #192 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a+b$ | $a$ |
| $b$ | $b$ | $a+b$ | $1$ | $b$ |
| $c$ | $c$ | $a$ | $b$ | $1'$ |

yes
$19_{65}$
RRA

$$\begin{bmatrix} 1' & a & a & b & c & b \\ a & 1' & a & a & a & b \\ a & a & 1' & b & a & b \\ b & a & b & 1' & b & b \\ c & a & a & b & 1' & b \\ b & b & b & b & b & 1' \end{bmatrix}$$

| #193 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-b$ | $c$ | $a+b$ |
| $b$ | $b$ | $c$ | $-a$ | $a+b$ |
| $c$ | $c$ | $a+b$ | $a+b$ | $1'$ |

no

no

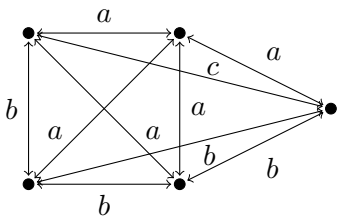
| #194 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a+c$ | $a+b$ |
| $b$ | $b$ | $a+c$ | $-a$ | $a+b$ |
| $c$ | $c$ | $a+b$ | $a+b$ | $1'$ |

no

$$\begin{bmatrix} 1' & a & a & b & c & b \\ a & 1' & a & a & a & c \\ a & a & 1' & c & a & a \\ b & a & c & 1' & b & b \\ c & a & a & b & 1' & b \\ b & c & a & b & b & 1' \end{bmatrix}$$

| #195 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $0'$ | $a+b$ |
| $b$ | $b$ | $0'$ | $1$ | $a+b$ |
| $c$ | $c$ | $a+b$ | $a+b$ | $1'$ |

no



| | atom table | RA | QRNA |
|---|---|---|---|

| #196 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+a$ | $0$ | $c$ |
| $b$ | $b$ | $0$ | $-a$ | $b$ |
| $c$ | $c$ | $c$ | $b$ | $1'+a$ |

no

no

| #197 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-c$ | $a$ | $c$ |
| $b$ | $b$ | $a$ | $-a$ | $b$ |
| $c$ | $c$ | $c$ | $b$ | $1'+a$ |

no

no

| #198 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-b$ | $0$ | $a+c$ |
| $b$ | $b$ | $0$ | $-a$ | $b$ |
| $c$ | $c$ | $a+c$ | $b$ | $1'+a$ |

no

no

| #199 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-a$ | $a$ | $a+c$ |
| $b$ | $b$ | $a$ | $-a$ | $b$ |
| $c$ | $c$ | $a+c$ | $b$ | $1'+a$ |

no

no

| #200 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a$ | $a+c$ |
| $b$ | $b$ | $a$ | $-a$ | $b$ |
| $c$ | $c$ | $a+c$ | $b$ | $1'+a$ |

no

$$\begin{bmatrix} 1' & a & a & b & c & a & b \\ a & 1' & a & a & a & c & a \\ a & a & 1' & a & a & c & a \\ b & a & a & 1' & b & a & b \\ c & a & a & b & 1' & a & b \\ a & c & c & a & a & 1' & a \\ b & a & a & b & b & a & 1' \end{bmatrix}$$

| #201 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+a$ | $b$ | $c$ |
| $b$ | $b$ | $b$ | $1$ | $b$ |
| $c$ | $c$ | $c$ | $b$ | $1'+a$ |

yes

$6_{65}$

RRA

$$\begin{bmatrix} 1' & a & a & b & c & b \\ a & 1' & a & b & c & b \\ a & a & 1' & b & c & b \\ b & b & b & 1' & b & b \\ c & c & c & b & 1' & b \\ b & b & b & b & b & 1' \end{bmatrix}$$

| atom table | RA | QRNA |
|---|---|---|

| #202 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-c$ | $a+b$ | $c$ |
| $b$ | $b$ | $a+b$ | $1$ | $b$ |
| $c$ | $c$ | $c$ | $b$ | $1'+a$ |

no

$$\begin{bmatrix} 1' & a & a & b & b & b & b \\ a & 1' & a & a & b & b & b \\ a & a & 1' & b & b & b & b \\ b & a & b & 1' & b & b & b \\ b & b & b & b & 1' & c & a \\ b & b & b & b & c & 1' & c \\ b & b & b & b & a & c & 1' \end{bmatrix}$$

| #203 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+c$ | $b$ | $a+c$ |
| $b$ | $b$ | $b$ | $1$ | $b$ |
| $c$ | $c$ | $a+c$ | $b$ | $1'+a$ |

yes
$12_{65}$
RRA

$$\begin{bmatrix} 1' & a & c & b & a & b \\ a & 1' & a & b & c & b \\ c & a & 1' & b & c & b \\ b & b & b & 1' & b & b \\ a & c & c & b & 1' & b \\ b & b & b & b & b & 1' \end{bmatrix}$$

| #204 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-b$ | $b$ | $a+c$ |
| $b$ | $b$ | $b$ | $1$ | $b$ |
| $c$ | $c$ | $a+c$ | $b$ | $1'+a$ |

yes
$13_{65}$
RRA

$$\begin{bmatrix} 1' & a & a & c & b & b \\ a & 1' & a & a & b & b \\ a & a & 1' & c & b & b \\ c & a & c & 1' & b & b \\ b & b & b & b & 1' & b \\ b & b & b & b & b & 1' \end{bmatrix}$$

| #205 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-a$ | $a+b$ | $a+c$ |
| $b$ | $b$ | $a+b$ | $1$ | $b$ |
| $c$ | $c$ | $a+c$ | $b$ | $1'+a$ |

no

$$\begin{bmatrix} 1' & a & b & c & b & b & b \\ a & 1' & a & a & b & b & b \\ b & a & 1' & b & b & b & b \\ c & a & b & 1' & b & b & b \\ b & b & b & b & 1' & c & a \\ b & b & b & b & c & 1' & c \\ b & b & b & b & a & c & 1' \end{bmatrix}$$

| #206 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a+b$ | $a+c$ |
| $b$ | $b$ | $a+b$ | $1$ | $b$ |
| $c$ | $c$ | $a+c$ | $b$ | $1'+a$ |

no

$$\begin{bmatrix} 1' & a & a & b & c & b \\ a & 1' & a & a & a & b \\ a & a & 1' & b & c & b \\ b & a & b & 1' & b & b \\ c & a & c & b & 1' & b \\ b & b & b & b & b & 1' \end{bmatrix}$$

| #207 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+a$ | $c$ | $b+c$ |
| $b$ | $b$ | $c$ | $-a$ | $a+b$ |
| $c$ | $c$ | $b+c$ | $a+b$ | $1'+a$ |

no

no

| atom table | RA | QRNA |
|---|---|---|

| #208 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-c$ | $a+c$ | $b+c$ |
| $b$ | $b$ | $a+c$ | $-a$ | $a+b$ |
| $c$ | $c$ | $b+c$ | $a+b$ | $1'+a$ |

yes
$41_{65}$
$\notin$ RRA

$$\begin{bmatrix} 1' & a & a & b & b & b \\ a & 1' & a & a & c & a \\ a & a & 1' & a & c & a \\ b & a & a & 1' & b & b \\ b & c & c & b & 1' & c \\ b & a & a & b & c & 1' \end{bmatrix}$$

| #209 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-b$ | $c$ | $0'$ |
| $b$ | $b$ | $c$ | $-a$ | $a+b$ |
| $c$ | $c$ | $0'$ | $a+b$ | $1'+a$ |

no

no

| #210 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-a$ | $a+c$ | $0'$ |
| $b$ | $b$ | $a+c$ | $-a$ | $a+b$ |
| $c$ | $c$ | $0'$ | $a+b$ | $1'+a$ |

yes
$47_{65}$
$\notin$ RRA

$$\begin{bmatrix} 1' & a & b & c & c & a \\ a & 1' & a & a & b & b \\ b & a & 1' & b & a & a \\ c & a & b & 1' & a & c \\ c & b & a & a & 1' & b \\ a & b & a & c & b & 1' \end{bmatrix}$$

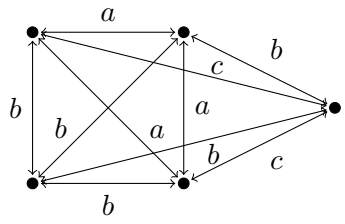
| #211 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a+c$ | $0'$ |
| $b$ | $b$ | $a+c$ | $-a$ | $a+b$ |
| $c$ | $c$ | $0'$ | $a+b$ | $1'+a$ |

yes
$48_{65}$
$\notin$ RRA

$$\begin{bmatrix} 1' & a & a & b & c & b \\ a & 1' & a & a & a & c \\ a & a & 1' & a & c & a \\ b & a & a & 1' & b & b \\ c & a & c & b & 1' & b \\ b & c & a & b & b & 1' \end{bmatrix}$$

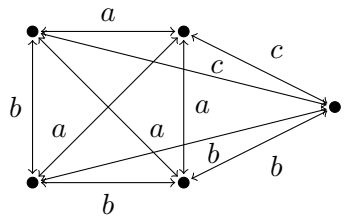
| #212 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+a$ | $b+c$ | $b+c$ |
| $b$ | $b$ | $b+c$ | $1$ | $a+b$ |
| $c$ | $c$ | $b+c$ | $a+b$ | $1'+a$ |

no




| #213 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-c$ | $0'$ | $b+c$ |
| $b$ | $b$ | $0'$ | $1$ | $a+b$ |
| $c$ | $c$ | $b+c$ | $a+b$ | $1'+a$ |

yes
$46_{65}$
RRA



| atom table | RA | QRNA |
|---|---|---|

| #214 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+c$ | $b+c$ | $0'$ |
| $b$ | $b$ | $b+c$ | $1$ | $a+b$ |
| $c$ | $c$ | $0'$ | $a+b$ | $1'+a$ |

no

$$\begin{bmatrix} 1' & a & c & b & b & b \\ a & 1' & a & b & c & c \\ c & a & 1' & b & b & b \\ b & b & b & 1' & b & b \\ b & c & b & b & 1' & a \\ b & c & b & b & a & 1' \end{bmatrix}$$

