CPSC 1301, Computer Science I Programming Exercise 08

Week 08, Exceptions.py

1   Instructions

This exercise is identical to Exercise 2. Please review the instructions for Exercise 2. You are expected to use the same code as before, with revisions to reflect more recent skills. You will recall that your solution to Exercise 2 was fragile in that it crashed on receiving improper input. For this exercise, add exception handling to make the application more robust.

Circles cannot have a radius of 0 or less than 0, so negative integers are not allowed. Hemispheres cannot have a radius of 0 or less than 0, so negative integers are not allowed. Triangles cannot have sides of 0 or less than 0, so negative integers are not allowed. However, quadratic equations may have negative numbers except in the divisor. Please see the output below.

Write a Python program. You should use the template below. Your output should be similar to the output shown below. More specific instructions follow.

circle()   Write a function that takes as input an integer as `radius`, computes the area of a circle with that radius and prints the area, and computes the circumference of a circle with that radius and prints the circumference. See the output below. Here are the formulas:

$$\text{Circumference} = 2\pi r$$
$$\text{Area} = \pi r^2$$

hemisphere()   Write a function that takes as input an integer as `radius`, computes the volume of a hemisphere with that radius and prints the volume. See the output below. Here is the formula:

$$\text{Volume} = \frac{\frac{4}{3}\pi r^3}{2}$$

triangle()   Write a function that takes as input three integers as `sideA`, `sideB`, and `sideC`, computes the area of a triangle with the three sides and prints the area. Use See the output below. Use Heron's method. Here is the formula:

$$p = \frac{a+b+c}{2}$$
$$\text{Area} = \sqrt{p(p-a)(p-b)(p-c)}$$

quadratic()   Write a function that takes as input three integers as coefficients A, B, and C for a quadratic equation, computes both the positive and negative solutions if they exist, and prints the solutions. Remember that a quadratic equation may have no solution, one solution, ot two solutions. Here are the appropriate formulas:

$$ax^2 + bx + c = 0$$
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Your deliverable is *one* plain text file (that is, it should have a `.txt` extension), with your program source code at the top and the output at the bottom. **Name the file with the exercise number and your last name.** That is, my deliverable would be named `progex01_carter.txt`. Create a new plain text file using your favorite text editor, copy your source listing and paste it into the file, then copy the output and past it into the file. You can generate an output text file by using the output redirection operator (`>`) like this:

`PROMPT: progex02.py > output02.txt`

2   Template

You may use this template for your program. You will need to import the `math` module if you want to use `math.pi` and `math.sqrt()`. Be sure to read the documentation at `https://docs.python.org/3/library/math.html`.

```python
1   #!python
2   # Name: Exceptions.py
3   # Author: Your Name
4   # Date: current date
5   # Purpose: implements exception handling, calculates data for circle, hemisphere, triangle,
           and quadratic equation
6
7   import math
8
9   # define your functions   here
10  # be be sure to implement exception handling
11  # see the discussion starting on page 344 of the book
12
13  #main function executes the defined functions
14  if __name__ == '__main__':
15      hello()
16      circle()
17      hemisphere()
18      triangle()
19      quadratic()
```

3   Output

Your output should match this listing.

```
This is Exceptions.py

calling circle()
Enter an integer greater than zero for the radius:
a
Improper input
Enter an integer greater than zero for the radius:
0
Zero not allowed
Improper input
Enter an integer greater than zero for the radius:
1
The area of the circle is 3.141592653589793
The circumference of the circle is 6.283185307179586

calling hemisphere()
Enter an integer greater than zero for the radius:
b
```

```
Improper input
Enter an integer greater than zero for the radius:
-2
Negative integers not allowed
Improper input
Enter an integer greater than zero for the radius:
2
The volume of the hemisphere is 16.755160819145562

calling triangle()
Enter an integer greater than zero for side A:
c
Improper input
Enter an integer greater than zero for side A:
3
Enter an integer greater than zero for side B:
0
Zero not allowed
Improper input
Enter an integer greater than zero for side B:
4
Enter an integer greater than zero for side C:
-5
Negative integers not allowed
Improper input
Enter an integer greater than zero for side C:
5
The area of the triangle is 6.0

calling quadratic()
Enter an integer for coefficient A:
0
Zero not allowed
Improper input
Enter an integer for coefficient A:
-2
Negative integers not allowed
Improper input
Enter an integer for coefficient A:
2
Enter an integer for coefficient B:
-4
Enter an integer for coefficient C:
2
The positive result for X is 1.0
The negative result for X is 1.0
```