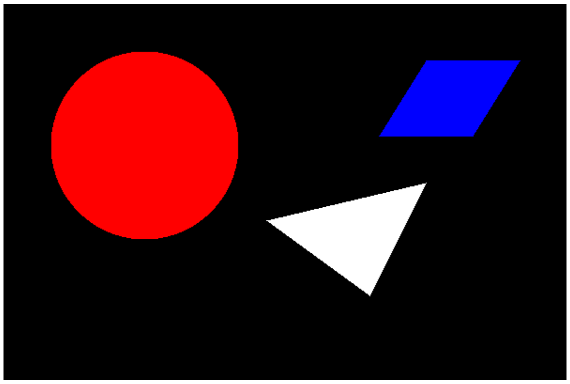
PROGRAMMING ASSIGNMENT 3
PRACTICE WITH INHERITANCE AND MORE PPM
DUE: April 14, 2017, Midnight

PROGRAM OVERVIEW:

This program is like PA2 with an inheritance twist.
Your program must be able to read, from a file, the necessary information needed to define the size of an image. The file will also have the points necessary to define a triangle, a quadrilateral, and a circle. The radius for the circle should also be included in the file. Using the information read in, you will loop through each point of the image to determine if the point is within any of the three shapes defined. Just as with PA2, if the point is within one of the defined shapes then set the color accordingly, otherwise set the color to the background color and write the pixel to the ppm image. An example of an output ppm image is below:



LEARNING OBJECTIVES:

This assignment will give you practice working with multiple files, as well as, multiple classes. This program, however, will focus on inheritance, but depending on how you design your program, it could also involve composition. This assignment will also give you practice designing and implementing a program from start to finish.

ACADEMIC INTEGRITY:

This is an individual assignment. You may not receive help from anyone other than myself or a lab TA. Please review the academic integrity policy provided in the syllabus.

REQUIREMENTS:

Unlike the previous assignment, I will not provide any starter code nor an outline. There are however some requirements you must follow.

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1. Below is a sample input file that your program must be able to read. I will use a file in the same format as below to test your program. However, your program should provide a validity check with respect to the data being read in. In other words, suppose the width is 200 and height is 300 but I give you a point such that the x value is 350, which is outside the parameter of the width and height. If the value read is invalid, you must print an error message and exit the program. Your program must be capable of printing a circle, a triangle, and a quadrilateral. I will test the program using various combinations of these shapes. For example, the program should be able to produce an image with two triangles, one circle and two quadrilaterals. You already know how to determine if a point is within the parameters of a triangle so the quadrilateral should be easy. You will need to search the internet for the **formula,** not the code, to determine if a point is within the parameter of a circle.

   Sample Input:

   ```
   600 400

   Triangle
   180.0 230.0
   350.0 190.0
   290.0 310.0

   Circle
   120.0 120.0
   50

   Quadrilateral
   400.0 140.0
   400.0 60.0
   500.0 60.0
   500.0 140.0
   ```

2. Spending time planning and designing your program prior to writing the code is, without a doubt, time well spent. You are required to provide a design of the classes you are going to use for this assignment. You must submit this design during your lab on Tuesday. (The lab TA’s will discuss the design process with you.) **You must use inheritance**. Therefore, you will have at least one Base/Parent class as well as several Derived/Child classes.

3. For each class in your program, you must have a ".h" file as well as a ".cpp" file. All implementation must be in the ".cpp" file.

4. You must provide a driver.cpp file. The main in your driver must have the minimal amount of code as possible. In other words, if there is a block of code in your main that could be moved to a client function, you must put it in a client function.

5. You must provide a makefile with your program. I should be able to type **make** and your program should compile. You can modify one of the make files I have provided with earlier assignments or create a new one. Bottom line, I want to be able to type **make** and the files compile. When your program compiles the executable must be named **driver**. The syntax to run the program should be as follows:

   ```
   ./driver <name of input file>  <name of output ppm file>
   ```

6. Because of the requirement in 5 above, you must use file pointers and command line arguments.

7. To encourage creativity, you are required to submit an input file you developed that I can use when testing along with my test files.

OTHER INSTRUCTIONS:

You should provide a README that consist of the following.

1. A short description of any problems you encountered when writing this program.
2. How you solved the problems you encountered.
3. Your thoughts on the assignment. This is your opportunity to tell me if you like the assignment or not. What you did or did not like about the assignment. Anything you want to tell me.

FORMATTING:

You will need to add a header to each of your files like the following:

```
/*************************
 *Your name
 *CPSC 1020 your section, Sp17
 *Your user name
 *************************/
```

Your program should compile with no warnings and no errors. There will be a deduction up to 40 points if your program does not compile. If your program compiles but has warnings, there will be a deduction up to 10 points.

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- Your code should be well documented. (comments)
- There should be no lines of code longer than 80 characters.
- You should use proper and consistent indention.

HANDIN:

Use handin.cs.clemson.edu to submit your files. I have created buckets named PA3 and PA3EC. Things to do prior to handing in your files:

1. **Test your program on the SoC servers**. I will not accept the excuse "It compiled on my computer." I test programming assignments on the SoC servers.
2. Tar zip your files naming the tarred file PA3.tar.gz if you are doing the Extra Credit name your file PA3EC.tar.gz Your tar file should NOT have nested files. When I run untar your files should be there. I should not have to change directories multiple times to get to your files. This will break my grading script.
3. If you are doing the extra credit, then you will use the PA3EC folder. You do **not** need to turn in 2 sets of files.

EXTRA CREDIT:

There will be three opportunities for extra credit in this assignment. You may implement up to 10 points of extra credit.

1. Write your code such that if the input file defines three circles with the same center point each circle will be printed. In other words, the output image would have a larger circle with a medium circle inside and then a small circle inside the medium circle. 5 points

2. Write your code such that the background of the image has some pattern in it. As an example, you may have horizontal or vertical stripes in the background. So rather than the background being solid create some pattern in it. Yes, the shapes must also be displayed. Be creative. I am excited to see what some of you will create. 5 points

   During class discussions of this assignment, the question was asked if you could change the background to another image rather than a striped background. Yes you may, that would be really cool.

3. In PA2, as well as this assignment, you have written, to the file, the color of each pixel as you determine the color. There is a way to write all pixels to the file at the same time. C++'s ofstream library provides an I/O function called **write**. Implement this assignment using the write function. This EC will require you to a little bit of research. 10 points