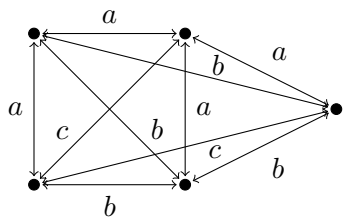
| #215 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-b$ | $b+c$ | $0'$ |
| $b$ | $b$ | $b+c$ | $1$ | $a+b$ |
| $c$ | $c$ | $0'$ | $a+b$ | $1'+a$ |

no

$$\begin{bmatrix} 1' & a & a & c & b & a \\ a & 1' & a & a & b & c \\ a & a & 1' & c & b & a \\ c & a & c & 1' & b & b \\ b & b & b & b & 1' & b \\ a & c & a & b & b & 1' \end{bmatrix}$$

| #216 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-a$ | $0'$ | $0'$ |
| $b$ | $b$ | $0'$ | $1$ | $a+b$ |
| $c$ | $c$ | $0'$ | $a+b$ | $1'+a$ |

yes
$58_{65}$
$\notin$ RRA




| #217 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $0'$ | $0'$ |
| $b$ | $b$ | $0'$ | $1$ | $a+b$ |
| $c$ | $c$ | $0'$ | $a+b$ | $1'+a$ |

yes
$59_{65}$
RRA

$$\begin{bmatrix} 1' & a & a & b & c & a \\ a & 1' & a & a & a & c \\ a & a & 1' & b & b & b \\ b & a & b & 1' & b & b \\ c & a & b & b & 1' & c \\ a & c & b & b & c & 1' \end{bmatrix}$$

| #218 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+a$ | $0$ | $c$ |
| $b$ | $b$ | $0$ | $1'+b$ | $c$ |
| $c$ | $c$ | $c$ | $c$ | $-c$ |

no

$$\begin{bmatrix} 1' & a & a & c & c & c \\ a & 1' & a & c & c & c \\ a & a & 1' & c & c & c \\ c & c & c & 1' & b & b \\ c & c & c & b & 1' & b \\ c & c & c & b & b & 1' \end{bmatrix}$$

| #219 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-c$ | $a$ | $c$ |
| $b$ | $b$ | $a$ | $1'+b$ | $c$ |
| $c$ | $c$ | $c$ | $c$ | $-c$ |

yes
$4_{65}$
RRA

$$\begin{bmatrix} 1' & a & a & b & c & b \\ a & 1' & a & a & c & a \\ a & a & 1' & a & c & a \\ b & a & a & 1' & c & b \\ c & c & c & c & 1' & c \\ b & a & a & b & c & 1' \end{bmatrix}$$

| | atom table | RA | QRNA |
|---|---|---|---|

| #220 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-b$ | $0$ | $a+c$ |
| $b$ | $b$ | $0$ | $1'+b$ | $c$ |
| $c$ | $c$ | $a+c$ | $c$ | $-c$ |

no

no

| #221 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-a$ | $a$ | $a+c$ |
| $b$ | $b$ | $a$ | $1'+b$ | $c$ |
| $c$ | $c$ | $a+c$ | $c$ | $-c$ |

yes
$17_{65}$
RRA

$$\begin{bmatrix} 1' & a & b & c & a & b \\ a & 1' & a & a & c & a \\ b & a & 1' & c & a & b \\ c & a & c & 1' & c & c \\ a & c & a & c & 1' & a \\ b & a & b & c & a & 1' \end{bmatrix}$$

| #222 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a$ | $a+c$ |
| $b$ | $b$ | $a$ | $1'+b$ | $c$ |
| $c$ | $c$ | $a+c$ | $c$ | $-c$ |

yes
$18_{65}$
RRA

$$\begin{bmatrix} 1' & a & a & b & c & b \\ a & 1' & a & a & a & a \\ a & a & 1' & a & c & a \\ b & a & a & 1' & c & b \\ c & a & c & c & 1' & c \\ b & a & a & b & c & 1' \end{bmatrix}$$

| #223 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-c$ | $a+b$ | $c$ |
| $b$ | $b$ | $a+b$ | $-c$ | $c$ |
| $c$ | $c$ | $c$ | $c$ | $-c$ |

yes
$11_{65}$
RRA

$$\begin{bmatrix} 1' & a & a & b & c & b \\ a & 1' & a & a & c & b \\ a & a & 1' & b & c & b \\ b & a & b & 1' & c & b \\ c & c & c & c & 1' & c \\ b & b & b & b & c & 1' \end{bmatrix}$$

| #224 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-b$ | $b$ | $a+c$ |
| $b$ | $b$ | $b$ | $-c$ | $c$ |
| $c$ | $c$ | $a+c$ | $c$ | $-c$ |

no

no

| #225 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-a$ | $a+b$ | $a+c$ |
| $b$ | $b$ | $a+b$ | $-c$ | $c$ |
| $c$ | $c$ | $a+c$ | $c$ | $-c$ |

no

no

| atom table | RA | QRNA |
|---|---|---|

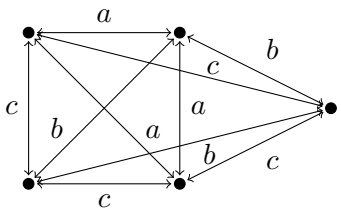
| #226 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a+b$ | $a+c$ |
| $b$ | $b$ | $a+b$ | $-c$ | $c$ |
| $c$ | $c$ | $a+c$ | $c$ | $-c$ |

no

$$\begin{bmatrix} 1' & a & a & b & c & b \\ a & 1' & a & a & a & a \\ a & a & 1' & b & c & b \\ b & a & b & 1' & c & b \\ c & a & c & c & 1' & c \\ b & a & b & b & c & 1' \end{bmatrix}$$

| #227 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+a$ | $c$ | $b+c$ |
| $b$ | $b$ | $c$ | $1'+b$ | $a+c$ |
| $c$ | $c$ | $b+c$ | $a+c$ | $-c$ |

no




| #228 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-c$ | $a+c$ | $b+c$ |
| $b$ | $b$ | $a+c$ | $1'+b$ | $a+c$ |
| $c$ | $c$ | $b+c$ | $a+c$ | $-c$ |

yes
$35_{65}$
$\notin$ RRA

$$\begin{bmatrix} 1' & a & a & b & c & b \\ a & 1' & a & a & b & c \\ a & a & 1' & a & c & c \\ b & a & a & 1' & c & b \\ c & b & c & c & 1' & a \\ b & c & c & b & a & 1' \end{bmatrix}$$

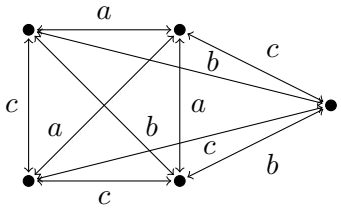
| #229 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-b$ | $c$ | $0'$ |
| $b$ | $b$ | $c$ | $1'+b$ | $a+c$ |
| $c$ | $c$ | $0'$ | $a+c$ | $-c$ |

no

$$\begin{bmatrix} 1' & a & a & c & a & c \\ a & 1' & a & a & c & c \\ a & a & 1' & c & c & c \\ c & a & c & 1' & b & b \\ a & c & c & b & 1' & b \\ c & c & c & b & b & 1' \end{bmatrix}$$

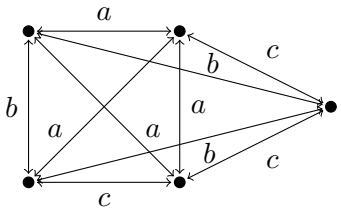
| #230 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-a$ | $a+c$ | $0'$ |
| $b$ | $b$ | $a+c$ | $1'+b$ | $a+c$ |
| $c$ | $c$ | $0'$ | $a+c$ | $-c$ |

yes
$51_{65}$
RRA




| #231 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a+c$ | $0'$ |
| $b$ | $b$ | $a+c$ | $1'+b$ | $a+c$ |
| $c$ | $c$ | $0'$ | $a+c$ | $-c$ |

yes
$52_{65}$
RRA



atom table | RA | QRNA

| #232 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-c$ | $0'$ | $b+c$ |
| $b$ | $b$ | $0'$ | $-c$ | $a+c$ |
| $c$ | $c$ | $b+c$ | $a+c$ | $-c$ |

yes
$37_{65}$
$\notin$ RRA

$$\begin{bmatrix} 1' & a & a & b & c & b \\ a & 1' & a & a & b & c \\ a & a & 1' & b & c & b \\ b & a & b & 1' & c & b \\ c & b & c & c & 1' & c \\ b & c & b & b & c & 1' \end{bmatrix}$$

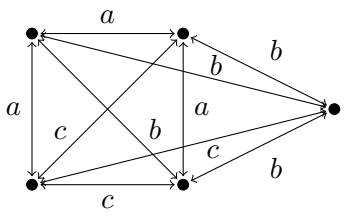
| #233 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-b$ | $b+c$ | $0'$ |
| $b$ | $b$ | $b+c$ | $-c$ | $a+c$ |
| $c$ | $c$ | $0'$ | $a+c$ | $-c$ |

yes
$49_{65}$
$\notin$ RRA

$$\begin{bmatrix} 1' & a & a & c & b & b \\ a & 1' & a & a & b & b \\ a & a & 1' & a & c & c \\ c & a & a & 1' & c & c \\ b & b & c & c & 1' & b \\ b & b & c & c & b & 1' \end{bmatrix}$$

| #234 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-a$ | $0'$ | $0'$ |
| $b$ | $b$ | $0'$ | $-c$ | $a+c$ |
| $c$ | $c$ | $0'$ | $a+c$ | $-c$ |

yes
$56_{65}$
RRA




| #235 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $0'$ | $0'$ |
| $b$ | $b$ | $0'$ | $-c$ | $a+c$ |
| $c$ | $c$ | $0'$ | $a+c$ | $-c$ |

yes
$57_{65}$
RRA

$$\begin{bmatrix} 1' & a & a & b & c & c \\ a & 1' & a & a & a & c \\ a & a & 1' & b & b & b \\ b & a & b & 1' & a & a \\ c & a & b & a & 1' & b \\ c & c & b & a & b & 1' \end{bmatrix}$$

| #236 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-a$ | $a+b$ | $a+c$ |
| $b$ | $b$ | $a+b$ | $-b$ | $b+c$ |
| $c$ | $c$ | $a+c$ | $b+c$ | $-c$ |

yes
$21_{65}$
$\notin$ RRA

no

| #237 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a+b$ | $a+c$ |
| $b$ | $b$ | $a+b$ | $-b$ | $b+c$ |
| $c$ | $c$ | $a+c$ | $b+c$ | $-c$ |

