ASSIGNMENT-2

C.RAMYA TULASI

Download all python codes from

```
https://github.com/CRAMYATULASI/
    ASSIGNMENT−2/tree/main/ASSIGNMENT
    %202/CODES
```

and latex-tikz codes from

```
https://github.com/CRAMYATULASI/
    ASSIGNMENT−2/tree/main/ASSIGNMENT
    %202
```

1 QUESTION NO-2.34

Draw GOLD such that OL = 7.5, GL = 6, GD= 6, LD = 5 and OD = 10 .

2 SOLUTION

Given,

$$OL = 7.5, GL = 6, GD = 6, LD = 5, OD = 10. \tag{2.0.1}$$

Now,

$$OL = \|\mathbf{O} - \mathbf{L}\| = 7.5 \tag{2.0.2}$$
$$GL = \|\mathbf{G} - \mathbf{L}\| = 6 \tag{2.0.3}$$
$$GD = \|\mathbf{G} - \mathbf{D}\| = 6 \tag{2.0.4}$$
$$LD = \|\mathbf{L} - \mathbf{D}\| = 5 \tag{2.0.5}$$
$$OD = \|\mathbf{O} - \mathbf{D}\| = 10 \tag{2.0.6}$$

1) We know,a quadrilateral is a polygon with 4 sides if we have four points they will not form a quadrilateral if any three points are collinear.
2) Now,let us use the above fact and consider two triangles on same base if any three points are collinear it cannot be a triangle and then given sides cannot form a quadrilateral if any three sides are collinear. $\triangle LDO$ and $\triangle LDG$ are two triangles of given quadrialateral which are on same base LD Now, we check if any three sides are collinear in two triangles. Let us consider $\triangle LDO$-

$$\|\mathbf{O} - \mathbf{L}\| + \|\mathbf{O} - \mathbf{D}\| = 7.5 + 10 = 17.5 > \|\mathbf{L} - \mathbf{D}\| \tag{2.0.7}$$
$$\|\mathbf{O} - \mathbf{D}\| + \|\mathbf{L} - \mathbf{D}\| = 10 + 5 = 15 > \|\mathbf{O} - \mathbf{L}\| \tag{2.0.8}$$
$$\|\mathbf{O} - \mathbf{L}\| + \|\mathbf{L} - \mathbf{D}\| = 7.5 + 5 = 12.5 > \|\mathbf{O} - \mathbf{D}\| \tag{2.0.9}$$

Triangle inequality is satisfied.
$\therefore$ $\triangle LDO$ can be constructed.
Similarly, Now we consider $\triangle LDG$

$$\|\mathbf{L} - \mathbf{D}\| + \|\mathbf{G} - \mathbf{L}\| = 5 + 6 = 11 > \|\mathbf{G} - \mathbf{D}\| \tag{2.0.10}$$
$$\|\mathbf{G} - \mathbf{L}\| + \|\mathbf{G} - \mathbf{D}\| = 6 + 6 = 12 > \|\mathbf{L} - \mathbf{D}\| \tag{2.0.11}$$
$$\|\mathbf{L} - \mathbf{D}\| + \|\mathbf{G} - \mathbf{D}\| = 5 + 6 = 11 > \|\mathbf{G} - \mathbf{L}\| \tag{2.0.12}$$

Triangle inequality is satisfied.
$\therefore$ $\triangle LDG$ can be constructed.
$\therefore$ Given sides form a quadrilateral.
Vertices of quadrilateral GOLD:

$$\mathbf{L} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \mathbf{D} = \begin{pmatrix} 5 \\ 0 \end{pmatrix}, \mathbf{O} = \begin{pmatrix} p \\ q \end{pmatrix}, \mathbf{G} = \begin{pmatrix} r \\ s \end{pmatrix} \tag{2.0.13}$$

Now from $\triangle LDO$

$$p = \frac{a^2 + c^2 - b^2}{2a} \tag{2.0.14}$$
$$= \frac{5^2 + 7.5^2 - 10^2}{10} \tag{2.0.15}$$
$$= -1.875 \tag{2.0.16}$$

Similarly,

$$q = \pm\sqrt{c^2 - p^2} \tag{2.0.17}$$
$$= \pm\sqrt{(7.5)^2 - (-1.875)^2} \tag{2.0.18}$$
$$= \pm 7.26 \tag{2.0.19}$$

Similarly,From $\triangle LDG$

$$r = \frac{a^2 + c^2 - b^2}{2a} \tag{2.0.20}$$
$$= \frac{5^2 + 6^2 - 6^2}{10} \tag{2.0.21}$$
$$= 2.5 \tag{2.0.22}$$

And

$$s = \pm\sqrt{c^2 - r^2} \tag{2.0.23}$$
$$= \pm\sqrt{(6)^2 - (2.5)^2} \tag{2.0.24}$$
$$= \pm 5.4 \tag{2.0.25}$$

Now, Vertices of given Quadrilateral GOLD can be written as,

$$\mathbf{L} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \mathbf{D} = \begin{pmatrix} 5 \\ 0 \end{pmatrix}, \mathbf{O} = \begin{pmatrix} p \\ q \end{pmatrix} = \begin{pmatrix} -1.875 \\ 7.26 \end{pmatrix}, \mathbf{G} = \begin{pmatrix} r \\ s \end{pmatrix} = \begin{pmatrix} 2.5 \\ 5.5 \end{pmatrix} \tag{2.0.26}$$

multlinePlot of the quadrilateral GOLD :

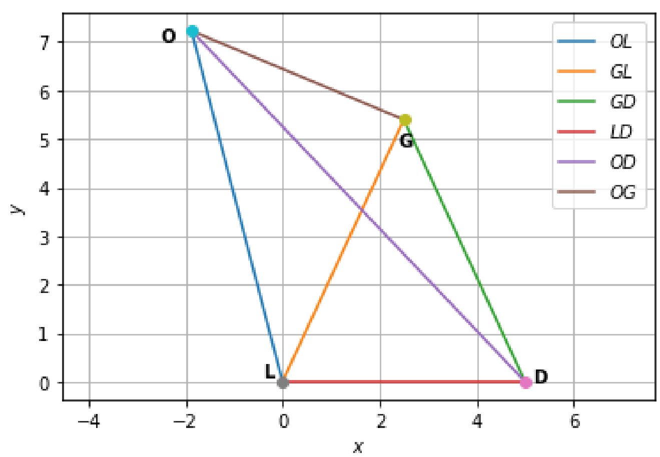

Fig. 2.1: Quadrilateral GOLD