Conventional Course Fall 2021
COMP-111 (Section 04) Programming Principles I

Programming Assignment 3

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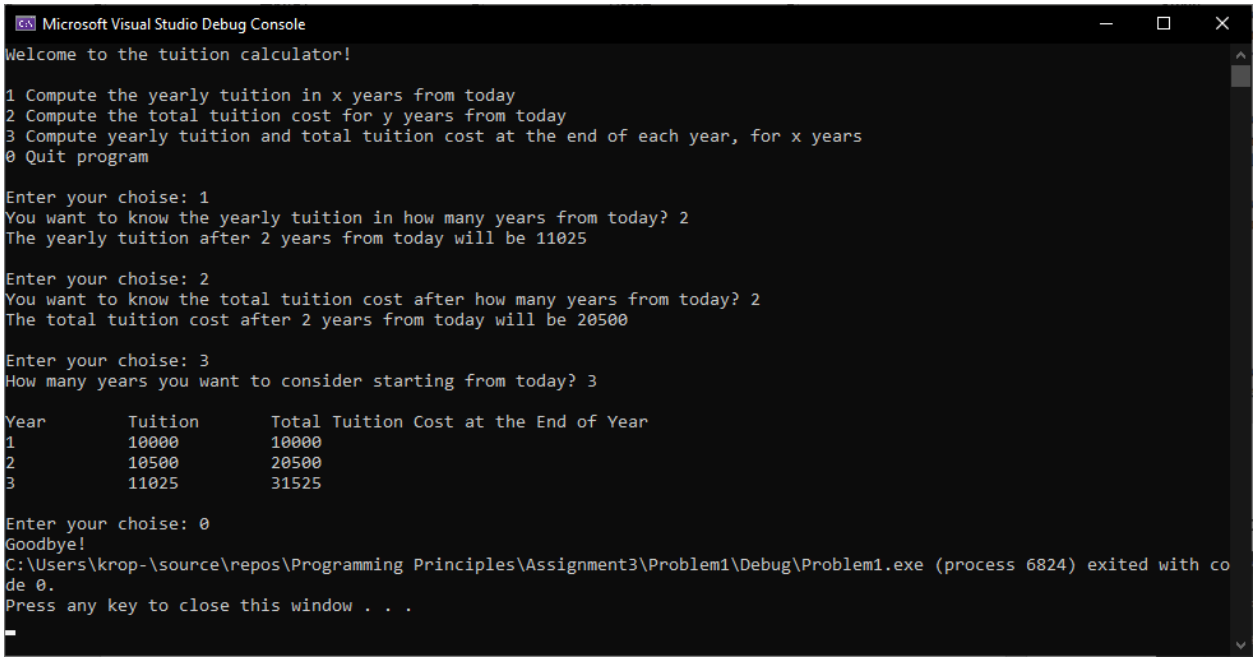
Problems

