

Homework 3

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Exercise 1

Draw the UML diagram and implement the class QuadraticEquation ($ax^2 + bx + c = 0$). The class should contain:

- A field for each coefficient a, b, c
- A constructor that takes the 3 coefficients
- A method getDiscriminant that computes the discriminant $b^2 - 4ac$
- A method hasRealSolution that checks if the discriminant is positive
- A method isQuadratic that checks if a is different from zero
- A method hasDuplicatedSolution that checks if the discriminant is zero
- Two methods getSolution1 and getSolution2 that returns the two solutions (if any)
 $\text{solution1} = (-b + \sqrt{\text{discriminant}}) / (2a)$ $\text{solution2} = (-b - \sqrt{\text{discriminant}}) / (2a)$

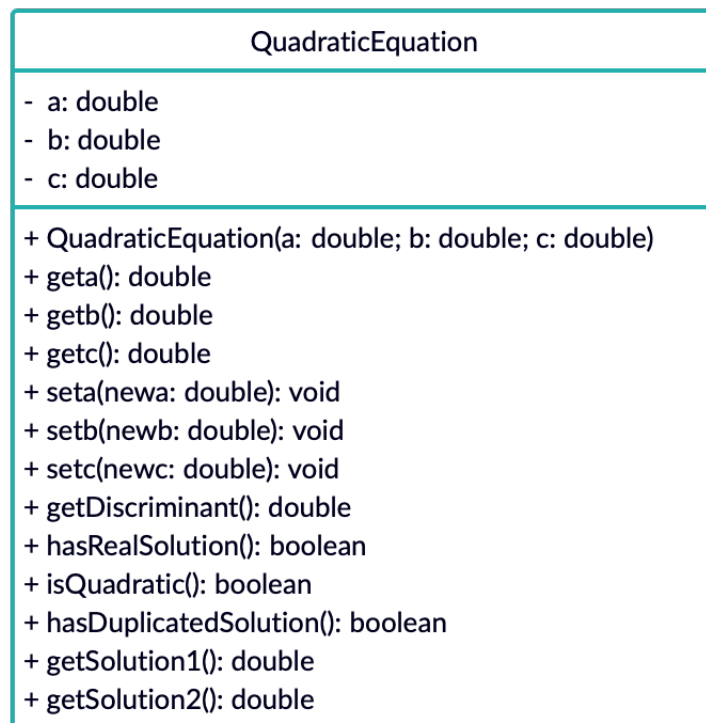


Figure 1: QuadraticEquation

Here is the output of my main:

12

```
baoyechen@BaoyedeMacBook-Air BaoyeChen_hw3_submission % java QuadraticEquation
2 noSolution:  $f(x) = 1.0x^2 + 1.0x + 2.0$ 
  Is noSolution quadratic? true
4 Does noSolution have real solution? false
  Does noSolution have duplicate solution? false
6 Discriminant = -7.0
  The solution to this equation is:  $x1 = \text{NaN}$ 
8 The solution to this equation is:  $x2 = \text{NaN}$ 

10 oneSolution:  $f(x) = 1.0x^2 + 2.0x + 1.0$ 
  Is oneSolution quadratic? true
12 Does oneSolution have real solution? true
  Does oneSolution have duplicate solution? true
14 Discriminant = 0.0
  The solution to this equation is:  $x1 = -1.0$ 
16 The solution to this equation is:  $x2 = -1.0$ 

18 twoSolution:  $f(x) = 1.0x^2 + 2.0x + -8.0$ 
  Is twoSolution quadratic? true
20 Does twoSolution have real solution? true
  Does twoSolution have duplicate solution? false
22 Discriminant = 36.0
  The solution to this equation is:  $x1 = 2.0$ 
24 The solution to this equation is:  $x2 = -4.0$ 

26 notQuadratic:  $f(x) = 0.0x^2 + 1.0x + 2.0$ 
  Is notQuadratic quadratic? false
28 Does notQuadratic have real solution? true
  Does notQuadratic have duplicate solution? false
30 baoyechen@BaoyedeMacBook-Air BaoyeChen_hw3_submission %
```

QuadraticEquation Output.txt

Exercise 2

Implement the code that follows this UML diagram. Add methods to add/remove students from courses and to assign professors to courses.

Source code is submitted separately.

Here is the output of my main:

12

```
baoyechen@BaoyedeMacBook—Air BaoyeChen_hw3_submission % java Course
2
Professor name: John
4 The Professor is teaching 3 classes :
cs101
6 cs102
cs103
8
10
Professor name: Jane
12 The Professor is teaching 1 classes :
cs104
14
16 *****
Course Title: cs101
18 Instructor: John
Class size: 58
20 The student list :
Student 1
22 Student 2
Student 3
24 Student 4
Student 5
26 Student 6
Student 7
28 Student 8
Student 9
30 Student 10
Student 11
32 Student 12
Student 13
34 Student 14
Student 15
36 Student 16
Student 17
38 Student 18
Student 19
40 Student 20
Student 21
42 Student 22
Student 23
44 Student 24
Student 25
46 Student 26
```

```

Student 27
48 Student 28
Student 29
50 Student 30
Student 31
52 Student 32
Student 33
54 Student 34
Student 35
56 Student 36
Student 37
58 Student 38
Student 39
60 Student 40
Student 41
62 Student 42
Student 43
64 Student 44
Student 45
66 Student 46
Student 47
68 Student 48
Student 49
70 Student 50
Student 51
72 Student 52
Student 53
74 Student 54
Student 55
76 Student 56
Student 57
78 Student 58
*****

80
*****

82 Courese Title: cs102
Instructor: John
84 Class size: 6
The student list:
86 Student 1
Student 2
88 Student 3
Student 4
90 Student 5
Student 6
92 *****

94 *****
Courese Title: cs103
96 Instructor: John
Class size: 6
98 The student list:
Student 1
100 Student 2

