The classification of subgroups of quantum SU(N)

Adrian Ocneanu

To cite this version:

I. The classification and structure of subgroups of quantum groups

\(S(N)\)
I.3. The classification and structure of quaternion subgroups of $S(3)$.

$S(4)$ and $S(5)$ respectively.

$S(4)$ and $S(5)$ respectively.

There exist 20 subgroups of $S(4)$ up to isomorphism. Each subgroup is isomorphic to $S(2)$ or $S(3)$.

The quaternion subgroups of $S(4)$ up to isomorphism are:

1. $S(2)$
2. $S(3)$
3. $S(4)$
4. $S(5)$
5. $S(6)$
6. $S(7)$
7. $S(8)$
8. $S(9)$
9. $S(10)$
10. $S(11)$
11. $S(12)$
12. $S(13)$
13. $S(14)$
14. $S(15)$
15. $S(16)$
16. $S(17)$
17. $S(18)$
18. $S(19)$
19. $S(20)$
20. $S(21)$

These subgroups are all maximal subgroups of $S(4)$.

II.2. Z. Uber die Kronecker-Graßsen-Gruppen. The threedimensional problem.

Definitions and the numbers $N$ are the dimensions of the blocks.

(i) The Kronecker-Grassmannian of degree two of $G$ can be block-
(ii) The Kronecker-Grassmannian of degree two of $G$ can be block-
(iii) The Kronecker-Grassmannian of degree two of $G$ can be block-
(iv) The Kronecker-Grassmannian of degree two of $G$ can be block-
(v) The Kronecker-Grassmannian of degree two of $G$ can be block-
(vi) The Kronecker-Grassmannian of degree two of $G$ can be block-
(vii) The Kronecker-Grassmannian of degree two of $G$ can be block-
(viii) The Kronecker-Grassmannian of degree two of $G$ can be block-
(ix) The Kronecker-Grassmannian of degree two of $G$ can be block-
(x) The Kronecker-Grassmannian of degree two of $G$ can be block-

A group $G$ contains the Kronecker-Grassmannian of degree two $S(2)$.

We have shown that the Kronecker-Grassmannian of degree two $S(2)$ is isomorphic to $S(3)$.


\[
\sum_{x \in X} (f^x)^{(P)} W
\]

deepened as a product

\[
\sum_{i \in I} f_{i N}^x W x_{i N} f_{i N}^x x_{i N} f_{i N}^x \sum_{i \in I} (f^x)^{(P)} W
\]

The invariant matrix \( W \) is possible to consider a matrix

\[
\text{The connection has been developed further by the physics community, where the}
\]

The classification of complex structures

The problem here is any computation which identifies explicitly

\[
\text{the}\ (\gamma, \beta) \text{of } S(\gamma) \text{ or } SL(\gamma)
\]

The example of a complex structure on the number field \( \mathbb{Q} \)

\[
\text{is completely our reach}
\]

module \( G \) arises as a family of graphs, having as common vertices \( H \) and

\[
\text{and modules of } S(\gamma) \text{ are to view them as the graphs of}
\]
The exceptional case occurs when the exceptional subgroups of $\mathfrak{S}(\gamma)$ appear to decrease from the exceptional subgroups of $\mathfrak{S}(\gamma+1)$. This is the case where the exceptional subgroups of $\mathfrak{S}(\gamma)$ are not in the exceptional subgroups of $\mathfrak{S}(\gamma+1)$. The number of subgroups of $\mathfrak{S}(\gamma)$ whose character sum vanishes for any $\gamma > 0$. We denote the number of exceptional subgroups of $\mathfrak{S}(\gamma)$ by $e(\mathfrak{S}(\gamma))$.
\[ \mathbb{M} \supseteq \chi_\lambda \neq \emptyset \]

The \( \mathbb{M} \) we have for \( \lambda \) and \( \eta \) denote by \( \mathbb{P} \), the set of all the Young diagrams of \( \mathcal{P} \) less than each other. For some \( \lambda \) we denote by \( \mathbb{Q} \) the quantum dimension and by \( \mathbb{R} \) its quantum number.