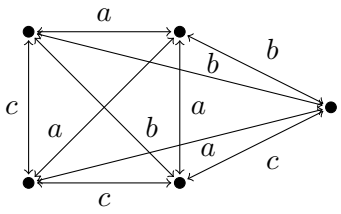
yes
$22_{65}$
$\notin$ RRA

$$\begin{bmatrix} 1' & a & a & b & c & b \\ a & 1' & a & a & a & a \\ a & a & 1' & b & c & b \\ b & a & b & 1' & b & c \\ c & a & c & b & 1' & c \\ b & a & b & c & c & 1' \end{bmatrix}$$

| atom table | RA | QRNA |
|---|---|---|

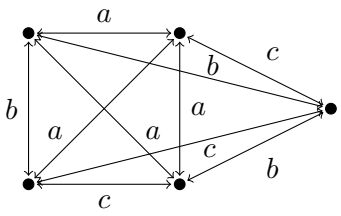
| #238 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-a$ | $0'$ | $0'$ |
| $b$ | $b$ | $0'$ | $-b$ | $0'$ |
| $c$ | $c$ | $0'$ | $0'$ | $-c$ |

yes
$62_{65}$
RRA




| #239 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $0'$ | $0'$ |
| $b$ | $b$ | $0'$ | $-b$ | $0'$ |
| $c$ | $c$ | $0'$ | $0'$ | $-c$ |

yes
$63_{65}$
RRA




| #240 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-b$ | $0$ | $a+c$ |
| $b$ | $b$ | $0$ | $-a$ | $b+c$ |
| $c$ | $c$ | $a+c$ | $b+c$ | $-c$ |

no

no

| #241 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a$ | $a+c$ |
| $b$ | $b$ | $a$ | $-a$ | $b+c$ |
| $c$ | $c$ | $a+c$ | $b+c$ | $-c$ |

no

$$\begin{bmatrix} 1' & a & a & b & c & a & b \\ a & 1' & a & a & a & c & a \\ a & a & 1' & a & a & c & a \\ b & a & a & 1' & b & a & b \\ c & a & a & b & 1' & a & c \\ a & c & c & a & a & 1' & a \\ b & a & a & b & c & a & 1' \end{bmatrix}$$

| #242 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a+b$ | $a+c$ |
| $b$ | $b$ | $a+b$ | $1$ | $b+c$ |
| $c$ | $c$ | $a+c$ | $b+c$ | $-c$ |

yes
$23_{65}$
$\notin$ RRA

$$\begin{bmatrix} 1' & a & a & b & c & b \\ a & 1' & a & a & a & a \\ a & a & 1' & b & c & b \\ b & a & b & 1' & b & b \\ c & a & c & b & 1' & c \\ b & a & b & b & c & 1' \end{bmatrix}$$

| #243 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-b$ | $c$ | $0'$ |
| $b$ | $b$ | $c$ | $-a$ | $0'$ |
| $c$ | $c$ | $0'$ | $0'$ | $-c$ |

no

$$\begin{bmatrix} 1' & a & a & c & a & c \\ a & 1' & a & a & c & c \\ a & a & 1' & c & c & b \\ c & a & c & 1' & b & b \\ a & c & c & b & 1' & b \\ c & c & b & b & b & 1' \end{bmatrix}$$

| atom table | RA | QRNA |
|---|---|---|

| #244 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a+c$ | $0'$ |
| $b$ | $b$ | $a+c$ | $-a$ | $0'$ |
| $c$ | $c$ | $0'$ | $0'$ | $-c$ |

yes
$60_{65}$
$\notin$ RRA

$$\begin{bmatrix} 1' & a & a & b & c & c \\ a & 1' & a & a & a & c \\ a & a & 1' & c & b & b \\ b & a & c & 1' & b & c \\ c & a & b & b & 1' & b \\ c & c & b & c & b & 1' \end{bmatrix}$$

| #245 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $0'$ | $0'$ |
| $b$ | $b$ | $0'$ | $1$ | $0'$ |
| $c$ | $c$ | $0'$ | $0'$ | $-c$ |

yes
$64_{65}$
RRA

$$\begin{bmatrix} 1' & a & a & b & c & a \\ a & 1' & a & a & a & c \\ a & a & 1' & b & b & c \\ b & a & b & 1' & b & c \\ c & a & b & b & 1' & c \\ a & c & c & c & c & 1' \end{bmatrix}$$

| #246 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+a$ | $0$ | $0$ |
| $b$ | $b$ | $0$ | $1'+b$ | $0$ |
| $c$ | $c$ | $0$ | $0$ | $1'+c$ |

no — no

| #247 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-c$ | $a$ | $0$ |
| $b$ | $b$ | $a$ | $1'+b$ | $0$ |
| $c$ | $c$ | $0$ | $0$ | $1'+c$ |

no — no

| #248 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a$ | $a$ |
| $b$ | $b$ | $a$ | $1'+b$ | $0$ |
| $c$ | $c$ | $a$ | $0$ | $1'+c$ |

no

$$\begin{bmatrix} 1' & a & a & b & a & b & a \\ a & 1' & a & a & c & a & c \\ a & a & 1' & a & a & a & a \\ b & a & a & 1' & a & b & a \\ a & c & a & a & 1' & a & c \\ b & a & a & b & a & 1' & a \\ a & c & a & a & c & a & 1' \end{bmatrix}$$

| #249 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-c$ | $a+b$ | $0$ |
| $b$ | $b$ | $a+b$ | $-c$ | $0$ |
| $c$ | $c$ | $0$ | $0$ | $1'+c$ |

no — no

| | atom table | RA | QRNA |
|---|---|---|---|

| #250 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-b$ | $b$ | $a$ |
| $b$ | $b$ | $b$ | $-c$ | $0$ |
| $c$ | $c$ | $a$ | $0$ | $1'+c$ |

no

no

| #251 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a+b$ | $a$ |
| $b$ | $b$ | $a+b$ | $-c$ | $0$ |
| $c$ | $c$ | $a$ | $0$ | $1'+c$ |

no

$$\begin{bmatrix} 1' & a & a & b & a & b & a \\ a & 1' & a & a & c & a & c \\ a & a & 1' & b & a & b & a \\ b & a & b & 1' & a & b & a \\ a & c & a & a & 1' & a & c \\ b & a & b & b & a & 1' & a \\ a & c & a & a & c & a & 1' \end{bmatrix}$$

| #252 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+a$ | $c$ | $b$ |
| $b$ | $b$ | $c$ | $1'+b$ | $a$ |
| $c$ | $c$ | $b$ | $a$ | $1'+c$ |

no

no

| #253 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-c$ | $a+c$ | $b$ |
| $b$ | $b$ | $a+c$ | $1'+b$ | $a$ |
| $c$ | $c$ | $b$ | $a$ | $1'+c$ |

no

no

| #254 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a+c$ | $a+b$ |
| $b$ | $b$ | $a+c$ | $1'+b$ | $a$ |
| $c$ | $c$ | $a+b$ | $a$ | $1'+c$ |

yes
$29_{65}$
RRA

$$\begin{bmatrix} 1' & a & a & b & c & a \\ a & 1' & a & a & b & b \\ a & a & 1' & c & a & c \\ b & a & c & 1' & a & c \\ c & b & a & a & 1' & b \\ a & b & c & c & b & 1' \end{bmatrix}$$

| #255 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-c$ | $0'$ | $b$ |
| $b$ | $b$ | $0'$ | $-c$ | $a$ |
| $c$ | $c$ | $b$ | $a$ | $1'+c$ |

no

no

| | atom table | RA | QRNA |
|---|---|---|---|

| #256 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-b$ | $b+c$ | $a+b$ |
| $b$ | $b$ | $b+c$ | $-c$ | $a$ |
| $c$ | $c$ | $a+b$ | $a$ | $1'+c$ |

no

no

| #257 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $0'$ | $a+b$ |
| $b$ | $b$ | $0'$ | $-c$ | $a$ |
| $c$ | $c$ | $a+b$ | $a$ | $1'+c$ |

yes
$31_{65}$
RRA

$$\begin{bmatrix} 1' & a & a & b & a & b \\ a & 1' & a & a & c & c \\ a & a & 1' & b & b & a \\ b & a & b & 1' & a & b \\ a & c & b & a & 1' & c \\ b & c & a & b & c & 1' \end{bmatrix}$$

| #258 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+a$ | $b$ | $c$ |
| $b$ | $b$ | $b$ | $-c$ | $0$ |
| $c$ | $c$ | $c$ | $0$ | $-b$ |

no

no

| #259 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-c$ | $a+b$ | $c$ |
| $b$ | $b$ | $a+b$ | $-c$ | $0$ |
| $c$ | $c$ | $c$ | $0$ | $-b$ |

no

no

| #260 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a+b$ | $a+c$ |
| $b$ | $b$ | $a+b$ | $-c$ | $0$ |
| $c$ | $c$ | $a+c$ | $0$ | $-b$ |

no

$$\begin{bmatrix} 1' & a & a & b & a & a & b & a \\ a & 1' & a & a & c & a & a & c \\ a & a & 1' & b & a & a & b & a \\ b & a & b & 1' & a & a & b & a \\ a & c & a & a & 1' & c & a & c \\ a & a & a & a & c & 1' & a & c \\ b & a & b & b & a & a & 1' & a \\ a & c & a & a & c & c & a & 1' \end{bmatrix}$$

| #261 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1'+a$ | $b+c$ | $b+c$ |
| $b$ | $b$ | $b+c$ | $-c$ | $a$ |
| $c$ | $c$ | $b+c$ | $a$ | $-b$ |

no

no

| | atom table | RA | QRNA |
|---|---|---|---|

| #262 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-c$ | $0'$ | $b+c$ |
| $b$ | $b$ | $0'$ | $-c$ | $a$ |
| $c$ | $c$ | $b+c$ | $a$ | $-b$ |

no

no

| #263 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $0'$ | $0'$ |
| $b$ | $b$ | $0'$ | $-c$ | $a$ |
| $c$ | $c$ | $0'$ | $a$ | $-b$ |