```

```

Student 3
102 Student 4
Student 5
104 Student 6
*****
106 *****
108 Courese Title: cs104
Instructor: Jane
110 Class size: 6
The student list:
112 Student 1
Student 2
114 Student 3
Student 4
116 Student 5
Student 6
118 *****
120 Try to add two students to cs101
add1 is added to cs101
122 add2 is added to cs101
New course information:
124 *****
Courese Title: cs101
126 Instructor: John
Class size: 60
128 The student list:
Student 1
130 Student 2
Student 3
132 Student 4
Student 5
134 Student 6
Student 7
136 Student 8
Student 9
138 Student 10
Student 11
140 Student 12
Student 13
142 Student 14
Student 15
144 Student 16
Student 17
146 Student 18
Student 19
148 Student 20
Student 21
150 Student 22
Student 23
152 Student 24
Student 25
154 Student 26

```

```

Student 27
156 Student 28
Student 29
158 Student 30
Student 31
160 Student 32
Student 33
162 Student 34
Student 35
164 Student 36
Student 37
166 Student 38
Student 39
168 Student 40
Student 41
170 Student 42
Student 43
172 Student 44
Student 45
174 Student 46
Student 47
176 Student 48
Student 49
178 Student 50
Student 51
180 Student 52
Student 53
182 Student 54
Student 55
184 Student 56
Student 57
186 Student 58
add1
188 add2
*****
190 We see they are added successfully

192 Try add another student to cs101
The class is full!
194 New course information:
*****
196 Course Title: cs101
Instructor: John
198 Class size: 60
The student list:
200 Student 1
Student 2
202 Student 3
Student 4
204 Student 5
Student 6
206 Student 7
Student 8
208 Student 9

```

```
210 Student 10
Student 11
Student 12
212 Student 13
Student 14
214 Student 15
Student 16
216 Student 17
Student 18
218 Student 19
Student 20
220 Student 21
Student 22
222 Student 23
Student 24
224 Student 25
Student 26
226 Student 27
Student 28
228 Student 29
Student 30
230 Student 31
Student 32
232 Student 33
Student 34
234 Student 35
Student 36
236 Student 37
Student 38
238 Student 39
Student 40
240 Student 41
Student 42
242 Student 43
Student 44
244 Student 45
Student 46
246 Student 47
Student 48
248 Student 49
Student 50
250 Student 51
Student 52
252 Student 53
Student 54
254 Student 55
Student 56
256 Student 57
Student 58
258 add1
add2
260 *****
We cannot do that since the class is full
262
```

```

264 Try to remove a student from cs102
264 This student is not erolled in the course!
264 New course information:
266 *****
266 Courese Title: cs102
268 Instructor: John
268 Class size: 6
270 The student list:
270 Student 1
272 Student 2
272 Student 3
274 Student 4
274 Student 5
276 Student 6
276 *****
278 We see the student is successfully removed

280 Try to remove another student from cs102
280 This student is not erolled in the course!
282 New course information:
282 *****
284 Courese Title: cs102
284 Instructor: John
286 Class size: 6
286 The student list:
288 Student 1
288 Student 2
290 Student 3
290 Student 4
292 Student 5
292 Student 6
294 *****
294 No one is removed this time because we've set that a class must have at lest 5
294 students

296 Now, try to remove a student who's not enrolled in cs103.
298 The student is: Josh
298 This student is not erolled in the course!
300 New course information:
300 *****
302 Courese Title: cs103
302 Instructor: John
304 Class size: 6
304 The student list:
306 Student 1
306 Student 2
308 Student 3
308 Student 4
310 Student 5
310 Student 6
312 *****
312 So we can see nothing's changed

314 Try to let John teach cs104 as well

```



```

316 A professor can only teach 3 classes!
    *****
318 Course Title: cs104
    Instructor: Jane
320 Class size: 6
    The student list:
322 Student 1
    Student 2
324 Student 3
    Student 4
326 Student 5
    Student 6
328 *****
    We see we cannot do that since John is already teaching 3 classes!
330
    _____
332 Professor name: John
    The Professor is teaching 3 classes:
334 cs101
    cs102
336 cs103
    _____
338
    _____
340 Professor name: Jane
    The Professor is teaching 1 classes:
342 cs104
    _____
344 We can see nothing is changed. They are still teaching the same classes.
346 Let Jane teach cs102, and then try assign John to cs104
348
    _____
350 Professor name: John
    The Professor is teaching 3 classes:
352 cs101
    cs103
354 cs104
    _____
356
    _____
358 Professor name: Jane
    The Professor is teaching 1 classes:
360 cs102
    _____
362 So we can see it changes as we expected.
    baoyechen@BaoyedeMacBook-Air BaoyeChen_hw3_submission %

```

Course Output.txt