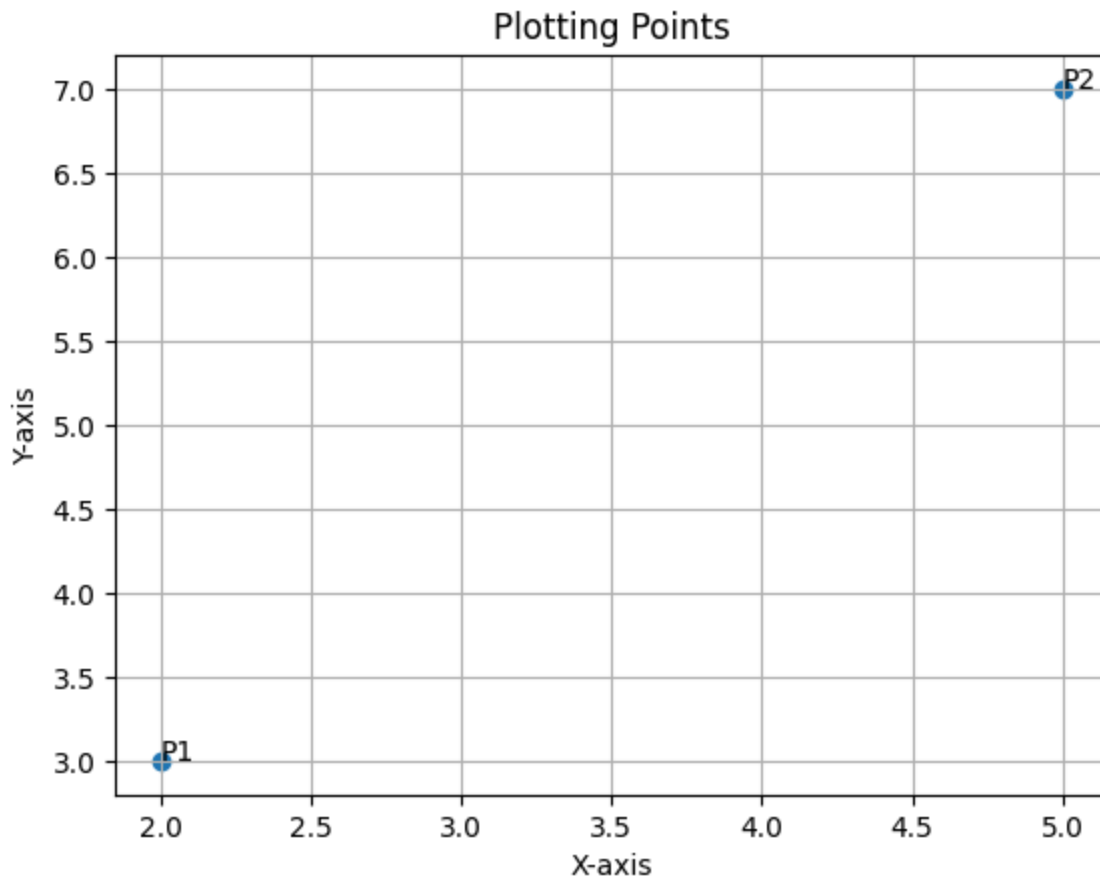# Amit Divekar | Practical 5

Plotting Geometric Shapes with SymPy and Matplotlib

```
In [1]:  import matplotlib.pyplot as plt
         from sympy import Point, Segment, Triangle, Polygon, RegularPolygon
         import numpy as np
```
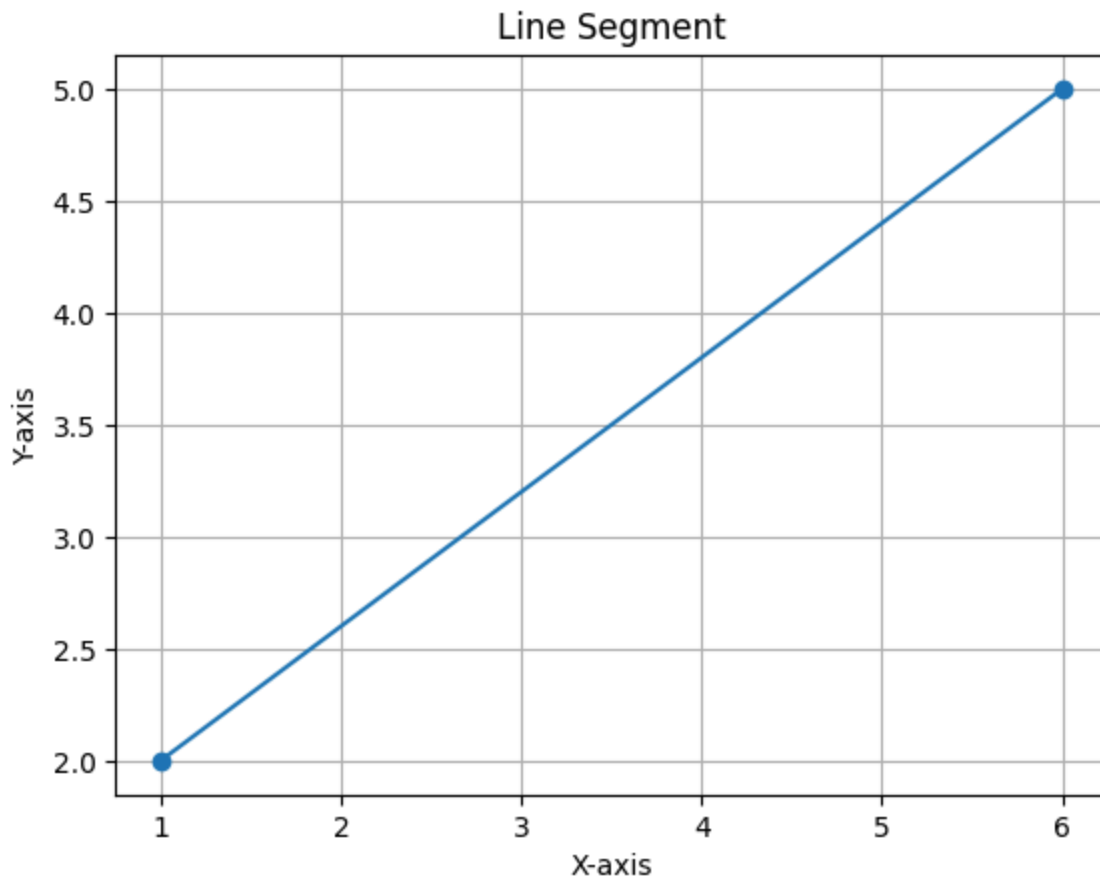
Q1. Write a Python program to plot points P1(2,3) and P2(5,7) in a 2D plane using Matplotlib and SymPy.

```
In [2]:  import matplotlib.pyplot as plt
