# Arithmetic of affine del Pezzo surfaces

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# Propositions

appended to the thesis

## Arithmetic of affine del Pezzo surfaces

by

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1. The algebraic Brauer group modulo constants of an ample log K3 surface of geometrically irreducible type of degree at most 7 is one of 27 possible finite groups.
   *joint with dr. Bright*

2. Let $U = X \backslash C$ be an ample log K3 surface of geometrically irreducible type of degree at most 7 over a number field $k$. The order of $\operatorname{Br} U / \operatorname{Br} k$ is bounded by a constant which only depends on the degree of $k$.
   *joint with dr. Bright*

3. There exist ample log K3 surfaces over $\mathbb{Q}$ which admit a model with an order 5 Brauer–Manin obstruction to the integral Hasse principle.

4. Let $k$ be an algebraically closed field and $Z$ a curvilinear scheme of degree $r$ on a smooth surface $S$ over $k$.

   The blowup $B \to S$ of $S$ in $Z$ decomposes as $B \xleftarrow{\gamma} X \xrightarrow{\pi} S$ where $\pi$ is the composition of $r$ blowups in closed $k$-points, and $\gamma$ is the morphism which contracts all integral curves on $X$ of self-intersection $-2$ which are contracted by $\pi$.

5. Let $k$ be a positive integer. We consider all possible football matches in which $2k$ goals are scored in total. The number of such matches in which the end result is a draw equals the number of such matches in which the home team is never behind. (By a "football match" we mean the set of all intermediate pairs of scores that occur during the match.)
   (MOAWOA 2016)
   *joint with dr. Van Bommel*

6. The sequence
$$1, \ 14, \ 144, \ 1444, \ 14444, \ \ldots$$
   contains precisely three squares. (LIMO 2017)

7. Fix a prime $p$. Let $x_i$ for $1 \le i \le r$ be the distinct elements of a subset $X$ of $\mathbb{F}_p^\times$ such that
$$\{x_i + x_j \mid 1 \le i < j \le r\}$$
   equals $\mathbb{F}_p^\times$ as a multiset.
   The set $X$ is a coset of squares modulo 11. (MOAWOA 2019)

8. A prime in music is the unit and always perfect, whereas in mathematics it is neither a unit nor perfect.

9. Trust in cognates, even proper ones, when speaking a foreign language can be misplaced as indicated by the words 'globaal' and 'global', and 'overal' and 'overall' in respectively Dutch and English.

Propositions 5, 6 and 7 are respectively a problem, the main idea behind a problem and a reformulation of a problem which were selected for the indicated mathematical contests.