

Lecture 14, 6 October 2026

Madhavan Mukund

<https://www.cmi.ac.in/~madhavan>

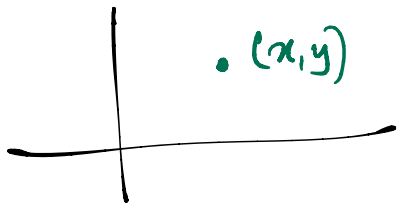
Programming and Data Structures with Python

Abstract datatypes, classes, objects

Object Oriented programming

- Template : class - data representation functions
- Instance : object

Point in 2D



Information: x, y

Functions:

Translate by $\Delta x, \Delta y$

Distance from origin

$$\sqrt{x^2 + y^2}$$

"Convert to string"

More special functions

$o1 == o2$

$\rightsquigarrow$ invokes `--eq--`
(default is to use "is")

$o1 < o2$

$\rightsquigarrow$ invokes `--lt--`

$o1 <= o2$

$\rightsquigarrow$ invokes `--le--`

$< \approx < \text{ or } ==$

$> \text{ --gt-- }$

$>= \text{ --ge-- } \neq \text{ --ne-- }$

$p1 + p2$?



--add--

↳ function will be applied to one object

$p1.--add--(p2)$

$p2.--add--(p1)$

$p1 \leq p2 \quad \leadsto \quad p1 \text{---le---} (p2)$

$self.x, self.y$ refer to $p1$
 $p2.x, p2.y$ refer to other point

For points

$p1 \leq p2$ is not $p1 < p2$ or $p1 == p2$

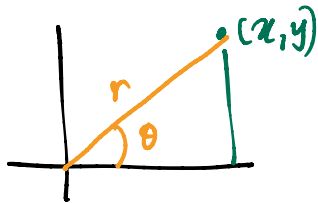
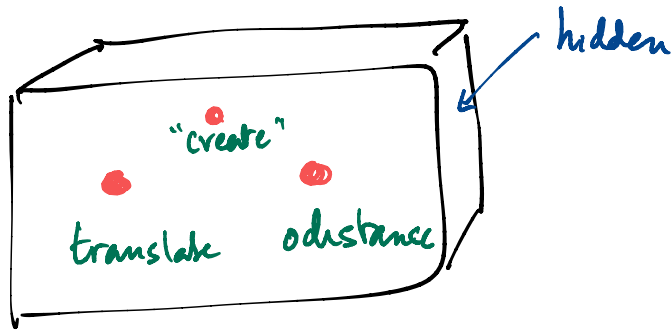
$$p1.x < p2.x$$

$$p1.y == p2.y$$

$p1 > p2$ is not $(p1 \leq p2)$?

Could be incomparable

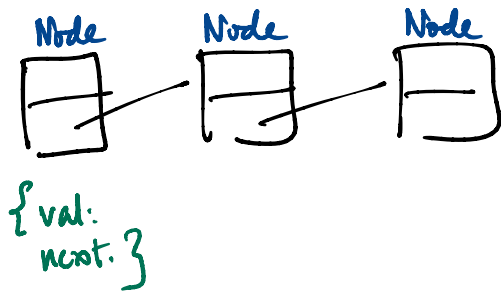
Representing information



$$x = r \cos \theta$$
$$y = r \sin \theta$$

	(x, y)	(r, θ)
Translate	✓	
Distance		✓
Rotate		✓

Lists

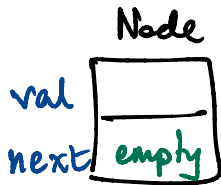


Dictionaries

Empty list = Empty dictionary
= $\{\}$

class Node:

def __init__



Simplest - use None

def append(l, v):

if l is empty

set l.value = v

l.next = {}

Empty list



Singleton



General

