```
 1 ********************************************
 2 * PROGRAMMED BY : Saul Moreno
 3 * STUDENT ID    : 269491
 4 * CLASS         : CS 1C MW-5:00pm
 5 * ASSIGNMENT #5 : Abstract Classes
 6 ********************************************
 7
 8 This program will take the side of a square and
 9 three sides of a triangle and it will calculate
10 and display the Perimeter and Area of both of
11 them using pure virtual functions
12
13 Perimeter of the triangle is 15.00
14 The area of the triangle is 30.00
15 Perimeter of the square is 39.96
16 The area of the square is 99.80
17
18 Saul
19 Moreno
20
21 a
22 o
```

```
1 /*****************************************************************************
2  * AUTHOR       : Saul Moreno
3  * STUDENT ID   : 269491
4  * ASSIGNMENT#5 : Abstract Class
5  * CLASS        : CS1C
6  * SECTION      : MW 5:00pm
7  * DUE DATE     : 3/2/20
8  *****************************************************************************/
9
10 #ifndef HEADER_H_
11 #define HEADER_H_
12
13 #include <iostream>  // input and output
14 #include <iomanip>   // setprecision and setw
15 #include <string>    // allows to use strings
16 #include <limits>    //
17 #include <ios>       //
18 #include <fstream>   // file in & out
19 #include <time.h>    // system time
20 #include <stdlib.h>  // srand and rand
21
22 void PrintHeader(std::string asName, int asNum, char asType);
23 void PrintPerimeter();
24 void PrintArea();
25
26 #endif /* HEADER_H_ */
27
```

Shape.h

```
/*****************************************************************************
 * AUTHOR       : Saul Moreno
 * STUDENT ID   : 269491
 * ASSIGNMENT#5 : Abstract Class
 * CLASS        : CS1C
 * SECTION      : MW 5:00pm
 * DUE DATE     : 3/2/20
 *****************************************************************************/

#ifndef SHAPE_H_
#define SHAPE_H_

class Shape
{
    public:

    //These are two pure virtual functions
    virtual double CalcPerimeter(double a, double b, double c) = 0;
    virtual double CalcArea(double a, double b, double c) = 0;

};

#endif /* SHAPE_H_ */