         from sympy import Point
         P1 = Point(2, 3)
         P2 = Point(5, 7)
         x = [P1.x, P2.x]
         y = [P1.y, P2.y]
         plt.scatter(x, y)
         plt.text(P1.x, P1.y, 'P1')
         plt.text(P2.x, P2.y, 'P2')
         plt.xlabel("X-axis")
         plt.ylabel("Y-axis")
         plt.title("Plotting Points")
         plt.grid()
         plt.show()
```
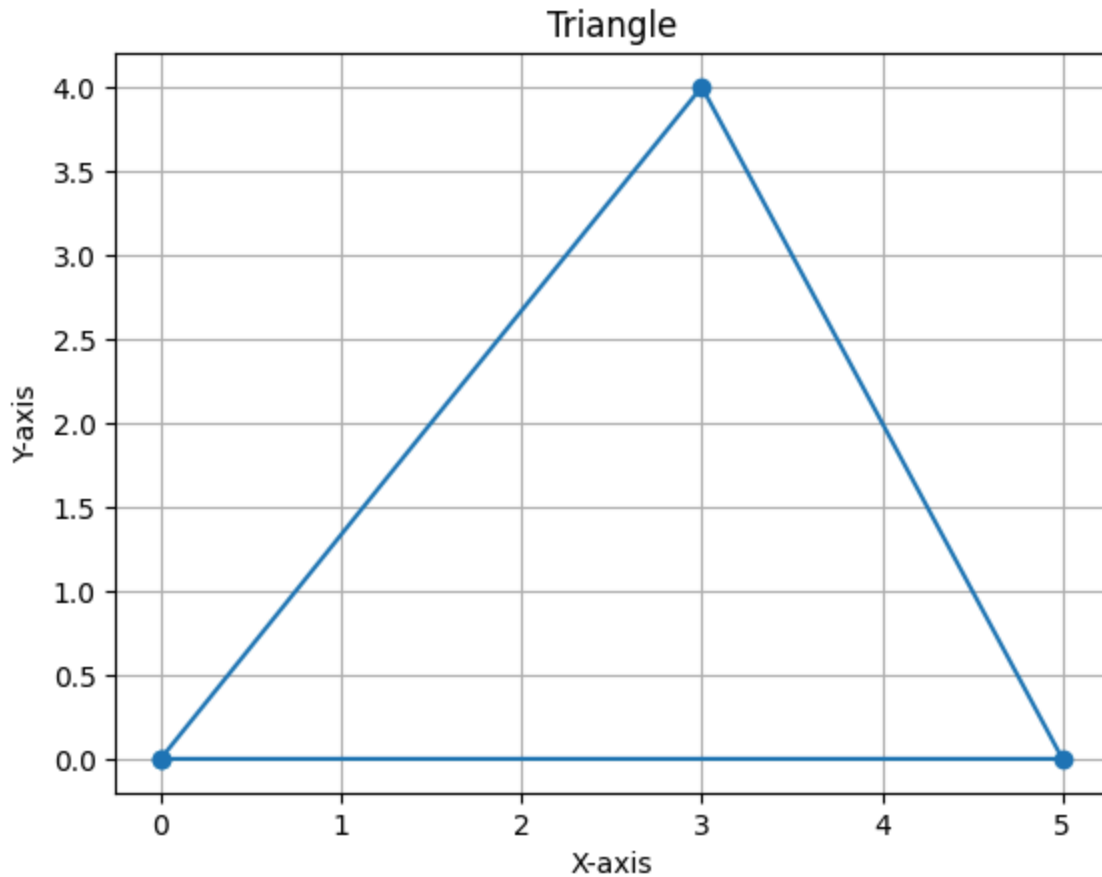
Q2. Write a Python program to plot a line segment in a 2D plane. Define two points A(1,2) and B(6,5)