Problem 1

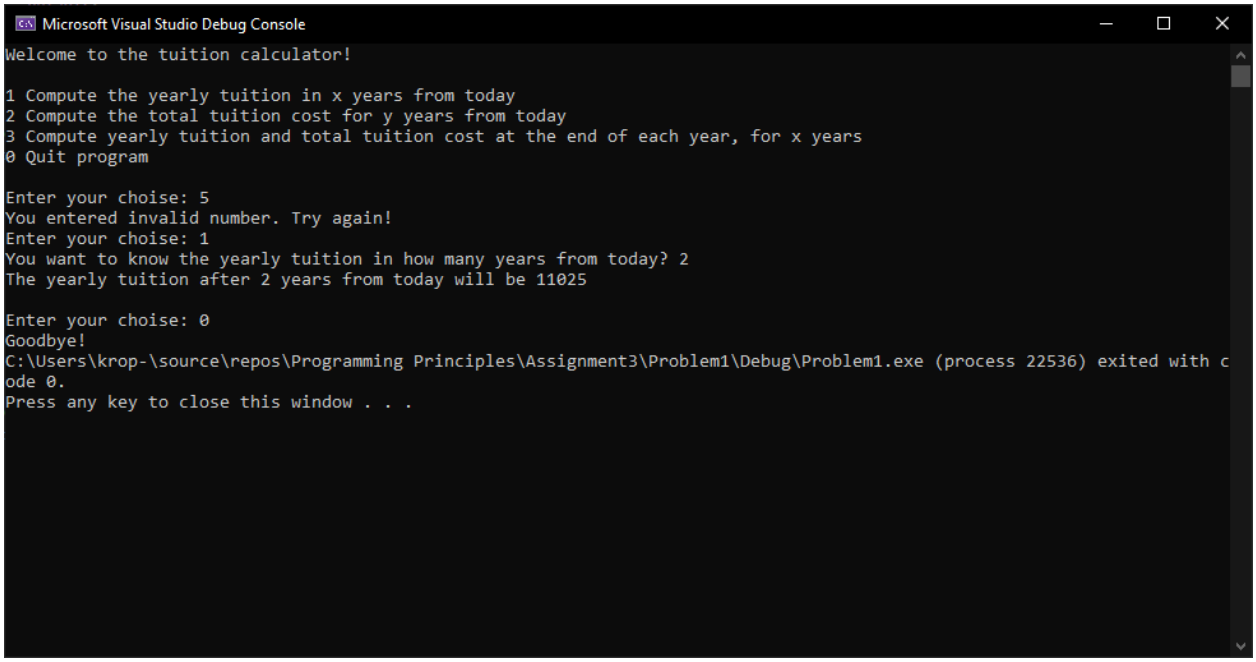
Suppose that the tuition for a university is $10,000 this year (year 1) and increases 5% every year. Write a program that computes the tuition in x years from now, with x being a number given by the user. In addition, the program should compute the total cost of y years' worth of tuition starting from now, with y being a number given by the user. Finally, the program should display the tuition for x years along with the total tuition cost at the end of each year. Your program will terminate when the user enters 0.

Here is a sample run:

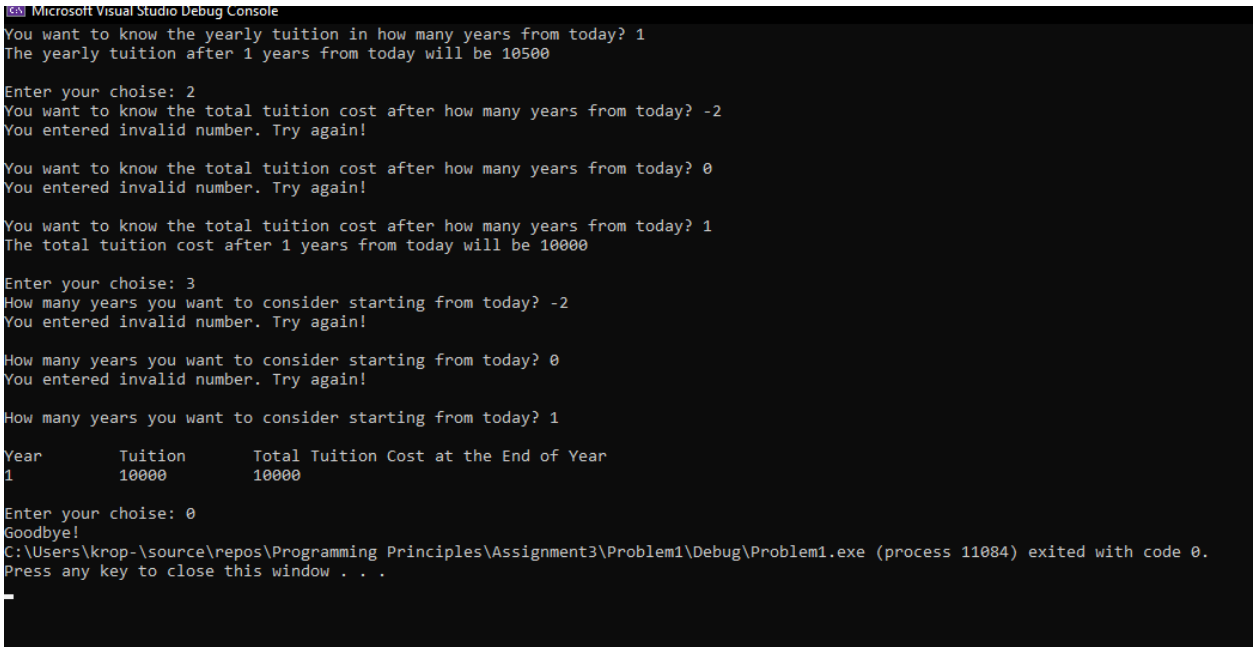
```
Welcome to the tuition calculator!

1 Compute the yearly tuition in x years from today
2 Compute the total tuition cost for y years from today
3 Compute yearly tuition and total tuition cost at the end of each year, for x years
0 Quit program

Enter choice: 1
You want to know the yearly tuition in how many years from today? 2
The yearly tuition after 2 years from today will be 11025


Enter choice: 2
You want to know the total tuition cost after how many years from today? 2
The total tuition cost after 2 years from today will be 20500

Enter choice: 3
How many years you want to consider starting from today? 3

Year      Tuition      Total Tuition Cost at the End of Year
1         10000        10000
2         10500        20500
3         11025        31525

Enter choice: 0
Goodbye!
```