yes
$34_{65}$
RRA

$$\begin{bmatrix} 1' & a & a & b & c & a \\ a & 1' & a & a & c & c \\ a & a & 1' & b & a & b \\ b & a & b & 1' & a & b \\ c & c & a & a & 1' & c \\ a & c & b & b & c & 1' \end{bmatrix}$$

| #264 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a$ | $a$ |
| $b$ | $b$ | $a$ | $-a$ | $b$ |
| $c$ | $c$ | $a$ | $b$ | $1'+c$ |

yes
$8_{65}$
RRA

$$\begin{bmatrix} 1' & a & a & b & c & b & c \\ a & 1' & a & a & a & a & a \\ a & a & 1' & a & a & a & a \\ b & a & a & 1' & b & b & b \\ c & a & a & b & 1' & b & c \\ b & a & a & b & b & 1' & b \\ c & a & a & b & c & b & 1' \end{bmatrix}$$

| #265 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a+b$ | $a$ |
| $b$ | $b$ | $a+b$ | $1$ | $b$ |
| $c$ | $c$ | $a$ | $b$ | $1'+c$ |

yes
$20_{65}$
RRA

$$\begin{bmatrix} 1' & a & a & b & c & b & c \\ a & 1' & a & a & a & b & a \\ a & a & 1' & b & a & b & a \\ b & a & b & 1' & b & b & b \\ c & a & a & b & 1' & b & c \\ b & b & b & b & b & 1' & b \\ c & a & a & b & c & b & 1' \end{bmatrix}$$

| #266 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a+c$ | $a+b$ |
| $b$ | $b$ | $a+c$ | $-a$ | $a+b$ |
| $c$ | $c$ | $a+b$ | $a+b$ | $1'+c$ |

yes
$36_{65}$
$\notin$ RRA

$$\begin{bmatrix} 1' & a & a & b & b & b \\ a & 1' & a & a & c & a \\ a & a & 1' & c & a & c \\ b & a & c & 1' & b & c \\ b & c & a & b & 1' & b \\ b & a & c & c & b & 1' \end{bmatrix}$$

| #267 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $0'$ | $a+b$ |
| $b$ | $b$ | $0'$ | $1$ | $a+b$ |
| $c$ | $c$ | $a+b$ | $a+b$ | $1'+c$ |

yes
$53_{65}$
RRA

$$\begin{bmatrix} 1' & a & a & b & c & c \\ a & 1' & a & a & a & b \\ a & a & 1' & b & b & b \\ b & a & b & 1' & b & b \\ c & a & b & b & 1' & c \\ c & b & b & b & c & 1' \end{bmatrix}$$

| | atom table | RA | QRNA |
|---|---|---|---|

| #268 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-c$ | $a$ | $c$ |
| $b$ | $b$ | $a$ | $-a$ | $b$ |
| $c$ | $c$ | $c$ | $b$ | $-b$ |

no

no

| #269 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a$ | $a+c$ |
| $b$ | $b$ | $a$ | $-a$ | $b$ |
| $c$ | $c$ | $a+c$ | $b$ | $-b$ |

no

$$\begin{bmatrix} 1' & a & a & b & c & a & b & c \\ a & 1' & a & a & a & c & a & a \\ a & a & 1' & a & a & c & a & a \\ b & a & a & 1' & b & a & b & b \\ c & a & a & b & 1' & a & b & c \\ a & c & c & a & a & 1' & a & a \\ b & a & a & b & b & a & 1' & b \\ c & a & a & b & c & a & b & 1' \end{bmatrix}$$

| #270 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-b$ | $b$ | $a+c$ |
| $b$ | $b$ | $b$ | $1$ | $b$ |
| $c$ | $c$ | $a+c$ | $b$ | $-b$ |

yes
$14_{65}$
RRA

$$\begin{bmatrix} 1' & a & a & c & b & b & c \\ a & 1' & a & a & b & b & c \\ a & a & 1' & c & b & b & c \\ c & a & c & 1' & b & b & c \\ b & b & b & b & 1' & b & b \\ b & b & b & b & b & 1' & b \\ c & c & c & c & b & b & 1' \end{bmatrix}$$

| #271 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a+b$ | $a+c$ |
| $b$ | $b$ | $a+b$ | $1$ | $b$ |
| $c$ | $c$ | $a+c$ | $b$ | $-b$ |

no

$$\begin{bmatrix} 1' & a & a & b & c & b & c \\ a & 1' & a & a & a & b & a \\ a & a & 1' & b & c & b & c \\ b & a & b & 1' & b & b & b \\ c & a & c & b & 1' & b & c \\ b & b & b & b & b & 1' & b \\ c & a & c & b & c & b & 1' \end{bmatrix}$$

| #272 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-c$ | $a+c$ | $b+c$ |
| $b$ | $b$ | $a+c$ | $-a$ | $a+b$ |
| $c$ | $c$ | $b+c$ | $a+b$ | $-b$ |

yes
$42_{65}$
$\notin$ RRA

$$\begin{bmatrix} 1' & a & a & b & b & b \\ a & 1' & a & a & c & c \\ a & a & 1' & a & c & c \\ b & a & a & 1' & b & b \\ b & c & c & b & 1' & c \\ b & c & c & b & c & 1' \end{bmatrix}$$

| #273 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a+c$ | $0'$ |
| $b$ | $b$ | $a+c$ | $-a$ | $a+b$ |
| $c$ | $c$ | $0'$ | $a+b$ | $-b$ |

yes
$50_{65}$
$\notin$ RRA

$$\begin{bmatrix} 1' & a & a & b & b & b \\ a & 1' & a & a & c & c \\ a & a & 1' & a & a & c \\ b & a & a & 1' & b & b \\ b & c & a & b & 1' & c \\ b & c & c & b & c & 1' \end{bmatrix}$$

| atom table | RA | QRNA |
|---|---|---|

| #274 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $-b$ | $b+c$ | $0'$ |
| $b$ | $b$ | $b+c$ | $1$ | $a+b$ |
| $c$ | $c$ | $0'$ | $a+b$ | $-b$ |

yes
$38_{65}$
$\notin$ RRA

$$\begin{bmatrix} 1' & a & a & c & b & c \\ a & 1' & a & a & b & b \\ a & a & 1' & c & b & c \\ c & a & c & 1' & b & c \\ b & b & b & b & 1' & b \\ c & b & c & c & b & 1' \end{bmatrix}$$

| #275 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $0'$ | $0'$ |
| $b$ | $b$ | $0'$ | $1$ | $a+b$ |
| $c$ | $c$ | $0'$ | $a+b$ | $-b$ |

yes
$61_{65}$
RRA

$$\begin{bmatrix} 1' & a & a & b & c & c \\ a & 1' & a & a & a & c \\ a & a & 1' & b & b & b \\ b & a & b & 1' & b & b \\ c & a & b & b & 1' & c \\ c & c & b & b & c & 1' \end{bmatrix}$$

| #276 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $a+b$ | $a+c$ |
| $b$ | $b$ | $a+b$ | $1$ | $b+c$ |
| $c$ | $c$ | $a+c$ | $b+c$ | $1$ |

yes
$24_{65}$
RRA

$$\begin{bmatrix} 1' & a & a & b & c & b & c \\ a & 1' & a & a & a & a & c \\ a & a & 1' & b & c & b & c \\ b & a & b & 1' & b & b & c \\ c & a & c & b & 1' & c & c \\ b & a & b & b & c & 1' & c \\ c & c & c & c & c & c & 1' \end{bmatrix}$$

| #277 | $1'$ | $a$ | $b$ | $c$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $b$ | $c$ |
| $a$ | $a$ | $1$ | $0'$ | $0'$ |
| $b$ | $b$ | $0'$ | $1$ | $0'$ |
| $c$ | $c$ | $0'$ | $0'$ | $1$ |

yes
$65_{65}$
RRA

$$\begin{bmatrix} 1' & a & a & b & c & c \\ a & 1' & a & a & a & c \\ a & a & 1' & b & b & c \\ b & a & b & 1' & b & c \\ c & a & b & b & 1' & c \\ c & c & c & c & c & 1' \end{bmatrix}$$

# 6 Atoms: atomic identity, one symmetric and one non-symmetric

| atom table | RA | QRNA |
|---|---|---|

| #278 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'$ | $0$ | $0$ |
| $r$ | $r$ | $0$ | $0$ | $1'$ |
| $r^\smile$ | $r^\smile$ | $0$ | $1'$ | $0$ |

no

no

| | atom table | RA | QRNA |
|---|---|---|---|

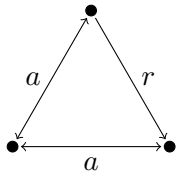
| #279 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'+a$ | $0$ | $0$ |
| $r$ | $r$ | $0$ | $0$ | $1'$ |
| $r^\smile$ | $r^\smile$ | $0$ | $1'$ | $0$ |

no

no

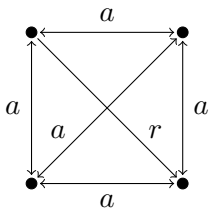
| #280 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $-a$ | $a$ | $a$ |
| $r$ | $r$ | $a$ | $0$ | $1'$ |
| $r^\smile$ | $r^\smile$ | $a$ | $1'$ | $0$ |

no



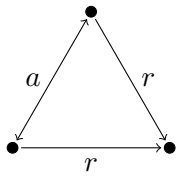

| #281 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1$ | $a$ | $a$ |
| $r$ | $r$ | $a$ | $0$ | $1'$ |
| $r^\smile$ | $r^\smile$ | $a$ | $1'$ | $0$ |

no



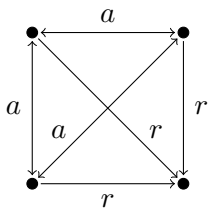

| #282 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'$ | $r$ | $0$ |
| $r$ | $r$ | $0$ | $0$ | $1'+a$ |
| $r^\smile$ | $r^\smile$ | $r^\smile$ | $1'$ | $0$ |

no




| #283 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'+a$ | $r$ | $0$ |
| $r$ | $r$ | $0$ | $0$ | $1'+a$ |
| $r^\smile$ | $r^\smile$ | $r^\smile$ | $1'$ | $0$ |

no




| #284 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $-a$ | $a+r$ | $a$ |
| $r$ | $r$ | $a$ | $0$ | $1'+a$ |
| $r^\smile$ | $r^\smile$ | $a+r^\smile$ | $1'$ | $0$ |

