COS 126	General Computer Science	Spring 2009

Programming Exam 1

This test has 1 question. You have 50 minutes. The exam is open book, open note, and open web. You may use code from your programming assignments or the Introduction to Programming in Java booksite. No communication with any non-staff members is permitted. Submit your solution via Moodle. **Write out and sign the Honor Code pledge before turning in the test.**

"I pledge my honor that I have not violated the Honor Code during this examination."

Name:

NetID:

```
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       Signature
```

Total	

|		
P01	TTh 1:30	Will
P01A	TTh 1:30	Rob
P01B	TTh 1:30	Aditya
P01C	TTh 1:30	Michael
P02	TTh 2:30	Will
P03	TTh 3:30	Rob
P04	TTh 7:30	Chris
P05	WF 10	JP
P06	WF 1:30	Chris
P06A	WF 1:30	Thomas
P06B	WF 1:30	Donna
P06C	WF 1:30	Michael

Problem. Write a program `Intersects.java` that reads in a sequence of circles from standard input, plots them using standard drawing, computes the circle that intersects with the most other circles, plots that circle in red, and prints to standard output the circle and the number of circles that it intersects.

Your program will be graded on correctness and clarity (including comments). You will earn more partial credit for a program that solves part of the problem (e.g., reads in the input and plots the circles) than one that does not compile.

Geometry. We specify a circle in the plane by its center (x, y) and its radius r. Circle i intersects circle j if the Euclidean distance between their centers is less than or equal to the sum of their radii. We consider two nested circles (one circle is completely contained inside the other) to intersect.
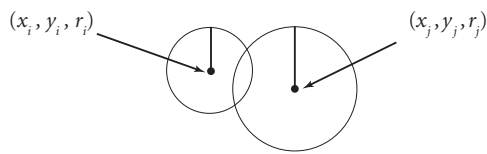
intersects: $\sqrt{(x_i - x_j)^2 + (y_i - y_j)^2} \le (r_i + r_j)$
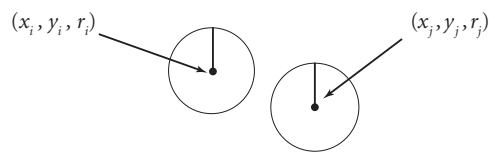
does not intersect: $\sqrt{(x_i - x_j)^2 + (y_i - y_j)^2} > (r_i + r_j)$

Input and output formats. The input consists of an integer N followed by N triples of real numbers (the x- and y-coordinates of the center of the circle, followed by its radius r). Plot the N circles using standard drawing. Plot the circle that intersects the most other circles in red. If there is a tie, plot the first circle in the input that has this property. Finally, print the circle and the number of other circles it intersects.

```
% more intersects10.txt
10
.3 .4 .20
.1 .1 .02
.7 .5 .10
.3 .9 .08
.3 .8 .06
.4 .9 .06
.1 .6 .03
.5 .5 .12
.4 .4 .15
.9 .3 .02
```

```
% java Intersects < intersects10.txt
(0.5, 0.5, 0.12)
3
```
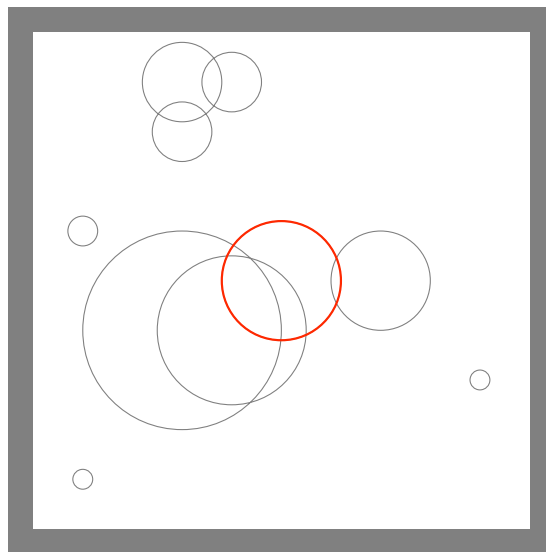

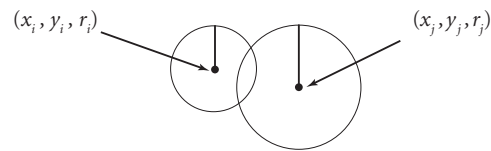**Submission.** Submit `Intersects.java` via Moodle.

Problem. Write a program `Contains.java` that reads in a sequence of circles from standard input, plots them using standard drawing, computes the circle that contains the most other circles, and plots that circle in red, and prints to standard output the circle and the number of circles it contains.

Your program will be graded on correctness and clarity (including comments). You will earn more partial credit for a program that solves part of the problem (e.g., reads in the input and plots the circles) than one that does not compile.

Geometry. We specify a circle in the plane by its center (x, y) and its radius r. Circle i contains circle j if the Euclidean distance between their centers is less than or equal to the radius of circle i minus the radius of circle j.

(x_i, y_i, r_i) (x_j, y_j, r_j)
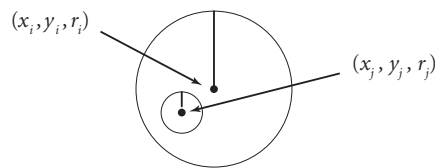
*contains:* $\sqrt{(x_i - x_j)^2 + (y_i - y_j)^2} \leq (r_i - r_j)$ *does not contain:* $\sqrt{(x_i - x_j)^2 + (y_i - y_j)^2} > (r_i - r_j)$

Input and output formats. The input consists of an integer N followed by N triples of real numbers (the x- and y-coordinates of the center of the circle, followed by its radius r). Plot the N circles using standard drawing. Plot the circle that contains the most other circles in red. If there is a tie, plot the first circle in the input that has this property. Finally, print the circle and the number of other circles it contains.

```
% more contains10.txt          % java Contains < contains10.txt
10                             (0.4, 0.5, 0.35)
.8 .3 .15                      6
.5 .5 .20
.3 .5 .15
.5 .3 .10
.5 .5 .05
.4 .5 .35
.4 .6 .05
.5 .5 .02
.1 .6 .05
.9 .3 .02
```
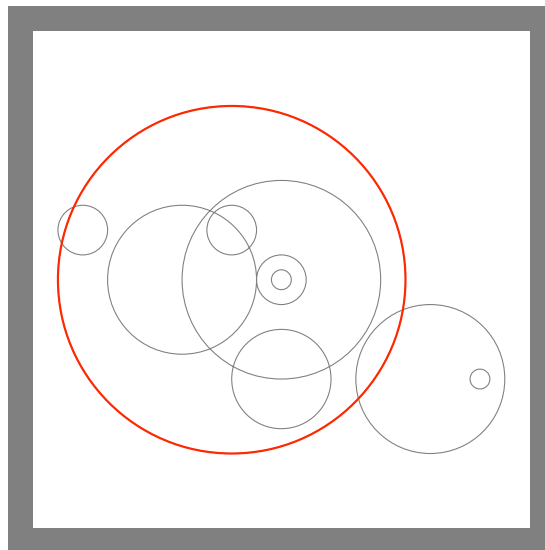

Submission. Submit `Contains.java` via Moodle.

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