Pic. 1.Try to enter a integers. Code compiled successfully.



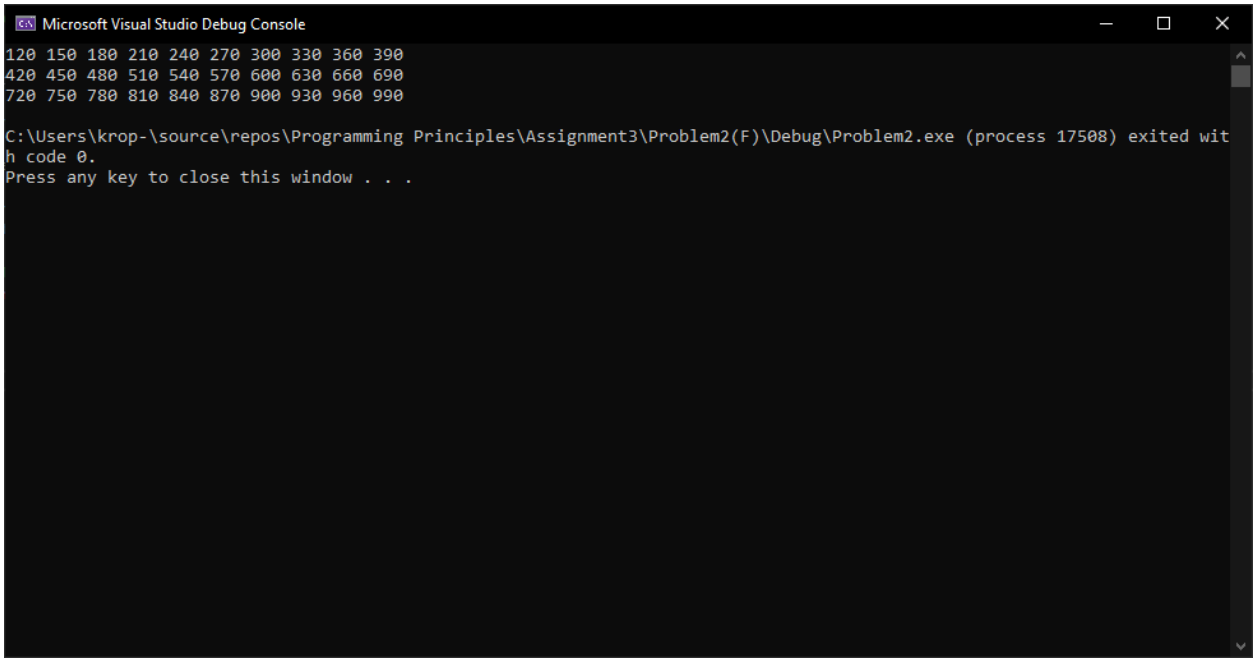
Pic. 2.Try to enter invalid number in selector. Program shows an error, but code compiled successfully.