```
In [3]:  import matplotlib.pyplot as plt
         from sympy import Point, Segment
         A = Point(1, 2)
         B = Point(6, 5)
         segment = Segment(A, B)
         x = [A.x, B.x]
         y = [A.y, B.y]
         plt.plot(x, y, marker='o')
         plt.xlabel("X-axis")
         plt.ylabel("Y-axis")
         plt.title("Line Segment")
         plt.grid()
         plt.show()
```
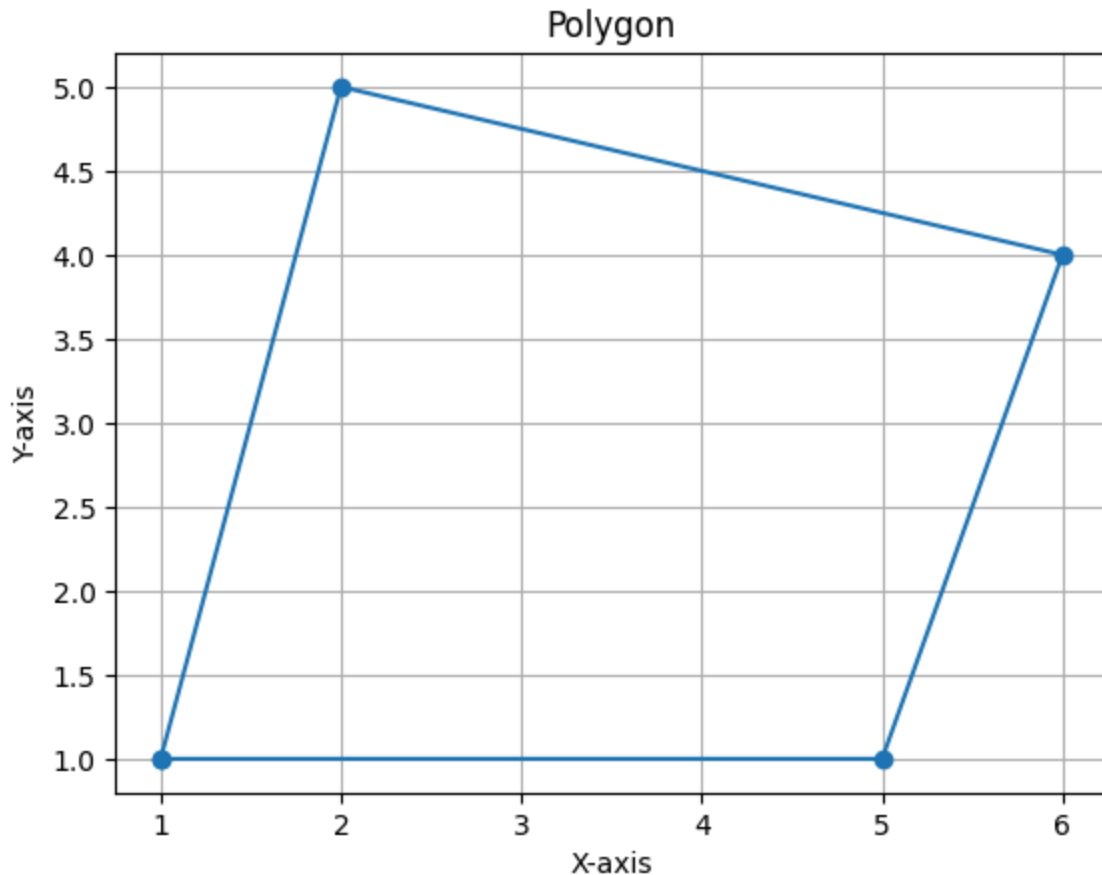
Line Segment