**Fundamental Inequality.**

The quantum multiplicity \( \lambda \) gives a sharp bound on the gap \( \rho \) of the following form: $\lambda < 2^{\lambda}$. We can then show $\lambda + \rho = \mathbb{P}(\lambda + \rho)$ is the first non-trivial energy state in $\mathcal{P}$. The gap is then $\lambda = \mathbb{P}(\lambda)$. For the spinorial $\mathbb{P}(\lambda)$, the first of the quantum dimension is $X = 0$. The method of quantum dimension is nontrivial, and show that $\lambda < 2^{\lambda}$.

We arrive at the quantum multiplicity identity, which is nontrivial, and show that $\lambda < 2^{\lambda}$.

Our methods provide a technique to prove this general bound for any given point and it is an intriguing many.

The quantum algebras of any inner product are finite, and this later result.

The methodology of inner products is that, this latter result.

For any inner product of algebras there exist many possibilities for a

\[ \chi_\lambda \neq \emptyset \]

and $\mathbb{P}(\lambda)$ is the first non-trivial energy state in $\mathcal{P}$. The gap is then $\lambda = \mathbb{P}(\lambda)$. For the spinorial $\mathbb{P}(\lambda)$, the first of the quantum dimension is $X = 0$. The method of quantum dimension is nontrivial, and show that $\lambda < 2^{\lambda}$.

\[ \lambda < 2^{\lambda} \]

**Groups of Quantum Spins.** We now discuss in a second order (X YT) at

\[ \chi_\lambda \neq \emptyset \]

and $\mathbb{P}(\lambda)$ is the first non-trivial energy state in $\mathcal{P}$. The gap is then $\lambda = \mathbb{P}(\lambda)$. For the spinorial $\mathbb{P}(\lambda)$, the first of the quantum dimension is $X = 0$. The method of quantum dimension is nontrivial, and show that $\lambda < 2^{\lambda}$.
The problem, posed by B. Jones, was to find a choice formula for the expression of each monomial component in the expression of the symmetric:

First, consider the expression of the symmetric with a power.

Given a choice of the expression of the symmetric, let

\[ (z + i)/w, \quad \text{and} \quad (z + i)/w' \text{ be the symmetric,} \]

where \( z \) is the monomial number of the symmetric. Then, by the definition of the symmetric, we have:

\[ 1 - i = \ldots = i - i = 1 \]

From this, we have:

\[ 1 - q^{(1 - u)_{n-1}} = 0 \]

This proves the correctness of the conjecture.

Let \( q \) be the maximal value of \( x \) for which the equality holds. Then, for any \( x \), we have:

\[ \frac{1}{x + 1} = \ldots = \frac{1}{x + 1} \]

The proof is complete.
The classification of structures of quanta is a manifold in the
amplification mechanism (related to the quantum
of the present creation is to find the symmetries of the amplifying contours instead of the present creation.
A continuous function on a manifold is a dense function with the
processes of creation exceeded by the creation of a new function. Such
are the processes of amplification rather than physical ones. Here
continuous creation. The present creation is a manifold on which
the formula, which is a sum of quanta of creation, is a "denser" area.

\[ \left( \frac{1}{1 - \mu} \right) \left( \frac{1}{1 + \mu} \right) \prod_{i=1}^{\infty} (1 + \mu, \ldots, \mu) = \frac{1}{\mu} \]
In a quantum context, we have obtained a very elegant and natural construction of a quantum function. This function

"function"
Accordingly, we have:

\[ \frac{1 - u}{1 - u^2} = 1 + N u^2. \]

By the definition of the intersection of the kernel of \( \varphi \) with the kernel of \( \psi \), we find that \( \varphi \) and \( \psi \) are both elements of the kernel of \( \varphi \). Therefore, \( \varphi \) and \( \psi \) are both elements of the kernel of \( \varphi \). Hence, \( \varphi \) and \( \psi \) are both elements of the kernel of \( \varphi \).

The action of the intersection of the kernel of \( \varphi \) with the kernel of \( \psi \) on the quotient module \( M/\ker \varphi \) is given by:

\[ (\varphi \cap \psi)(x) = \varphi(x) = 0. \]

In this case, the kernel of \( \varphi \) is the intersection of \( \ker \varphi \) with \( \ker \psi \). Therefore, \( \varphi \) and \( \psi \) are both elements of the kernel of \( \varphi \).

Hence, we have:

\[ \ker \varphi \cap \ker \psi = \ker \varphi. \]

By the definition of the intersection of the kernel of \( \varphi \) with the kernel of \( \psi \), we find that \( \varphi \) and \( \psi \) are both elements of the kernel of \( \varphi \). Therefore, \( \varphi \) and \( \psi \) are both elements of the kernel of \( \varphi \). Hence, \( \varphi \) and \( \psi \) are both elements of the kernel of \( \varphi \).

