

Computational Complexity

Easy problems with prime numbers

- Generating a prime number p
- Addition, multiplication, exponentiation
- Inversion, solving linear equations

Hard problem with prime numbers

- Factoring primes
e.g. given n find p and q such that $n = p \cdot q$

RSA - generating the key pair

1. Pick p and q two large prime numbers and calculate $n = p \cdot q$
(see primality tests)
2. Compute $z = (p-1) \cdot (q-1)$
3. Pick a prime number $e < z$ such that e and z are relative primes
➔ (e, n) is the **public key**
4. Solve the linear equation $e * d = 1 \pmod{z}$ to find d
➔ (d, n) is the **private key**
however p and q must be kept secret too