CS 104 - Homework 09

The deadline for this homework is Tuesday, 28st of December, 23:59 (midnight). Please name your solution files as solution1.py, solution2.py, solution3.py, solution4.py. Once you're finished with the homework, upload the files to LMS in order to complete the assignment. The assignment can and must be solved with the content we have covered during the first thirteen weeks.

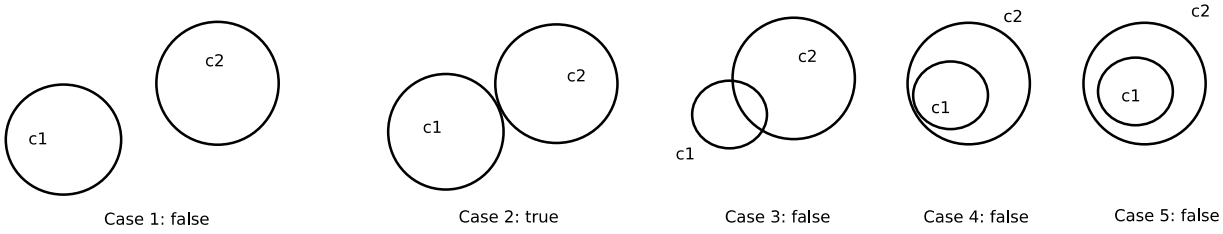
1. (25 pts) Please implement a *Circle* class where you can generate objects in the following way:

```
c = Circle(x, y, r);
# x: x coordinate of center
# y: y coordinate of center
# r: radius
```

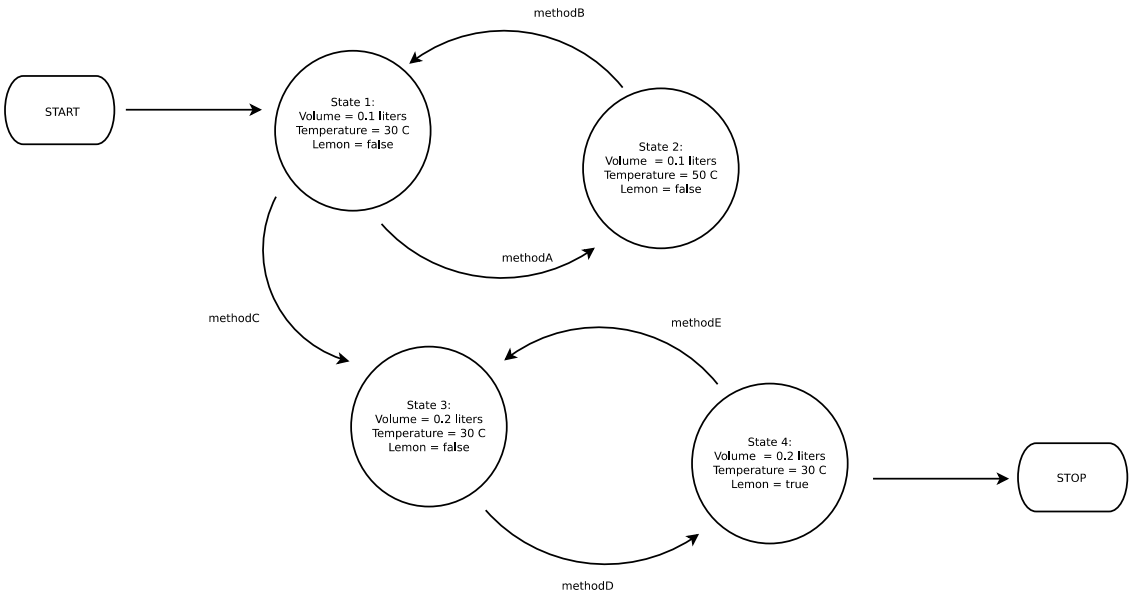
Add a method named "touches" to this Circle class which receives another Circle instance and checks whether these two circles touch each other externally and only at one point. The method should return a Boolean value and will be called like this:

```
c1.touches(c2) # returns either true or false.
```

Please implement assertions that simulates each of the following cases.



2. (25 pts) Please check the diagram which describes a scenario for some states of a *TeaCup* object.

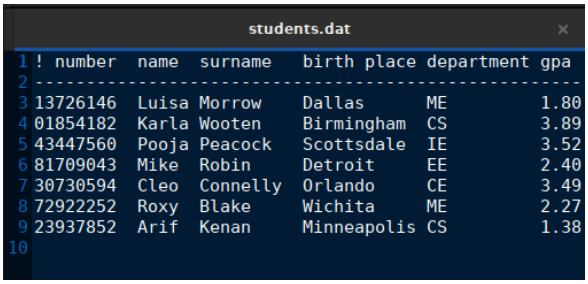


- Please implement the *TeaCup* class with necessary attributes that will help you define possible steps.
- Please implement the necessary methods (*methodA*, *methodB*, *methodC*, *methodD* and *methodE*). Please rename them so that their behavior can be better understood by the users of the class.
- Implement a *report()* method in the *TeaCup* class which prints information about object's state.
- Implement a test function which simulates construction of an object (in State 1) and calls *methodA*, *methodB*, *methodC*, *methodD*, *methodE*, *methodD* sequence. Please verify your state changes by assertions.

3. (25 pts) Implement a *Car* class. A *Car* object has the following information: *odometer*, *brand*, *color*, and *gear*.
   - You will be creating brand new *Car* objects with *odometer* set initially to 0.
   - Implement methods *increment_gear()* and *decrement_gear()* to increment or decrement the gear. It is initially set to 0.
   - Implement a *drive()* method which takes two arguments: (1) Number of hours traveled and (2) km traveled per hour. This function is going to be used to modify the *odometer*.
   - Implement a method named *display()* to display the information of a car.
   - Implement a test method that creates three *Car* objects. Assign their *brand*, *color* and *gear*. Then, call their *display()* methods to print their information.

4. (25 pts) Please revisit the second question in Homework 06. Check the file called "*students.dat*". In this file, there are 6 columns representing *number*, *name*, *surname*, *birth place*, *department* and *GPA*s of students. Implement a *Student* class and define attributes for this class (based on the columns of this file). Please read the data from the file and generate *Student* objects for each line and put them into a dictionary (called *students*) where key is the student number and value is the Student object. You are not allowed to modify the input file. Additionally implement, five functions in *Student* class that print the necessary information.

   For example, when you say *students[81709043].print_birth_place()*, it shall print "Detroit".
   - *students[student_number].print_name()*
   - *students[student_number].print_surname()*
   - *students[student_number].print_birth_place()*
   - *students[student_number].print_department()*
   - *students[student_number].print_gpa()*



students.dat

```
! number  name  surname   birth place department gpa
-------------------------------------------------------
13726146  Luisa Morrow    Dallas      ME         1.80
01854182  Karla Wooten    Birmingham  CS         3.89
43447560  Pooja Peacock   Scottsdale  IE         3.52
81709043  Mike  Robin     Detroit     EE         2.40
30730594  Cleo  Connelly  Orlando     CE         3.49
72922252  Roxy  Blake     Wichita     ME         2.27
23937852  Arif  Kenan     Minneapolis CS         1.38
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