Assignment – 2

CS 170 Total Points: 100

Note: Only typed submissions are accepted. **You are required to use only the coding techniques you have learned in the first 4 chapters.**

Each problem carries 20 points.

YOUR SOLUTIONS MUST BE YOUR ORIGINAL WORK. FAILURE TO DO SO WOULD RESULT IN SEVERE PENALTY.

1. See: https://y-2001.tripod.com/christian/easter.htm
   The Gregorian epact is the number of days between January 1st and the previous new moon. This value is used to figure out the date of Easter. It is calculated by these formulas (using int arithmetic):

   C = year/ /100

   epact = (8 + (C // 4)- C + ((8C + 13) // 25) + 11 (year % 19)) % 30

   Write a program that asks/prompts the user for a 4-digit year and then outputs the value of the epact.
2. Write a program to determine the length of a ladder required to reach a given height when leaned against a house. The height and angle of the ladder are given as inputs (prompt user to input these). To compute length use:

   length = height / sin (angle)

   Note: The angle must be in radians. Prompt for an angle in degrees and use this formula to convert:

   radians = (π / 180) degrees
3. A Fibonacci sequence is a sequence of numbers where each successive number is the sum of the previous two. The classic Fibonacci sequence begins: 1, 1, 2, 3, 5, 8, 13 ...
   Mathematically it is represented as:

   F(0) = 0, F(1) = 1

   F(n) = F(n – 1) + F(n – 2), for n > 1.

   Write a function 'fib()' (program) that computes the nth Fibonacci number where n is a value input by the user. For example, if n = 6, then the result is 8.
   Now extend this program by writing another function 'sum_fib()' that computes the sum of first n fibonacci numbers, again n is the input from the user. For example, if n = 5, then the result is 12.

4. Circle Intersection: Write a program that computes the intersection of a circle with a horizontal line and displays the information textually and graphically.

   Input: Radius of the circle and the y-intercept of the line.

   Output: Draw a circle centered at (0, 0) with the given radius in the graphics window with coordinates running from -10,-10 to 10,10. Draw a horizontal line across the window with the given y-intercept. Draw the two points of intersection in red. Print out the x values of the points of intersection.

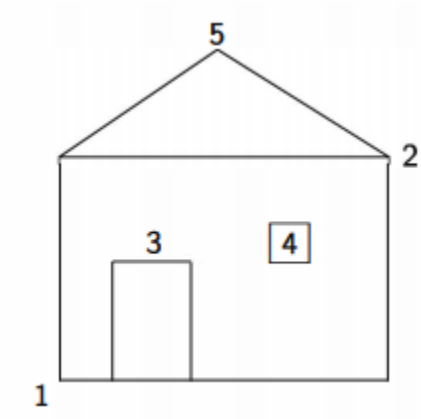
   Formula for finding corresponding x values:

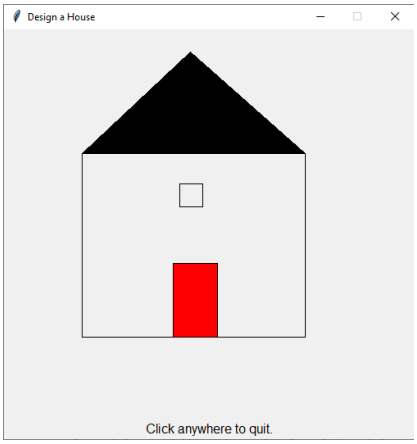
   x = $\pm\sqrt{r^2 - y^2}$

Help: First few lines of the code might look like: (You may choose not to use it)

```
from graphics import *
import math
def main():
    print("This program computes the intersection of a circle and")
    print("a horizontal line.")
    print()
    radius = float(input("Please enter the radius of the circle: "))
    y_inter = float(input("Please enter the y-intercept of the line: "))
    win = GraphWin("Circle Intersection")
    win.setCoords(-10,-10,10,10)
    # your code follows
```

5. Five-click House: You are to write a program that allows the user to draw a simple house using five mouse clicks. The first two clicks will be the opposite corners of the rectangular frame of the house. The third click will indicate the center of the top edge of a rectangular door. The door should have a total width that is $(\frac{1}{5})$ th of the width of the house frame. The sides of the door should extend from the corners of the top down to the bottom of the frame. The fourth click will indicate the center of a square window. The window is half as wide as the door. The last click will indicate the peak of the roof. The edges of the roof will extend from the point at the peak to the corners of the top edge of the house frame.





Now, ask user to perform three more clicks so that it draws an imaginary tree on the side of the house. Something like this: