

C200 PROGRAMMING FINAL

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Introduction

This is the final. This is done individually without any help or materials outside of class. **No questions about the final will be answered. Do not post on Inscribe. State any assumptions you've made if you need to.** This is due on **May, 04 at 6:00 PM EST.**

Instructions:

1. Download the files FinalExam.pdf and Final.py from Canvas.
2. Make a new folder called 'Final' in your repositories (do not use quotes in folder name).
3. Copy the downloaded files into the 'Final' folder.
4. Start writing the code in the Final.py file.
5. Commit and push before the deadline.

Note: There will be no grade review for this so ensure that the code runs without error and that you test it reasonably.

Good luck and have fun!

Problem 1

This problem extends the triangle class from the practice final. You'll be adding two methods:

- `herron()`
- `__eq__` (`==`)

The `herron()` function calculates the area of the triangle—differently from the linear algebra approach used in `area_d()`. For a triangle that has lengths a, b, c :

$$s(a, b, c) = \frac{a + b + c}{2} \quad (1)$$

$$area(s, a, b, c) = \sqrt{s(s - a)(s - b)(s - c)} \quad (2)$$

You should return the value rounded to two decimal places. The `==` function returns true if two triangles have the same area.

Here is the framework:

```
1 import numpy as np
2
3 class Triangle:
4
5     def __init__(self,p=[]):
6         self.__p = np.array(p)
7
8     def area_d(self):
9         d_ = []
10        for i in range(3):
11            d_.append([i for i in self.__p[i]]+[1])
12        return round(abs(np.linalg.det(np.array(d_)))/2,2)
13
14    def distance(self,p0,p1):
15        x0,y0 = self.__p[p0]
16        x1,y1 = self.__p[p1]
17        return ((x0-x1)**2 + (y0-y1)**2)**(1/2)
18
19    def herron(self):
20        pass
21
22    def __eq__(self,other):
23        pass
24
25 t = Triangle([[ -2,2], [1,5], [6,1]])
26 s = Triangle([[4,4], [2,-2], [-4,0]])
27 r = Triangle([[ -1,1],[2,6],[7,1]])
28
29 print(t.area_d())
30 print(r.area_d())
31 print(s.area_d())
32 print(t.herron())
33 print(r.herron())
34 print(s.herron())
35
36 print(t == r)
37 print(r == s)
```

Here is the output:

```
1 13.5
2 20.0
3 20.0
4 13.5
```

- 5 20.0
 - 6 20.0
 - 7 False
 - 8 True
-

You should return the value rounded to two decimal places.

Tasks

- Implement the two functions functions.
- Do not speak with anyone and do not use any materials outside of class.