Pic. 3.Try to enter a negative value or zero in functions. Program shows an error, but code compiled successfully.

Problem 2

Write a program that displays 10 numbers per line, all numbers from 100 to 1000 that are divisible by 5 and 6.



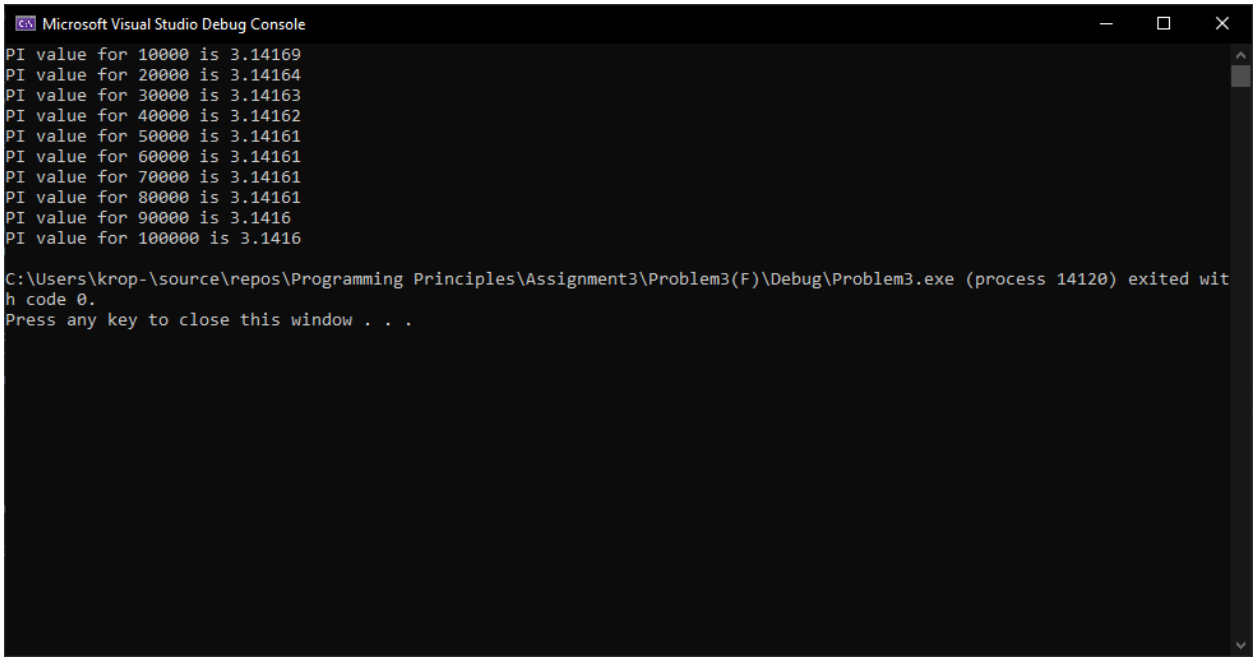
Pic. 1. Code compiled successfully.

Problem 3

You can approximate π by using the following series:

$$\pi = 4\left(1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \frac{1}{11} + \frac{1}{13} - \cdots - \frac{1}{2i-1} + \frac{1}{2i+1}\right)$$