Q3. Write a Python program to plot a triangle in a 2D plane. Define a triangle with vertices at points (0,0), (5,0) and (3,4)

In [4]:
```python
import matplotlib.pyplot as plt
from sympy import Point, Triangle
T = Triangle(Point(0, 0), Point(5, 0), Point(3, 4))
x = [p.x for p in T.vertices] + [T.vertices[0].x]
y = [p.y for p in T.vertices] + [T.vertices[0].y]
plt.plot(x, y, marker='o')
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.title("Triangle")
plt.grid()
plt.show()
```

Triangle

Q4. Write a Python program to plot a polygon in a 2D plane. Define a polygon with vertices at points (1,1), (5,1), (6,4), and (2,5)

In [5]:
```python
import matplotlib.pyplot as plt
from sympy import Point, Polygon
P = Polygon(Point(1,1), Point(5,1), Point(6,4), Point(2,5))
x = [p.x for p in P.vertices] + [P.vertices[0].x]
y = [p.y for p in P.vertices] + [P.vertices[0].y]
plt.plot(x, y, marker='o')
plt.xlabel("X-axis")
plt.ylabel("Y-axis")
plt.title("Polygon")
plt.grid()
plt.show()
```

Polygon

Q5. Write a Python program to plot a regular polygon (hexagon) in a 2D plane. Define a regular hexagon with center at (0,0), 4 units as the circumradius, and 6 sides.

```
In [6]:  import matplotlib.pyplot as plt
         from sympy import RegularPolygon, Point
         R = RegularPolygon(Point(0,0), 4, 6)
         x = [v.x for v in R.vertices] + [R.vertices[0].x]
         y = [v.y for v in R.vertices] + [R.vertices[0].y]
         plt.plot(x, y, marker='o')
         plt.xlabel("X-axis")
         plt.ylabel("Y-axis")
         plt.title("Regular Hexagon")
         plt.grid()
         plt.show()
```

Regular Hexagon