Efficient arithmetic for cryptography and cryptanalysis

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Math Innov day

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MATH INNOV

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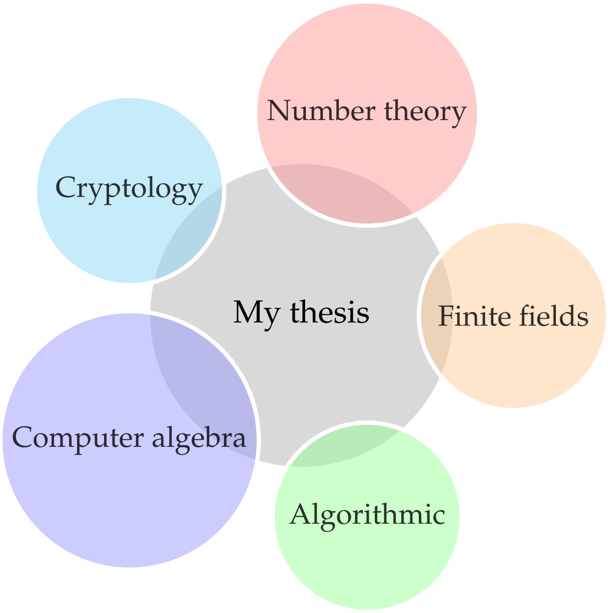

Number theory

Cryptology

My thesis

Finite fields

Computer algebra

Algorithmic

Some recalls

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Definition (Wall)

Construction used for shelter, protection, or privacy, etc.

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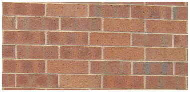

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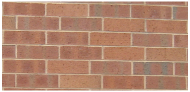

Definition (Door)

Part of a wall that can be opened to enter inside the walls.

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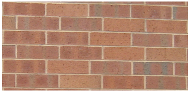

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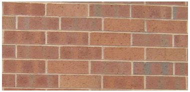

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Definition (Lock and key)

Device for securing a door: a *locked* door can only be opened with the associated *key*.

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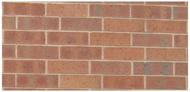

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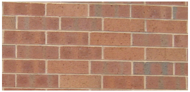

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Definition (Cryptology)

The art/science of building walls, doors, locks and keys for protecting informations.

ⓘ 🔒 https://www.

Goal of the thesis

= Number theory

= Algorithmically hard problems

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- Goal: study the material used to craft locks and keys to better understand how to open the doors.
- Goal: (maths) study the algebraic structures used in the hard problems to better understand how to efficiently solve them.

WHAT *exactly* DID I STUDY?

- If $\ell \mid m$, then $\mathbb{F}_{p^\ell} \hookrightarrow \mathbb{F}_{p^m}$
- If $\ell \mid m \mid n$, then $\mathbb{F}_{p^\ell} \hookrightarrow \mathbb{F}_{p^m} \hookrightarrow \mathbb{F}_{p^n}$

$$\begin{tikzcd}
 & G & \\
 & & F \arrow[ul, "\phi_{F\hookrightarrow G}"'] \\
E \arrow[uur, "\phi_{E\hookrightarrow G}"] \arrow[urr, "\phi_{E\hookrightarrow F}"'] & &
\end{tikzcd}$$

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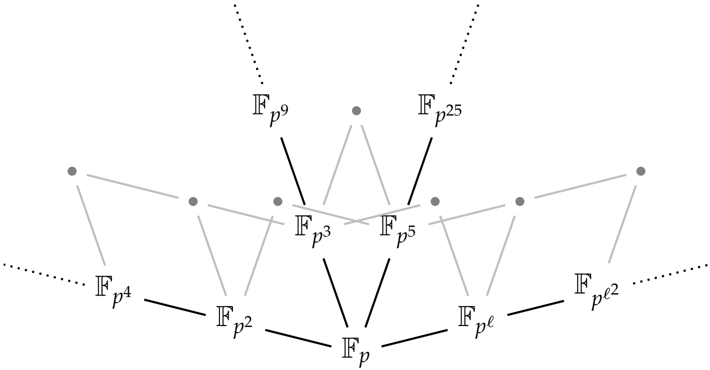
$$\phi_{F\hookrightarrow G} \circ \phi_{E\hookrightarrow F} \overset{?}{=} \phi_{E\hookrightarrow G}$$



Thanks for your attention!