

Quiz 22 — Operator Overloading

C# Programming

This is a timed test. You have thirty minutes to complete the test. When you finish the test, upload your `Program.cs` to Canvas. Do not publish your answer to your `git` repository.

Create a console application. Create a struct (or class if you prefer) for a `Circle`. Override the `ToString()` method. Overload the addition (+), subtraction(-), and multiplication (*) operators. We arbitrarily define the + operator as adding the *area* of two circles to create a new circle, the - operator as subtracting the *area* of two circles to create a new circle, and the * operator as multiplying the *area* of two circles to create a new circle.¹

Define a constructor that takes a double as the radius and makes a circle using the radius argument. Instantiate two circles. I called them `a` which has a radius of 4, and `b` which has a radius of 3. I then created a new circle `c` by adding, subtracting, and multiplying `a` and `b`. Be careful in the subtraction that you do not have a negative radius. Also, it may be helpful to see that you can calculate the radius r of a circle given its area a by $r = \sqrt{\frac{a}{\pi}}$.

Here is my `Main()` method:

```
1 static void Main(string[] args)
2 {
3     Console.WriteLine("This is C# quiz 22");
4     Circle a = new Circle(3);
5     Console.WriteLine(a.ToString());
6
7     Circle b = new Circle(4);
8     Console.WriteLine(b.ToString());
9
10    Console.WriteLine("new + operator");
11    Circle c = a + b;
12    Console.WriteLine(c.ToString());
13
14    Console.WriteLine("new - operator");
15    c = a - b;
16    Console.WriteLine(c.ToString());
17
18    Console.WriteLine("new * operator");
19    c = a * b;
20    Console.WriteLine(c.ToString());
21 }
```

Here is the expected output:

```
This is C# quiz 22
I am a Circle. My radius is 3, my area is 28.274333882308138, and my circumference is 18.84955592153876
I am a Circle. My radius is 4, my area is 50.26548245743669, and my circumference is 25.132741228718345
new + operator
I am a Circle. My radius is 5, my area is 78.53981633974483, and my circumference is 31.41592653589793
new - operator
I am a Circle. My radius is 2.6457513110645907, my area is 21.991148575128555, and my circumference is
16.623745764132163
new * operator
I am a Circle. My radius is 21.269446210866192, my area is 1421.2230337568676, and my circumference is
133.63987192396098
```

¹What do you get when you “add” two circles? You could add their radii, or you could add their areas, or you could add their circumferences. Pretend that we have an application where area is important, maybe a painting application, and it makes sense to add the areas of two circles.