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Corrigendum

Corrigendum to “Improved Bounds on the Domatic Numbers of Queens Graphs” [Discrete Math. Lett. 16 (2025) 94–99]*

Juho Lauri†

Helsinki, Finland

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The abstract, Table 1.1, Figures 3.1(a), 3.1(c), 3.2(a) and 3.4(b), Theorems 3.2, 3.4, 3.5 and 3.9, the proof of Theorem 3.6, and reference [6] in [1] require correction.

In the abstract and reference [6] of [1], the year 2024 should be replaced by 2025. The corrections below are due to a programming error found in the computations used in [1].

The two sentences in the abstract of [1] concerning the domatic and idomatic numbers should be replaced by the following. For the domatic number, we prove that $\operatorname{dom}(Q_7) = 11$, $\operatorname{dom}(Q_9) = 15$, $\operatorname{dom}(Q_{10}) = 17$, $\operatorname{dom}(Q_{11}) \in \{18, 19, 20\}$, and $\operatorname{dom}(Q_{12}) \in \{20, 21\}$. For the idomatic number, we show that $\operatorname{idom}(Q_9) = 15$, $\operatorname{idom}(Q_{10}) = 16$, $\operatorname{idom}(Q_{11}) = 18$, and $\operatorname{idom}(Q_{12}) \in \{18, 19, 20\}$.

Table 1.1 in [1] should be replaced with Table 1 given below. Indeed, Figure 2b gives an idomatic 16-partition of Q_{10}, and a corrected exact-cover certificate rules out an idomatic 17-partition. Hence $\operatorname{idom}(Q_{10}) = 16$. The remaining corrected values in Table 1 are established below.

Table 1: Corrected version of Table 1.1 from [1]. Bold entries differ from the original publication.

n	4	5	6	7	8	9	10	11	12
$\gamma(Q_n)$	2	3	3	4	5	5	5	5	6
$i(Q_n)$	3	3	4	4	5	5	5	5	7
$\gamma_t(Q_n)$	2	3	4	4	5	5	6	7	7
$\operatorname{dom}(Q_n)$	8	8	10	11	12	**15**	**17**	18–20	20–21
$\operatorname{idom}(Q_n)$	5	7	8	10	12	**15**	**16**	**18**	18–20
$\operatorname{tdom}(Q_n)$	8	8	9	11	12	14	15–16	16–17	18–20

(a) $\operatorname{dom}(Q_9) = 15$

(b) $\operatorname{idom}(Q_9) = 15$

Figure 1: Panels (a) and (b) replace Figures 3.1(a) and 3.1(c) of [1], respectively. Equal colors and labels belong to the same part.

Theorem 3.2 should be replaced by the following.

Theorem 3.2. *The queens graph* Q_9 *has* $\operatorname{dom}(Q_9) = 15$.

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†E-mail address: juho.lauri@gmail.com

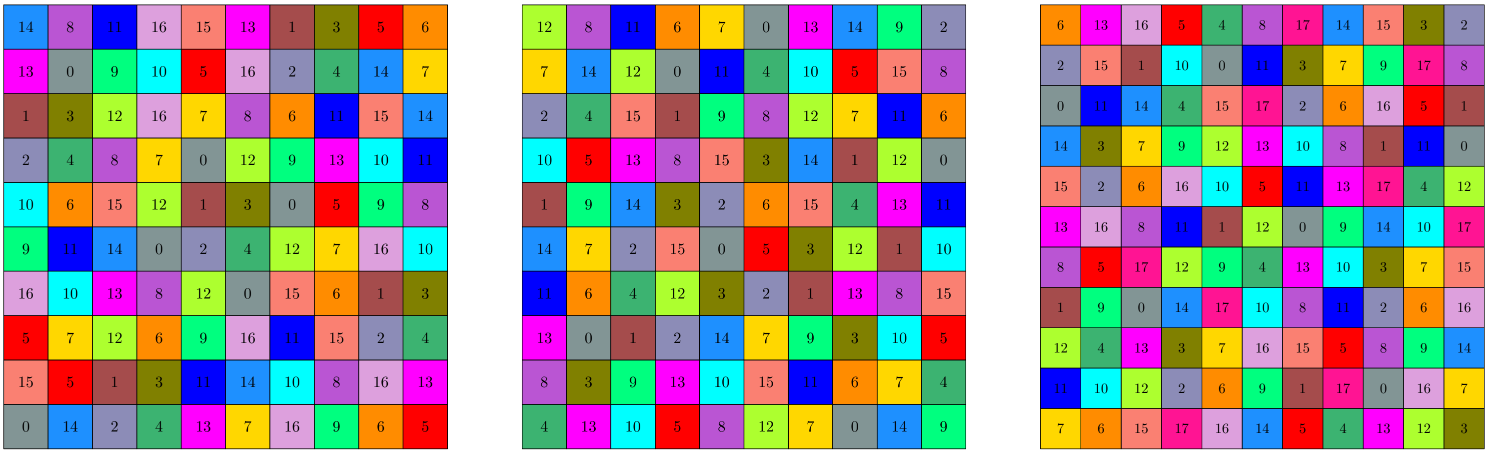
Proof. The construction in Figure 1a is a domatic 15-partition of Q_9, proving that $\mathrm{dom}(Q_9) \geq 15$. For optimality, we show that a domatic 16-partition of Q_9 does not exist. Since $\gamma(Q_9) = 5$, each part would have size at least 5. The parts sum to 81, so the only possible size distribution is fifteen parts of size 5 and one part of size 6. We exhaustively enumerate all dominating sets of cardinality 5 in Q_9 and obtain 114 such sets. A SAT encoding of the corresponding set-packing problem is satisfiable for 13 pairwise disjoint sets and unsatisfiable for 14. Hence a domatic 16-partition cannot exist, as it would require fifteen pairwise disjoint dominating sets of cardinality 5. We conclude that $\mathrm{dom}(Q_9) = 15$. $\square$

