MCT-242 : COMPUTER PROGRAMMING-I

using Python 3.7

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LAB 9: USER DEFINED FUNCTIONS: CLO 4

We have practiced user defined functions in previous lab. Now let's explore further possibilities in functions.

Firstly, there can be multiple functions in one program. For example, see the code here:

```
[1]     def sum(x,y):
[2]          'Calculates the sum of x and y'
[3]          return x+y
[4]     def difference(x,y):
[5]          'Calculates the difference of x and y'
[6]          return abs(x-y)
[7]     ### Main Program Starts Below ###
[8]     num1=eval(input('Enter first number:'))
[9]     num2=eval(input('Enter second number:'))
[10]    a=sum(num1,num2)
[11]    b=difference(num1,num2)
[12]    print(f'The sum of entered numbers is: {a}')
[13]    print(f'The difference of entered numbers is: {b}')
```

The execution flow of the program is line number: 8→9→10→3→10→11→6→11→12→13. Important point to note is that the variables **x** and **y** in first and second function are local **variables**. The variable **x** in first function has no effect on the variable **x** of the second function.

There is also the possibility that a function calls another function. For example:

```
[1]     def printTwice(x):
[2]          'prints the input text two times'
[3]          print(x)
[4]          print(x)
[5]     def printFourTimes(y):
[6]          'prints the input text four times'
[7]          printTwice(y)
[8]          printTwice(y)
[9]
[10]    ### Main Program Starts Below ###
[11]    printFourTimes('Hello')
[12]    print('Thanks')
```

The output of above program is:

```
Hello
Hello
Hello
```

```
Hello
Thanks
```

The execution flow of the program is as under:

11→7→3→4→7→8→3→4→8→11→12

Tasks:

[1] We created these two functions in previous lab:

```
import math
def dist(x1,y1,x2,y2):
    'Calculates Distance between points (x1,y1) & (x2,y2)'
    d=math.sqrt(((x2-x1)**2)+((y2-y1)**2))
    return d
def triAreaSides(a,b,c):
    'Calculates Area of a Triangle with sides a,b and c'
    s=(a+b+c)/2
    a=math.sqrt(s*(s-a)*(s-b)*(s-c))
    return a
```

Now create another function that will have three X-Y points as input arguments (total six input arguments) and will use the above two functions to calculate and return the area of the triangle made from those three points. The structure of the function along with the main program is given as:

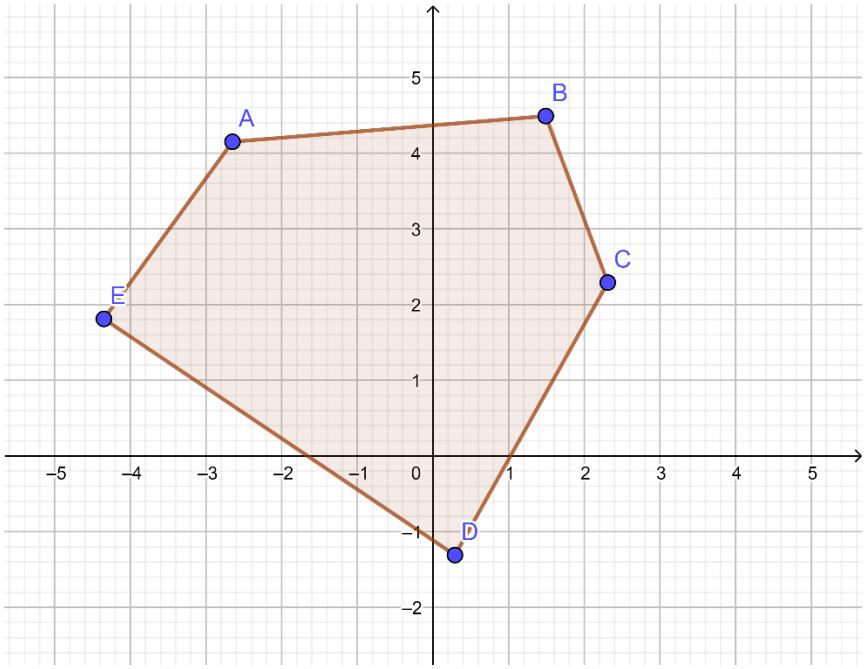
```
def triAreaPoints(x1,y1,x2,y2,x3,y3):
    'Calculates Area of a Triangle made from three points'
    #Complete the code

### Main Program Starts Below ###
x1,y1=eval(input('Enter 1st Point (Format: a,b) :'))
x2,y2=eval(input('Enter 2nd Point (Format: a,b) :'))
x3,y3=eval(input('Enter 3rd Point (Format: a,b) :'))
area=triAreaPoints(x1,y1,x2,y2,x3,y3)
print(f'The area of triangle with entered points is: {area}')
```