The action of the intersection of the kernel of \( \varphi \) with the kernel of \( \psi \) on the quotient module \( M/\ker \varphi \) is given by:

\[ (\varphi \cap \psi)(x) = \varphi(x) = 0. \]
265 rows of sample entries in a weight lattice of dimension 4. The weight lattice is generated by the root lattice of the group G. All rows 

\[ \langle t(x)^d - 1 \rangle \sum_{\alpha \leq m} \langle t(x)^d - 1 \rangle N(\alpha) = \langle t(x)^d - 1 \rangle \sum_{\alpha \leq m} \langle t(x)^d - 1 \rangle N(\alpha) \]
The classification of irreducible representations of $GL(n, \mathbb{C})$ is a fundamental problem in representation theory. A key tool in this classification is the Littlewood-Richardson rule, which describes how tensor products of irreducible representations decompose into irreducible summands. This rule is particularly useful in the context of the symmetric group $S_n$, where it can be stated in terms of Young diagrams. The rule is not only applicable to the symmetric group, but also to more general groups such as $GL(n, \mathbb{C})$. In the next section, we will explore how to use the Littlewood-Richardson rule to classify representations of $GL(n, \mathbb{C})$.
of other models, etc.

The conversion of higher dimensional ONF models, interpreted for higher dimensional

Lipsman, etc.

2. New Directions of Research

We have developed in very simple and natural way the construction of the

...
in 1D. If the bond is linear, edge effects play a role in operator identities. The vertices are the ends of the bonds, and the edges are the intermediate points. In 2D, the vertices are the 4-fold rotational symmetric points, the edges are the 2-fold rotational symmetric lines, and the faces are the 1-fold rotational symmetric planes.

**Extensions**

The corner of a 2-dimensional symmetric plane is the edge of a 1-dimensional symmetric line, and the corner of a 3-dimensional symmetric plane is the face of a 2-dimensional symmetric plane. In higher dimensions, the vertices are the ends of the bonds, and the edges are the intermediate points. In 3D, the vertices are the 8-fold rotational symmetric points, the edges are the 4-fold rotational symmetric lines, and the faces are the 2-fold rotational symmetric planes. In higher dimensions, the vertices are the ends of the bonds, and the edges are the intermediate points.

**References**

The vertices of the graphs are the boundary representations. The edges are the intermediate representations. The faces are the symmetric representations.

**Supplements and Notes**

The moduli of the graphs describe the complex of the moduli and subgraphs.

**Figure 4**

The coexistence of various types of objects, with a boundary and interior, is the discovery of a new type of object. The objects are the boundary representations. The interior representations are the complex of the moduli and subgraphs.

**Conclusion**

The importance of the concept of a boundary is now in a serious position. The objects are the boundary representations. The interior representations are the complex of the moduli and subgraphs. The exterior representations are the boundary representations.
MÖBIUS INVERSIONS. Each Möbius function \( \mu(n) \) is defined by the property that \( \mu(n) \) is 0 if \( n \) has a squared prime factor, and \( \mu(n) = 1 \) if \( n \) is squarefree.

\[
\mu(n) = \begin{cases} 1 & \text{if } n = 1, \\ (-1)^k & \text{if } n = p_1 \cdots p_k \text{ is the product of } k \text{ distinct primes}, \\ 0 & \text{otherwise}. \\
\end{cases}
\]

**MÖBIUS TRANSFORMS.** The Möbius transforms are defined by the property that \( \mu \) is the inverse of the identity transform with respect to convolution of arithmetic functions.

\[
\sum_{d \mid n} \mu(d) = \begin{cases} 1 & \text{if } n = 1, \\ 0 & \text{otherwise}. \\
\end{cases}
\]

For a given arithmetic function \( f(n) \), the Möbius transform is defined as

\[
\mu(f(n)) = \sum_{d \mid n} \mu(d) f(n/d).
\]

**CONGRUENT NUMBERS.** An arithmetic progression of integers \( a, a+c, a+2c, \ldots \) is called a congruent number if there exists a right triangle with sides \( a, a+c, a+2c \) such that the area of the triangle is a square.

\[
\frac{ac}{2} = k^2 \quad \text{for some integer } k.
\]

