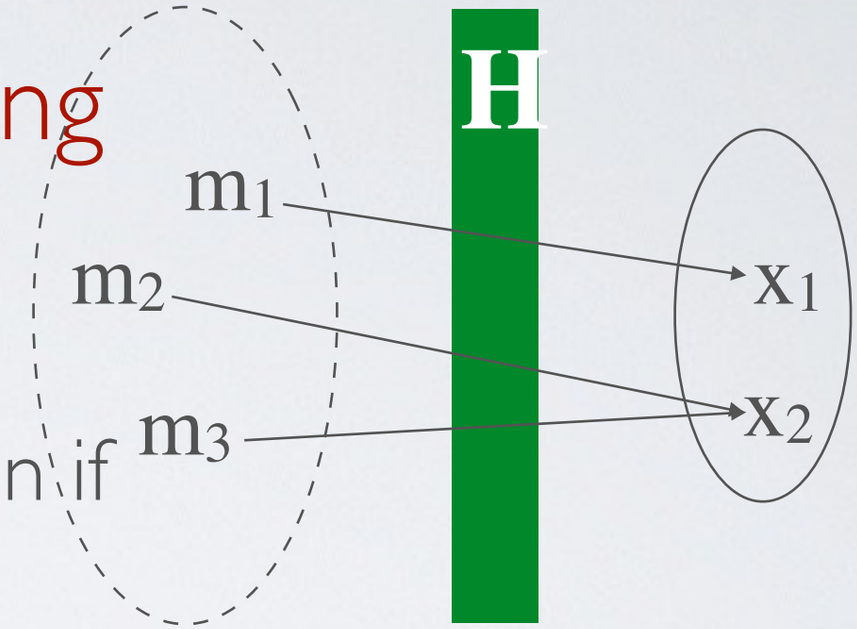
Cryptographic hashing



$H(m) = x$ is a hash function if

- H is one-way function
- m is a message of any length
- x is a message digest of a fixed length

➡ H is a lossy compression function
necessarily there exists x, m_1 and m_2 | $H(m_1) = H(m_2) = x$

Preimage resistance and collision resistance

PR - Preimage Resistance (a.k.a One Way)

➡ given H and x, hard to find m
e.g. password storage

2PR - Second Preimage Resistance (a.k.a Weak Collision Resistance)

➡ given H, m and x, hard to find m' such that $H(m) = H(m') = x$
e.g. virus identification

CR - Collision Resistance (a.k.a Strong Collision Resistance)

➡ given H, hard to find m and m' such that $H(m) = H(m') = x$
e.g. digital signatures

CR → 2PR and CR → PR