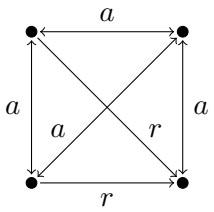
no

no

| | atom table | RA | QRNA |
|---|---|---|---|

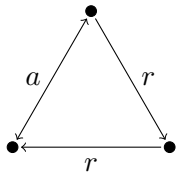
| #285 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1$ | $a+r$ | $a$ |
| $r$ | $r$ | $a$ | $0$ | $1'+a$ |
| $r^\smile$ | $r^\smile$ | $a+r^\smile$ | $1'$ | $0$ |

no




| #286 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'$ | $r^\smile$ | $r$ |
| $r$ | $r$ | $r^\smile$ | $a$ | $1'$ |
| $r^\smile$ | $r^\smile$ | $r$ | $1'$ | $a$ |

yes
$18_{37}$
RRA



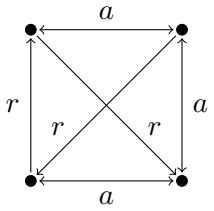

| #287 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'+a$ | $r^\smile$ | $r$ |
| $r$ | $r$ | $r^\smile$ | $a$ | $1'$ |
| $r^\smile$ | $r^\smile$ | $r$ | $1'$ | $a$ |

no

no

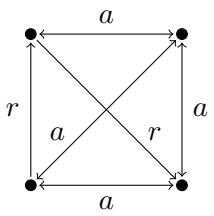
| #288 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $-a$ | $a+r^\smile$ | $a+r$ |
| $r$ | $r$ | $a+r^\smile$ | $a$ | $1'$ |
| $r^\smile$ | $r^\smile$ | $a+r$ | $1'$ | $a$ |

no




| #289 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1$ | $a+r^\smile$ | $a+r$ |
| $r$ | $r$ | $a+r^\smile$ | $a$ | $1'$ |
| $r^\smile$ | $r^\smile$ | $a+r$ | $1'$ | $a$ |

no




| #290 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'$ | $r+r^\smile$ | $r$ |
| $r$ | $r$ | $r^\smile$ | $a$ | $1'+a$ |
| $r^\smile$ | $r^\smile$ | $r+r^\smile$ | $1'$ | $a$ |

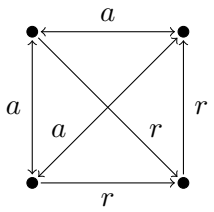
no

no

| atom table | RA | QRNA |
|---|---|---|

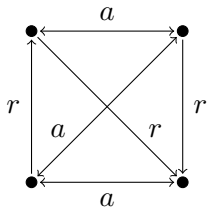
| #291 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'+a$ | $r+r^\smile$ | $r$ |
| $r$ | $r$ | $r^\smile$ | $a$ | $1'+a$ |
| $r^\smile$ | $r^\smile$ | $r+r^\smile$ | $1'$ | $a$ |

no



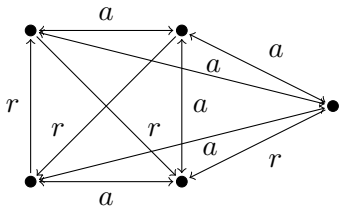

| #292 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $-a$ | $0'$ | $a+r$ |
| $r$ | $r$ | $a+r^\smile$ | $a$ | $1'+a$ |
| $r^\smile$ | $r^\smile$ | $0'$ | $1'$ | $a$ |

no



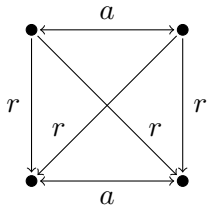

| #293 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1$ | $0'$ | $a+r$ |
| $r$ | $r$ | $a+r^\smile$ | $a$ | $1'+a$ |
| $r^\smile$ | $r^\smile$ | $0'$ | $1'$ | $a$ |

no



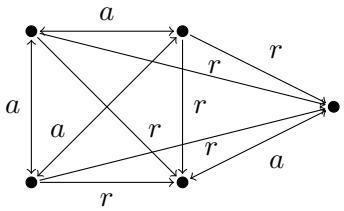

| #294 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'$ | $r$ | $r^\smile$ |
| $r$ | $r$ | $r$ | $0$ | $1'+a$ |
| $r^\smile$ | $r^\smile$ | $r^\smile$ | $1'+a$ | $0$ |

no



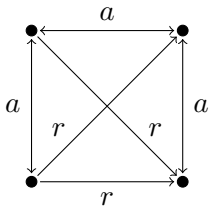

| #295 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'+a$ | $r$ | $r^\smile$ |
| $r$ | $r$ | $r$ | $0$ | $1'+a$ |
| $r^\smile$ | $r^\smile$ | $r^\smile$ | $1'+a$ | $0$ |

no




| #296 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $-a$ | $a+r$ | $a+r^\smile$ |
| $r$ | $r$ | $a+r$ | $0$ | $1'+a$ |
| $r^\smile$ | $r^\smile$ | $a+r^\smile$ | $1'+a$ | $0$ |

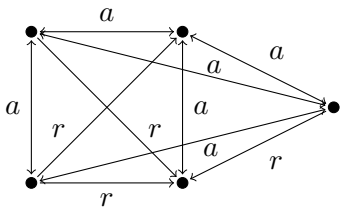
no



| atom table | RA | QRNA |
|---|---|---|

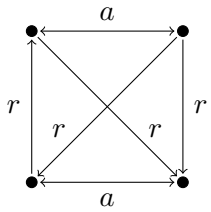
| #297 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1$ | $a+r$ | $a+r^\smile$ |
| $r$ | $r$ | $a+r$ | $0$ | $1'+a$ |
| $r^\smile$ | $r^\smile$ | $a+r^\smile$ | $1'+a$ | $0$ |

no



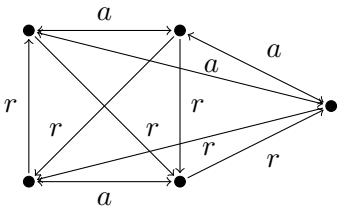

| #298 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'$ | $r+r^\smile$ | $r+r^\smile$ |
| $r$ | $r$ | $r+r^\smile$ | $a$ | $1'+a$ |
| $r^\smile$ | $r^\smile$ | $r+r^\smile$ | $1'+a$ | $a$ |

no



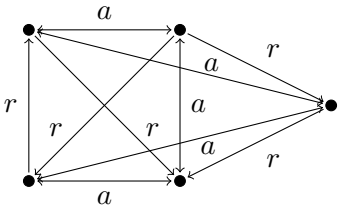

| #299 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'+a$ | $r+r^\smile$ | $r+r^\smile$ |
| $r$ | $r$ | $r+r^\smile$ | $a$ | $1'+a$ |
| $r^\smile$ | $r^\smile$ | $r+r^\smile$ | $1'+a$ | $a$ |

yes
$20_{37}$
RRA



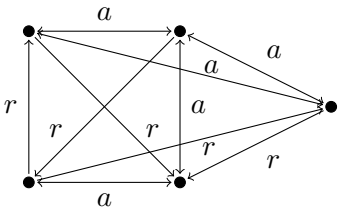

| #300 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $-a$ | $0'$ | $0'$ |
| $r$ | $r$ | $0'$ | $a$ | $1'+a$ |
| $r^\smile$ | $r^\smile$ | $0'$ | $1'+a$ | $a$ |

no




| #301 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1$ | $0'$ | $0'$ |
| $r$ | $r$ | $0'$ | $a$ | $1'+a$ |
| $r^\smile$ | $r^\smile$ | $0'$ | $1'+a$ | $a$ |

yes
$31_{37}$
RRA




| #302 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'$ | $0$ | $0$ |
| $r$ | $r$ | $0$ | $r$ | $-a$ |
| $r^\smile$ | $r^\smile$ | $0$ | $-a$ | $r^\smile$ |

no

no

| | atom table | RA | QRNA |
|---|---|---|---|

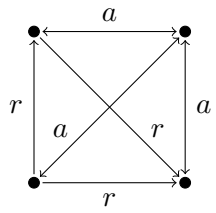
| #303 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'+a$ | $0$ | $0$ |
| $r$ | $r$ | $0$ | $r$ | $-a$ |
| $r^\smile$ | $r^\smile$ | $0$ | $-a$ | $r^\smile$ |

no

no

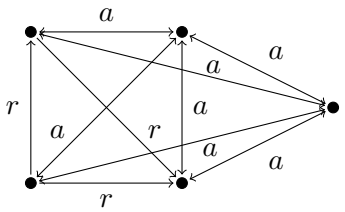
| #304 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $-a$ | $a$ | $a$ |
| $r$ | $r$ | $a$ | $r$ | $-a$ |
| $r^\smile$ | $r^\smile$ | $a$ | $-a$ | $r^\smile$ |

yes
$7_{37}$
RRA



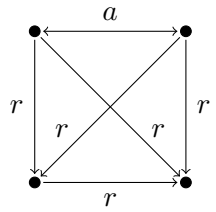

| #305 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1$ | $a$ | $a$ |
| $r$ | $r$ | $a$ | $r$ | $-a$ |
| $r^\smile$ | $r^\smile$ | $a$ | $-a$ | $r^\smile$ |

yes
$8_{37}$
RRA



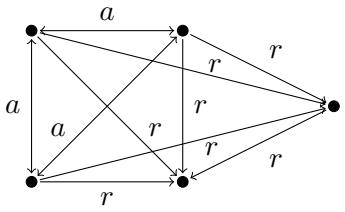

| #306 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'$ | $r$ | $0$ |
| $r$ | $r$ | $0$ | $r$ | $1$ |
| $r^\smile$ | $r^\smile$ | $r^\smile$ | $-a$ | $r^\smile$ |

no



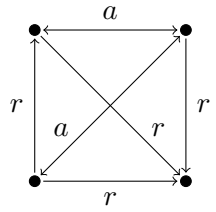

| #307 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'+a$ | $r$ | $0$ |
| $r$ | $r$ | $0$ | $r$ | $1$ |
| $r^\smile$ | $r^\smile$ | $r^\smile$ | $-a$ | $r^\smile$ |

no




| #308 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $-a$ | $a+r$ | $a$ |
| $r$ | $r$ | $a$ | $r$ | $1$ |
| $r^\smile$ | $r^\smile$ | $a+r^\smile$ | $-a$ | $r^\smile$ |