Write a program that displays the π value for i=10000, 20000, …,100000



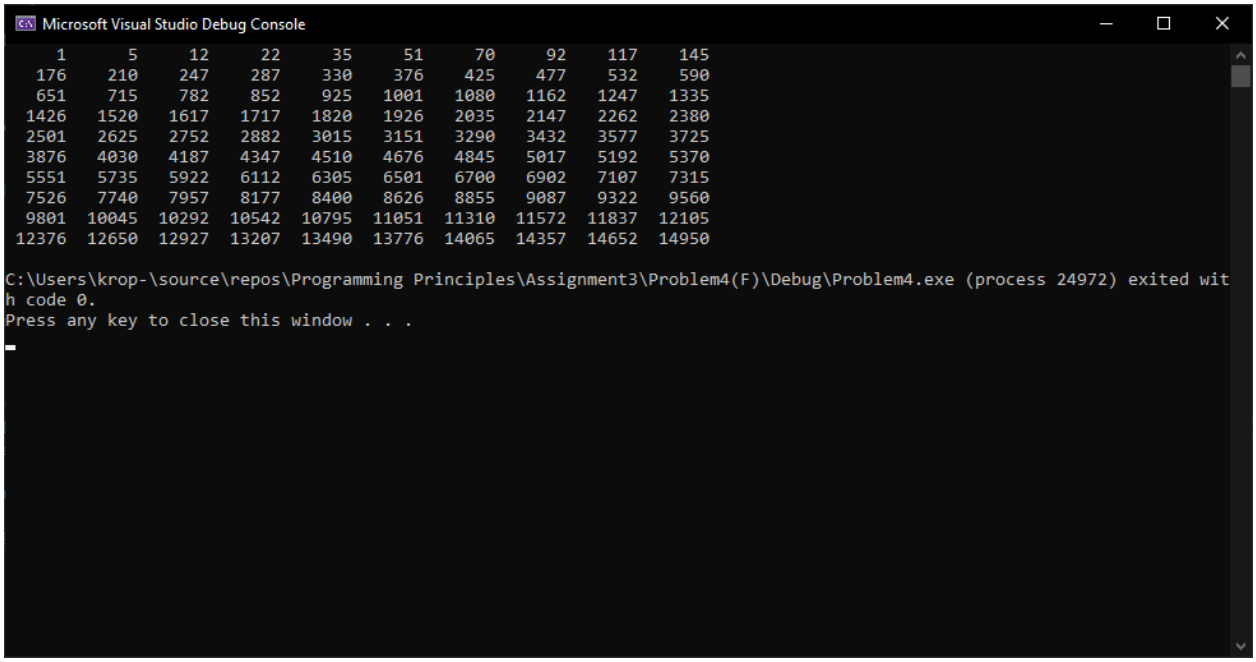
Pic. 1. Code compiled successfully.

Problem 4

A pentagonal number is defined as n(3n-1)/2 for n=1, 2, …, and so on. The first few numbers are 1,5,12, 22, …Write the following function that returns a pentagonal number:

int getPentagonalNumber(int n)

Write a test program that displays the first 100 pentagonal numbers with 10 numbers on each line.