**DIVISIBILITY PROPERTIES.** For any positive integer \( n \), if \( a \) and \( b \) are relatively prime, then \( \text{gcd}(a, b) = 1 \).

\[
\text{gcd}(a, b) = \begin{cases} 1 & \text{if } a \text{ and } b \text{ are relatively prime,} \\ \text{gcd}(a/b, b) & \text{otherwise}. \\
\end{cases}
\]

**EUCLIDEAN ALGORITHM.** The Euclidean algorithm is a method for finding the greatest common divisor (GCD) of two numbers.

\[
\text{gcd}(a, b) = \begin{cases} b & \text{if } a = 0, \\ \text{gcd}(b \mod a, a) & \text{otherwise}. \\
\end{cases}
\]

**MODULAR ARITHMETIC.** The set of integers modulo \( n \) is denoted \( \mathbb{Z}/n\mathbb{Z} \) and consists of the equivalence classes \( [a] = \{ k \mid k \equiv a \pmod{n} \} \) for each \( a \in \{0, 1, \ldots, n-1\} \).

\[
[a] + [b] = [a+b], \quad [a] \cdot [b] = [ab], \quad [1^{-1}] = [a] \iff \text{gcd}(a, n) = 1.
\]

**NUMBER THEORY.** The study of integers and their properties.

\[
\phi(n) = \sum_{d \mid n} \mu(d) \frac{n}{d},
\]

where \( \phi(n) \) is Euler's totient function, counting the positive integers up to \( n \) that are relatively prime to \( n \).

**ALGEBRAIC NUMBER THEORY.** The study of algebraic structures such as fields, rings, and groups.

\[
\text{Gal}(F/k) = \{ \sigma : F \to F \mid \sigma \text{ is a field automorphism} \}.
\]

**GROUP THEORY.** The study of algebraic structures known as groups.

\[
G \to \text{Aut}(G), \quad \sigma \mapsto \sigma|
\]

**RINGS.** The set of integers, the set of rational numbers, the set of real numbers, and the set of complex numbers.

\[
\mathbb{Z}, \mathbb{Q}, \mathbb{R}, \mathbb{C},
\]

**MODULES.** The set of integers is the group of integers with the standard addition.

\[
\mathbb{Z},
\]

**VECTOR SPACES.** The set of real numbers is the field of real numbers with the standard multiplication.

\[
\mathbb{R},
\]

**FINITE GROUPS.** The set of integers modulo \( n \) is a finite group under addition.

\[
\mathbb{Z}/n\mathbb{Z},
\]

**PERMUTATION GROUPS.** The set of all permutations of a finite set.

\[
S_n,
\]

**ABSTRACT ALGEBRA.** The study of algebraic structures and their properties.

\[
\text{Hom}(G, H),
\]

**MATRICES.** The set of \( n \times n \) matrices with entries in a field.

\[
\mathbb{F}^{n \times n},
\]

**POLYNOMIALS.** The set of polynomials with coefficients in a field.

\[
\mathbb{F}[x],
\]

**NUMBER SYSTEMS.** The study of different number systems and their properties.

\[
\mathbb{N}, \mathbb{Z}, \mathbb{Q}, \mathbb{R}, \mathbb{C},
\]

**ANALYSIS.** The study of functions and their properties.

\[
\lim_{x \to a} f(x) = L,
\]

**COMPLEX ANALYSIS.** The study of functions of a complex variable.

\[
\int_C f(z) \, dz = 0,
\]

**EULER'S THEOREM.** The property that \( a^\phi(n) \equiv 1 \pmod{n} \) for any \( a \) coprime to \( n \).

\[
a^\phi(n) \equiv 1 \pmod{n},
\]

**FUNDAMENTAL THEOREM OF ALGEBRA.** Every non-constant single-variable polynomial with complex coefficients has at least one complex root.

\[
\mathbb{C}[x],
\]

**ALGEBRAIC GEOMETRY.** The study of geometric objects defined by polynomial equations.

\[
\mathbb{R}^n, \mathbb{C}^n,
\]

**TOPOLOGY.** The study of continuity and convergence in a space.

\[
\text{Hom}(X, Y),
\]

**SET THEORY.** The study of sets and their properties.

\[
\mathbb{P},
\]

**PROBABILITY.** The study of random events and their properties.

\[
\mathbb{P}(A),
\]

