INSOFE

CSE 5224: Advanced Python Programming for Data Science
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Class Coding Basics: Programming Assignment

1 Fractions

Create a new data type to represent a number as a fraction by implementing a class `Fraction` in Python. The internal representation is two integers: a numerator and a denominator.

Write the interface for this class, i.e. methods for interacting with `Fraction` objects, including a print representation, addition and subtraction of fractions, and converting a fraction to a float. Use getters to get the numerator and denominator.

Starter code for this class and output of a program using this class are shown below.

```
class Fraction(object):
    def __init__(self, numer, denom):
        self.numer = numer
        self.denom = denom

    def __str__(self):
        #your code goes here

    def getNumer(self):
        #your code goes here
    def getDenom(self):
        #your code goes here

    def __add__(self, other):
        #your code goes here
    def __sub__(self, other):
        #your code goes here

    def convert(self):
        #your code goes here

oneHalf = Fraction(1,2)
twoThirds = Fraction(2,3)
print(oneHalf.getNumer())
print(twoThirds.getDenom())
res = oneHalf + twoThirds
print(res)
print(res.convert())
```

Output:

```
1
3
7 / 6
1.1666666666666667
```

2 Complex numbers

Create a new data type to represent a complex number by implementing a class `Complex` in Python. The internal representation is two real numbers: the real part of the complex number and the imagi-

nary part of the complex number. Write the interface for this class, i.e. methods for interacting with `Complex` objects, including a print representation, addition, subtraction, multiplication, magnitude, and angle (in degrees). Use getters to obtain the real and imaginary parts. Write a method `convert` that converts the complex number to polar form, expressed as an ordered pair (r, θ) consisting of the magnitude and angle of the complex number, respectively.

Hint: If the complex number is $a + bi$, where $i = \sqrt{-1}$, then the magnitude of the complex number is $\sqrt{a^2 + b^2}$, and the angle of the complex number is $\tan^{-1}(b/a)$ (in radians). You can import the `math` module and use the `math.atan` function to obtain the angle.

A sample sequence of instructions that use this class and the output of the program are shown below.

```
import math

class Complex(object):
    #your code goes here

a = Complex(1,2)  #create complex number 1+2i
b = Complex(3, -4)  #create complex number 3-4i
print(a)
print(b)
print(a+b)
print(a-b)
print(a.magnitude()) #print magnitude of a
print(a.angle())     #print angle of a (in degrees)
print(a.multiply(b))     #multiply two complex numbers
print(b.convert())       #convert b to polar form
```

Output:

```
1 + 2i
3 - 4i
4 - 2i
-2 + 6i
2.23606797749979
63.43494882292201
11 + 2i
(5.0, -53.13010235415598)
```