The value $\mathrm{tdom}(Q_9) = 14$ stated in Theorem 3.3 and Table 1.1 of [1] remains valid. The total domatic 14-partition displayed in Figure 3.1(b) of [1] gives the lower bound. A corrected computation rules out a total domatic 15-partition.

Theorem 3.4 should be replaced by the following.

Theorem 3.4. *The queens graph Q_9 has $\mathrm{idom}(Q_9) = 15$.*

Proof. The construction in Figure 1b is an idomatic 15-partition of Q_9, proving that $\mathrm{idom}(Q_9) \geq 15$. Since every independent dominating set is a dominating set, $\mathrm{idom}(G) \leq \mathrm{dom}(G)$ for every graph G. By Theorem 3.2, $\mathrm{dom}(Q_9) = 15$, and hence $\mathrm{idom}(Q_9) = 15$. $\square$



(a) $\mathrm{dom}(Q_{10}) = 17$ **(b)** $\mathrm{idom}(Q_{10}) = 16$ **(c)** $\mathrm{idom}(Q_{11}) = 18$

Figure 2: Panels (a) and (c) replace Figures 3.2(a) and 3.4(b) of [1], respectively. Panel (b) strengthens Figure 3.4(a) by exhibiting an idomatic 16-partition of Q_{10}. Equal colors and labels belong to the same part.

Theorem 3.5 should be replaced by the following.

Theorem 3.5. *The queens graph Q_{10} has $\mathrm{dom}(Q_{10}) = 17$.*

Proof. The construction in Figure 2a is a domatic 17-partition of Q_{10}, proving that $\mathrm{dom}(Q_{10}) \geq 17$.

For the upper bound, $\gamma(Q_{10}) = 5$. Thus every part of a domatic 18-partition has cardinality at least 5, and a simple count forces at least eight 5-parts. Exhaustive enumeration gives exactly eight dominating 5-sets in Q_{10}. The only admissible distribution with exactly eight 5-parts is $5^8 6^{10}$, which would require these eight sets to be pairwise disjoint. They are not pairwise disjoint. Hence no domatic 18-partition exists, and $\mathrm{dom}(Q_{10}) = 17$. $\square$

The proof of Theorem 3.6 should be corrected as follows. The bounds $\mathrm{dom}(Q_{11}) \leq 20$ and $\mathrm{dom}(Q_{12}) \leq 21$ do not follow from $\lfloor n^2/\gamma(Q_n) \rfloor$, which gives $\lfloor 121/5 \rfloor = 24$ and $\lfloor 144/6 \rfloor = 24$. For Q_{11}, exhaustive enumeration gives exactly two dominating sets of cardinality 5 and none of smaller cardinality. Thus a domatic 21-partition would require at least $2 \cdot 5 + 19 \cdot 6 = 124$ vertices, which is impossible since Q_{11} has 121 vertices. Hence $\mathrm{dom}(Q_{11}) \leq 20$.

For Q_{12}, $\gamma(Q_{12}) = 6$. A domatic 22-partition would need at least ten parts of cardinality 6, since otherwise it would use at least $9 \cdot 6 + 13 \cdot 7 = 145$ vertices. Exhaustive enumeration gives only eight dominating sets of cardinality 6 in Q_{12}, so such a partition does not exist and $\mathrm{dom}(Q_{12}) \leq 21$.

Finally, Theorem 3.9 should be corrected as follows.

Theorem 3.9. *The queens graph Q_{11} has $\mathrm{idom}(Q_{11}) = 18$.*

Proof. The construction in Figure 2c is an idomatic 18-partition of Q_{11}, proving that $\mathrm{idom}(Q_{11}) \geq 18$.

For the upper bound, exhaustive enumeration gives no independent dominating sets of cardinality less than 5, and the two independent dominating sets of cardinality 5 intersect. Hence at most one part can have cardinality 5. Among the 208 independent dominating sets of cardinality 6, a set-packing SAT certificate shows that no nine are pairwise disjoint. Hence at most eight parts can have cardinality 6. An idomatic 19-partition would therefore have total cardinality at least $1 \cdot 5 + 8 \cdot 6 + 10 \cdot 7 = 123$, which is impossible since Q_{11} has 121 vertices. Thus $\mathrm{idom}(Q_{11}) = 18$. $\square$

References

[1] J. Lauri, Improved bounds on the domatic numbers of queens graphs, *Discrete Math. Lett.* **16** (2025) 94–99.