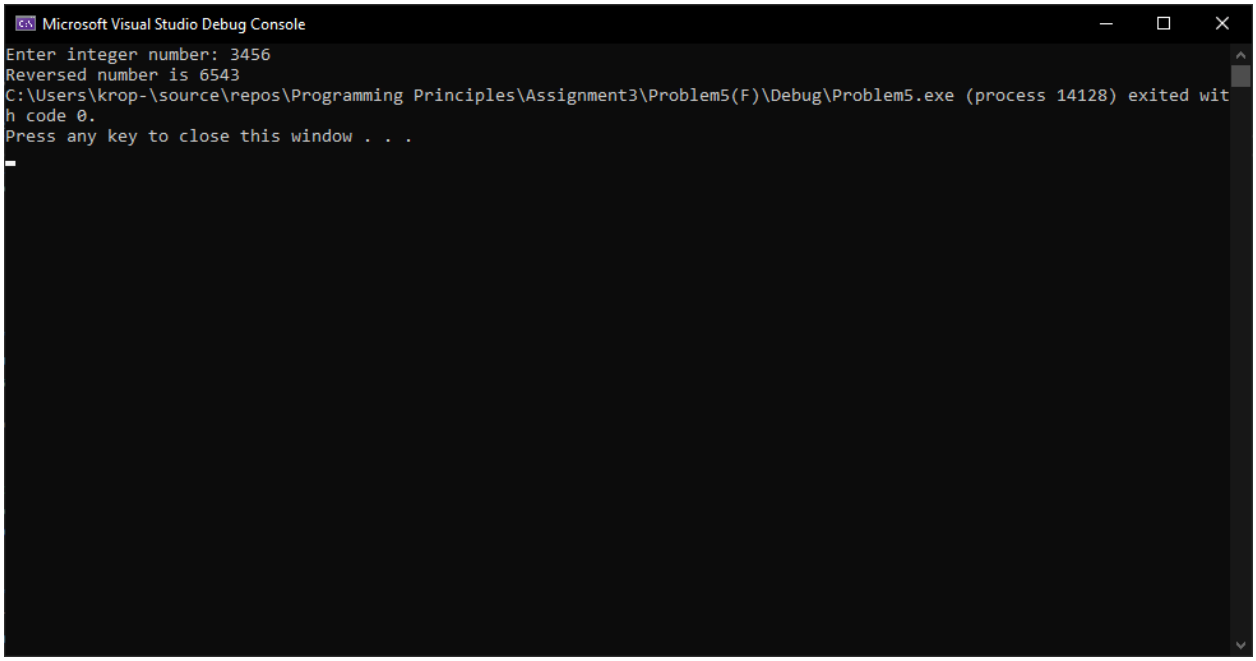
Pic. 1.Code compiled successfully.

Problem 5

Write the following function to return the reverse of an integer number:

int reverse(int number)

For example, reverse(3456) returns 6543. Write a test program that prompts the user to enter an integer and displays its reversal.



Pic. 1.Try to enter integer numbers. Code compiled successfully.

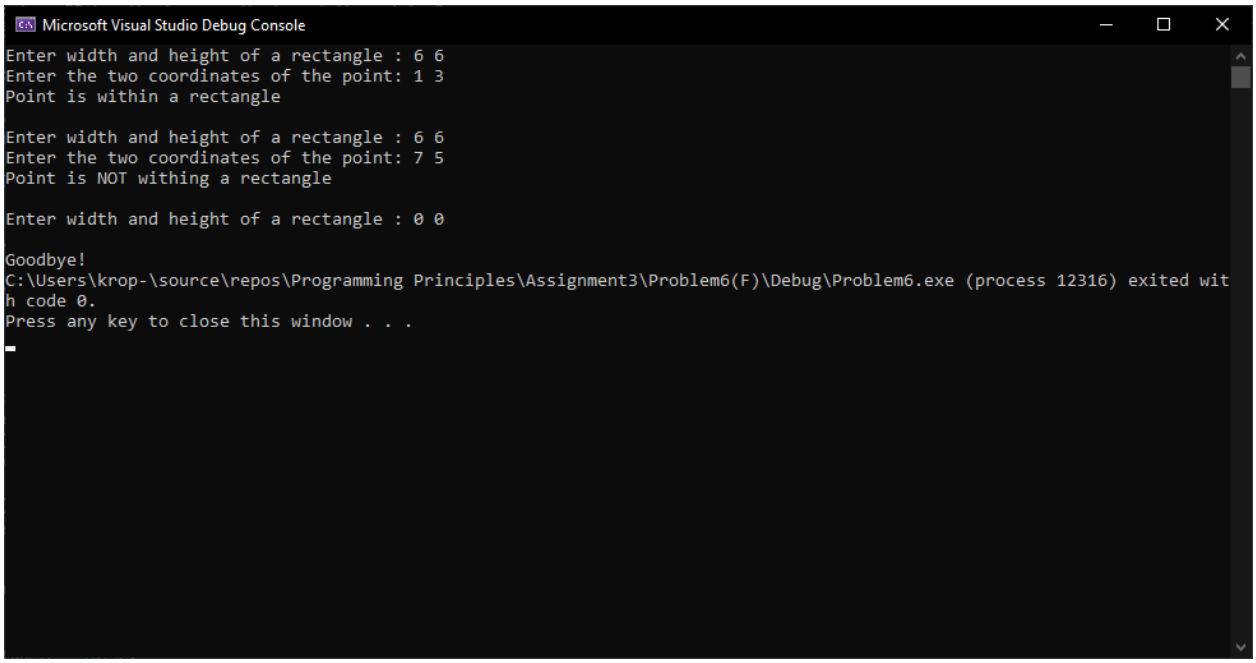
Pic. 2.Try to enter negative numbers. Program asks for re-entering a value. Code compiled successfully.

