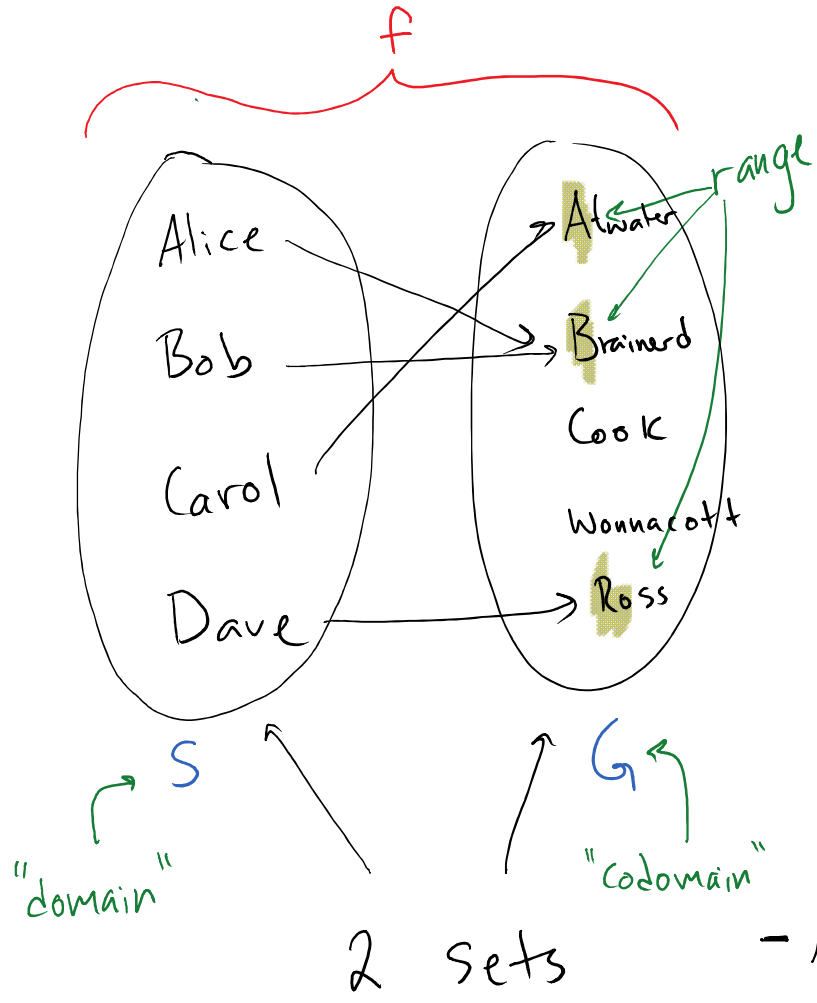


Functions: way to relate elements of 2 sets

ex: Common affiliation



You give the function a student name as input, it gives a grade as output

We write:

$f: S \rightarrow G$

input set output set

means " f is a function from domain S to codomain G "

This arrow means something different than if-then. How to tell? Are there predicates or set?

• $f(\text{Carol}) = \text{Atwater}$

- Atwater is "image" of carol
- Carol is "preimage" of Atwater

Q: Which is always true? Let $f: S \rightarrow G$

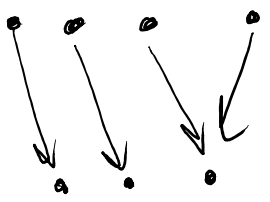
A: $\forall x \in S, \exists y \in G: f(x) = y$

B: $\forall y \in G, \exists x \in S: f(x) = y$

3 important properties

Surjection

"Onto"



Surjective



Not Surjective

"One-to-One"

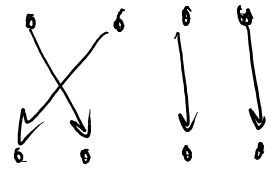
Injection



Injective



Not injective



Injective & Surjective
= Bijective

Q: Which is always true? Let $f: S \rightarrow G$

A: $\forall x \in S, \exists y \in G: f(x) = y$

B: $\forall y \in G, \exists x \in S: f(x) = y$

A: Every input maps to an output ✓

B: Every output has a corresponding input ✗

Not Always True

If true, we say f is surjective

3 important properties

Surjection "Onto"

Surjective Not Surjective

"One-to-One" Injection

Injective Not injective

Injective & Surjective
= Bijective

See slides for additional problems/solutions