Lecture 9: Data Abstraction

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Announcements

Roadmap

- Introduction
- Functions
- Data
- Mutability
- Objects
- Interpretation
- Paradigms
- Applications

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  - To continue our journey through abstraction with *data abstraction*

Roadmap

Introduction

Functions

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Paradigms

Applications

- This week (Data), the goals are:
  - To continue our journey through abstraction with *data abstraction*
  - To study useful data types we can construct with data abstraction

List Comprehensions

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- But most data that we care about are *compound values*, rather than just a single value like a number or string
  - A date is three numbers: year, month, and day
  - A location is two numbers: latitude and longitude
- *Data abstraction* allows us to manipulate compound values as *units*, rather than having to deal with their *parts*

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from fractions import gcd  # Greatest common divisor
def rational(n, d):
    """Return the rational number with numerator n
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    divisor = gcd(n, d)  # Reduce to lowest terms
    return [n//divisor, d//divisor]
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The Abstraction Barrier

The almighty abstraction barrier!

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Data Type
Implementation

The Abstraction Barrier

Data Type Implementation

Rational numbers as two-element lists

The Abstraction Barrier

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The Abstraction Barrier

Data Type
Usage

Data Type Implementation	Rational numbers as two-element lists	[n, d] rat[0] rat[1]

The Abstraction Barrier

Data Type Usage	Rational numbers as a unit and its parts	

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The Abstraction Barrier

Data Type Usage	Rational numbers as a unit and its parts	`mul_rational`
		`add_rational`
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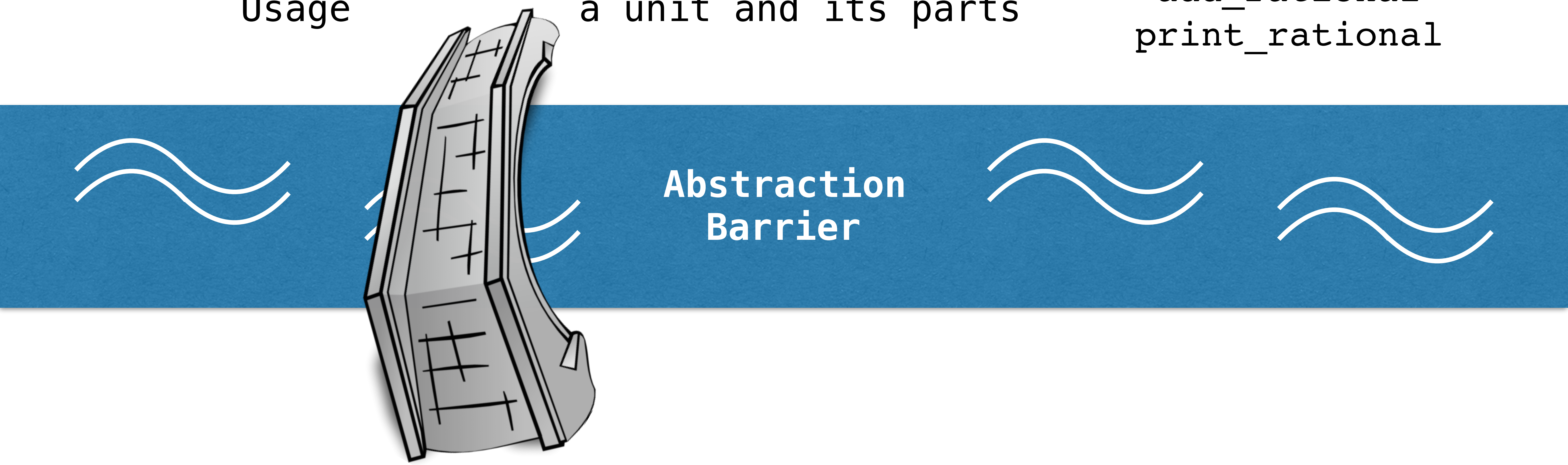

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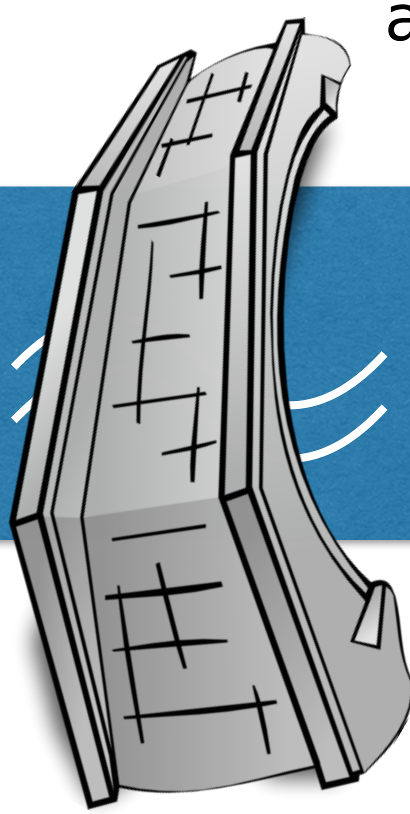

Abstraction Barrier

Constructors and Selectors

rational, numer, denom

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- Why is this such a bad thing?

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A Dictionary Abstract Data Type

(demo)

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