Problem 5

Write the following function that tests whether or not a point is within a rectangle centered at (0,0):

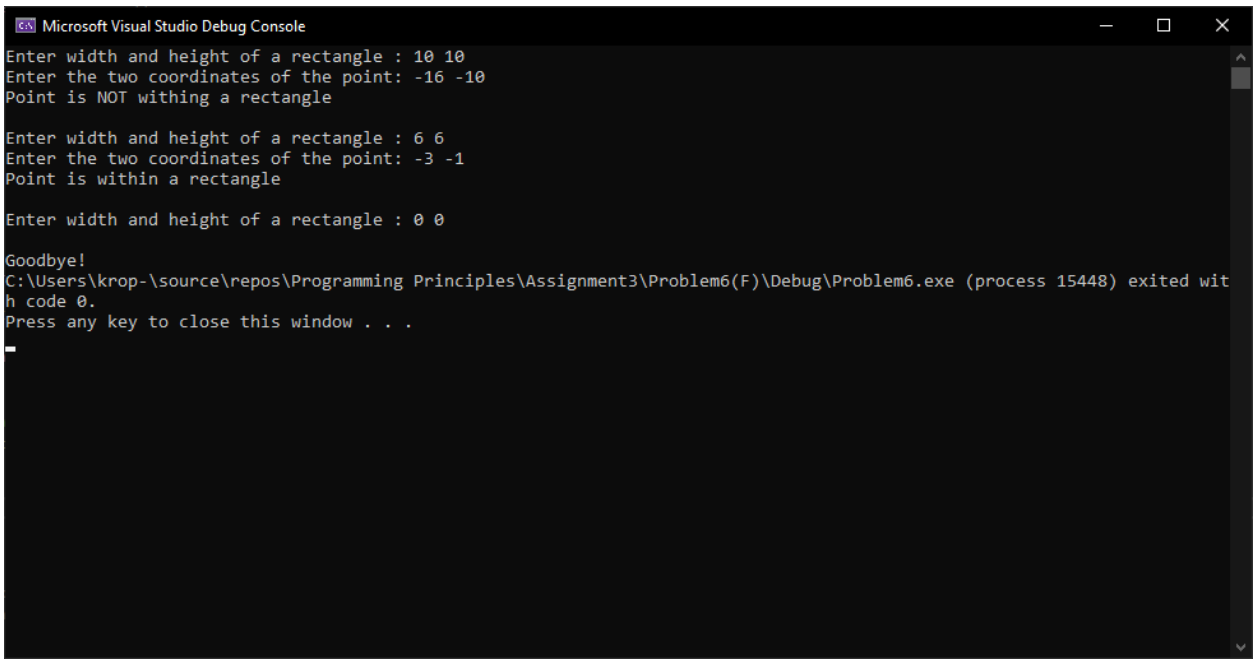
void pointInRectangle(double width, double height, double x, double y, bool &inRectangle)

Write a test program that prompts the user to enter the dimensions of a rectangle and the coordinates of a point and displays the appropriate message depending on whether or not the point is within the rectangle. The process is repeated until the user enters 0 for the width and 0 for the height. Your program should do error checking on the width and height.



Pic. 1.Try to enter integer numbers. Code compiled successfully.

Pic. 2.Try to enter negative values for rectangle. Program asks for re-entering a value. Code compiled successfully.



Pic. 3.Try to enter negative values for coordinates of point. Code compiled successfully.