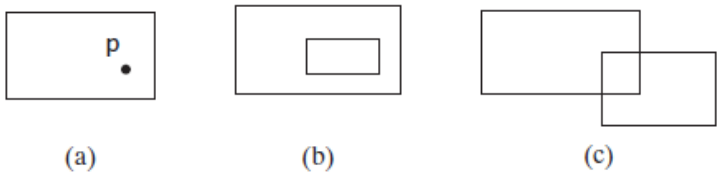
Assignment #2

DDR, Spring 2021

Design Problem – Solve the following design problem by using a console app (Java), analyze & improve design as instructed in each step.
ARectangle class has following properties:

- ptX and ptY of type float that is the midpoint of the rectangle with getX, getY, setX and setY.
- wd & ht of type float with getH and getW.
- Constructor (default) producing a rectangle at origin (ptX=0, ptY=0) and wd=1 and ht=1.
- Constructor with arguments ptX, ptY, wd, & ht.
- Area() returns area and Perimeter() returns perimeter.
- holds(ptX, ptX) returns true if the mentioned point (x, y) is inside this rectangle (see Figure (a)).
- holds(ARectangle rect) returns true if the mentioned rectangle is within this rectangle (see Figure (b)).
- covers(ARectangle rect) returns true if the mentioned rectangle intersects or any part of it covers / overlays with this rectangle (see Figure (c)).



(a) (b) (c)

(1) Draw UML class diagram and then implement the class.
(2) Write a client program that:
2(a) creates a ARectangle object rect01 (new ARectangle(1.5, 1.5, 5.5, 4.9)),
2(b) print its area
2(c) print its perimeter
2(d) displays the result of rect01.holds(2.5, 2.5)
2(e) displays the result of rect01.holds(new ARectangle(3, 5, 8.5, 3.5)),
2(f) displays the result of rect01. covers (new ARectangle(3, 5, 2.3, 5.4)).
(3) Re-Design ARectangle class that implement a portable interface IRect. Client will now use interface to communicate with your Rectangle object.
Repeat steps 2(a), 2(b), 2(c), 2(d), 2(e), 2(f) with improved design in part(3).
(4) Draw UML class diagram for the part (3).
(5) Refactor the design of your software to include Abstraction of "AShape" and its concrete classes will be ARectangle, ASquare, and ACircle. Concrete classes should have similar features as discussed of ARectangle.
Repeat steps 2(a), 2(b), 2(c), 2(d), 2(e), 2(f) with improved design in part(5). (Use different parameters for different shapes as required.)
(6) Draw UML class diagram for the part (5).
(7) Refactor the design of this software requirement in part (5) so that client should only access the "Shape" via its interface only.
Repeat steps 2(a), 2(b), 2(c), 2(d), 2(e), 2(f) with improved design in part(7). (Use different parameters for different shapes as required.)
(8) Draw UML class diagram for the part (7).
(9) Design improvement and evolution: Write in your own words about the design improvement in part(3), part(5) and part(7).

Hints: (1) https://stackoverflow.com/questions/27768039/find-out-if-a-rectangle-is-inside-another-rectangle-c
(2) https://stackoverflow.com/questions/2752725/finding-whether-a-point-lies-inside-a-rectangle-or-not
(3) https://www.geeksforgeeks.org/find-two-rectangles-overlap/

Note:

1. Assignment must be submitted on **slate. Following folders must be present in the Zip archive:**
   a. SourceCode : containing Java code for Q2, Q3, Q5, Q7 separately in further subfolders. See figure (d).
   b. UML: containing UML class diagrams in PNG or any image format in subfolders: Q2, Q3, Q5, Q7)
   c. Report: containing MS word report of your assignment. Report should have your name, roll number, and answers of all the questions part(1) – part(9), code for all design improvements, screenshots of the working / execution of all parts Q2, Q3, Q5, Q7, and also the UML diagrams for all kinds of design Q2, Q3, Q5, Q7.
   d. Zip the archive with this format: **Ass01_YourRollnumber_YourName_YourSection.zip** before submission to slate.
2. Also submit the hard copy of the assignment within due date to instructor's office.
3. You can use Eclipse Papyrus or any other tool to draw the UML class diagram.
4. Last date of submission is **Thursday March 11, 2020, 11:00 AM (sharp)**
5. Assignments will not be accepted after due date.
6. If you fail to submit the assignment on time, you may not be able to do it later on. Do not submit assignment on 11th hour, if in case connection is dropped you won't be able to submit it again. Assignment submission on emails after passing the due date and time is not allowed.
7. If you upload the empty or corrupted archive, you will get zero marks. Hence double check before uploading.
8. Plagiarism, if detected, will result in zero marks.
9. Do not use the sample shown in the reading assignment / text books or form internet.
10. Contents of the Word report:
    a. Cover Page of Assignment must contain: Student name, Roll no, Date of submission.
    b. Attach print of the question paper after cover page.
    c. Solutions to all the questions
11. Assignment must be submitted in a **proper punched folder or stappled properly**, and must be labeled properly.

Figure (d)