Consider following steps to complete the code of the function:

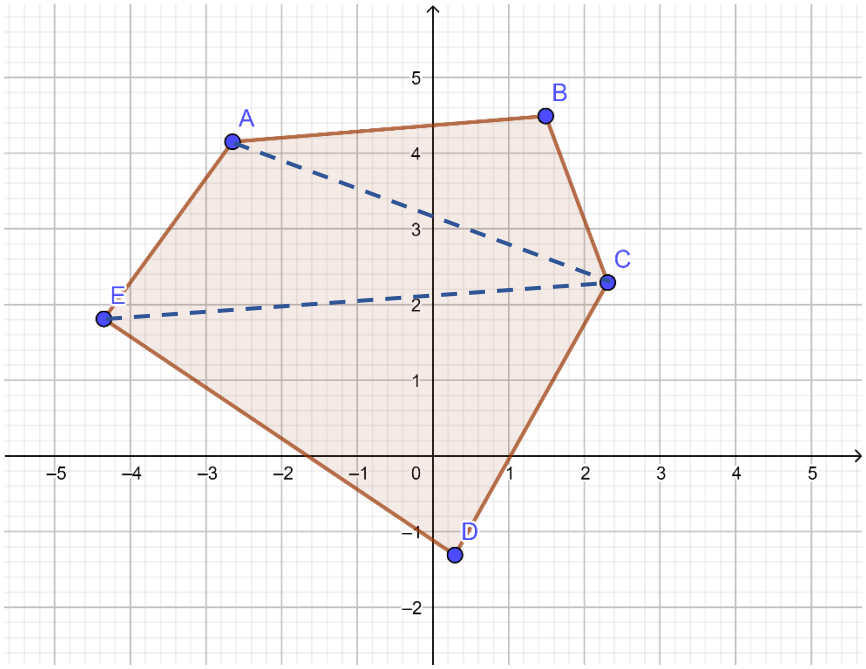
- Calculate three sides of the triangle using the **`dist`** function and provide 1st and 2nd point as input, then 1st and 3rd point and then 2nd and 3rd point. So, you will be using the function **`dist`** three times and storing the results in three variables of your choice.
- After the three sides obtained in three variables, use the function **`triAreaSides`** and provide the three variables as input.
- Return the calculated answer from above step.

[2] Area of Pentagon:

An irregular pentagon **ABCDE** is shown here:



To find the area of this pentagon, we can divide the shape into three triangles; ΔABC, ΔACE and ΔECD as shown below:



Write a program that will ask user to enter five X-Y points and will display the area of the pentagon made of those. You must do the task by creating following functions:

- **`dist`** → It will have four input arguments (2 X-Y Points) and will return the distance between them.
- **`triAreaSides`** →It will have three input arguments and will return the area of the triangle made of those three points.
- **`triAreaPoints`** → It will have six input arguments (3 X-Y Points) and will return the area of triangle made by those three points using the **`dist`** function to calculate three sides and **`triAreaSides`** to calculate the area.
- **`pentaArea`** → It will have ten input arguments (5 X-Y Points) and will return the area of the pentagon made of those points. This function will use **`triAreaPoints`** three times for the three triangle areas as explained above and will return their sum as the area of the pentagon.

The main program of the task will be as:

```
### Main Program Starts Below ###
x1,y1=eval(input('Enter 1st Point (Format: a,b) :'))
x2,y2=eval(input('Enter 2nd Point (Format: a,b) :'))
x3,y3=eval(input('Enter 3rd Point (Format: a,b) :'))
x4,y4=eval(input('Enter 4th Point (Format: a,b) :'))
x5,y5=eval(input('Enter 5th Point (Format: a,b) :'))
area=pentaArea(x1,y1,x2,y2,x3,y3,x4,y4,x5,y5)
print(f'The area of pentagon with entered points is: {area}')
```

[3] A triangle is made up of three vertices i.e. X-Y points. A fourth point can be inside or outside the triangle. Write a program that will ask user to enter four X-Y points and will display whether the fourth point lies inside the triangle made up of first three points or it lies outside.