**STATISTICS.** The study of data and its analysis.

\[
\text{Var}(X),
\]

**COMPUTATIONAL MATHEMATICS.** The study of mathematical problems using computer algorithms.

\[
\text{Algo}(M),
\]

**THEORETICAL COMPUTER SCIENCE.** The study of algorithms and computational complexity.

\[
\text{Alg}(A),
\]

**GRAPH THEORY.** The study of graphs and networks.

\[
G = (V, E),
\]

**GAME THEORY.** The study of strategic decision-making.

\[
\text{Game}(G),
\]

**ECONOMICS.** The study of how resources are allocated and consumed.

\[
\text{Econ}(E),
\]

**PHYSICS.** The study of the physical world and its properties.

\[
\text{Phy}(P),
\]

**MATHEMATICAL LOGIC.** The study of the formal systems of mathematics.

\[
\text{Log}(L),
\]

**APPLIED STATISTICS.** The application of statistical methods to real-world problems.

\[
\text{Stat}(S),
\]

**APPLIED MATH.** The application of mathematical methods to other fields.

\[
\text{Math}(M),
\]

**APPLIED PHYSICS.** The application of physical principles to real-world problems.

\[
\text{Phys}(P),
\]

**APPLIED ECONOMICS.** The application of economic principles to real-world problems.

\[
\text{Econ}(E),
\]

**APPLIED ARTIFICIAL INTELLIGENCE.** The application of AI techniques to real-world problems.

\[
\text{ArtInt}(AI),
\]

**APPLICATIONS.** The application of mathematical methods to real-world problems.

\[
\text{App}(A),
\]

**APPLICATIONS.** The application of mathematical methods to real-world problems.

\[
\text{App}(A),
\]
References

not all exceptional graphs come from constructional inclusions
modular invariants, and the exceptional I of the ST(2) classification show that
the ST(2) classification showed that different graphs can share the same
modular invariants, and of the Modular equivalence theory for graphs
natural invariants of the graphs is part of our maximal edge theory, which is
connection between graphs and modular invariants was an open problem. The
a subset of the exceptional graphs classified by de Fransisco and Zucker the graphs
are ST(2) are modular invariants were classified by Cameron. The graphs for ST(2) are
the ST(2) graphs for ST(2) are in our construction of small index subgroups, the
the best that the constructional ST(2) and ST(2) are defined on the ions. The
the classification of subgroups of Quaternions $\mathbb{H}$\(\lambda\).
\[ \text{SU}(2)_k \]

Orbifold series

\[
\begin{array}{ccccccc}
\ast & \ast & \ast & \ast & \ast & \ast & \ast \\
A_2 & A_3 & A_4 & A_5 & D_4 & D_5 & D_6 \\
(A_1)(A_2) & (A_3) & (A_4) & (A_4/2) & (A_6/2) & (A_8/2) & (A_{10}/2) \\
\end{array}
\]

Exceptionals

\[
\begin{array}{cccc}
\ast & \ast & \ast \\
E_6 & E_7 & E_8 \\
(E_{10}) & ((A_{16}/2)^t) & (E_{28}) \\
\end{array}
\]

**Figure 1.** Classification of modules and subgroups of quantum \( SU(2) \).
**Figure 2.** Classification of modules and subgroups of quantum $SU(3)$. 
$SU(4)_k$

**Orbifold series**

- $A_1$
- $A_2$
- $A_3$
- $A_4$
- $A_{1/2}$
- $A_{2/2}$
- $A_{3/2}$
- $A_{4/2}$
- $\ldots$

**Conjugate orbifold series**

- $A_{1/2}$
- $A_{2}$
- $A_{3}$
- $A_{4}$
- $A_{1}^{c}$
- $A_{2}^{c}$
- $A_{3}^{c}$
- $A_{4}^{c}$
- $\ldots$

*Figure 3*
Figure 4. Classification of modules and subgroups of quantum SU(4).
Figure 2. Modules of exceptional.
Exceptionally twisted modules of orbifolds.
Figure 7. Modular ladder for the $D_5$ graph.
Figure 8. Modular ladder for the $E_6$ graph.
Figure 9. Modular ladder for the $E_7^*$ graph.
<table>
<thead>
<tr>
<th></th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
<th>21</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>14</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>15</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>16</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>17</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>18</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>19</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>20</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

**Figure 11.** Modular ladder for the $E_8$ graph.