

# Classes of Integral Domains

Factorization  
into irreducibles

UFD  $F[x_1, x_2, x_3, \dots]$

Noetherian

$\mathbb{Z}[x]$ ,  $F[x, y]$

Dedekind  
Domains

$\mathbb{Z}[\sqrt{-5}]$

PID

Euclidean

$\mathbb{Z}$ ,  $F[x]$

$\mathbb{Z}[\frac{1}{2}(1 + \sqrt{-19})]$

$\mathbb{Z}[\sqrt{-5}, x]$

$F$  is a field

UFD: irreducibles are prime, gcd exists

PID: gcd can be expressed in the form  $xa+yb$

Euclidean: gcd can be computed with the euclidean algorithm

Dedekind Domain: Every Ideal is a product of prime ideals (Rings of algebraic integers in a field extension are Dedekind domains)