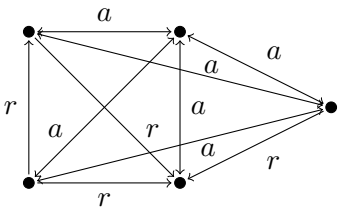
no



| atom table | RA | QRNA |
|---|---|---|

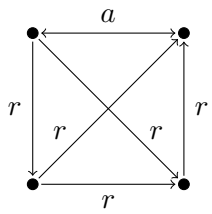
| #309 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1$ | $a+r$ | $a$ |
| $r$ | $r$ | $a$ | $r$ | $1$ |
| $r^\smile$ | $r^\smile$ | $a+r^\smile$ | $-a$ | $r^\smile$ |

yes
$13_{37}$
RRA




| #310 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'$ | $r^\smile$ | $r$ |
| $r$ | $r$ | $r^\smile$ | $a+r$ | $-a$ |
| $r^\smile$ | $r^\smile$ | $r$ | $-a$ | $a+r^\smile$ |

no



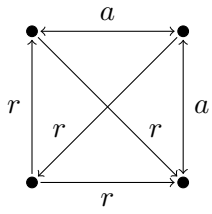

| #311 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'+a$ | $r^\smile$ | $r$ |
| $r$ | $r$ | $r^\smile$ | $a+r$ | $-a$ |
| $r^\smile$ | $r^\smile$ | $r$ | $-a$ | $a+r^\smile$ |

no

no

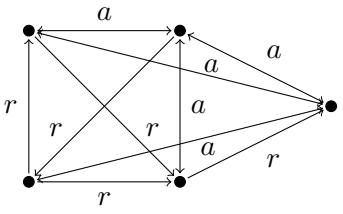
| #312 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $-a$ | $a+r^\smile$ | $a+r$ |
| $r$ | $r$ | $a+r^\smile$ | $a+r$ | $-a$ |
| $r^\smile$ | $r^\smile$ | $a+r$ | $-a$ | $a+r^\smile$ |

yes
$23_{37}$
RRA



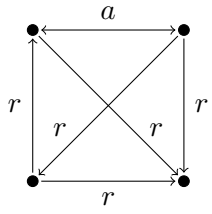

| #313 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1$ | $a+r^\smile$ | $a+r$ |
| $r$ | $r$ | $a+r^\smile$ | $a+r$ | $-a$ |
| $r^\smile$ | $r^\smile$ | $a+r$ | $-a$ | $a+r^\smile$ |

yes
$24_{37}$
$\notin$ RRA




| #314 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'$ | $r+r^\smile$ | $r$ |
| $r$ | $r$ | $r^\smile$ | $a+r$ | $1$ |
| $r^\smile$ | $r^\smile$ | $r+r^\smile$ | $-a$ | $a+r^\smile$ |

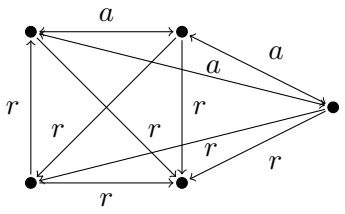
no



| atom table | RA | QRNA |
|---|---|---|

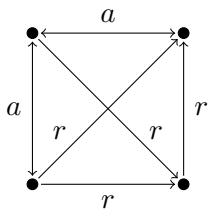
| #315 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'+a$ | $r+r^\smile$ | $r$ |
| $r$ | $r$ | $r^\smile$ | $a+r$ | $1$ |
| $r^\smile$ | $r^\smile$ | $r+r^\smile$ | $-a$ | $a+r^\smile$ |

no



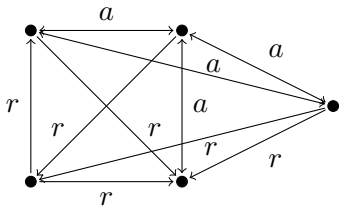

| #316 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $-a$ | $0'$ | $a+r$ |
| $r$ | $r$ | $a+r^\smile$ | $a+r$ | $1$ |
| $r^\smile$ | $r^\smile$ | $0'$ | $-a$ | $a+r^\smile$ |

yes
$27_{37}$
$\notin$ RRA



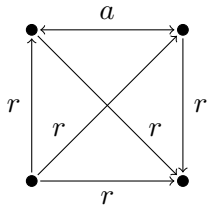

| #317 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1$ | $0'$ | $a+r$ |
| $r$ | $r$ | $a+r^\smile$ | $a+r$ | $1$ |
| $r^\smile$ | $r^\smile$ | $0'$ | $-a$ | $a+r^\smile$ |

yes
$28_{37}$
$\notin$ RRA



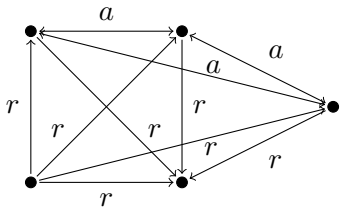

| #318 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'$ | $r$ | $r^\smile$ |
| $r$ | $r$ | $r$ | $r$ | $1$ |
| $r^\smile$ | $r^\smile$ | $r^\smile$ | $1$ | $r^\smile$ |

yes
$1_{37}$
RRA



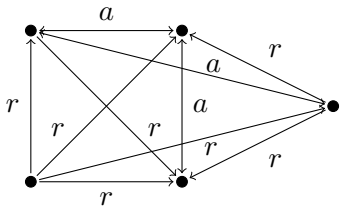

| #319 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'+a$ | $r$ | $r^\smile$ |
| $r$ | $r$ | $r$ | $r$ | $1$ |
| $r^\smile$ | $r^\smile$ | $r^\smile$ | $1$ | $r^\smile$ |

yes
$2_{37}$
RRA




| #320 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $-a$ | $a+r$ | $a+r^\smile$ |
| $r$ | $r$ | $a+r$ | $r$ | $1$ |
| $r^\smile$ | $r^\smile$ | $a+r^\smile$ | $1$ | $r^\smile$ |

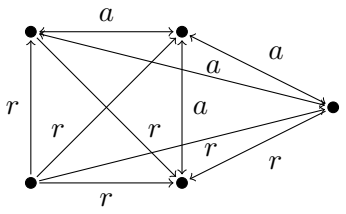
yes
$14_{37}$
$\notin$ RRA



| atom table | RA | QRNA |
|---|---|---|

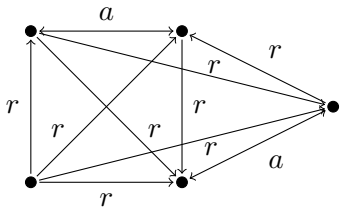
| #321 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1$ | $a+r$ | $a+r^\smile$ |
| $r$ | $r$ | $a+r$ | $r$ | $1$ |
| $r^\smile$ | $r^\smile$ | $a+r^\smile$ | $1$ | $r^\smile$ |

yes
$15_{37}$
RRA



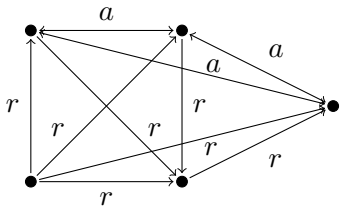

| #322 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'$ | $r+r^\smile$ | $r+r^\smile$ |
| $r$ | $r$ | $r+r^\smile$ | $a+r$ | $1$ |
| $r^\smile$ | $r^\smile$ | $r+r^\smile$ | $1$ | $a+r^\smile$ |

no



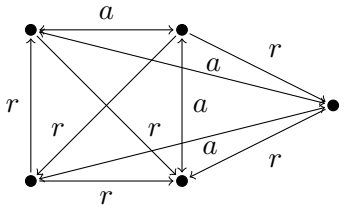

| #323 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'+a$ | $r+r^\smile$ | $r+r^\smile$ |
| $r$ | $r$ | $r+r^\smile$ | $a+r$ | $1$ |
| $r^\smile$ | $r^\smile$ | $r+r^\smile$ | $1$ | $a+r^\smile$ |

yes
$21_{37}$
$\notin$ RRA



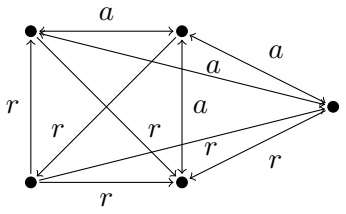

| #324 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $-a$ | $0'$ | $0'$ |
| $r$ | $r$ | $0'$ | $a+r$ | $1$ |
| $r^\smile$ | $r^\smile$ | $0'$ | $1$ | $a+r^\smile$ |

yes
$32_{37}$
$\notin$ RRA




| #325 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1$ | $0'$ | $0'$ |
| $r$ | $r$ | $0'$ | $a+r$ | $1$ |
| $r^\smile$ | $r^\smile$ | $0'$ | $1$ | $a+r^\smile$ |

yes
$33_{37}$
RRA




| #326 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'$ | $0$ | $0$ |
| $r$ | $r$ | $0$ | $r^\smile$ | $1'$ |
| $r^\smile$ | $r^\smile$ | $0$ | $1'$ | $r$ |

no

no

| | atom table | RA | QRNA |
|---|---|---|---|

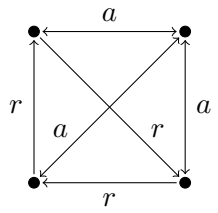
| #327 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'+a$ | $0$ | $0$ |
| $r$ | $r$ | $0$ | $r^\smile$ | $1'$ |
| $r^\smile$ | $r^\smile$ | $0$ | $1'$ | $r$ |

no

no

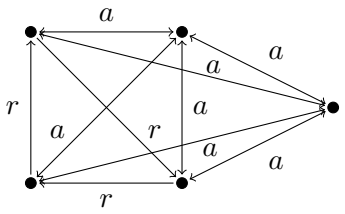
| #328 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $-a$ | $a$ | $a$ |
| $r$ | $r$ | $a$ | $r^\smile$ | $1'$ |
| $r^\smile$ | $r^\smile$ | $a$ | $1'$ | $r$ |

yes
$9_{37}$
RRA




| #329 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1$ | $a$ | $a$ |
| $r$ | $r$ | $a$ | $r^\smile$ | $1'$ |
| $r^\smile$ | $r^\smile$ | $a$ | $1'$ | $r$ |