```

```
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4  * ASSIGNMENT#5 : Abstract Class
5  * CLASS        : CS1C
6  * SECTION      : MW 5:00pm
7  * DUE DATE     : 3/2/20
8  *****************************************************************************/
9
10 #ifndef SQUARE_H_
11 #define SQUARE_H_
12
13 #include "Shape.h"
14 #include "Math.h"   // math functions like sqrt & pow
15
16 class Square: public Shape
17 {
18     public:
19
20     double CalcPerimeter(double a, double b, double c)
21     {
22         return sPerimeter = 4 * a;
23     }
24
25     double CalcArea(double d, double e, double f)
26     {
27         return sArea = pow(d, 2);
28     }
29
30     void Print()
31     {
32         std::cout << "Perimeter of the square is " << std::fixed
33                   << std::setprecision(2) << Square::sPerimeter
34                   <<
35         std::endl << "The area of the square is "  << std::fixed
36                   << std::setprecision(2)<< Square::sArea;
37     }
38
39     private:
40     double sPerimeter; // CALC & OUT - Holds the value of the perimeter
41     double sArea;      // CALC & OUT - Holds the value of the area
42 };
43
44 #endif /* SQUARE_H_ */
45
```

```
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7  * DUE DATE     : 3/2/20
8  *****************************************************************************/
9
10 #ifndef TRIANGLE_H_
11 #define TRIANGLE_H_
12
13 #include "Shape.h"
14 #include "Math.h"  // sqrt & pow functions
15
16 class Triangle: public Shape
17 {
18     public:
19
20     double CalcPerimeter(double a, double b, double c)
21     {
22         return tPerimeter = (a + b + c) / 2.0;
23     }
24     double CalcArea(double d, double e, double f)
25     {
26         bSqrt = tPerimeter*(tPerimeter-d)*(tPerimeter-e)*(tPerimeter-f);
27         return tArea = sqrt(bSqrt);
28     }
29     void Print()
30     {
31         std::cout << "Perimeter of the triangle is " << std::fixed
32                   << std::setprecision(2) << Triangle::tPerimeter
33                   <<
34         std::endl << "The area of the triangle is " << std::fixed
35                   << std::setprecision(2) << Triangle::tArea;
36     }
37
38     private:
39     double tPerimeter; // CALC & OUT - Holds the value of the perimeter
40     double tArea;      // CALC & OUT - Holds the value of the area
41     double bSqrt;      // CALC       - The value before it is square rooted
42
43
44 };
45
46 #endif /* TRIANGLE_H_ */
47
```

```cpp
/*****************************************************************************
 * AUTHOR       : Saul Moreno
 * STUDENT ID   : 269491
 * ASSIGNMENT#5 : Abstract Class
 * CLASS        : CS1C
 * SECTION      : MW 5:00pm
 * DUE DATE     : 3/2/20
 *****************************************************************************/

#include "header.h"
#include "Shape.h"
#include "Square.h"
#include "Triangle.h"

namespace variables
{
    int index;

}

int main(int argc, char *argv[])
{
    Triangle tri; // instance of Triangle object
    Square   sqr; // instance of Square object;

    //This will call the PrintHeader function
    PrintHeader("Abstract Classes", 5, 'A');
    std::cout << "This program will take the side of a square and\n"
              << "three sides of a triangle and it will calculate\n"
              << "and display the Perimeter and Area of both of\n"
              << "them using pure virtual functions\n\n";
    //This will call the function to get the perimeter of the triangle
    tri.CalcPerimeter(5.0,12.0,13.0);
    //This will call the function to get the area of the triangle
    tri.CalcArea(5.0,12.0,13.0);
    //This will call the function to print out the perimeter and area
    tri.Print();

    std::cout << std::endl;

    //This will call the function to get the perimeter of the Square
    sqr.CalcPerimeter(9.99, 0 ,0);
    //This will call the function to get the area of the Square
    sqr.CalcArea(9.99, 0 ,0);
    //This will call the function to print out the perimeter and area
    sqr.Print();

    std::cout << std::endl;
    std::cout << std::endl;

    for (variables::index = 1; variables::index < argc; variables::index++ )
    {
        std::cout << argv[variables::index] << " " << std::endl;
    }//endfor(variables::index = 1; variables::index < argc;
            //variables::index++ )

    std::cout << std::endl;
```

```
58      std::cout << argv[1][1];
59      std::cout << std::endl;
60      std::cout << argv[2][1];
61
62      return 0;
63  }
64
```

```cpp
/*****************************************************************************
 * AUTHOR       : Saul Moreno
 * STUDENT ID   : 269491
 * ASSIGNMENT#5 : Abstract Class
 * CLASS        : CS1C
 * SECTION      : MW 5:00pm
 * DUE DATE     : 3/2/20
 *****************************************************************************/

#include"header.h"

/*****************************************************************************
*FUNCTION - PrintHeader
*_____________________________________________________________________________
*This function receives an assignment name, type and number then outputs the
* appropriate header - returns nothing.
*_____________________________________________________________________________
*PRE-CONDITIONS
*     asName:  Has to be previously defined
*     asType:    Has to be previously defined
*     asNum: Has to be previously defined
*
*POST-CONDITIONS
*      This function will output class heading.
*      <Post-conditions are the changed outputs either passed by value or
*      by reference OR anything affected by the function.
*
*****************************************************************************/

void PrintHeader(std::string asName,  // IN - Assignment Name
                 int asNum,  // IN - assignment type
                             // (LAB or ASSIGNMENT)
                 char asType)// IN - assignment number
{
 std::cout << std::left;
 std::cout << "*********************************************\n";
 std::cout << "* PROGRAMMED BY : Saul Moreno\n";
 std::cout << "* "<< std::setw (14) << "STUDENT ID" << ": 269491\n";
 std::cout << "* "<< std::setw (14) << "CLASS" << ": CS 1C MW-5:00pm\n";
 std::cout << "* ";
 if (toupper (asType) == 'L')
 {
     std::cout << "LAB #"<< std::setw(9);
 }
 else
 {
     std::cout <<"ASSIGNMENT #" << std::setw(2);
 }
 std::cout << asNum << ": " << asName << std::endl;
 std::cout << "*********************************************\n\n";
 std::cout << std::right;
}

```