Q.1)	Q.2)	Q.3)	Q.4)

Q.1) (20) Write a function to calculate the area of a triangle with side lengths a, b, and c. The area can be computed using the Heron's formula: $Area = \sqrt{s \times (s - a) \times (s - b) \times (s - c)}$

where $s = \frac{1}{2}(a + b + c)$. For a, b, and c to form a triangle, two conditions must be satisfied. First, all side lengths must be positive: $a > 0, b > 0, c > 0$. Second, the sum of any two side lengths must be greater than the third side length: $a + b > c$, $b + c > a$, or $a + c > b$.

```python
from math import sqrt

def get_triangle_area(a,b,c):
    if [                    ]:
        raise ValueError("All side lengths must be positive!")
    if [                    ]:
        s = [               ]
        return sqrt([               ])
    raise ValueError("This is not a valid triangle!")


print(f"get_triangle_area(4,13,15): {get_triangle_area(8,4,5)}")
```

Q.2) (45) A quadratic equation of the form

$$Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$$

with the product $ABC \neq 0$ corresponds to a conic section (parabola, ellipse, circle, or hyperbola). The type of conic section is determined by the values of the *characteristic* and the *discriminant*. The discriminant is the value $B^2 - 4AC$, and the characteristic is

$$\begin{vmatrix} A & B/2 & D/2 \\ B/2 & C & E/2 \\ D/2 & E/2 & F \end{vmatrix} = A\begin{vmatrix} C & E/2 \\ E/2 & F \end{vmatrix} - \frac{B}{2}\begin{vmatrix} B/2 & E/2 \\ D/2 & F \end{vmatrix} + \frac{D}{2}\begin{vmatrix} B/2 & C \\ D/2 & E/2 \end{vmatrix} \quad \text{where} \quad \begin{vmatrix} a & b \\ c & d \end{vmatrix} = ad - bc .$$

The resulting conic sections are classified as follows:

Discriminant	Characteristic	Type of Conic Section
0	$\neq 0$	Nondegenerate Parabola
0	0	Degenerate Parabola
<0	$\neq 0$	Nondegenerate ellipse or circle
<0	0	Degenerate Ellipse
>0	$\neq 0$	Nondegenerate Hyperbola
>0	0	Degenerate Hyperbola

```python
def get_discriminant(a,b,c):
  return b*b-4*a*c

def get_determinant(a,b,c,d):
  return a*d-b*c

def get_characteristic(A,B,C,D,E,F):
  return A * get_determinant( _____ )
    - (B/2) * get_determinant(_____ )
    + (D/2) * get_determinant(_____ )

def get_type_of_conic(A,B,C,D,E,F):
  discriminant = get_discriminant(A,B,C)
  characteritic = get_characteristic(A,B,C,D,E,F)
  if _____ :
    return "Nondegenerate Parabola"
  elif _____ :
    return "Degenerate Parabola"
  elif _____ :
    return "Nondegenerate ellipse or circle"
  elif _____ :
    return "Degenerate Ellipse"
  elif _____ :
    return "Nondegenerate Hyperbola"
  elif _____ :
    return "Degenerate Hyperbola"
```
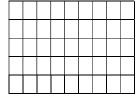
Q.3) (15) What is the output of the following script? <u>Write your answer inside the boxes</u>.

```python
def fun(t):
  a, b, c = t
  if a <= b <= c:
    return b
  elif b <= a <= c:
    return a
  else:
    return c


for u in [(7,2,4), (22,15,33), (14,15,16)]:
  print(f"fun({u}): {fun(u)}")
```

fun((7, 2, 4)): 4
fun((22, 15, 33)): 22
fun((14, 15, 16)): 15

Q.4) (20) What is the output of the following script? <u>Write your answer inside the boxes</u>.

```python
for i in range(0,5):
 for j in range(0,10):
  if 5-i <= j <= 5+i:
   print("*",end="")
  else:
   print(" ",end="")
 print()
```

```
     *    
    ***   
   *****  
  ******* 
 *********
```