yes
$10_{37}$
RRA




| #330 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'$ | $r$ | $0$ |
| $r$ | $r$ | $0$ | $r^\smile$ | $1'+a$ |
| $r^\smile$ | $r^\smile$ | $r^\smile$ | $1'$ | $r$ |

no

no

| #331 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'+a$ | $r$ | $0$ |
| $r$ | $r$ | $0$ | $r^\smile$ | $1'+a$ |
| $r^\smile$ | $r^\smile$ | $r^\smile$ | $1'$ | $r$ |

no

no

| #332 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $-a$ | $a+r$ | $a$ |
| $r$ | $r$ | $a$ | $r^\smile$ | $1'+a$ |
| $r^\smile$ | $r^\smile$ | $a+r^\smile$ | $1'$ | $r$ |

no

no

| atom table | RA | QRNA |
|---|---|---|

| #333 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1$ | $a+r$ | $a$ |
| $r$ | $r$ | $a$ | $r^\smile$ | $1'+a$ |
| $r^\smile$ | $r^\smile$ | $a+r^\smile$ | $1'$ | $r$ |

no

$$\begin{bmatrix} 1' & a & r & r^\smile & a & a \\ a & 1' & a & a & a & r \\ r^\smile & a & 1' & r & a & a \\ r & a & r^\smile & 1' & a & a \\ a & a & a & a & 1' & r \\ a & r^\smile & a & a & r^\smile & 1' \end{bmatrix}$$

| #334 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'$ | $r^\smile$ | $r$ |
| $r$ | $r$ | $r^\smile$ | $a+r^\smile$ | $1'$ |
| $r^\smile$ | $r^\smile$ | $r$ | $1'$ | $a+r$ |

no

no

| #335 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'+a$ | $r^\smile$ | $r$ |
| $r$ | $r$ | $r^\smile$ | $a+r^\smile$ | $1'$ |
| $r^\smile$ | $r^\smile$ | $r$ | $1'$ | $a+r$ |

no

no

| #336 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $-a$ | $a+r^\smile$ | $a+r$ |
| $r$ | $r$ | $a+r^\smile$ | $a+r^\smile$ | $1'$ |
| $r^\smile$ | $r^\smile$ | $a+r$ | $1'$ | $a+r$ |

no

no

| #337 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1$ | $a+r^\smile$ | $a+r$ |
| $r$ | $r$ | $a+r^\smile$ | $a+r^\smile$ | $1'$ |
| $r^\smile$ | $r^\smile$ | $a+r$ | $1'$ | $a+r$ |

no

$$\begin{bmatrix} 1' & a & r & r^\smile & a & a \\ a & 1' & a & a & a & r \\ r^\smile & a & 1' & r & a & a \\ r & a & r^\smile & 1' & a & a \\ a & a & a & a & 1' & r^\smile \\ a & r^\smile & a & a & r & 1' \end{bmatrix}$$

| #338 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'$ | $r+r^\smile$ | $r$ |
| $r$ | $r$ | $r^\smile$ | $a+r^\smile$ | $1'+a$ |
| $r^\smile$ | $r^\smile$ | $r+r^\smile$ | $1'$ | $a+r$ |

no

no

| | atom table | RA | QRNA |
|---|---|---|---|

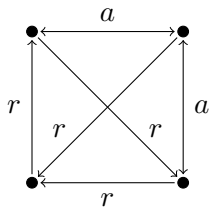
| #339 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'+a$ | $r+r^\smile$ | $r$ |
| $r$ | $r$ | $r^\smile$ | $a+r^\smile$ | $1'+a$ |
| $r^\smile$ | $r^\smile$ | $r+r^\smile$ | $1'$ | $a+r$ |

no

no

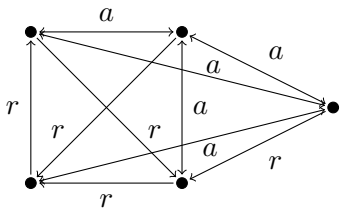
| #340 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $-a$ | $0'$ | $a+r$ |
| $r$ | $r$ | $a+r^\smile$ | $a+r^\smile$ | $1'+a$ |
| $r^\smile$ | $r^\smile$ | $0'$ | $1'$ | $a+r$ |

no



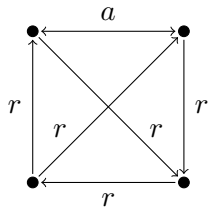

| #341 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1$ | $0'$ | $a+r$ |
| $r$ | $r$ | $a+r^\smile$ | $a+r^\smile$ | $1'+a$ |
| $r^\smile$ | $r^\smile$ | $0'$ | $1'$ | $a+r$ |

no



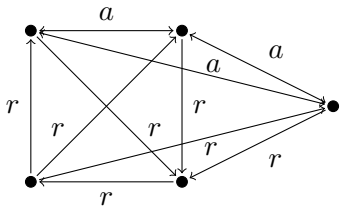

| #342 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'$ | $r$ | $r^\smile$ |
| $r$ | $r$ | $r$ | $r^\smile$ | $1'+a$ |
| $r^\smile$ | $r^\smile$ | $r^\smile$ | $1'+a$ | $r$ |

yes
$3_{37}$
RRA




| #343 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'+a$ | $r$ | $r^\smile$ |
| $r$ | $r$ | $r$ | $r^\smile$ | $1'+a$ |
| $r^\smile$ | $r^\smile$ | $r^\smile$ | $1'+a$ | $r$ |

yes
$4_{37}$
RRA




| #344 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $-a$ | $a+r$ | $a+r^\smile$ |
| $r$ | $r$ | $a+r$ | $r^\smile$ | $1'+a$ |
| $r^\smile$ | $r^\smile$ | $a+r^\smile$ | $1'+a$ | $r$ |

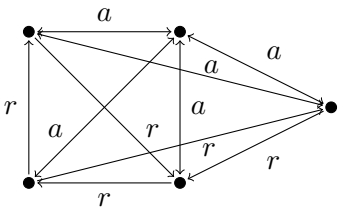
no

no

| atom table | RA | QRNA |
|---|---|---|

| #345 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1$ | $a+r$ | $a+r^\smile$ |
| $r$ | $r$ | $a+r$ | $r^\smile$ | $1'+a$ |
| $r^\smile$ | $r^\smile$ | $a+r^\smile$ | $1'+a$ | $r$ |

no




| #346 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'$ | $r+r^\smile$ | $r+r^\smile$ |
| $r$ | $r$ | $r+r^\smile$ | $a+r^\smile$ | $1'+a$ |
| $r^\smile$ | $r^\smile$ | $r+r^\smile$ | $1'+a$ | $a+r$ |

no

no

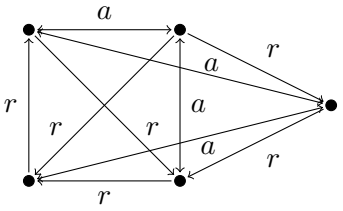
| #347 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'+a$ | $r+r^\smile$ | $r+r^\smile$ |
| $r$ | $r$ | $r+r^\smile$ | $a+r^\smile$ | $1'+a$ |
| $r^\smile$ | $r^\smile$ | $r+r^\smile$ | $1'+a$ | $a+r$ |

no

no

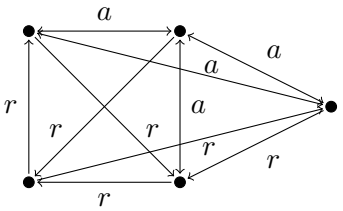
| #348 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $-a$ | $0'$ | $0'$ |
| $r$ | $r$ | $0'$ | $a+r^\smile$ | $1'+a$ |
| $r^\smile$ | $r^\smile$ | $0'$ | $1'+a$ | $a+r$ |

yes
$34_{37}$
$\notin$ RRA




| #349 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1$ | $0'$ | $0'$ |
| $r$ | $r$ | $0'$ | $a+r^\smile$ | $1'+a$ |
| $r^\smile$ | $r^\smile$ | $0'$ | $1'+a$ | $a+r$ |

yes
$35_{37}$
RRA




| #350 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'$ | $0$ | $0$ |
| $r$ | $r$ | $0$ | $r+r^\smile$ | $-a$ |
| $r^\smile$ | $r^\smile$ | $0$ | $-a$ | $r+r^\smile$ |

no

no

| | atom table | RA | QRNA |
|---|---|---|---|

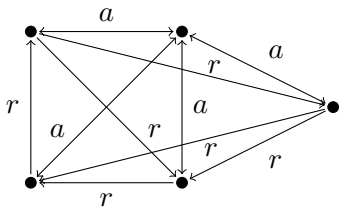
| #351 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'+a$ | $0$ | $0$ |
| $r$ | $r$ | $0$ | $r+r^\smile$ | $-a$ |
| $r^\smile$ | $r^\smile$ | $0$ | $-a$ | $r+r^\smile$ |

no

no

| #352 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $-a$ | $a$ | $a$ |
| $r$ | $r$ | $a$ | $r+r^\smile$ | $-a$ |
| $r^\smile$ | $r^\smile$ | $a$ | $-a$ | $r+r^\smile$ |

yes
$11_{37}$
RRA



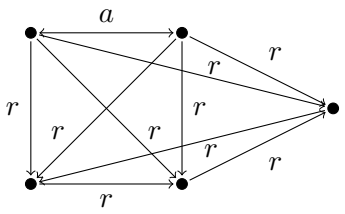

| #353 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1$ | $a$ | $a$ |
| $r$ | $r$ | $a$ | $r+r^\smile$ | $-a$ |
| $r^\smile$ | $r^\smile$ | $a$ | $-a$ | $r+r^\smile$ |

yes
$12_{37}$
RRA

$$\begin{bmatrix} 1' & a & r & r^\smile & a & r \\ a & 1' & a & a & a & a \\ r^\smile & a & 1' & r & a & r^\smile \\ r & a & r^\smile & 1' & a & r^\smile \\ a & a & a & a & 1' & a \\ r^\smile & a & r & r & a & 1' \end{bmatrix}$$

| #354 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'$ | $r$ | $0$ |
| $r$ | $r$ | $0$ | $r+r^\smile$ | $1$ |
| $r^\smile$ | $r^\smile$ | $r^\smile$ | $-a$ | $r+r^\smile$ |

