

Chapter 4 roadmap:

- ▶ Subset proofs (last week Wednesday)
- ▶ Set equality and emptiness proofs (last week Friday)
- ▶ Conditional and biconditional proofs (Monday)
- ▶ Proofs about powersets (Wednesday)
- ▶ From theorems to algorithms (**Today**)
- ▶ (Start Chapter 5 relations next week)

Today: Two programming topics

- ▶ From theorems to algorithms
 - ▶ Greatest common divisor
 - ▶ Exponentiation
 - ▶ The quotient-remainder theorem
- ▶ Bull and cows

Ex 4.10.5 (rewritten). Consider the lemmas

Lemma (Invariant.)

If $n, d \in \mathbb{N}$, then there exist unique $q, r \in \mathbb{W}$ such that $n = d \cdot q + r$ and $0 \leq r < d$.

Lemma (Progress.)

If $n, d \in \mathbb{N}$ and $q, r \in \mathbb{W}$, then $d \cdot q + r = d \cdot (q + 1) + (r - d)$.

Write a function `quotRem` that takes natural numbers `n` and `d` and computes the quotient and remainder of `n` divided by `d` using the lemmas above.

For next time:

Pg 177: 4.10.(3, 4, 6)

For exercise 4.10.3, name the function `pow`.

For exercise 4.10.4, name the function `mul`.

See Schoology for an important correction to Ex 4.10.6

Read carefully 5.1

Read 5.(2 & 3)

Take quiz