

ASSIGNMENT-2

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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,

$$OL = 7.5, GL = 6, GD = 6, LD = 5, OD = 10. \quad (2.0.1)$$

Now,

$$OL = \|O - L\| = 7.5 \quad (2.0.2)$$

$$GL = \|G - L\| = 6 \quad (2.0.3)$$

$$GD = \|G - D\| = 6 \quad (2.0.4)$$

$$LD = \|L - D\| = 5 \quad (2.0.5)$$

$$OD = \|O - D\| = 10 \quad (2.0.6)$$

- 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 quadrilateral which are on same base LD . Now, we check if any three sides

are collinear in two triangles. Let us consider $\triangle LDO$ -

$$\|O - L\| + \|O - D\| = 7.5 + 10 = 17.5 > \|L - D\| \quad (2.0.7)$$

$$\|O - D\| + \|L - D\| = 10 + 5 = 15 > \|O - L\| \quad (2.0.8)$$

$$\|O - L\| + \|L - D\| = 7.5 + 5 = 12.5 > \|O - D\| \quad (2.0.9)$$

Triangle inequality is satisfied.

$\therefore \triangle LDO$ can be constructed.

Similarly, Now we consider $\triangle LDG$

$$\|L - D\| + \|G - L\| = 5 + 6 = 11 > \|G - D\| \quad (2.0.10)$$

$$\|G - L\| + \|G - D\| = 6 + 6 = 12 > \|L - D\| \quad (2.0.11)$$

$$\|L - D\| + \|G - D\| = 5 + 6 = 11 > \|G - L\| \quad (2.0.12)$$

Triangle inequality is satisfied.

$\therefore \triangle LDG$ can be constructed.

\therefore Given sides form a quadrilateral.

Vertices of quadrilateral GOLD:

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

Now from $\triangle LDO$

$$p = \frac{a^2 + c^2 - b^2}{2a} \quad (2.0.14)$$

$$= \frac{5^2 + 7.5^2 - 10^2}{10} \quad (2.0.15)$$

$$= -1.875 \quad (2.0.16)$$

Similarly,

$$q = \pm \sqrt{c^2 - p^2} \quad (2.0.17)$$

$$= \pm \sqrt{(7.5)^2 - (-1.875)^2} \quad (2.0.18)$$

$$= \pm 7.26 \quad (2.0.19)$$

Similarly, From $\triangle LDG$

$$r = \frac{a^2 + c^2 - b^2}{2a} \quad (2.0.20)$$

$$= \frac{5^2 + 6^2 - 6^2}{10} \quad (2.0.21)$$

$$= 2.5 \quad (2.0.22)$$

And

$$s = \pm \sqrt{c^2 - r^2} \quad (2.0.23)$$

$$= \pm \sqrt{(6)^2 - (2.5)^2} \quad (2.0.24)$$

$$= \pm 5.4 \quad (2.0.25)$$

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

$$\mathbf{L} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \mathbf{D} = \begin{pmatrix} 5 \\ 0 \end{pmatrix}, \mathbf{O} = \begin{pmatrix} p \\ q \end{pmatrix} = \begin{pmatrix} -1.875 \\ 7.26 \end{pmatrix},$$

$$\mathbf{G} = \begin{pmatrix} r \\ s \end{pmatrix} = \begin{pmatrix} 2.5 \\ 5.5 \end{pmatrix} \quad (2.0.26)$$

Plot of the Quadrilateral GOLD :

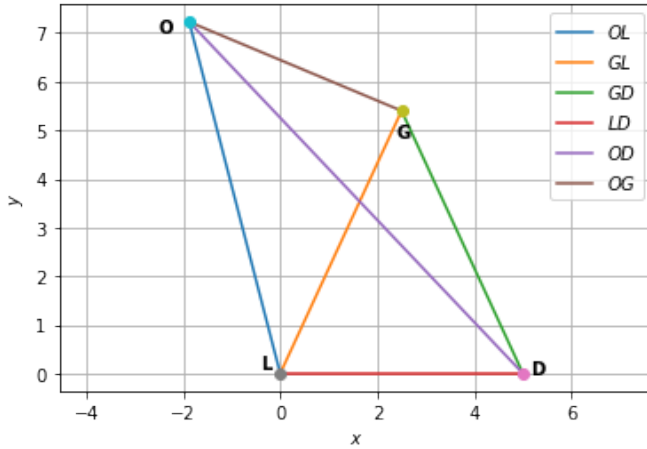


Fig. 2.1: Quadrilateral GOLD