no



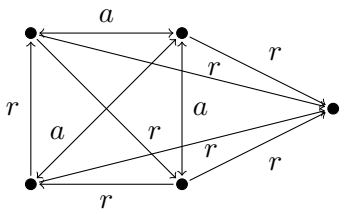

| #355 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'+a$ | $r$ | $0$ |
| $r$ | $r$ | $0$ | $r+r^\smile$ | $1$ |
| $r^\smile$ | $r^\smile$ | $r^\smile$ | $-a$ | $r+r^\smile$ |

no

$$\begin{bmatrix} 1' & a & r & a & r & r \\ a & 1' & r & a & r & r \\ r^\smile & r^\smile & 1' & r^\smile & r^\smile & r \\ a & a & r & 1' & r & r \\ r^\smile & r^\smile & r & r^\smile & 1' & r^\smile \\ r^\smile & r^\smile & r^\smile & r^\smile & r & 1' \end{bmatrix}$$

| #356 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $-a$ | $a+r$ | $a$ |
| $r$ | $r$ | $a$ | $r+r^\smile$ | $1$ |
| $r^\smile$ | $r^\smile$ | $a+r^\smile$ | $-a$ | $r+r^\smile$ |

no



| atom table | RA | QRNA |
|---|---|---|

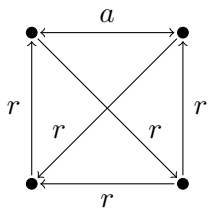
| #357 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1$ | $a+r$ | $a$ |
| $r$ | $r$ | $a$ | $r+r^\smile$ | $1$ |
| $r^\smile$ | $r^\smile$ | $a+r^\smile$ | $-a$ | $r+r^\smile$ |

no

$$\begin{bmatrix} 1' & a & r & r^\smile & a & r \\ a & 1' & a & a & a & a \\ r^\smile & a & 1' & r^\smile & r^\smile & r^\smile \\ r & a & r & 1' & a & r^\smile \\ a & a & r & a & 1' & a \\ r^\smile & a & r & r & a & 1' \end{bmatrix}$$

| #358 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'$ | $r^\smile$ | $r$ |
| $r$ | $r$ | $r^\smile$ | $0'$ | $-a$ |
| $r^\smile$ | $r^\smile$ | $r$ | $-a$ | $0'$ |

yes
$19_{37}$
RRA



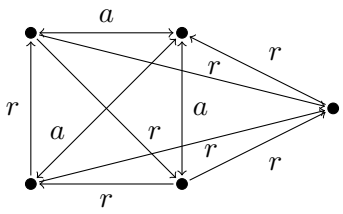

| #359 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'+a$ | $r^\smile$ | $r$ |
| $r$ | $r$ | $r^\smile$ | $0'$ | $-a$ |
| $r^\smile$ | $r^\smile$ | $r$ | $-a$ | $0'$ |

no

no

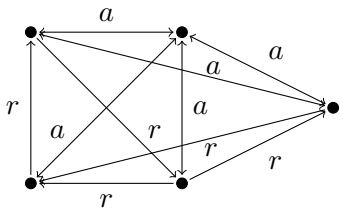
| #360 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $-a$ | $a+r^\smile$ | $a+r$ |
| $r$ | $r$ | $a+r^\smile$ | $0'$ | $-a$ |
| $r^\smile$ | $r^\smile$ | $a+r$ | $-a$ | $0'$ |

yes
$25_{37}$
$\notin$ RRA



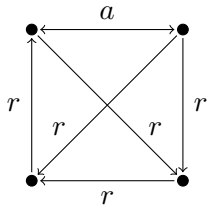

| #361 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1$ | $a+r^\smile$ | $a+r$ |
| $r$ | $r$ | $a+r^\smile$ | $0'$ | $-a$ |
| $r^\smile$ | $r^\smile$ | $a+r$ | $-a$ | $0'$ |

yes
$26_{37}$
$\notin$ RRA




| #362 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'$ | $r+r^\smile$ | $r$ |
| $r$ | $r$ | $r^\smile$ | $0'$ | $1$ |
| $r^\smile$ | $r^\smile$ | $r+r^\smile$ | $-a$ | $0'$ |

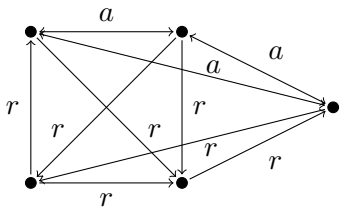
no



| atom table | RA | QRNA |
|---|---|---|

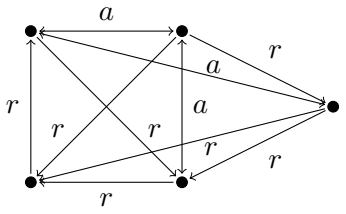
| #363 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'+a$ | $r+r^\smile$ | $r$ |
| $r$ | $r$ | $r^\smile$ | $0'$ | $1$ |
| $r^\smile$ | $r^\smile$ | $r+r^\smile$ | $-a$ | $0'$ |

no



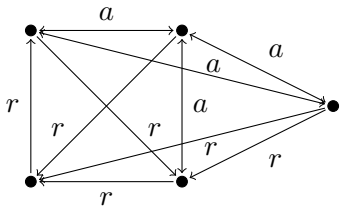

| #364 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $-a$ | $0'$ | $a+r$ |
| $r$ | $r$ | $a+r^\smile$ | $0'$ | $1$ |
| $r^\smile$ | $r^\smile$ | $0'$ | $-a$ | $0'$ |

yes
$29_{37}$
$\notin$ RRA



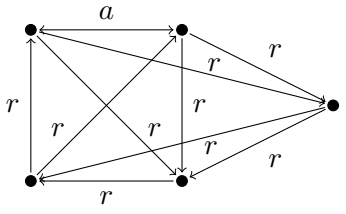

| #365 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1$ | $0'$ | $a+r$ |
| $r$ | $r$ | $a+r^\smile$ | $0'$ | $1$ |
| $r^\smile$ | $r^\smile$ | $0'$ | $-a$ | $0'$ |

yes
$30_{37}$
RRA




| #366 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'$ | $r$ | $r^\smile$ |
| $r$ | $r$ | $r$ | $r+r^\smile$ | $1$ |
| $r^\smile$ | $r^\smile$ | $r^\smile$ | $1$ | $r+r^\smile$ |

yes
$5_{37}$
RRA



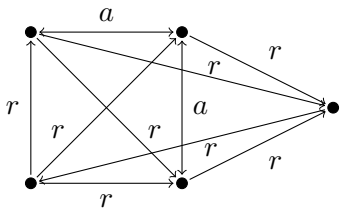

| #367 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'+a$ | $r$ | $r^\smile$ |
| $r$ | $r$ | $r$ | $r+r^\smile$ | $1$ |
| $r^\smile$ | $r^\smile$ | $r^\smile$ | $1$ | $r+r^\smile$ |

yes
$6_{37}$
RRA

$$\begin{bmatrix} 1' & a & r & r^\smile & a & r \\ a & 1' & r & r^\smile & a & r \\ r^\smile & r^\smile & 1' & r & r^\smile & r^\smile \\ r & r & r^\smile & 1' & r & r^\smile \\ a & a & r & r^\smile & 1' & r \\ r^\smile & r^\smile & r & r & r^\smile & 1' \end{bmatrix}$$

| #368 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $-a$ | $a+r$ | $a+r^\smile$ |
| $r$ | $r$ | $a+r$ | $r+r^\smile$ | $1$ |
| $r^\smile$ | $r^\smile$ | $a+r^\smile$ | $1$ | $r+r^\smile$ |

yes
$16_{37}$
$\notin$ RRA



atom table | RA | QRNA

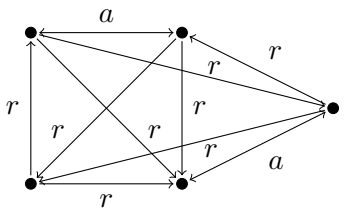
| #369 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1$ | $a+r$ | $a+r^\smile$ |
| $r$ | $r$ | $a+r$ | $r+r^\smile$ | $1$ |
| $r^\smile$ | $r^\smile$ | $a+r^\smile$ | $1$ | $r+r^\smile$ |

yes
$17_{37}$
RRA

$$\begin{bmatrix} 1' & a & r & r^\smile & a & r \\ a & 1' & a & r^\smile & a & r \\ r^\smile & a & 1' & r^\smile & r^\smile & r \\ r & r & r & 1' & r & r^\smile \\ a & a & r & r^\smile & 1' & r \\ r^\smile & r^\smile & r^\smile & r & r^\smile & 1' \end{bmatrix}$$

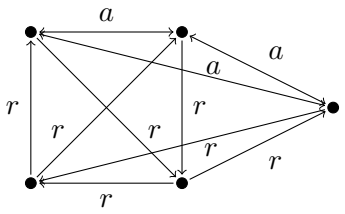
| #370 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'$ | $r+r^\smile$ | $r+r^\smile$ |
| $r$ | $r$ | $r+r^\smile$ | $0'$ | $1$ |
| $r^\smile$ | $r^\smile$ | $r+r^\smile$ | $1$ | $0'$ |

no



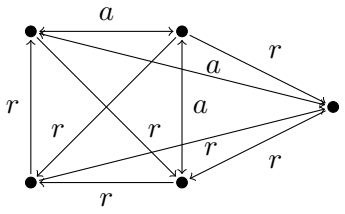

| #371 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1'+a$ | $r+r^\smile$ | $r+r^\smile$ |
| $r$ | $r$ | $r+r^\smile$ | $0'$ | $1$ |
| $r^\smile$ | $r^\smile$ | $r+r^\smile$ | $1$ | $0'$ |

yes
$22_{37}$
RRA




| #372 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $-a$ | $0'$ | $0'$ |
| $r$ | $r$ | $0'$ | $0'$ | $1$ |
| $r^\smile$ | $r^\smile$ | $0'$ | $1$ | $0'$ |

yes
$36_{37}$
RRA




| #373 | $1'$ | $a$ | $r$ | $r^\smile$ |
|---|---|---|---|---|
| $1'$ | $1'$ | $a$ | $r$ | $r^\smile$ |
| $a$ | $a$ | $1$ | $0'$ | $0'$ |
| $r$ | $r$ | $0'$ | $0'$ | $1$ |
| $r^\smile$ | $r^\smile$ | $0'$ | $1$ | $0'$ |

yes
$37_{37}$
RRA