CS 332 Programming Assignment P2: Largest Container

TIME ESTIMATE: 2 hours

DELIVERABLES: Deliver one Racket file, named p2.rkt, by uploading to Canvas.

Only electronic documents submitted via Canvas are acceptable. Do not submit a hard copy of your assignment. Do not email your assignment to the course instructor or grader. Late assignments will be graded at half credit.

PROBLEM DESCRIPTION:

1. A point, P, is defined as an ordered pair, (x, y), where x is the x-coordinate, and y is the y-coordinate of the point's position.
2. A point cloud, pList, is a list of points. pList = ((x_1, y_1), (x_2, y_2), ... (x_n, y_n))
3. A circle, C, is defined as a triple (x, y, r), where x is the x-coordinate, y is the y-coordinate, and r is the radius.
4. Given a circle, C, and a point cloud, pList, let |C| = the number of points in pList contained in C.
5. Given a list of circles, cList, and a point cloud, pList, return a list having two parts: the circle that contains the most points, and the list of points contained in that circle. The returned list has length of two: (C, pList). C is the circle with the largest number of points, and pList is the list of points contained in C. The returned list is formatted as follows: ((x, y, r) , ((x_1, y_1), (x_2, y_2), ... (x_n, y_n)))

Note: cList and pList are names used in the problem statement. That is not intended to be a requirement have the same name in the program.

SOFTWARE REQUIREMENTS:

R1. The software shall be named p2.rkt.
R2. The software shall perform the tests cases in Table 1 with no user input.
R3. For any given cList and pList, the program shall return the circle, C, having maximal |C|.
R4. For any given cList and pList, the program shall return the list of points contained by the circle having maximal |C|.
R5. For any given cList and pList, if there are two circles having maximal |C|, the program shall return only one of them. There is no preference as to which one.
R6. The program shall return an empty list when given an empty cList.
R7. The program shall return any circle in cList when given an empty pList.

TEST CASES: Test cases are provided in Table 1.

Table 1: Test Cases

Test Case ID	Input	Output
1	cList = ((0 0 1)) pList = ((5, 5) (10 10) (15 15))	((0 0 1) '())
2	cList = ((10 10 10) (20 20 20)) pList = ((5 5) (1 10) (10 15) (10 19) (19 10) (18 18))	((10 10 10) ((5 5) (1 10) (10 15) (10 19) (19 10)))
3	cList = ((5 10 5) (20 20 5)) pList = ((7 8) (15 5) (18 18) (22 23))	((20 20 5) ((18 18) (22 23)))

RUBRIC: Grades are distributed per the grading rubric in Table 2.

Table 2: Grading Rubric

Deliverable	Points	Awarded
Program operates and produces output	10	
Correct test case results	20	
Correctness on other inputs	30	
Totals	60	